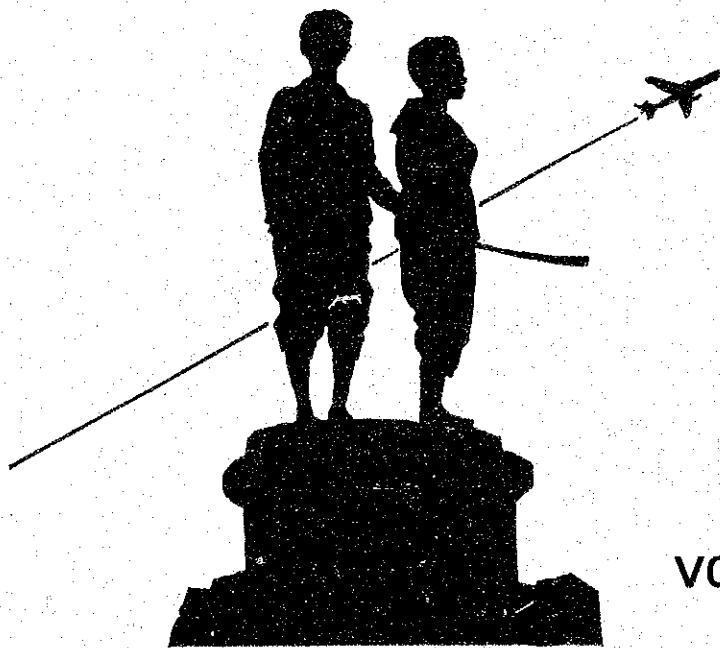


JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)
AIRPORTS AUTHORITY OF THAILAND
THE KINGDOM OF THAILAND

*The Study on Phuket International Airport
Development Plan
in the Kingdom of Thailand*



FINAL REPORT
VOLUME II: MAIN REPORT

OCTOBER 1993

JICA
AAT

THE STUDY ON PHUKET INTERNATIONAL AIRPORT
DEVELOPMENT PLAN IN THE KINGDOM OF THAILAND

FINAL REPORT
VOLUME II MAIN REPORT

OCTOBER 1993

JICA
122
757
SSF
LIBRARY
93-107(2/3)

PACIFIC CONSULTANTS INTERNATIONAL
PASCO INTERNATIONAL INC.

S S F
J R
93-107(2/3)

NOTE

The following exchange rate was adopted throughout this report :

US\$ 1.00 = Baht 25.0 = Yen 110 (February, 1993)

Baht 1.0 = Yen 4.4

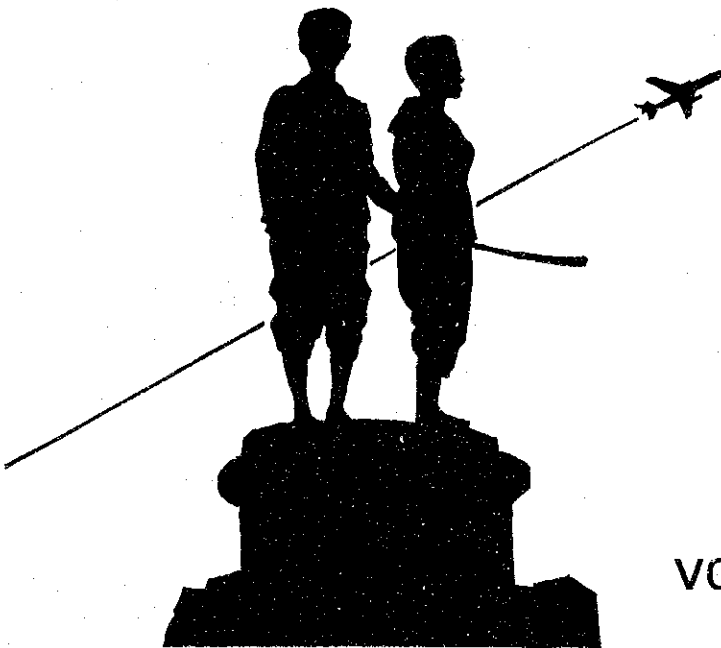
JICA LIBRARY



1111260141

JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)
AIRPORTS AUTHORITY OF THAILAND
THE KINGDOM OF THAILAND

*The Study on Phuket International Airport
Development Plan
in the Kingdom of Thailand*



FINAL REPORT
VOLUME II:MAIN REPORT

OCTOBER 1993

PACIFIC CONSULTANTS INTERNATIONAL
PASCO INTERNATIONAL INC.

国際協力事業団

25939

PREFACE

In response to a request from the Government of the Kingdom of Thailand, the Government of Japan decided to conduct the Study on Phuket International Airport Development Plan in the Kingdom of Thailand, and entrusted the study to the Japan International Cooperation Agency (JICA) .

JICA sent to Thailand a study team headed by Mr. Yoshiya Niinomi, Pacific Consultants International, four times between August 1992 and August 1993.

The team held discussions with the officials concerned of the Government of Thailand, and conducted field surveys at the study area. After the team returned to Japan, further studies were accomplished and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between the two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Thailand for their close cooperation extended to the Study Team.

October 1993



Kensuke Yanagiya

President
Japan International Cooperation Agency

October 1993

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Dear Mr. Yanagiya

Letter of Transmittal

We are pleased to submit to you the final report on the Study on Phuket International Airport Development Plan in the Kingdom of Thailand.

This study has been conducted by Pacific Consultants International in association with Pasco International Inc. based on a contract with JICA, from August 1992 to October 1993. Throughout the study, we have taken into full consideration the present situation of Phuket International Airport and have recommended that the Government of Thailand implement this project as a top priority.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs, and the Ministry of Transport in Japan. We also wish to express our deep gratitude to the officials concerned of Airports Authority of Thailand (AAT) and other authorities concerned of the Kingdom of Thailand for their close cooperation and assistance during our study.

Finally, we hope that this report will be effectively used for the development of Phuket International Airport.

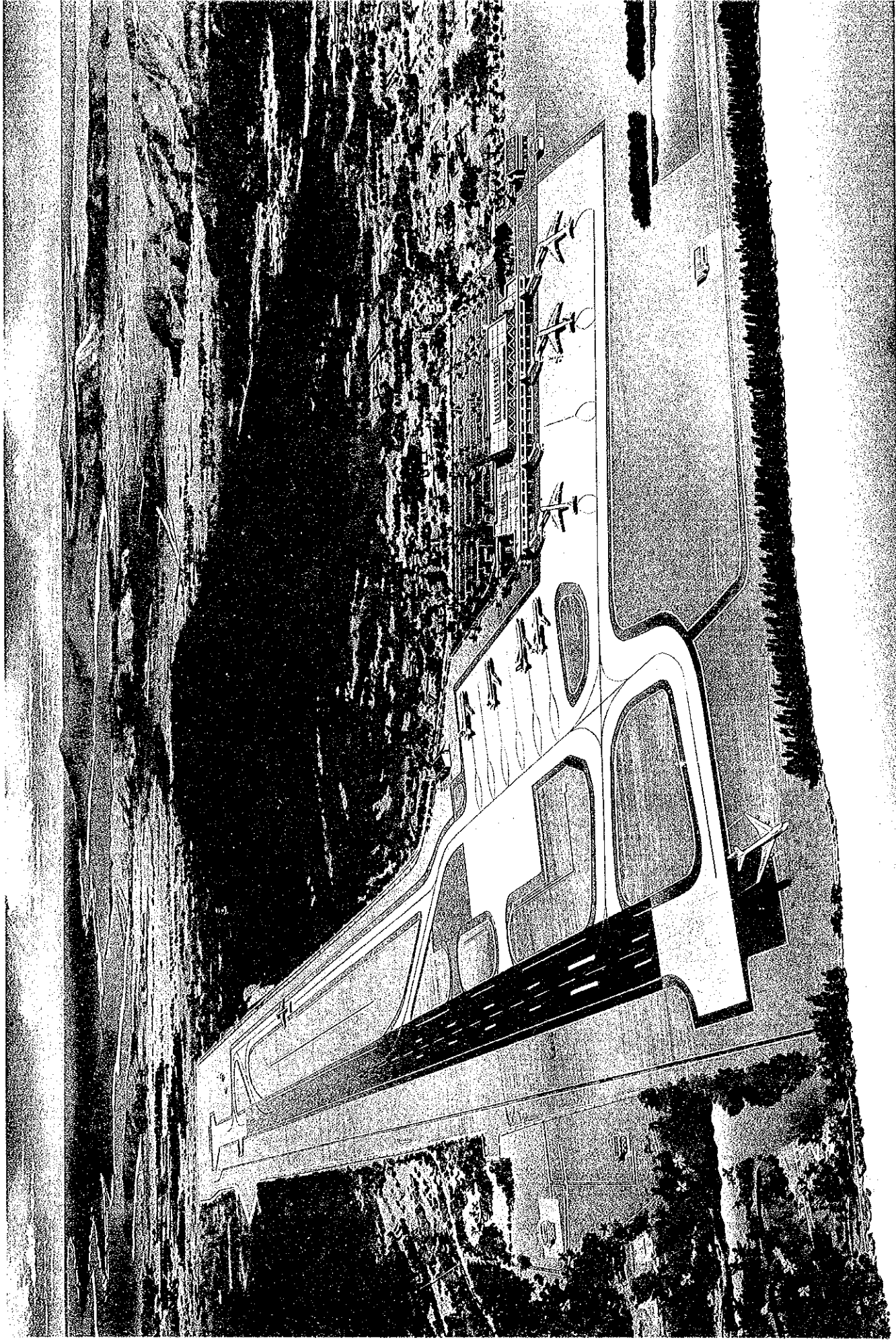
Very truly yours,


YOSHIIYA NIINOMI

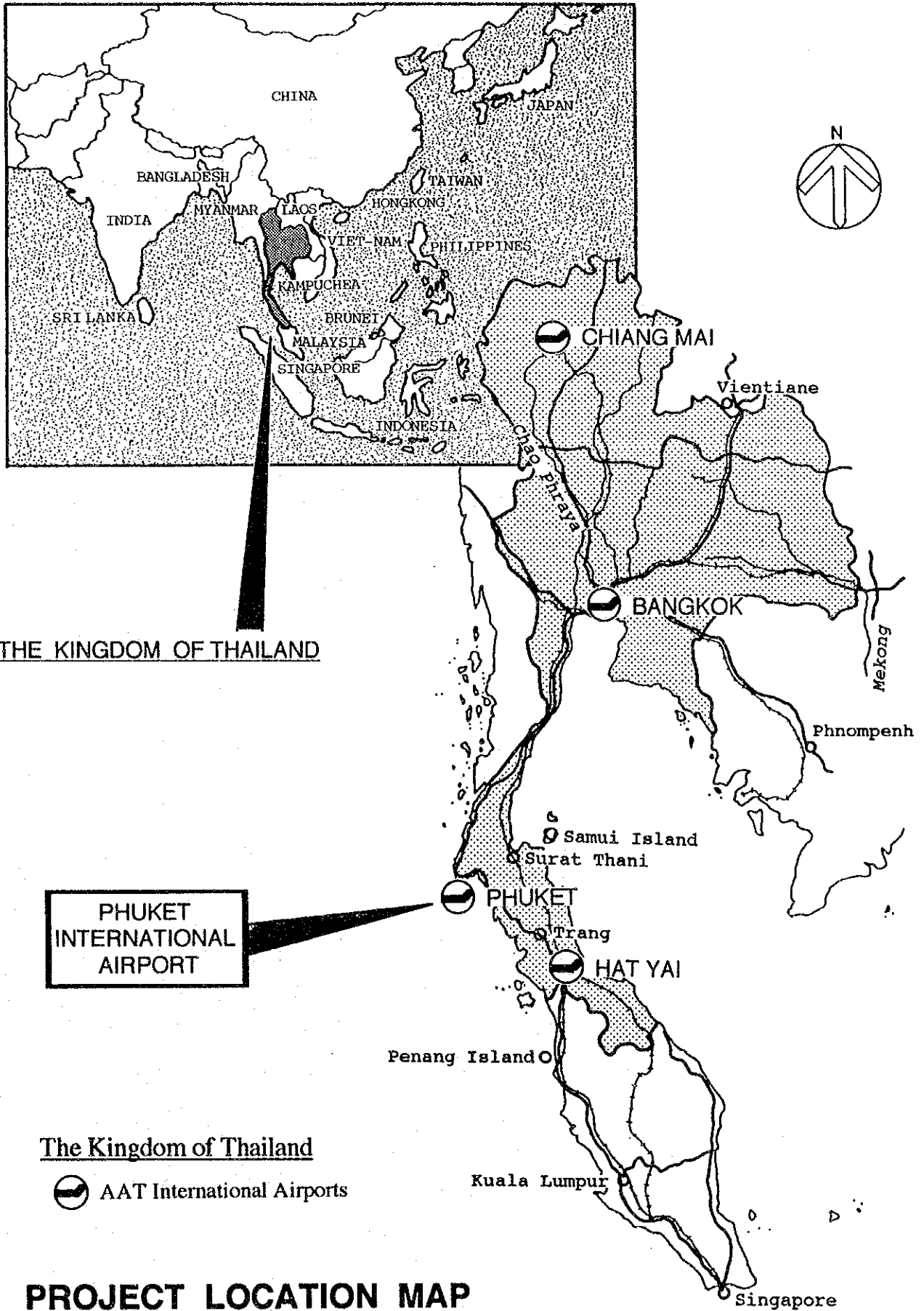
Team Leader

Phuket International Airport Development Plan

Pacific Consultants International in Association
with Pasco International Inc.



PHUKET INTERNATIONAL AIRPORT SHORT-TERM DEVELOPMENT PLAN



THE KINGDOM OF THAILAND

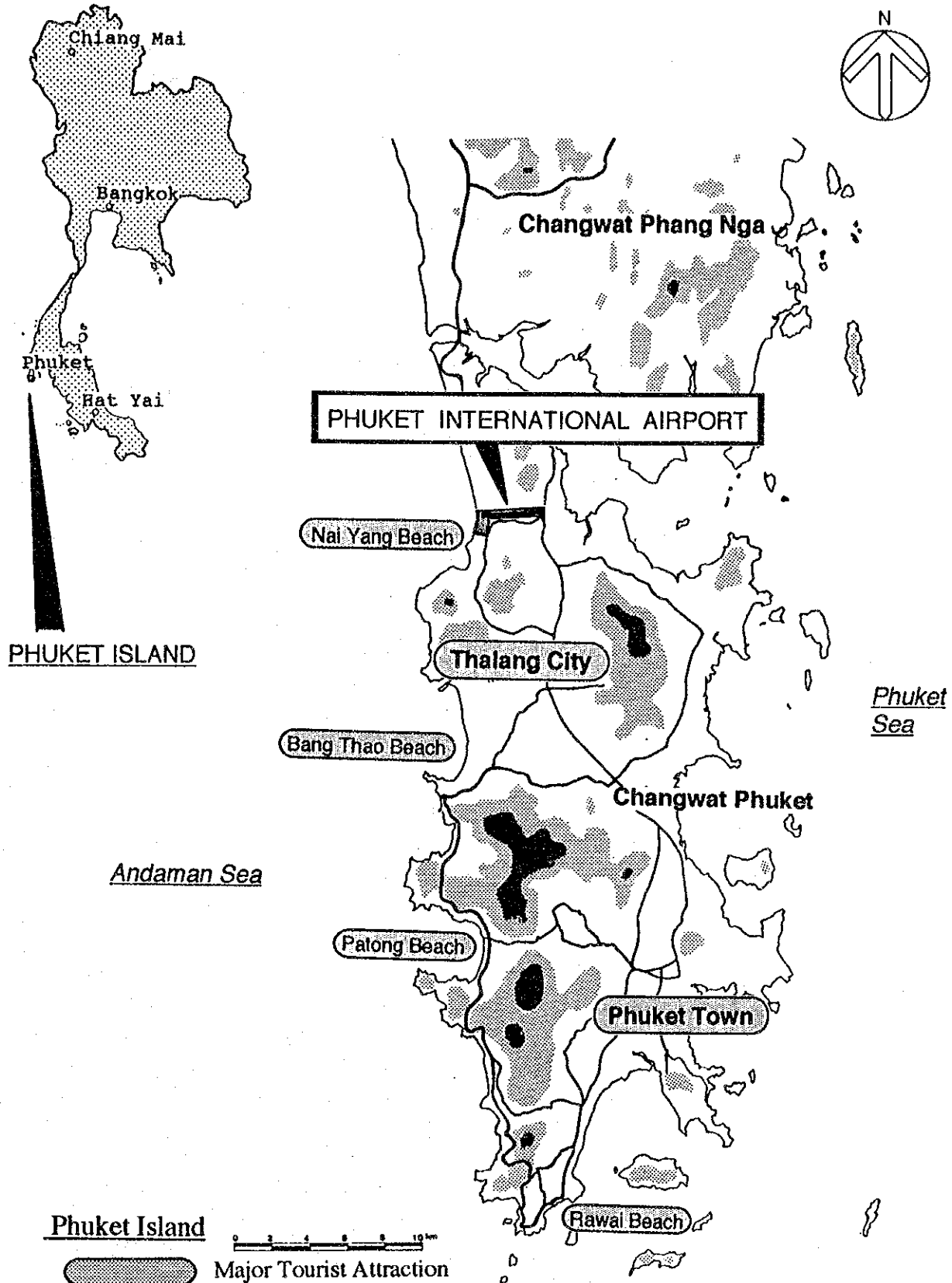
**PHUKET
INTERNATIONAL
AIRPORT**

The Kingdom of Thailand

⊖ AAT International Airports

PROJECT LOCATION MAP

(1)



PROJECT LOCATION MAP

(2)

The Kingdom of Thailand
The Study on
Phuket International Airport Development Plan
Synopsis

(1) Background and Objective of the Study

Phuket Island is an island with an area of 543 sq.km situated on the west coast of Malay Peninsula in southern Thailand. It is well known as one of the famous marine resorts not only in Thailand but also in Southeast Asia due to the abundance of nature especially with the beautiful sea.

Phuket International Airport is the gateway to this resort island, and it is located in the northern part of the island. There are many air routes operated from Phuket International Airport; domestic routes to Bangkok and other cities in Thailand, and international routes to major cities in Asia such as Singapore, Hongkong and Tokyo. Charter flights from Europe are also operated in the tourist season.

The total number of passengers to/from Phuket International Airport was 2 million in 1992; 1.3 million in domestic routes and 700 thousand in international routes. Annual growth rate of passengers in these ten years amounts to 25% for domestic and 30% for international passengers. According to the results of the demand forecast in our Study, the passenger demand is expected to continue increasing to reach 3.8 million in 2000 and 6.8 million in 2010.

In order to cope with the increasing demand, the Government of Thailand and Airports Authority of Thailand have carried out several development works since 1987 such as runway extension to 3,000 m and construction of a new passenger terminal building.

However, the necessity of airport development for safety of aircraft operation has been recognized in terms of the problems regarding the facilities which are not in compliance with international standards sufficiently such as the width of the runway strip and separation distance between the runway and the parallel taxiway. Another serious problem is regarding the terrain conditions surrounding the airport such as the existence of obstructions intruding on the obstacle limitation surfaces stipulated in ICAO standards.

The objectives of the Study are to formulate a Master Plan for long-term development of Phuket International Airport for the target year 2010 and to study the feasibility of a short-term development plan for the existing airport to be formulated within the framework of the Master Plan.

(2) Airport Master Plan for Long-Term Development

Three alternative plans including a new airport alternative described below were studied for the Phuket International Airport development for the year 2010.

- (1) Alternative-1: Expansion of the existing airport where the facilities will be expanded so as to cope with the demand in the target year

- (2) Alternative-2: Upgrading of the existing airport where the facilities will be improved so as to comply with international standards in addition to the expansion works included in Alternative-1
- (3) Alternative-3: Construction of a New Airport which will be constructed with the same capacity and same grade as Alternative-2 to replace the existing airport

Through the comparative studies of these three alternatives, Alternative-3 was selected as an optimum development plan due to the following reasons;

- The new airport shall be developed with an ideal layout of facilities and with expansibility in the future.
- The new airport shall be developed in compliance with international standards.
- There are some difficulties for future development at the existing airport such as land acquisition and large-scale earthwork.

Outline of a new airport of the selected alternative is summarized as follows:

Annual passengers:	6.8 million
	international: 3.1million
	domestic: 3.7million
Target aircraft operated:	B747 class
Major facilities:	
Runway	3,500 m x 45 m
Runway strip	3,620 m x 300 m
Taxiway	Parallel taxiway and Exit taxiways
Apron	B747 class x 4 spots
	B777 class x 3 spots
	A300 class x 2 spots
	Small aircraft x 2 spots
Passenger terminal building	Floor area: 47,000 sq.m
	Two-level, reinforced concrete
Cargo terminal building	Floor area: 1,400 sq.m
Air navigation systems	ILS(Cat-I) or MLS, VOR/DME, NDB, Approach lighting system (Cat-I), etc.
Fuel supply system	Fuel storage and apron hydrant system

(3) Short-term Development Plan

In the framework of the airport master plan, a new airport will be constructed for the long-term development of Phuket International Airport. Therefore, development of the existing airport shall be minimized only to cope with the increase of traffic demand until completion of the new airport.

The scope of the short-term development plan at the existing airport for the target year 2000 are summarized as shown below:

Runway:	Pavement overlay for structure strengthening (Length:2,280m, Average overlay thickness: 12.7cm)
Passenger Terminal Building:	Expansion (6,980 sq.m)
Road and Car Park:	Expansion of parking slots (420 slots)
Utilities:	Installation of power generator, incinerator and telephone exchanger, and construction of deep water wells
Others:	Construction of additional security fence (L = 800 m)

(4) Implementation Schedule and Project Cost of Short-Term Development Plan

Implementation schedule of the Short-term Development Plan is summarized as follows:

Financial arrangement:	First quarter of 1994
Basic and detailed design:	Second to fourth quarter of 1994
Tendering:	1995
Commencement of construction works:	Beginning of 1996
Completion of construction works:	End of 1997

Project cost of the Short-Term Development Plan is as listed below:

<u>Items</u>	<u>Cost (in Million Baht)</u>		
	Local Portion	Foreign Portion	Total
Civil works:	51	77	128
Architectural works:	81	145	226
Airport utilities:	24	33	57
Physical contingency:	16	25	41
Engineering services:	4	41	45
Total:	176	321	497

(5) Evaluation of Short-Term Development Plan

Short-term development plan is evaluated from technical, economic and environmental viewpoints.

From the technical points of view, it is evaluated that the project has no technical problems since the preliminary design has been prepared in accordance with the

technical requirements and design standards such as ICAO standards for safe and efficient operation of the traffic in the airport.

From the economic point of view, the EIRR and NPV of the Project have been estimated at 25.96 % and 295.67 million Baht respectively which are high enough to justify the Project, while the FIRR has been estimated at 12.03 % using a discount rate of 12 %. Therefore, the financial arrangement of capital costs should be considered under subsidized conditions. Increase in regional incomes through the tourist expenditures by the incremental international passengers is essential to the continuous development of the tourism sector in Phuket.

From the environmental point of view, no significant impact is evaluated to the environment surrounding the airport judging from the work items and scale of works of the short-term development works.

(6) Recommendations

- 1) National and regional consensus for the project implementation should be obtained.
- 2) The preparatory and coordination works with organizations concerned are advisable to be undertaken as soon as possible.
- 3) Financial arrangement for project implementation should be prepared.
- 4) A separate study should be carried out for selection of a new airport site in full compliance with ICAO and other international standards alongside Phuket Island including in the sea or on the adjacent mainland, since such a site has not been found in our study area.

Especially in case of a new site in the sea, following items should be studied in detail:

- Meteorological conditions such as wind direction and velocity
- Marine conditions such as tidal current, wave height, etc.
- Environmental conditions in the reclamation area

TABLE OF CONTENTS

	Page
PREFACE	
PROJECT LOCATION MAP	
SYNOPSIS	
CHAPTER 1 INTRODUCTION	
1.1 Background.....	1- 1
1.2 Objectives of the Study.....	1- 2
1.3 Scope of the Study.....	1- 2
1.4 Study Organization.....	1- 4
1.5 Activities of the Study Team	1- 5
1.6 Organization of Interim Report (2).....	1- 9
CHAPTER 2 NATURAL AND SOCIO-ECONOMIC ENVIRONMENT	
2.1 General	2- 1
2.2 Natural Conditions.....	2- 1
2.3 Socio-economic Conditions.....	2- 5
2.4 Tourism	2-14
2.5 Air Transportation.....	2-24
2.6 Other Transport.....	2-38
2.7 Environment.....	2-44
CHAPTER 3 EXISTING AIRPORT AND SURROUNDINGS	
3.1 General	3- 1
3.2 Airport History	3- 4
3.3 Airport Inventory.....	3- 5
3.4 Air Traffic Characteristics.....	3-10
3.5 Meteorological Conditions.....	3-15
3.6 Airport Management	3-17
3.7 Security.....	3-20
3.8 Present Development Works.....	3-20

CHAPTER 4 AIR TRAFFIC DEMAND FORECAST

4.1	General	4- 1
4.2	Development Plan.....	4- 2
4.3	Planning Framework	4- 7
4.4	Air Traffic Demand Forecast.....	4-10
4.5	Breakdown into Design Basis.....	4-33

CHAPTER 5 AIRPORT FACILITY REQUIREMENTS

5.1	General	5- 1
5.2	Runway and Runway Strip.....	5- 1
5.3	Obstacle Limitation Surfaces.....	5- 3
5.4	Taxiway and Apron.....	5- 4
5.5	Passenger Terminal Building and Other Buildings.....	5- 6
5.6	Car Park and Passenger Building Curb	5- 8
5.7	Air Navigation Systems	5- 9
5.8	Rescue and Fire Fighting Services.....	5-10
5.9	Airport Utilities.....	5-11
5.10	Other Facilities and Services.....	5-12

CHAPTER 6 EVALUATION OF EXISTING AIRPORT

6.1	General	6- 1
6.2	Runway and Runway Strip.....	6- 9
6.3	Taxiway and Apron.....	6-12
6.4	Airfield Pavement	6-13
6.5	Drainage.....	6-14
6.6	Passenger Terminal Building	6-16
6.7	Cargo Terminal Building.....	6-26
6.8	Control Tower Building.....	6-26
6.9	Fire Station Building.....	6-29
6.10	Access Road and Car Parking.....	6-29
6.11	Airspace Use.....	6-30
6.12	Obstacle Limitation Surfaces.....	6-36
6.13	Air Navigation Systems	6-43
6.14	Rescue and Fire Fighting Services.....	6-55
6.15	Airport Utilities.....	6-56
6.16	Fuel Supply System	6-58

CHAPTER 7	BASIC DEVELOPMENT POLICY FOR AIRPORT MASTER PLANNING	
7.1	Objective of Airport Master Plan	7- 1
7.2	Target Year.....	7- 1
7.3	Concept of Development Alternatives.	7- 1
CHAPTER 8	SELECTION OF NEW AIRPORT SITE	
8.1	General	8- 1
8.2	Requirement for New Airport Sites.....	8- 1
8.3	Background of the Study Area	8- 3
8.4	Evaluation Criteria	8- 5
8.5	Selection of Alternative Sites	8- 9
8.6	Selection of a New Airport Site	8-19
CHAPTER 9	ALTERNATIVE AIRPORT MASTER PLAN	
9.1	Work Items for Each Alternative	9- 1
9.2	Alternatives for Existing Airport Development	9- 3
9.3	Alternative for New Airport Development	9-13
CHAPTER 10	AIRSPACE USE PLAN	
10.1	General	10- 1
10.2	Existing Airport	10- 1
10.3	New Airport	10-16
CHAPTER 11	ENVIRONMENTAL CONSIDERATIONS	
11.1	General	11- 1
11.2	Existing Conditions in Phuket.....	11- 1
11.3	Existing Condition at Airport Sites.....	11- 6
11.4	Environmental Evaluation.....	11-65
CHAPTER 12	AIRCRAFT NOISE ANALYSIS	
12.1	General	12- 1
12.2	Aircraft Noise Contours.....	12- 1
12.3	Evaluation of Noise Influence	12- 5

CHAPTER 13	AIRPORT MASTER PLAN	
13.1	Selection of Optimum Alternatives.....	13- 1
13.2	Airport Master Plan.....	13- 8
CHAPTER 14	SCOPE OF THE SHORT-TERM DEVELOPMENT PLAN	
14.1	General.....	14- 1
14.2	Construction Work Items for Short-Term Development Plan	14- 1
CHAPTER 15	PRELIMINARY DESIGN	
15.1	General.....	15- 1
15.2	Civil Works.....	15- 4
15.3	Architectural Works.....	15-12
15.4	Airport Utilities.....	15-21
CHAPTER 16	AIRPORT MANAGEMENT STUDY	
16.1	General.....	16- 1
16.2	Organization and Number of Staff.....	16- 1
16.3	Evaluation of Present Airport Management.....	16- 2
CHAPTER 17	ENVIRONMENTAL IMPACT ASSESSMENT	
17.1	General.....	17- 1
17.2	Environmental Evaluation.....	17- 1
CHAPTER 18	AIRCRAFT NOISE ANALYSIS (PRESENT AND YEAR 2000)	
18.1	General.....	18- 1
18.2	Aircraft Noise Contours.....	18- 1
18.3	Evaluation of Noise Influence.....	18- 2
CHAPTER 19	PROJECT IMPLEMENTATION SCHEDULE AND COST ESTIMATES	
19.1	General.....	19- 1
19.2	Project Implementation Schedule.....	19- 1
19.3	Project Cost Estimates.....	19- 3

CHAPTER 20 FINANCIAL AND ECONOMIC ANALYSIS

20.1 General	20- 1
20.2 Methodology of the Analysis	20- 1
20.3 Financial Analysis.....	20- 6
20.4 Economic Analysis.....	20-15

CHAPTER 21 CONCLUSIONS AND RECOMMENDATIONS

21.1 Conclusions.....	21- 1
21.2 Recommendationas	21- 2

LIST OF ABBREVIATIONS

AAT	:	Airports Authority of Thailand
A300	:	Airbus 300
AEROTHAI	:	Aeronautical Radio of Thailand Ltd.
AFFF	:	Aqueous Film Forming Foam
AFL	:	Airfield Lighting
AFTN	:	Aeronautical Fixed Telecommunication Network
AIP	:	Aeronautical Information Publication
ALS	:	Approach Lighting System
ALT	:	Altitude
AMSL	:	Above Mean Sea Level
APP	:	Approach Control Office
ASEAN	:	Association of Southeast Asian Nations
ATC	:	Air Traffic Control
ATS	:	Air Traffic Services
ATZ	:	Aerodrome Traffic Zone
AZ	:	Azimuth Antenna (MLS)
B737	:	Boeing 737
B747	:	Boeing 747
B767	:	Boeing 767
B/C	:	Benefit Cost Ratio
BKK	:	Bangkok
CBR	:	California Bearing Ratio
CCR	:	Constant Current Regulator
CIP	:	Commercial Important Person
CIQ(S)	:	Customs, Immigration, Quarantine (and Security)
CTB	:	Cargo Terminal Building
CTR	:	Control Zone
CVOR	:	Conventional VHF Omni-Directional Radio Range
DC10	:	McDonnell Douglas 10
DMD	:	Deputy Managing Director
DME	:	Distance Measuring Equipment
DOA	:	Department of Aviation
DOM	:	Domestic
DVOR	:	Doppler VHF Omni-Directional Radio Range
EIA	:	Environmental Impact Assessment
EIRR	:	Economic Internal Rate of Return
EL	:	Elevation Antenna (MLS)
FAA	:	Federal Aviation Administration of the United States
FIC	:	Flight Information Center
FIR	:	Flight Information Region
FIS	:	Flight Information Service
FSS	:	Flight Service Station
GDP	:	Gross Domestic Product
GP	:	Glide Path Antenna (ILS)
GPP	:	Gross Provincial Product
GSE	:	Ground Service Equipment
HF	:	High Frequency
HTY	:	Hat Yai
IATA	:	International Air Transport Association
ICAO	:	International Civil Aviation Organization
ILS	:	Instrument Landing System

IM	:	Inner Marker
IMC	:	Instrument Meteorological Condition
IWDI	:	Illuminated Wind Direction Indicator
JCAB	:	Japan Civil Aviation Bureau
JICA	:	Japan International Cooperation Agency
KHz	:	Kilo Hertz
LLZ	:	Localizer Antenna (ILS)
MD-11	:	McDonnell Douglas 11
MHz	:	Mega Hertz
MLS	:	Microwave Landing System
MM	:	Middle Marker
MOTC	:	Ministry of Transport and Communications
NDB	:	Non Directional Radio Beacon
NEB	:	National Environmental Board
NESDB	:	National Economic and Social Development Board
NESDP	:	National Economic and Social Development Plan
NM	:	Nautical Mile
NPV	:	Net Present Value
OAS	:	Obstacle Assessment Surface
OECF	:	Overseas Economic Cooperation Fund
OIS	:	Obstacle Identification Surface
OLS	:	Obstacle Limitation Surface
PAPI	:	Precision Approach Path Indicator
PABX	:	Private Automatic Branch Exchange
PCN	:	Pavement Classification Number
P-DME	:	Precision Distance Measuring Equipment
PEA	:	Provincial Electricity Authority
PG	:	Bangkok Airways
PTB	:	Passenger Terminal Building
QNE	:	The barometric pressure used for the standard altimeter setting (29.92 inches Ug)
QNH	:	Altimeter sub-scale setting to obtain elevation when on the ground
QNU	:	The barometric pressure as used by a particular station
RIV	:	Rapid Intervention Vehicle
RWY 09	:	Runway 09
RWY 27	:	Runway 27
RX	:	Receiver
SALS	:	Simple Approach Lighting System
SID	:	Standard Instrument Departure
SSB	:	Single Side Band
TAT	:	Tourism Association of Thailand
TG	:	Thai Airways International
TKOF	:	Take-Off
TMA	:	Terminal Control Area
TWR	:	Aerodrome Control Tower
TX	:	Transmitter
USA	:	United States of America
VASIS	:	Visual Approach Slope Indication System
VFR	:	Visual Flight Rule
VHF	:	Very High Frequency
VIP	:	Very Important Person
VMC	:	Visual Meteorological Condition
WECPNL	:	Weighted Equivalent Continuous Perceived Noise Level

LIST OF TABLES

	Page
Table 1.5.1	Activities of the Study Team 1 - 8
Table 2.2.1	Climate for Selected Meteorological Stations in 1988..... 2 - 3
Table 2.2.2	Temperature, Rainfall and Humidity of Phuket by Month (1988 - 1990)..... 2 - 4
Table 2.3.1	Population and Population Density of Thailand (1980 and 1990)..... 2 - 6
Table 2.3.2	Population of Phuket Changwat by Amphoe (1981 - 1991) 2 - 6
Table 2.3.3	Major Economic Indicators of Thailand (1980 - 1993) 2 - 9
Table 2.3.4	GPP of Phuket, GRP of Southern Region and GDP of Whole Kingdom at constant prices of 1972 (1981-1990)..... 2 - 10
Table 2.3.5	GDP of Phuket Changwat, Southern Region and Whole Kingdom by Industrial Origin, 1989..... 2 - 11
Table 2.3.6	Change in GPP Structure of Phuket Changwat (1981 - 1989)..... 2 - 12
Table 2.3.7	Land Utilization in Phuket and Southern Region (1983 and 1988).... 2 - 13
Table 2.3.8	Production of Rubber and Coconut in Phuket and Southern Region (Crop year 1984/85 and 1987/88)..... 2 - 13
Table 2.3.9	Tin Mining in Phuket..... 2 - 13
Table 2.4.1	Main Exports of Goods and Services 2 - 14
Table 2.4.2	International Tourist Arrivals in ASEAN Countries (1981 - 1989).... 2 - 15
Table 2.4.3	Revenue from International Tourism, 1990 2 - 15
Table 2.4.4	International Tourist Arrivals and Tourism Revenue in Thailand (1970 - 1991) 2 - 16
Table 2.4.5	Number of Accommodation Establishments, Rooms and Guest Arrivals to Five Major Cities (1986-1990) 2 - 17
Table 2.4.6	Accommodation Establishments and Number of Rooms in Phuket, 1991..... 2 - 21
Table 2.4.7	Tourist Arrivals by Nationality, 1990..... 2 - 21
Table 2.4.8	Guest Arrivals to Accommodation Establishments in Phuket by nationality and Month, 1990 2 - 23
Table 2.4.9	Purpose of Travel, 1990..... 2 - 22
Table 2.5.1	Airport Classification..... 2 - 26
Table 2.5.2	Top Ten Airlines serving Bangkok International Airport by International Aircraft Movement, 1991 2 - 27
Table 2.5.3	International Aircraft Movements and Airlines in Services at Chiang Mai, Hat Yai and Phuket International Airports, 1991..... 2 - 27
Table 2.5.4	International Air Services at Phuket International Airport 2 - 29
Table 2.5.5	Domestic Air Services at Phuket International Airport 2 - 31
Table 2.5.6	Fleet for Thai Airways International as of September, 1992 2 - 33
Table 2.5.7	Air Traffic in Thailand, 1991..... 2 - 34
Table 2.5.8	Number of Passengers at the Four International Airports 2 - 36
Table 2.5.9	Domestic Passengers and Freight..... 2 - 37
Table 2.6.1	International tourist Arrivals to Thailand by Mode of Transport 2 - 38
Table 2.6.2	International Tourist Arrivals to Thailand by Nationality and Mode of Transport, 1990 2 - 40
Table 2.6.4	Fare and Traveling Time between Bangkok and Phuket..... 2 - 39
Table 2.6.3	Immigration Record in Phuket Island by Mode of Transport (Oct 1991 - Sep. 1992) 2 - 39
Table 2.7.1	Types and Sizes of Projects or Activities Requiring EIA Reports 2 - 47
Table 3.3.1	Inventory of Phuket International Airport 3 - 5

Table 3.4.1	Aircraft Movement at Phuket International Airport by Year	3 - 12
Table 3.4.2	Aircraft Movement at Phuket International Airport by Month	3 - 13
Table 3.4.3	Load Factor (Passengers Average) by Type of Aircraft (1990 and 1991).....	3 - 14
Table 3.5.1	Wind Coverage.....	3 - 15
Table 3.5.2	Income Statements of AAT.....	3 - 19
Table 3.8.1	Major Development Works.....	3 - 21
Table 4.2.1	Major Development Targets of 7th NESDP	4 - 3
Table 4.2.2	Projection for Guest Arrivals to Phuket.....	4 - 6
Table 4.3.1	Population Forecast	4 - 7
Table 4.3.2	National Economic Framework (Whole Kingdom)	4 - 8
Table 4.3.3	Provincial Economic Framework of Phuket Changwat.....	4 - 8
Table 4.3.4	Projection for Annual Growth Rate of GDP by Region	4 - 9
Table 4.4.1	Results of Demand Forecast	4 - 10
Table 4.4.2	Previous Air Traffic Forecasts of International Passengers and International Freights for Bangkok International Airport.....	4 - 11
Table 4.4.3	Route of Access to Phuket International Airport.....	4 - 13
Table 4.4.4	International Passenger by Market Segment (1983-1990).....	4 - 18
Table 4.4.5	Parameter and Coefficient of Determination (R2).....	4 - 17
Table 4.4.6	Forecast for International Passengers From/To Thailand (1991-2010).....	4 - 20
Table 4.4.7	Projected Average Annual Growth Rate of International Passengers From/To Thailand (1991-2010).....	4 - 20
Table 4.4.8	Parameter and Coefficient of Determination (R2).....	4 - 23
Table 4.4.9	Forecast for Domestic Air Passengers Determination (R2).....	4 - 23
Table 4.4.10	Foreign Guest Arrivals to Accommodation in Phuket by Region of Nationality, 1990.....	4 - 24
Table 4.4.11	Air Passengers by Region of Nationality at Phuket International Airport, 1990.....	4 - 25
Table 4.4.12	Forecast for Total Air Passengers From/To Phuket International Airport (1991-2010).....	4 - 26
Table 4.4.13	Projected Average Annual Growth Rate of Total Air Passengers From/To Phuket International Airport (1991-2010)	4 - 26
Table 4.4.14	Forecast for International and Domestic Passengers From/To Phuket International Airport (1991-2010)	4 - 28
Table 4.4.15	International and Domestic Freights From/To Thailand (1983-1990).....	4 - 30
Table 4.4.16	Parameter and Coefficient of Determination (R2).....	4 - 30
Table 4.4.17	Forecast for International and Domestic Air Freights From/To Thailand(1991-2010).....	4 - 31
Table 4.4.18	Estimated Future GDP and Share of Phuket	4 - 31
Table 4.4.19	Forecast for International and Domestic Freights From/To Phuket(1991-2010).....	4 - 32
Table 4.5.1	Share of Nationality of Tourist and Air Passenger	4 - 35
Table 4.5.2	Demand for London, Paris and Zurich Routes.....	4 - 35
Table 4.5.3	Assumed Demand for Direct Routes from Europe.....	4 - 36
Table 4.5.4	Annual Passengers by Route.....	4 - 37
Table 4.5.5	Summary of Air Traffic Demand Forecast.....	4 - 40
Table 4.5.6	Typical Week Traffic by Route (Year 2000)	4 - 41
Table 4.5.7	Typical Week Traffic by Route (Year 2010)	4 - 42
Table 5.1.1	Summary of Airport Facility Requirements	5 - 2
Table 5.2.1	Aerodrome Reference Code and Operational Category	5 - 1
Table 5.2.2	Required Runway Length	5 - 3
Table 5.4.1	Number of Aircraft Stands	5 - 6
Table 5.4.2	Size of Aircraft Stands	5 - 6
Table 5.5.1	Required Floor Area of Passenger Terminal Buildings.....	5 - 7

Table 5.5.2	Required Floor Area of Cargo Terminal Building	5 - 7
Table 5.6.1	Required Number of Parking Slots and Carpark Area	5 - 8
Table 5.6.2	Required Length of Passenger Building Curb	5 - 8
Table 5.8.1	Requirements of Rescue and Fire Fighting Services	5 - 11
Table 5.9.1	Unit Utility Demand	5 - 11
Table 5.9.2	Airport Utility Demands	5 - 12
Table 5.10.1	Requirements for Aviation Fuel Storage and Fuel Depot Area	5 - 12
Table 6.1.1	Summary of Evaluation of Existing Airport	6 - 3
Table 6.1.2	Comparison of Existing Facility Characteristics with ICAO Recommendation	6 - 7
Table 6.1.3	Existing Facilities and Aircraft Possible to be Operated.....	6 - 8
Table 6.1.4	Comparison of Capacity and Demand of Existing Facilities.....	6 - 8
Table 6.1.5	Obstacle Limitation Surfaces (OLS) and Obstructions	6 - 9
Table 6.2.1	Runway Usability Factor	6 - 10
Table 6.4.1	Airfield Pavement.....	6 - 14
Table 6.6.1	Comparison of Total Floor Area.....	6 - 21
Table 6.11.1	Dimension of Bangkok Flight Information and Area of Responsibility.....	6 - 32
Table 6.11.2	Dimension of Danger Areas of VT D59 and VT D61	6 - 33
Table 6.12.1	Dimension and Slopes of Obstacle Limitation Surfaces for Approach Runways	6 - 37
Table 6.12.2	Dimension and Slopes of Obstacle Limitation Surfaces for Take- Off Runways.....	6 - 42
Table 6.13.1	Inventory List.....	6 - 47
Table 8.4.1	Dimension of Take-off Climb Area and Obstacle Limitation Surfaces for Take-off	8 - 5
Table 8.5.1	Evaluation of Airport Sites	8 - 12
Table 8.5.2	Comparison of Alternative Airport Sites.....	8 - 22
Table 9.1.1	Work Items for Alternatives-1, 2 and 3.....	9 - 1
Table 9.2.1	Comparison of Runway Extension Alternatives	9 - 4
Table 9.2.2	Comparative Evaluation of Runway Extension for Alternative-2.....	9 - 9
Table 9.2.3	Alternatives for Improvement of the Separation Distance between Runway and Taxiway.....	9 - 11
Table 10.2.1	Assessment of Obstacles within OAS for Runway 27 of Alternative 1 at Phuket International Airport	10 - 6
Table 10.2.2	OCH/A for Precision Approach Category I to Runway 27.....	10 - 7
Table 10.2.3	Assessment of Obstacles within OAS for Runway 27 of Alternative 2 at Phuket International Airport	10 - 11
Table 10.2.4	OCH/A for Precision Approach Category I to Runway 27.....	10 - 12
Table 10.2.5	Assessment of Obstacles within OAS for Runway 27 of Alternative 2 at Phuket International Airport	10 - 15
Table 10.2.6	OCH/A for Precision Approach Category I to Runway 09.....	10 - 15
Table 10.3.1	The Study of OCA and Visibilities for Circling Approach for I-3 Site	10 - 16
Table 10.3.2	Assessment of Obstacles within OAS for West Side of I-3	10 - 18
Table 10.3.3	Assessment of Obstacles within OAS for East Side of I-3	10 - 19
Table 11.2.1	Cultural Properties in Phuket.....	11 - 2
Table 11.3.1	Study Periods	11 - 13
Table 11.3.2	Land Use Pattern at Site A.....	11 - 20
Table 11.3.3	Land Use Pattern at Site B.....	11 - 20
Table 11.3.4	Land Use Pattern at Site C.....	11 - 21
Table 11.3.5	Population of Tambon Maikao.....	11 - 21
Table 11.3.6	List of Flora at Site A (General Study).....	11 - 28

Table 11.3.7	List of Flora at Site A (Specific Study during the Rainy Season).....	11 - 29
Table 11.3.8	List of Flora at Site A (Specific Study during the Dry Season).....	11 - 30
Table 11.3.9	List of Flora at Site B (General Study).....	11 - 31
Table 11.3.10	List of Flora at Site C (General Study).....	11 - 32
Table 11.3.11	List of Flora at Site C (Specific Study during the Dry Season).....	11 - 34
Table 11.3.12	List of Birds at Site A (General Study).....	11 - 42
Table 11.3.13	List of Birds at Sub-area A1 (Specific Study during the Rainy Season).....	11 - 45
Table 11.3.14	List of Birds at Sub-area A3 (Specific Study during the Rainy Season).....	11 - 46
Table 11.3.15	List of Birds at Sub-area A5 (Specific Study during the Rainy Season).....	11 - 46
Table 11.3.16	Additional Birds found at Site A during the Dry Season.....	11 - 47
Table 11.3.17	List of Birds at Site B (General Study).....	11 - 48
Table 11.3.18	List of Birds at Site C (General Study).....	11 - 50
Table 11.3.19	List of Fish at Site A.....	11 - 56
Table 11.3.20	List of Benthic Fauna at Site A (individuals/square meter).....	11 - 64
Table 11.4.1	The Relationship of Activities and Environmental Items.....	11 - 66
Table 11.4.2	Outline of Each Site.....	11 - 68
Table 12.2.1	Assumptions for the Calculation of Aircraft Noise Contour.....	12 - 1
Table 12.3.1	Noise Affected Areas and House Units around Phuket International Airport.....	12 - 5
Table 12.3.2	Major Items in the Noise Affected Area.....	12 - 6
Table 13.1.1	Evaluation of the Basic Function for Airport Operation.....	13 - 2
Table 13.1.2	Evaluation of Airport Development Alternatives.....	13 - 3
Table 13.1.3	Comparison of Airport Development Alternatives (1).....	13 - 4
Table 13.1.4	Comparison of Airport Development Alternatives (2).....	13 - 5
Table 13.1.5	Cost Comparison of Airport Development Alternatives.....	13 - 6
Table 13.1.6	Organizations Concerned for Cutting of Hills and Mountains.....	13 - 8
Table 14.2.1	Construction Work Items.....	14 - 2
Table 15.3.1	Required Units of Facility.....	15 - 13
Table 15.3.2	Floor Area of Passenger Terminal Building.....	15 - 16
Table 16.3.1	Number of Staff at Present and in Year 2000.....	16 - 3
Table 17.2.1	The Relationship of Activities and Environmental Items.....	17 - 3
Table 18.2.1	Assumptions for the Calculation of Aircraft Noise Contour.....	18 - 1
Table 18.3.1	Noise Affected Areas and House Units around Phuket International Airport.....	18 - 2
Table 19.3.1	Cost Estimates for the Short-term Development Project.....	19 - 4
Table 20.2.1	Air Passengers and Aircraft Movements "with" and "without Project".....	20 - 3
Table 20.2.2	Cost Estimates.....	20 - 4
Table 20.2.3	Personnel Expenses at Phuket International Airport (1991 and 1992).....	20 - 5
Table 20.2.4	Operating and Maintenance Expenses.....	20 - 5
Table 20.2.5	Incremental Operating Expenses.....	20 - 5
Table 20.3.1	Passenger Service Charges.....	20 - 7
Table 20.3.2	Rate of Landing Charges, and Storage Fee.....	20 - 7
Table 20.3.3	Landing Charges and Storage Charges by Aircraft Class.....	20 - 7

Table 20.3.4	Rates of Landing Charges for International Flights in Main Airports as of February 1993	20 - 8
Table 20.3.5	Rent for Offices and Real Properties in the Passenger Terminal Building of Phuket International Airport.....	20 - 9
Table 20.3.6	Service and Concession Revenue of Phuket International Airport in 1991 and 1992	20 - 10
Table 20.3.7	Incremental Revenues of the Project	20 - 10
Table 20.3.8	Revenues and Costs of the Project	20 - 11
Table 20.3.9	Condition of Long-term Loans.....	20 - 12
Table 20.3.10	Long-term Loan Schedule	20 - 12
Table 20.3.11	Project Cash-flow with Long-term Loan	20 - 13
Table 20.3.12	Result of Sensitivity Analysis.....	20 - 14
Table 20.4.1	Benefits of the Project.....	20 - 15
Table 20.4.2	Benefits of the Project.....	20 - 17
Table 20.4.3	Distribution of Foreign Tourist Expenditure, 1990.....	20 - 17
Table 20.4.4	Tourist Expenditure and Contribution to the Project per Foreign Tourist	20 - 18
Table 20.4.5	Benefits of the Project including the Related Businesses	20 - 19
Table 20.4.6	Economic Construction Costs.....	20 - 19
Table 20.4.7	Benefits and Costs of the Project	20 - 20
Table 20.4.8	Benefits and Costs of the Project including the Benefits from Related Tourist Expenditures and Air Fares.....	20 - 21
Table 20.4.9	Result of Economic Sensitivity Analysis	20 - 22

LIST OF FIGURES

	Page
Figure 1.3.1	Work Flow Chart of Study..... 1 - 3
Figure 1.4.1	Study Organization..... 1 - 4
Figure 2.1.1	Workflow of Process..... 2 - 2
Figure 2.2.1	Annual Rainfall of Changwat Phuket 1980-1990..... 2 - 4
Figure 2.3.1	Population Density of Changwat Phuket..... 2 - 7
Figure 2.4.1	Guest Arrivals to Accommodation Establishments in Major Cities.... 2 - 18
Figure 2.4.2	Change in Number of Rooms in Major Cities..... 2 - 19
Figure 2.4.3	Major Beaches and Number of Rooms in Phuket, 1991..... 2 - 20
Figure 2.4.4	Tourist Arrivals to Accommodation Establishments in Phuket by Month, 1990..... 2 - 22
Figure 2.5.1	Airports in Thailand..... 2 - 25
Figure 2.5.2	International Flight Routes Originating from Phuket International Airport..... 2 - 30
Figure 2.5.3	Domestic Flight Route Originating from Phuket International Airport..... 2 - 32
Figure 2.5.4	International Tourist Arrivals to Thailand and Number of Passengers at Bangkok International Airport (1970 - 1991)..... 2 - 35
Figure 2.5.5	Change in Number of Passengers at International Airports..... 2 - 35
Figure 2.6.1	Transportation Network in Southern Thailand..... 2 - 41
Figure 2.6.2	Transportation Network in Phuket..... 2 - 43
Figure 2.7.1	Organization Chart of Departments Concerned, Ministry of Science, Technology and Environment..... 2 - 45
Figure 2.7.2	EIA Approval Process..... 2 - 48
Figure 3.1.1	Layout Plan of Phuket International Airport..... 3 - 2
Figure 3.1.2	Terminal Area Layout Plan..... 3 - 3
Figure 3.4.1	Record of Air Passengers From/To Phuket..... 3 - 10
Figure 3.4.2	Number of Total Passengers by Month (1990 and 1991)..... 3 - 11
Figure 3.4.3	Record of Air Freight From/To Phuket..... 3 - 11
Figure 3.5.1	Wind Rose at Phuket International Airport..... 3 - 16
Figure 3.6.1	Overall AAT Organizational Structure..... 3 - 18
Figure 3.8.1	Development Plan of Terminal Area..... 3 - 22
Figure 4.1.1	Workflow of Demand Forecast..... 4 - 1
Figure 4.2.1	Projection of Guest Arrivals to Phuket..... 4 - 6
Figure 4.4.1	Air Passengers Access to Phuket International Airport..... 4 - 12
Figure 4.4.2	Process of Air Passenger Demand Forecast for Phuket International Airport..... 4 - 15
Figure 4.4.3	Workflow of Air Passenger Demand Forecast for Phuket International Airport..... 4 - 16
Figure 4.4.4	Forecast for International Passenger From/To Thailand..... 4 - 21
Figure 4.4.5	Workflow of Domestic Passengers Forecast in Thailand..... 4 - 22
Figure 4.4.6	Forecast for Air Passengers From/To Phuket..... 4 - 27
Figure 4.4.7	Workflow of Air Freight Forecast for Phuket International Airport..... 4 - 29
Figure 4.4.8	Forecast for Air Freights From/To Phuket..... 4 - 32
Figure 4.5.1	Workflow of Breakdown of Traffic Demand..... 4 - 33
Figure 4.5.2	Air Passengers to/from Phuket By Nationality and Route..... 4 - 34

Figure 5.3.1	Obstacle Limitation Surfaces	5 - 4
Figure 6.1.1	Summary of Evaluation for Existing Facilities.....	6 - 2
Figure 6.2.1	Relation to Transitional Surface for Hill with Control Tower.....	6 - 11
Figure 6.3.1	Transitional Surface and Apron B.....	6 - 13
Figure 6.4.1	Airfield Pavement Plan.....	6 - 15
Figure 6.6.1	Passenger Terminal Building First Floor Plan	6 - 17
Figure 6.6.2	Passenger Terminal Building Second Floor Plan	6 - 18
Figure 6.6.3	Passenger Terminal Building Third Floor Plan	6 - 19
Figure 6.6.4	Passenger Terminal Building Roof Plan	6 - 20
Figure 6.6.5	Passenger Flow and Floor Area of Each Zone.....	6 - 22
Figure 6.6.6	Passenger Flow.....	6 - 24
Figure 6.7.1	Existing Cargo Terminal.....	6 - 27
Figure 6.8.1	Blind Area at Apron C	6 - 28
Figure 6.13.2	Layout Plan of Air Navigation Aids.....	6 - 46
Figure 6.11.1	Bangkok Flight Information Region and Area of Responsibility	6 - 31
Figure 6.11.2	Prohibited, Danger and Restricted Areas Established within Bangkok FIR.....	6 - 34
Figure 6.11.3	Diagram of ILS Facility at Phuket International Airport	6 - 35
Figure 6.11.4	Diagram in Relationship to OIS for RWY 27 and Obstacle at Phuket International Airport	6 - 36
Figure 6.12.1	Obstacle Limitation Surface for Code Number 4 of Precision and Non-Precision Approach Runway	6 - 38
Figure 6.12.2	The Existing Obstacle Limitation Surface.....	6 - 41
Figure 6.12.3	Diagram in Relationship to Approach Surface for Runway 27 and 142.2 m High Hill.....	6 - 39
Figure 6.12.4	Diagram in Relationship to Take-Off Climb Surface for Take-Off Runway 09 and 142.2 m High Hill	6 - 42
Figure 6.12.5	The Blow Up Chart of Transitional Surfaces Around Runway at Phuket International Airport.....	6 - 44
Figure 6.13.1	Air Navigation System Conceptual Diagram	6 - 45
Figure 6.13.2	Layout Plan of Air Navigation Aids.....	6 - 46
Figure 6.13.3	Direct Speech Network	6 - 50
Figure 6.13.4	Communication Cable Diagram.....	6 - 51
Figure 6.13.5	Layout of Radars in Thailand FIR.....	6 - 54
Figure 6.15.1	Power Supply System Diagram.....	6 - 57
Figure 7.1.1	Flowchart of Airport Master Planning	7 - 2
Figure 8.1.1	Flow Chart of New Airport Site Selection.....	8 - 2
Figure 8.2.1	Layout of New Airport.....	8 - 4
Figure 8.4.1	Wind Rose (All Seasons).....	8 - 7
Figure 8.4.2	Wind Rose (Dry Season).....	8 - 7
Figure 8.4.3	Wind Rose (Rainy Season).....	8 - 8
Figure 8.5.1	Possible Site for New Airport	8 - 10
Figure 8.5.2	Site Location of I-1 and I-3.....	8 - 11
Figure 8.5.3	Location of Royal Park Project	8 - 16
Figure 8.5.4	Obstacle Limitation Surfaces at Alternative Site of I-1	8 - 17
Figure 8.5.5	Obstacle Limitation Surfaces at Alternative Site of I-3	8 - 18
Figure 8.5.6	General Layout of New Airport Site I-1	8 - 23
Figure 8.5.7	General Layout of New Airport Site I-3	8 - 24
Figure 9.2.1	Layout Plan of Alternative-1	9 - 7
Figure 9.2.2	Layout Plan of Alternative-2	9 - 12
Figure 9.3.1	Layout Plan of Alternative-3	9 - 15
Figure 10.2.1	The Obstacle Limitation Surfaces for Alternative 1 at Phuket International Airport.....	10 - 2

Figure 10.2.2	Profile of the Relationship between the Approach Surface for Runway 27 of Alternative 1 and 142.2 m AMSL Hill.....	10 - 4
Figure 10.2.3	Profile of the Relationship between the Take of Climb Surface for Runway 27 of Alternative 1 and 142.2 m AMSL Hill.....	10 - 4
Figure 10.2.4	The Obstacle Assessment Surfaces for Runway 27 of Alternative 1 at Phuket International Airport.....	10 - 5
Figure 10.2.5	The Assumption for Study of Precision Approach Procedures for Runway 27.....	10 - 6
Figure 10.2.6	The Obstacle Limitation Surfaces for Alternative 2 at Phuket International Airport.....	10 - 10
Figure 10.2.7	Profile of the Relationship between the Approach Surface for Runway 27 of Alternative 2 and 142.2 m AMSL Hill.....	10 - 8
Figure 10.2.8	Profile of the Relationship between the Take Of Climb Surface for Runway 27 of Alternative 2 and 142.2 m AMSL Hill.....	10 - 9
Figure 10.2.9	The Obstacle Assessment Surfaces for Runway 27 of Alternative 2 at Phuket International Airport.....	10 - 13
Figure 10.2.10	The Obstacle Assessment Surfaces for Runway 09 of Alternative 2 at Phuket International Airport.....	10 - 14
Figure 10.3.1	The Relationship between the Circling Area for each Approach Category Aircraft and Mountains near the I-3 Site.....	10 - 17
Figure 10.3.2	The Obstacle Assessment Surfaces for West Side of I-3 Site	10 - 20
Figure 10.3.3	The Obstacle Assessment Surfaces for East Side of I-3 Site	10 - 21
Figure 11.2.1	Protected Areas in Phuket	11 - 5
Figure 11.3.1	Land Use Surrounding the Airport	11 - 7
Figure 11.3.2	Possible Site for New Airport.....	11 - 10
Figure 11.3.3	Study Area.....	11 - 14
Figure 11.3.4	Land Use Map at Site A.....	11 - 16
Figure 11.3.5	Land Use Map at Site B.....	11 - 17
Figure 11.3.6	Land Use Map at Site C.....	11 - 18
Figure 11.3.7	Political Boundaries around Site A and its Vicinities.....	11 - 19
Figure 11.3.8	Vegetation Map at Site A.....	11 - 25
Figure 11.3.9	Vegetation Map at Site B.....	11 - 26
Figure 11.3.10	Vegetation Map at Site C.....	11 - 27
Figure 11.3.11	Sampling Site for Birds at Site A	11 - 38
Figure 11.3.12	Sampling Site for Birds at Site B	11 - 39
Figure 11.3.13	Sampling Site for Birds at Site C.....	11 - 40
Figure 11.3.14	Sampling Stations for Fish and Benthic Fauna at Site A.....	11 - 53
Figure 12.2.1	Aircraft Noise Contours in WECPNL for Alternative-1 at the Existing Airport.....	12 - 2
Figure 12.2.2	Aircraft Noise Contours in WECPNL for Alternative-2 at the Existing Airport.....	12 - 3
Figure 12.2.3	Aircraft Noise Counters in WECPNL for Alternative-3 at the New Airport	12 - 4
Figure 13.2.1	Master Plan of Phuket International Airport (Year 2010)	13 - 9
Figure 15.1.1	Airport Layout Plan for Short Term Development.....	15 - 2
Figure 15.1.2	Terminal Area Layout Plan for Short Term Development	15 - 3
Figure 15.2.1	Runway Profile	15 - 5
Figure 15.2.2	Typical Cross Sections.....	15 - 6
Figure 15.2.3	Storm Water Drainage Layout Plan.....	15 - 8
Figure 15.2.4	Pavement Plan	15 - 10
Figure 15.2.5	Thickness of Runway Overlay.....	15 - 11
Figure 15.3.1	Flowchart of Terminal Building Layout Planning	15 - 14
Figure 15.3.2	Passenger Terminal Building Ground Floor Plan	15 - 17
Figure 15.3.3	Passenger Terminal Building Second Floor Plan.....	15 - 18

Figure 15.3.4	Passenger Terminal Building Third Floor Plan.....	15 - 19
Figure 15.3.5	Passenger Terminal Building Elevations.....	15 - 20
Figure 16.2.1	Organization of AAT Phuket.....	16 - 1
Figure 18.2.1	Aircraft Noise Contours in WECPNL at Preent (1993).....	18 - 3
Figure 18.2.2	Aircraft Noise Contours in WECPNL for Short Term Development	18 - 4
Figure 19.2.1	Project Implementation Schedule for Phase I and II.....	19 - 2
Figure 19.2.2	Project Implementation Schedule for short-term development.....	19 - 2
Figure 20.2.1	Traffic Volume "With Project" and "Without Project"	20 - 2

CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND

The Kingdom of Thailand is located in the center of the Indochina Peninsula, and shares its borders with Myanmar to the west and a part to the north, Kampuchea and Laos to the south and east divided by the Mekong River, and Malaysia to the South.

The country has an area of 513,115 sq.kms and had a population of 52 million in 1991.

The main industrial sectors of Thailand are manufacturing, wholesale and retail trade, agriculture and services, and the total GDP of these industrial origins reached to 69 % in 1989. Their shares were 25.5, 15.4, 15.0 and 13.3% respectively.

During the period of the Sixth National Economic and Social Development Plan (1987 - 1991), the GDP of total Thailand expanded at an average growth rate of 10.5 % per year .

This economic growth has been spurred mainly by the rapid increase in direct investments and exports. One of the factors supporting this growth is considered the encouragement of tourism industries .

Tourism industry has played an important role for the acquisition of foreign currency from the beginning of 1980, and the annual average growth rate of foreign tourist was about 20 % up to 1991 before the start of the Gulf War .

The enhancement of the investment and tourism industry from the foreign countries is one of the important targets of the Seventh National Economic and Social Development Plan (1992 - 1996) to correct the concentration of economical activities to Bangkok City, and to develop the remote areas for the fair distribution of national income to other areas of the country.

Phuket located in the Southern Region is one of the famous resort areas around the South Asian Area. The GPP of Phuket was twice the country's average and three times that for the Southern Region.

The Phuket International Airport is one of the five international airports in Thailand and is situated in the northern part of Phuket Island, which is located 862 km south of Bangkok City.

The traffic volume of passengers and aircraft movement in 1992 was 1.9 million and 18,844, and the annual average growth rates during the period from 1982 and 1992 was 26.4 and 17% respectively.

The airport has many difficulties and constraints for the development to cope with the sharply increased demand of passenger traffic.

In consideration of the above mentioned circumstances and decentralization of international flights from Bangkok International Airport to other airports due to the saturated condition of current facilities, the Government is now considering

for the Phuket International Airport to become one of the promising alternative airports to Bangkok International Airport. The Government has assigned a high priority to the airport for development, and AAT has executed the development to cope with the increased traffic demand based on the government policy.

Accordingly, AAT recognized the necessity for the establishment of a long-term master plan for the development of Phuket International Airport to cope with the increase of air traffic demand and to secure safe operation of aircrafts and the airport.

1.2 OBJECTIVES OF THE STUDY

Based on these situations, the objectives of the study are established as follows :

- Establishment of a long-term master plan for the development of Phuket International Airport targeted for the year 2010,
- Implementation of a feasibility study for the short-term development plan targeted for the year 2000,
- Implementation of technology transfer during the Study.

1.3 SCOPE OF THE STUDY

Scope of the study was defined in the Agreement in APPENDIX - 1.3 which was agreed upon between Airports Authority of Thailand (AAT) and the Japan International Cooperation Agency (JICA) on January 30, 1992.

In order to fully cover the Scope of the Study, 39 major study items are identified and illustrated in **Figure 1.3.1** as the work flow chart of the Study .

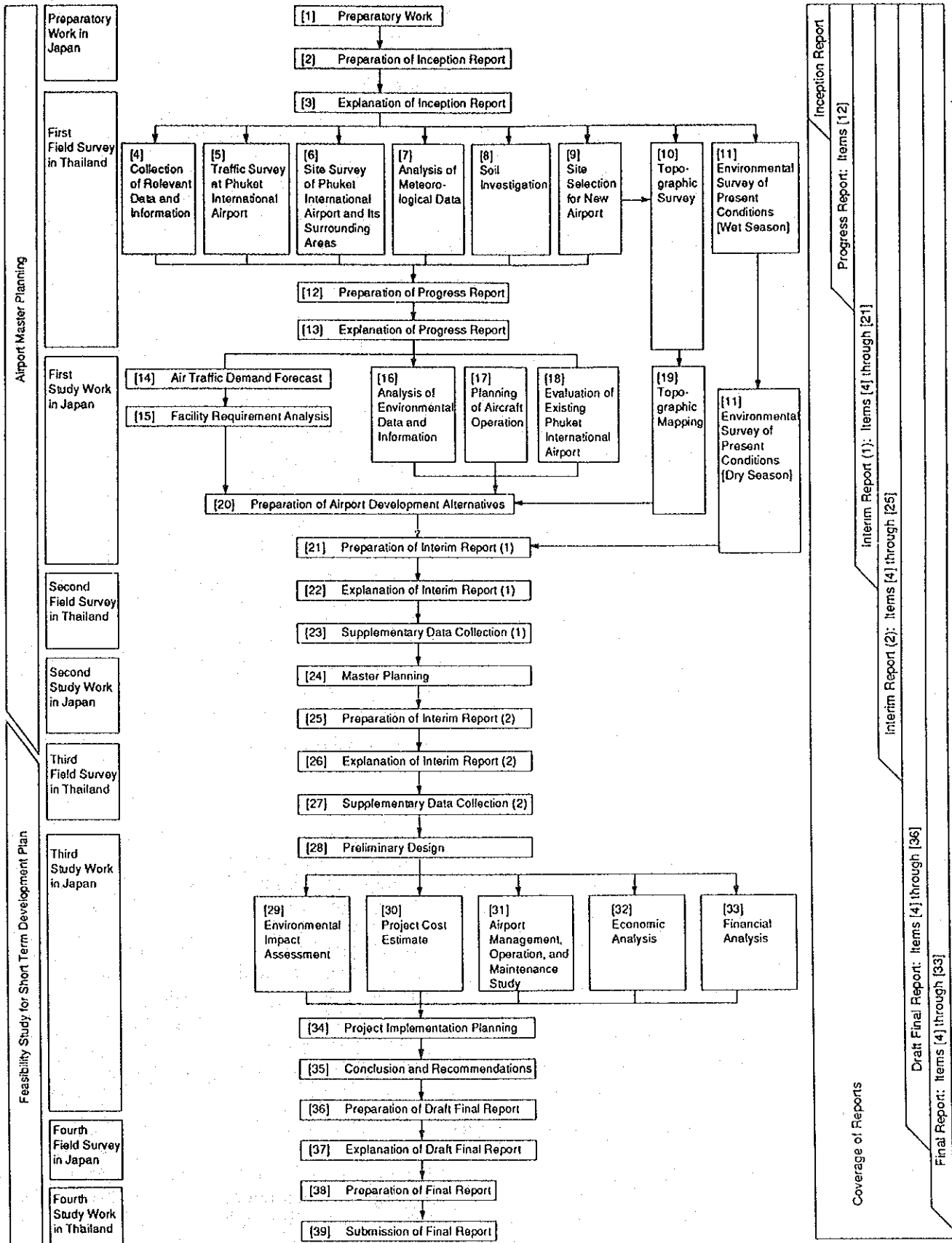


Figure 1.3.1 Work Flow Chart of Study

1.4 STUDY ORGANIZATION

The Study is being carried out by the JICA Study Team under the direction of the Advisory Committee that has also been organized by the JICA .

The counterpart team of the JICA Study Team was established by AAT .

The Study is being conducted in close coordination with concerned authorities of the Government of Thailand .

(1) Overall Concept of Study Organization

The overall organization framework is Shown in **Figure 1.4.1**

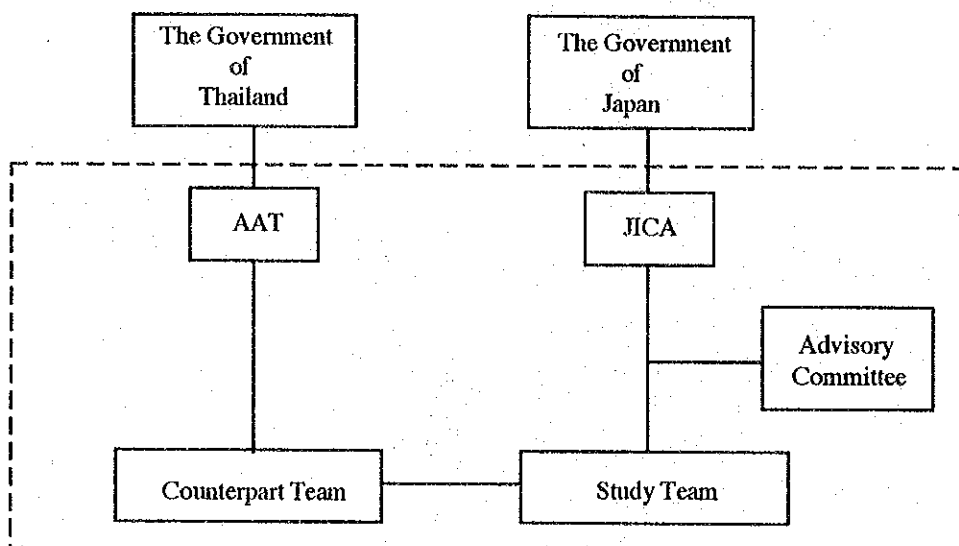


Figure 1.4.1 Study Organization

(2) Members of the JICA Team

Mr. Yoshiya NIINOMI	: Team Leader/Airport Planner/ Airport Management Planner
Mr. Hajime HONJO	: Airport Architect
Mr. Shinichi SAKABE	: Airport Civil Engineer
Ms. Chizuko IHARA	: Traffic Forecaster/Economic Analyst
Mr. Osamu ISODA	: Environment Specialist
Mr. Akira KADOGUCHI	: Air Navigation Systems Engineer
Mr. Tadimitsu ITOH	: Airways Planner
Mr. Yutaka KYAKUNO	: Senior Topographic Surveyor
Mr. Mitsuhashi NISHIMURA	: Topographic Surveyor

(3) Members of the Advisory Committee

Mr. Makoto TAKAHASHI	: Director, Construction Division, Aerodrome Department, Civil Aviation Bureau, Ministry of Transport
----------------------	--

- Mr. Masaharu IKEGAMI (Former) : Special Assistant to the Director, Construction Division, Aerodrome Department, Civil Aviation Bureau, Ministry of Transport
- Mr. Keiichi MIKAMI (Successor) : Special Assistant to the Director, Construction Division, Aerodrome Department, Civil Aviation Bureau, Ministry of Transport
- Mr. Junichi TAKEMURA (up to July 1993) : Chief, Planning Division, Aerodrome Department, Civil Aviation Bureau, Ministry of Transport
- Mr. Yukio HASEBE : Chief, Radio Engineering Division, Air Traffic Service Department, Civil Aviation Bureau, Ministry of Transport
- (4) JICA Coordinator
- Mr. Humio ISHIKAWA : Project Officer, First Development Study Division, Social Development Study Dept, Japan International Cooperation Agency (JICA)
- (5) Members of Counterpart Team
- Ms. Sopar ROJNUCKRIN : Deputy Managing Director, AAT
- Group Captain Udorn BURANAJARU : Assistant Managing Director, AAT
- Mr. Kavee NITITHAM (Former) : Director, Airports Development Office, AAT
- Mr. Passakorn SUWANAKANIT (Successor) : Director, Airports Development Office, AAT
- Mr. Decha USWARANGSRI : Specialist, Airports Development Office, AAT
- Mr. Virat TANTIATIMONGKOL : Electrical Engineer, Airports Development Office, AAT
- Mr. Chaowalit PAKA-ARIYA : Communication Engineer, Airports Development Office, AAT
- Mr. Torsak NINGSANON : Civil Engineer, Airports Development Office, AAT
- Ms. Suwannee SAMRONGWATANA : Planning Dept., AAT
- Mr. Serirat PRASUTANOND : Planning Dept., AAT
- Ms. Suthasinee PORAPONGSA : Airports Development Office, AAT

1.5 ACTIVITIES OF THE STUDY TEAM

1.5.1 First Field Survey in Thailand

On August 17 1992, the Study Team arrived in Bangkok, Thailand, to carry out the two-month and half First Field Survey. On August 21 1992 after series discussions, the Study Team and the Advisory Committee held the meeting on the Inception Report with the representatives of AAT and the Report was accepted by AAT. The minutes of the meeting on the Inception Report is shown in **Appendix 1.5.1.**

The Study Team completed the First Field Survey in Thailand with close cooperation of the Counterpart Team of AAT. The major activities of the Study Team during the First Field Survey included data collection, topographic survey, soil investigation, evaluation of the existing airport, general environmental survey and site survey for new airport sites.

The Study Team prepared the Progress Report which compiled the results of the First Field Survey. The Study Team submitted and explained the report to the Counterpart Team of AAT on 27 October, 1992.

The minutes of the meeting on the Progress Report is shown in **Appendix 1.5.2.**

1.5.2 First Study Work in Japan

After returning from Thailand, the Study Team proceeded with the First Study Work in Japan which aimed at producing a preparation of three Airport Development Alternatives for Phuket International Airport. The work included air traffic demand forecasts, estimation of facility requirements, evaluation of the existing facilities for future requirements, analysis of environmental data and information, topographic mapping and airport master planning for the year 2010 including selection of new airport site. The Interim Report (1) was prepared to summarize the achievement up to the First Study Work in Japan.

The counterpart training was also carried out in January 1993.

1.5.3 Second Field Survey in Thailand

On February 1 1993, the Study Team arrived in Bangkok to carry out the half month Second Field Survey. The Study Team and the Advisory Committee submitted the Interim Report (1) to Counterpart Team of AAT and held the meeting for the presentation of the report to AAT during the period from February 3 to February 12 1993.

The Study Team and the Advisory Committee conducted a supplemental field survey from February 6 to 10 1993 in Phuket.

The minutes of the meeting on the Interim Report (1) are shown in **Appendix 1.5.3.**

1.5.4 Second Study Work in Japan

After returning from Thailand, the Study Team proceeded with the Second Study Work in Japan which aimed at the establishment of master planning based on the agreed selected alternative by AAT, alternative airport master plan, airspace use plan, environmental study, etc. The study results were summarized on the Interim Report (2).

1.5.5 Third Field Survey in Thailand

The Study Team arrived at Bangkok on May 10 1993 for the presentation of detailed study result on selected alternative of Master Planning for Phuket International Airport Development Project. The minutes of the meeting on the Interim Report (2) are shown in **Appendix 1.5.4**.

The additional site survey was also carried out between May 15 to 17 1993.

1.5.6 Third Study Work in Japan

After return to Japan on June 9 1993, the Study Team started the Third Study Work in Japan for the aiming of the completion of Draft Final Report consisting of preliminary design on the short term development plan, environmental impact assessment, project cost estimation, project implementation planning, financial and economic analysis and conclusion and recommendation.

1.5.7 Fourth Field Survey in Thailand

The Study Team arrived at Bangkok on August 16 1993, and submitted AAT the Draft Final Report including the results of the feasibility study for the short-term development plan. The meetings for the presentation and discussion of the report were held with AAT from August 17 to 20, 1993.

Through the above meetings, the Draft Final Report was generally accepted by Thai side. It was confirmed that the comments on the Report would be provided within four weeks after submission of the Report in compliance with agreed Scope of Work for this Study. The minutes of meeting on the Draft Final Report are shown in **Appendix 1.5.5**.

A workshop on airport master planning and airport development in Japan was held from August 23 to 25, 1993. Lectures and discussions with participants of AAT were made by the Advisory Committee and the Study Team.

1.5.8 Fourth Study Work in Japan

After returning from Thailand, the Study Team proceeded with the Fourth Study Work in Japan which aimed at finalizing the Report. It was informed by AAT on September 23 that all the comments have been already given during the Fourth Field Survey and that the Report should be finalized in accordance with those comments.

This Final Report was completed and submitted to JICA in October 1993.

The major activities of the Study Team during the whole study period are illustrated on **Table 1.5.1**.

Table 1.5.1 Activities of the study Team

Month	April				May				June				July			August			Remarks		
	1	5	12	19	26	3	10	17	24	31	7	14	21	28	5	12	19	26		2	9
Activity																					
< Study Team >																					
Third Field Survey in Thailand																					
Third Study Work in Japan																					
< Field Survey in Thailand >																					
Explanation of Interim Report (2)																					
Supplementary Data Collection (2)																					
< Study work in Japan >																					
Feasibility Study																					
Preparation of Draft Final Report																					
Mr. Y. Ninomi Team Leader																					
Mr. S. Sakabe Airport Planner																					
Ms. C. Ihara Economist																					
Mr. H. Honjo Airport Architect																					
Mr. O. Isoda Environment Specialist																					
Mr. A. Kadoguchi Air Navigation Systems Engineer																					
Mr. T. Itoh Airways Planner																					
Meeting with Counterpart Team																					
Meeting with Advisory Committee																					

Legend : ■ Field Survey in Thailand
□ Study Work in Japan

1.6 ORGANIZATION OF THE FINAL REPORT

This Final Report of the Study for the Phuket International Airport Development Plan in the kingdom of Thailand consists of 21 chapters.

Contents and coverage, in terms of the work items, of each chapter are as follows:

a) Chapter 1 Introduction

The introductory chapter.

b) Chapter 2 Natural and Socio-economic Environment

This chapter reviews and assesses the natural and socio-economic environment of Thailand including transportation fields based on work item [4].

c) Chapter 3 Existing Airport and Surrounding

This chapter describes very briefly the airport history, inventory and traffic characteristics as the results of the work items [4] and [5]. Existing land use the airport surroundings, meteorological conditions which correspond to the work items [6], [7] and [11] are also dealt with in this chapter.

d) Chapter 4 Air Traffic Demand Forecast

Air traffic demand forecasts, work item [14], which provide the design bases of air traffic volume for the airport master planning are described in this chapter.

e) Chapter 5 Airport Facility Requirements

In this chapter, corresponding to work item [15], the number, concept, type, size and performance necessary for each airport facility are estimated based on the air traffic demand forecasts.

f) Chapter 6 Evaluation of Existing Airport

This chapter evaluates the existing Phuket International Airport from the various aspects corresponding to the work item [18]. The evaluation of the airport which was done for the present traffic demand in the Progress Report has been extended for the future traffic demands. A demand vs. capacity analyses and safe operational aspect clarify the usable life of each facility against future requirements.

g) Chapter 7 Basic Development Policy for Airport Master Planning

This chapter explains the concept of alternatives for airport master plan for long-term development based on the facility requirement analysis, evaluation results of the existing airport facilities, and environmental consideration.

h) Chapter 8 Selection of New Airport Site

This chapter explains the selection of a suitable site for a new airport. The most suitable site was selected from the possible sites established on the map and site survey corresponding to the work item [9].

i) Chapter 9 Alternative Airport Master Plans

In this chapter, airport development alternatives are established in accordance with the basic policy explained in Chapter 7. Work items included in each alternative are also indicated in this chapter.

j) Chapter 10 Airspace Use Plan

This chapter corresponding to work item [17] describes the airspace use plan for each development plan in relation with the surrounding obstacles at the existing airport and the new airport site.

k) Chapter 11 Environmental Considerations

This chapter describes the existing environmental conditions in Phuket Island and at the existing airport and new airport sites. Environmental evaluation was also explained in this chapter. Environmental evaluation of possible new airport sites selected in Chapter 8 is detailed in this chapter.

l) Chapter 12 Aircraft Noise Analysis

Aircraft noise influence in the year 2010 for airport master planning are examined and evaluated in this chapter for the existing airport and the selected new airport site.

m) Chapter 13 Airport Master Plan

Airport development alternative established in Chapter 9 are compared and evaluated in this chapter, and the optimum alternative was selected. Airport master plan for selected alternative is shown in this chapter.

n) Chapter 14 Scope of the Short-term Development Plan

This chapter corresponding to Airport Master Plan lists the construction work items of the short-term development plan.

o) Chapter 15 Preliminary Design

The preliminary design is carried out on the facilities of the short-term development project at the existing airport. This chapter corresponds to the work item [28] and designates the size, dimensions, performance and materials to be used for each airport facility.

p) Chapter 16 Airport Management Study

Based on the evaluation of present conditions of the airport management, requirements for the operation and maintenance in the short-term development are described in accordance with item [31].

q) Chapter 17 Environmental Impact Assessment

Environmental Impact Assessment was carried out for short-term development at the existing airport corresponding to work item [29].

r) Chapter 18 Aircraft Noise Analysis (Year 2000)

Aircraft noise influence in the year 2000 on the short-term development at the existing airport is examined and evaluated in this chapter.

s) Chapter 19 Project Implementation Schedule

This chapter, corresponding to work item [34], describes the cost and implementation planning of the short-term development project.

t) Chapter 20 Financial and Economic Analysis

This chapter evaluates the financial and economic impacts of the short-term development project respectively on the airport management and the national economy corresponding to work items [32] and [33]. According to the result of financial and economic analysis, the short-term development project is concluded that this is a feasible project by indicating of 12.03 % of FIRR, 25.96% of EIRR.

u) Chapter 21 Conclusions and Recommendations

Corresponding to work item [35], the conclusion of the whole study and recommendations on how to implement the short-term development project are described in this chapter as a final result of the Study.

CHAPTER 2

NATURAL AND SOCIO- ECONOMIC ENVIRONMENT

CHAPTER 2 NATURAL AND SOCIO-ECONOMIC ENVIRONMENT

2.1 GENERAL

Air transportation plays an important role in public welfare and socio-economic development of the country. Transportation services need to meet the demand from export, tourism and regional development and should keep pace with economic growth.

Thailand experienced a remarkable economic growth in the late 1980s. However, the infrastructure services including air transportation were unable to meet the demand resulting from the rapid growth of the economy. The bottlenecks of the infrastructure have become even more severe at present. Therefore, transportation services should be improved in terms of quantity, standards, convenience and quality to satisfy the need for socio-economic development.

The Government has set forth the seventh National Economic and Social Development Plan, aiming at the balance of development in terms of quality and quantity. Upgrading quality of life and the management of environmental and natural resources is one of the main objectives in the Plan.

This chapter provides a summary of the national and socio-economic environment of the country in general, and that of Phuket Changwat (Province) in particular in order to prepare the optimum master plan for the development of Phuket International Airport in terms of quality and quantity.

Figure 2.1.1 has been prepared to provide the logic for the process of master planning.

2.2 NATURAL CONDITIONS

2.2.1 Geography

Thailand is located in the western part of the Indochinese Peninsula, bordered by Myanmar to the West, the Lao People's Democratic Republic to the North and Northeast, Cambodia to the East, and Malaysia to the South. The country's total area covers 513,115 square kilometers and its longest north to south distance is approximately 1,650 kilometers from 5° 37' to 20° 27' north latitude.

The country can be divided into four geographical regions: the fertile central region dominated by the Chao Phraya River, the cool and mountainous north region, the semiarid north-east plateau, which is the country's poorest region, and the southern peninsular region extending to the border of Malaysia. There are 73 Changwats (Provinces) in Thailand and Governors of each Changwat are appointed by the Ministry of Interior of the central Government. Bangkok, the capital of the country, is located at 14 degrees north latitude in the central plains.

Natural & Socio-economic Environment

Master Planning

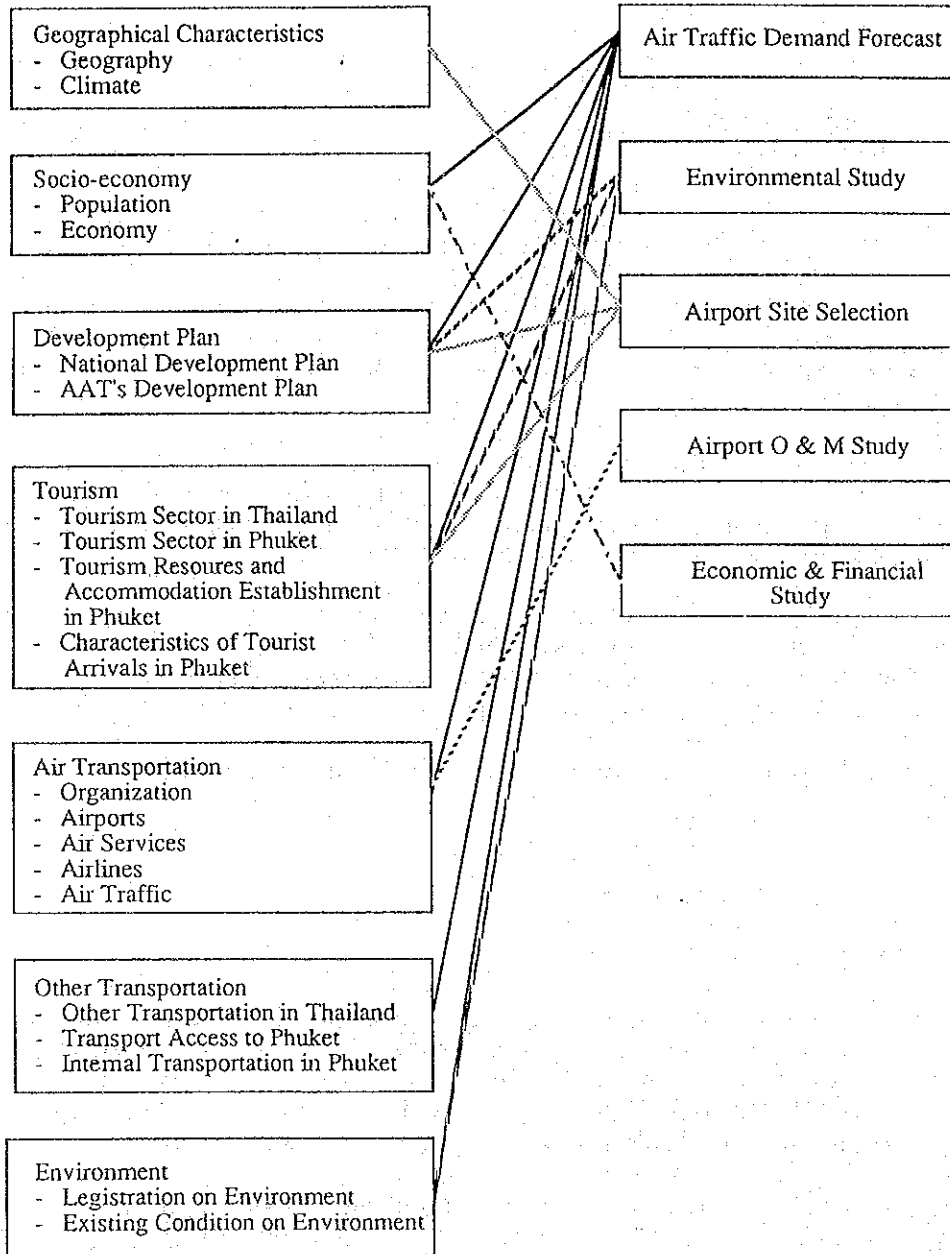


Figure 2.1.1 Workflow of Process

Phuket, one of the 73 Changwats, is the largest island in Thailand and covers an area of 543 square kilometers (or 0.1 % of the country's total) including 39 surrounding small islands. It is located in the Andaman Sea of the west coast of southern Thailand at a distance of 862 kilometers from Bangkok, lying between 7° 30' and 8° 10' north latitude and 98° 15' and 98° 30' east longitude, and measures 50 kilometers from north to south.

Most of Phuket Island is lowland of less than 60 meters above sea level, however, along the west coast the island is hilly. The east and west coasts of the island are remarkably different. The west coast of the island drops off to deep water and the east coast is shallow for some distance from the shore. The island is varied with rocky beaches, long sandy beaches, limestone cliffs, forested hills and tropical vegetation.

2.2.2 Climate

The following three seasons can be distinguished in the country:

- The rainy season is generally from late May to mid October. The average annual rainfall of the country is about 1,800 mm and the region of heaviest rainfall extends along the west coast of the southern part and along the east coast of the Gulf of Thailand where the annual rainfall is more than 4,000 mm.
- The cool season, from mid October to mid February, is the mildest season of the year.
- The hot season begins in late February and lasts to mid May and the average temperature is above 30° C.

A summary of meteorological data for selected meteorological stations in Thailand is shown in **Table 2.2.1**.

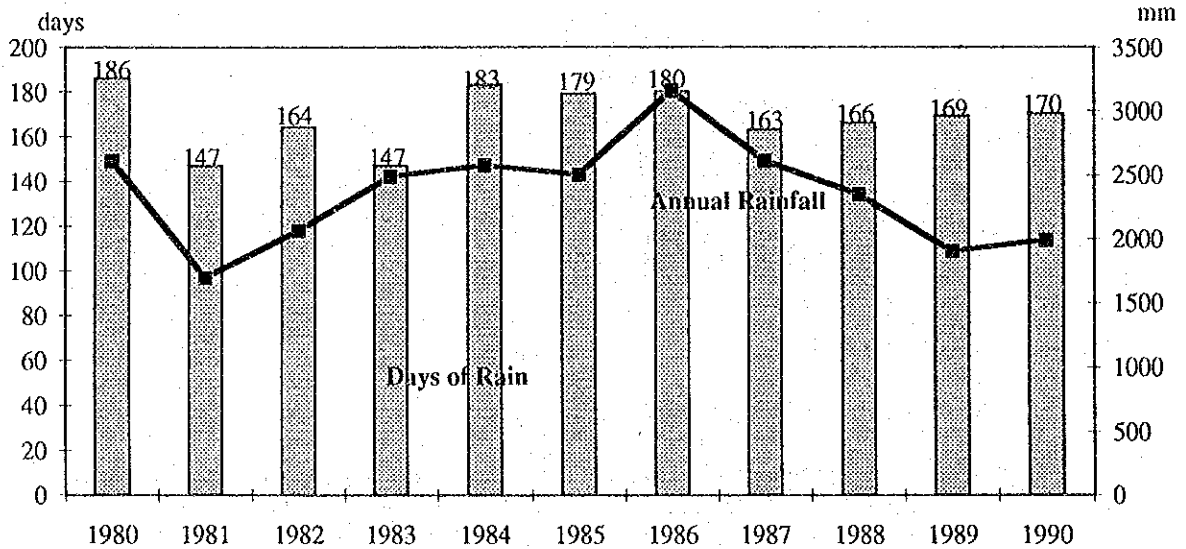
Table 2.2.1 Climate for Selected Meteorological Stations in 1988

Meteorological Station	Latitude	Longitude	Altitude above MSL (meter)	Mean Atmospheric Pressure (mb)	Temperature			Rainfall (mm)	Days of Rain (days)	Mean Relative Humidity (%)
					Mean Max. (° C)	Mean (° C)	Mean Min. (° C)			
Bangkok Metropolis	13 44' N	100 30'E	2	1,009.2	32.6	28.5	24.3	2,097.3	136	73.9
Chiang Mai	18 47' N	98 59'E	312	1,009.4	32.1	26.2	20.3	1,412.4	127	71.5
Phuket	07 53' N	98 24'E	2	1,009.0	32.3	28.2	24.2	2,343.5	166	76.8
Songkhla	07 12' N	100 36'E	4	1,008.9	31.5	28.3	24.9	1,796.2	166	75.4

Source: Statistical Yearbook, Thailand, National Statistical Office

In Phuket, the temperature variations are slight throughout the year. The average rainfall is approximately 2,400 mm per year, although there is significant variation from year to year as shown in **Figure 2.2.1**. The monsoon winds determine the major climate of the province and it is generally rainy from late May to October when the western coast receives the monsoons. It is cool and dry from November to mid February, and hot from late February to mid May.

Temperature, rainfall and humidity of Phuket Changwat by month in 1988, 1989 and 1990 are shown in Table 2.2.2.



Source: Statistical Reports of Southern Region, National Statistical Office

Figure 2.2.1 Annual Rainfall of Changwat Phuket 1980-1990

Table 2.2.2 Temperature, Rainfall and Humidity of Phuket by Month (1988 - 1990)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	total	
Average of Air Temperature in the Shade(°C)	1988	28.3	28.5	29.3	29.3	28.1	28.3	27.7	28.5	27.6	28.2	27.5	27.6		
	1989	28.0	28.0	28.5	28.7	28.4	28.2	27.9	27.7	27.6	27.0	27.8	27.9		
	1990	28.0	29.1	29.6	29.6	28.3	28.7	27.7	28.9	27.2	27.6	27.1	27.6		
Monthly Rainfall	days	1988	4	0	1	6	22	21	13	22	21	23	24	6	163
		1989	6	7	3	13	19	12	20	17	24	23	14	8	166
		1990	4	3	5	13	20	21	17	26	22	25	11	2	169
	mm	1988	11	0	18	38	371	139	76	657	368	327	501	104	2,609
		1989	19	74	44	103	275	114	333	192	546	322	292	31	2,344
		1990	16	1	152	67	217	118	220	323	249	480	49	7	1,899
Average Relative Humidity of Air (%)	1988	70	72	70	76	81	76	82	80	85	80	79	71		
	1989	70	66	70	76	79	77	79	78	80	83	75	69		
	1990	70	65	67	73	81	78	80	74	82	82	82	73		

Source: Statistical Reports of Southern Region, National Statistical Office

2.2.3 Ecology

(1) Natural Environment

In Thailand there are some 15,000 vascular plants native to the country, but the number could be 30 to 40% higher than is presently known. Thailand forests can be classified into 6 categories consisting of rain forest, evergreen forests, montane broad leaved evergreen forests, tropical broad-leaved or seasonal evergreen, mixed species deciduous and dry dipterocarp or deciduous dipterocarp. Also, there are small forests with the precious habitats such as Limestone crags, mangroves, freshwater swamps and pine forests.

There were 918 birds found up to the end of 1989, 282 maximal species were found. Thailand's coast line fronts the Gulf of Thailand on the east coast and the Andaman Sea on the west. Consequently, the marine life includes flora and fauna which have the characteristics of both the Indian Ocean and the Indo-Pacific regions.

(2) Pollution

In Thailand, environmental pollution problems occur in the city area, especially in Bangkok. Most significant problems are air pollution, water pollution and noise. Air pollution and noise problems are caused by vehicles, water pollution is caused by drainage discharge from houses and factories.

2.3 **SOCIO-ECONOMIC CONDITIONS**

2.3.1 Population

In 1980, Thailand had a population of 44,825 thousand, which increased to 54,532 thousand in 1990, with an average growth rate of 2.0 % per year during the 1980s. The population growth rate dropped from almost 4 % in the late 1960s to 1.5 % in the late 1980s. Despite urban migration, the urban population was lower than 20 % in 1990, of which more than one half lived in Bangkok Metropolis. Bangkok Metropolis had some 5,876,000 residents, followed by Chiang Mai with 160,000 and Hat Yai with 130,000 residents. The average population density of the country was 106.3 persons per square kilometer, while that of Bangkok Metropolis was 3,754.2 persons in 1990 (see **Table 2.3.1**).

The population in Phuket Changwat amounted to 172 thousand or 0.3 % of the country's total in 1991 and it is continuously growing mainly due to migration for participation in the tourism industry. The population density of the Changwat was 322 persons per square kilometer in 1991, which is the second highest in all Changwats of the country after the region of Bangkok Metropolitan and Vicinity.

Phuket is divided into three administrative "Amphoes" (Districts): Amphoe Muang, Amphoe Thalang and Amphoe Kathu. About 50,000 people are concentrated in Phuket Town, the provincial capital. The population by Amphoe is shown in **Table 2.3.2** and the population density is illustrated in **Figure 2.3.1**.

Table 2.3.1 Population and Population Density of Thailand (1980 and 1990)

Region	1980		1990		Average Annual Growth Rate 1980-1990 %
	Number	Density per sq. km.	Number	Density per sq. km.	
Bangkok Metropolis	4,697,071	3,000.9	5,876,000	3,754.2	2.3%
Central Region (Excluding BKK Metropolis)	9,726,272	95.0	12,072,000	118.0	2.2%
Northern Region	9,074,103	53.5	10,583,000	62.4	1.6%
Northeastern Region	15,698,874	93.3	19,037,000	112.7	1.9%
Southern Region	5,628,216	79.6	6,964,000	98.5	2.2%
Whole Kingdom	44,824,540	87.4	54,532,000	106.3	2.0%
Municipal Area	7,632,916 (17.0%)		10,207,000 (18.7%)		
Non-Municipal Area	37,191,624 (83.0%)		44,325,000 (81.3%)		

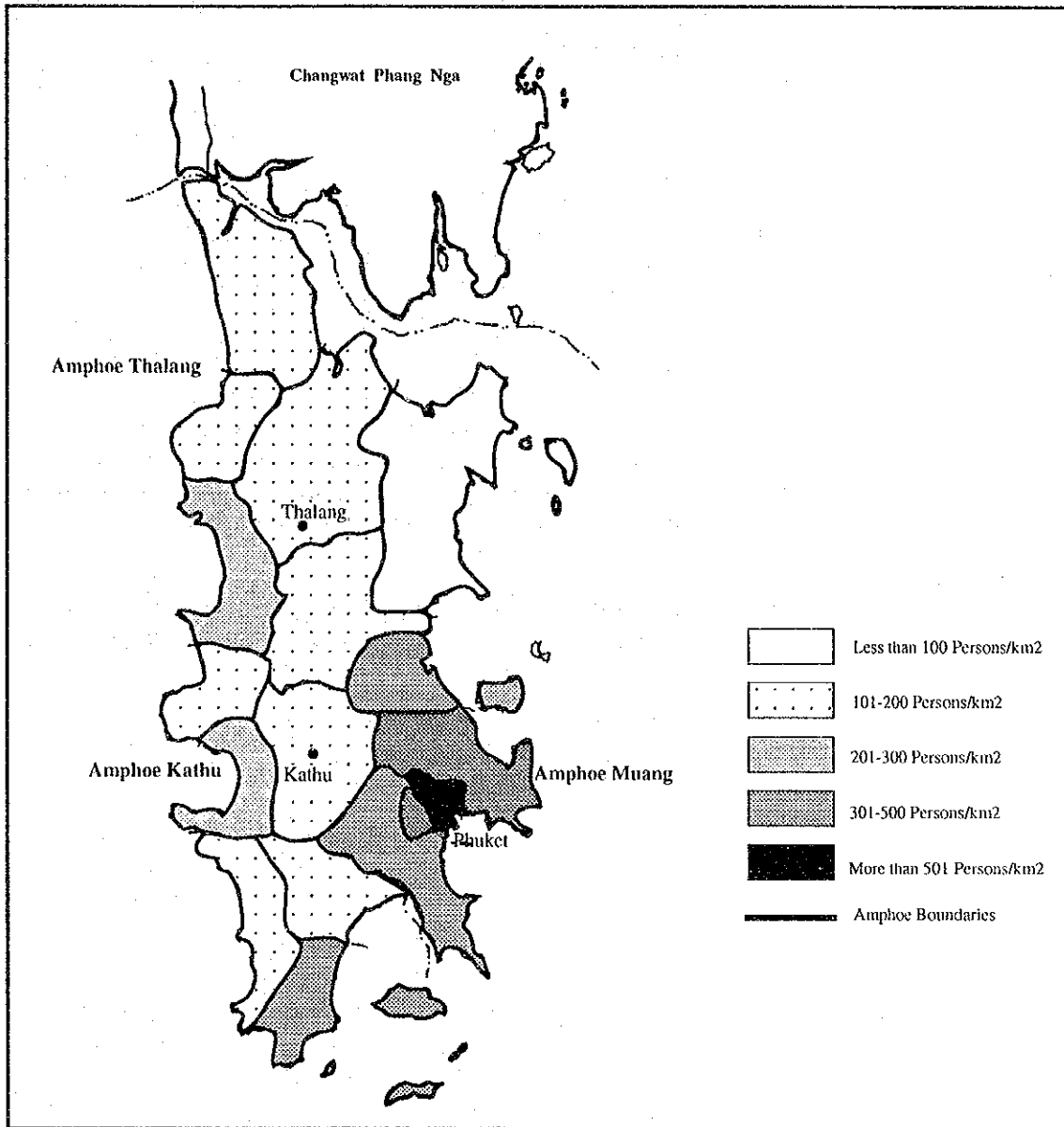
Source: Preliminary Report 1990 Population and Housing Census, National Statistical Office

Table 2.3.2 Population of Phuket Changwat by Amphoe (1981 - 1991)

	Muang		Kathu		Thalang		Whole Changwat	
		%		%		%		%
1981	80,561		13,305		42,420		136,286	
1982	81,859	1.61	13,780	3.57	43,033	1.45	138,672	1.75
1983	83,891	2.48	14,053	1.98	43,917	2.05	141,861	2.30
1984	86,067	2.59	14,161	0.77	45,001	2.47	145,229	2.37
1985	87,489	1.65	14,480	2.25	45,498	1.10	147,467	1.54
1986	89,604	2.42	14,802	2.22	45,889	0.86	150,295	1.92
1987	90,292	0.77	15,099	2.01	46,325	0.95	151,716	0.95
1988	92,659	2.62	15,546	2.96	47,162	1.81	155,367	2.41
1989	97,820	5.57	16,383	5.38	48,160	2.12	162,363	4.50
1990	101,909	4.18	17,112	4.45	49,098	1.95	168,119	3.55
1991	102,994	1.06	19,158	11.96	49,995	1.83	172,147	2.40
Average growth rate (1981-1991)		2.49		3.71		1.66		2.36

Source: Local Administration Department, Ministry of Interior

In Thailand almost 90 percent of the total population profess themselves to Buddhism, however the share of Muslims is relatively high in Phuket. According to the report of the Changwat in 1990, about 74.7 % of the total population were Buddhist, 22.3 % Muslim, 2.7 % Christian and 0.3 % other faiths .



Source: Local Administration Department, Ministry of Interior

Figure 2.3.1 Population Density of Changwat Phuket

2.3.2 Production

(1) National Economy

During the period of the Sixth National Economic and Social Development Plan (1987-1991), Thailand experienced a sustained economic growth. In 1991, its Gross Domestic Product (GDP) amounted to 2,509,000 million bahts at current prices. GDP has expanded at an average growth rate of 10.9 % per year, which is roughly twice as high as the target set in the Sixth Five Year Plan. The per capita income has increased from 21,000 bahts in 1986 to 44,000 bahts in 1991. Thailand's economic growth has been spurred mainly by the rapid increase in investments, exports and tourism revenue.

The annual growth rate of private investment during the 1987-1990 period exceeded 20 % at constant prices of 1972 and the percentage of international trade in relation to GDP increased from 60 % in 1986 to 80 % in 1991. The tourism sector has been the leading earner of foreign currency during the period of the Plan, and its revenue has increased from 37,321 million bahts in 1986 to 111,000 million bahts in 1991. The international tourist arrivals to Thailand amounted to more than 5 million in 1990 from some 2.8 million in 1986.

In spite of the remarkable performance during the Sixth Plan, there was a slowdown of the GDP growth rate to 7.9 % in 1991 from 11.5 % in 1990, mainly due to a decrease of investments and tourism revenue resulting from the Persian Gulf War. However, the economic growth of the country still remains at a relatively high level.

In 1992 the National Economic and Social Development Board (NESDB) have revised the GDP growth of the country in its forecast down to 7.4 % from the previous 7.9 %.

Major economic indicators during the period from 1980 to 1993 are given in **Table 2.3.3**.

**Table 2.3.3 Major Economic Indicators of Thailand
(1980 - 1993)**

	Sixth NESDP Period								
	1980	1985	1987	1988	1989	1990	1991 ^p	1992 ^e	1993 ^e
GDP in current prices (in billion bahts)	658	1,056	1,300	1,560	1,856	2,182	2,509	2,960	3,380
GDP per capita in current prices (in bahts)	20,473	24,331	28,713	33,617	38,895	44,095	51,211	57,330	
GDP Growth (in 1972 prices)	4.8	4.6	9.5	13.3	12.3	11.5	7.9	7.4	8.0
Agriculture	1.7	4.5	0.1	10.5	9.7	-3.7	4.4	3.1	2.5
Manufacturing	2.9	-1.4	16.0	17.9	16.0	15.9	11.9	10.8	11.0
Construction	n.a.	-0.2	9.8	12.7	28.3	19.7	18.2	7.5	10.5
Others	7.0	8.0	9.8	12.1	9.8	13.0	5.5	6.5	7.4
Expenditure									
Consumption (percentage changes in 1972 prices)									
Private	5.4	1.4	8.7	8.8	12.0	13.8	7.2	6.5	7.0
Public	2.8	8.8	0.3	4.0	2.6	7.8	8.4	1.5	1.5
Investment (percentage changes in 1972 prices)									
Private	-2.6	-8.1	29.5	29.9	26.2	30.5	10.5	3.5	10.0
Public	18.9	7.4	-9.6	-6.9	8.8	33.3	26.6	22.5	15.0
Balance of Payments (in billion bahts)									
Trade Balance	-60.4	-62	-43	-102	-140	-255	-248	-230	-255
Export	130.4	192	298	399	509	583	721	840	965
Import	190.8	253	341	501	649	838	968	1,070	1,220
Current Account Balance									
% of GDP		-41.9	-9.3	-41.8	-64.4	-186.2	-193.5	-180.0	-200.0
% of GDP		-4.0	-0.7	-2.7	-3.5	-8.5	-7.7	-6.1	-5.9
Unemployment Rate (percent)			5.9	4.3	3.6	3.8			

Source: National Economic and Social Development Board

Note: *P preliminary

*e estimate

(2) Production in Phuket Changwat

The economic growth of the country was remarkable in the late 1980s as mentioned above, and the growth of Phuket Changwat was even higher. The Gross Provincial Product (GPP) of Phuket has risen from 1,824 million bahts in 1985 to 3,355 million bahts in 1989 at 1972 constant prices with an annual growth rate of 16.5 %, which was much higher than the average growth rate of the whole Kingdom (9.6 %). The growth rates of GDP for Phuket, the Southern Region and the Whole Kingdom at constant prices of 1972 are given in **Table 2.3.4**.

The level of the per capita income of Phuket Changwat is also high. In 1989, per capita GPP for Phuket was 66,372 bahts, while per capita GRP of the Southern Region and per capita GDP of the whole Kingdom were 21,965 and 32,028 bahts respectively. The average GPP per capita in Phuket was twice the country's average and three times the Southern Region's average.

Table 2.3.4 GPP of Phuket, GRP of Southern Region and GDP of Whole Kingdom at constant prices of 1972 (1981-1990)

	Whole Kingdom		Southern Region		Phuket Changwat	
	(million bahts)	%	(million bahts)	%	(million bahts)	%
1981	318,439		30,827		1,740	
1982	331,379	4.1	32,086	4.1	1,726	-0.8
1983	355,408	7.3	33,381	4.0	1,665	-3.5
1984	380,738	7.1	35,894	7.5	1,809	8.6
1985	394,113	3.5	37,355	4.1	1,824	0.8
1986	413,490	4.9	40,592	8.7	1,998	9.6
1987	452,636	9.5	43,690	7.6	2,252	12.7
1988	512,466	13.2	48,210	10.3	2,832	25.8
1989	574,195	12.0	52,804	9.5	3,355	18.5
1990	631,610	10.0	n.a.		n.a.	
1991	681,500	7.9	n.a.		n.a.	

Source: NESDB

Note: GDP (Gross Domestic Product), GRP (Gross Regional Product)
GPP (Gross Provincial Product)

Table 2.3.5 shows products by industrial origin in 1989 and **Table 2.3.6** shows the change in the structure of GPP of Phuket Changwat during the 1981 - 1989 period.

In Phuket Changwat, the share of construction, transportation & communication and services in GPP, which are the industries supported by the tourism sector, is relatively high compared with their share in the Southern Region and in the whole Kingdom (see **Table 2.3.5**).

The share of construction, transportation & communication and services increased from 2.5 %, 7.2 % and 19.6 % in 1985, to 14.0 %, 15.3 % and

22.6 % in 1989 respectively. On the other hand, the share of mining and quarrying, which had been an important industry in Phuket until the early 1980s, declined to 0.2 % in 1989 from 12.0 % in 1985. The share of agriculture has been almost constant between 12-16 %, during the same period (see Table 2.3.6).

Table 2.3.5 GDP of Phuket Changwat, Southern Region and Whole Kingdom by Industrial Origin, 1989

	Phuket Changwat		Southern Region		Whole Kingdom	
	million bahts	%	million baht	%	million baht	%
Agriculture	1,461	12.9	53,033	32.9	266,379	15.0
Mining & quarrying	28	0.2	8,407	5.2	60,648	3.4
Manufacturing	1,047	9.2	8,769	5.4	453,258	25.5
Construction	1,588	14.0	9,391	5.8	112,283	6.3
Electricity & water supply	314	2.8	3,162	2.0	41,499	2.3
Transportation & communication	1,740	15.3	9,881	6.1	123,047	6.9
Wholesale & retail trade	1,532	13.5	30,075	18.6	272,748	15.4
Banking, insurance & retail trade	681	6.0	5,501	3.4	87,845	4.9
Ownership of dwellings	156	1.4	5,568	3.5	58,430	3.3
Public administration & defence	235	2.1	7,674	4.8	64,326	3.6
Services	2,567	22.6	19,823	12.3	235,515	13.3
GDP	11,350	100.0	161,284	100.0	1,775,978	100.0

Source: NESDB

Table 2.3.6 Change in GPP Structure of Phuket Changwat (1981 - 1989)

	1981	1985	1986	1987	1988	1989
	%	%	%	%	%	%
Agriculture	9.4	12.2	12.9	16.0	15.7	12.9
Mining & quarrying	11.1	12.0	3.5	3.1	2.8	0.2
Manufacturing	40.4	26.3	16.2	12.2	9.5	9.2
Construction	2.8	2.5	3.7	3.1	9.4	14.0
Electricity & water supply	1.9	2.8	3.2	3.2	2.9	2.8
Transportation & communication	5.6	7.2	16.0	15.3	14.3	15.3
Wholesale & retail trade	9.5	8.8	12.0	11.7	13.4	13.5
Banking, insurance & retail trade	2.1	3.4	3.7	4.6	5.0	6.0
Ownership of dwellings	1.3	2.0	2.3	2.0	1.6	1.4
Public administration & defence	2.6	3.1	3.8	3.2	2.5	2.1
Services	13.2	19.6	22.7	25.6	23.0	22.6
GPP	100.0	100.0	100.0	100.0	100.0	100.0

Source: NESDB

2.3.3 Land Use

The total area of 543 square kilometers in Phuket Changwat was classified into three parts, wood lands, farm holding lands and others according to its land utilization (see **Table 2.3.7**). The farm holding lands amounted to 263.0 square kilometers, almost half of the total area of the changwat and the share of wood lands was 7.46 %, which was relatively low compared with that of the Southern Region.

Rubber and coconut are the main crops in Phuket, followed by cashew nuts, sator and fruits such as durian, banana and pineapple. The Government maintains a rubber research station on the island to develop higher-yielding trees and to encourage replacement of old plantings with new plants. (see **Table 2.3.8**)

Rice yields can still be seen, however, they are increasingly being turned into more profitable orchards, and into resort facilities in the areas near the sea. Most of the rice consumed in Phuket comes from neighboring provinces.

Tin mining had been an important industry until the early 1980s in Phuket, however, when the tin prices declined at the world market, and the tin industry collapsed sharply. At that time, the share of the tourism industry started to increase timely in Phuket. Although the production of tin increased from 3,493 metric tons in 1985 to 4,028 metric tons in 1988, the total value of tin production decreased to about 35 % during the same period (see **Table 2.3.9**). Number of mines in operation decreased to 12 in 1988 from 52 in 1985.

Table 2.3.7 Land Utilization in Phuket and Southern Region (1983 and 1988)

	Phuket				Southern Region			
	1983		1988		1983		1988	
	Area (sq.km)	share (%)	Area (sq.km)	share (%)	Area (sq.km)	share (%)	Area (sq.km)	share (%)
Wood land	45.0	8.28	40.5	7.46	16,115.7	22.79	14,629.6	20.69
Farm holding land	202.4	37.27	263.0	48.44	22,967.6	32.48	30,383.2	42.97
Housing area	4.9	0.91	3.4	0.63	628.6	0.89	711.5	1.01
Paddy land	20.7	3.80	12.4	2.29	7,921.3	11.20	6,867.5	9.71
Under field crops	0.6	0.11	0.0	0.00	212.6	0.30	361.3	0.51
Under fruit tree and fruit crops	164.0	30.20	201.8	37.15	12,958.1	18.32	18,954.2	26.80
Under vegetables & flowers	1.0	0.18	2.1	0.38	46.7	0.07	111.4	0.16
Idle land	3.5	0.65	4.7	0.87	633.6	0.90	2,720.1	3.85
Grassland	0.0	0.00	38.6	7.12	112.4	0.16	239.1	0.34
Others	7.6	1.41	0.0	0.00	454.2	0.64	418.1	0.59
Others	295.7	54.45	239.5	44.10	31,631.9	44.73	25,702.4	36.35
	543.0	100.00	543.0	100.00	70,715.2	100.00	70,715.2	100.00

Source: Statistical Reports of Southern Region, National Statistical Office

Table 2.3.8 Production of Rubber and Coconut in Phuket and Southern Region (Crop year 1984/85 and 1987/88)

	Crop year 1984/85			Crop year 1987/88		
	Harvest area (sq. km)	Production (tons)	Average yield (tons/sq.k m)	Harvest are (sq. km)	Production (tons)	Average yield (ton/sq.km)
Phuket						
Para rubber	145.2	13,451	115.0	149.7	16,799	130.6
Coconut	48.2	17,274	387.5	49.6	19,740	428.1
Southern Region						
Para rubber	12,282.7	877,535	102.5	13,942.9	1,083,611	113.1
Coconut	2,168.7	677,711	400.0	2,209.2	835,982	435.0

Source: Statistical Reports of Southern Region, National Statistical Office

Table 2.3.9 Tin Mining in Phuket

	1985	1988
Number of Mines in operation	52	12
Number of Labor employed	2,337	3,509
Production (metric ton)	3,493	4,028
Price (bahts per metric ton)	229,780	127,240
Value (thousand bahts)	802,622	512,523

Source: Statistical Reports of Southern Region, National Statistical Office

The future land use-plans ("General Plan") for each Changwat in Thailand are prepared by the Department of Town and Country Planning, Ministry of Interior. Phuket Changwat is divided into eight planning areas as follows:

- 1) Phuket General Plan
- 2) Phuket Port and Vinchit General Plan
- 3) Chalong and Rawai General Plan
- 4) Pathong and Karon General Plan
- 5) Chang-Talag and Kamala General Plan
- 6) Mai-Khao and Sakru General Plan
- 7) Kok Kathu, Rasada and Kathu General Plan
- 8) Thap Kasat-tri and Pa-Klog and Sri-Soon Torn General Plan

Eight General Plans are attached in **Appendix 2.3.1**.

2.4 TOURISM

2.4.1 General

The impact of tourism on the balance of payment, opportunity of employment and rural development is essential for national development. Particularly during the period of the rapid economic growth in the late 1980s in Thailand, the tourism sector played an important role in the national economy.

Table 2.4.1 presents the major export products of Thailand. In 1982 the tourism sector became the leading earner of foreign currency and it maintains this position at the present time. The share of tourism amounted to 14.6 % of the total export of goods and services in 1990.

Table 2.4.1 Main Exports of Goods and Services

Rank	1981	1982	1986	1988	1990	million bahts	%
1st	Rice	Tourism	Tourism	Tourism	Tourism	110,572	14.6
2nd	Tourism	Rice	Textile products	Textile products	Textile products	84,472	11.2
3rd	Tapioca	Tapioca	Rice	Rice	Computer & parts	38,671	5.1
4th	Textile products	Textile products	Tapioca	Rubber	Rice	27,770	3.7
5th	Rubber	Sugar	Rubber	Tapioca	Rubber	23,557	3.1
Exports of Good and Services:						755,400	100.0

Source: Thailand Tourism Statistical Report, Tourism Authority of Thailand

In the late 1980s, the international tourists arrivals to ASEAN countries increased remarkably, showing the highest growth rate in the world. The average annual growth rate of international tourist arrivals in ASEAN countries during the 1985-1989 period was 12.6 %, which was more than twice the world's average. Thailand and Indonesia showed the highest growth rate among the ASEAN countries (see **Table 2.4.2**).

Table 2.4.2 : International Tourist Arrivals in ASEAN Countries (1981 - 1989)

	1981 (thousand persons)	1985 (thousand persons)	1989 (thousand persons)	annual growth 1985-89 (%)
Thailand	2,016	2,438	4,810	18.5
Brunei	287	398	457	3.5
Malaysia	656	2,933	3,673	5.8
Philippines	939	773	1,190	11.4
Singapore	2,829	2,738	4,385	12.5
Indonesia	600	749	1,626	21.4
ASEAN total	7,327	10,029	16,141	12.6
(share of ASEAN)	2.5%	3.1%	4.0%	
Whole world	288,848	326,435	403,578	5.4

Source: WTO, PATA, and Tourism Authority of each country

In 1990, the international tourist arrivals to Thailand amounted to 5,299 thousands, of which 62.4 % was the tourists from Asia and Pacific countries. Europe was 23.2 % of the total. The revenue from tourism increased to 110,572 million bahts, of which 58,373 million bahts or 52.8 % of the total revenue was received from the tourists of Asian and Pacific countries and 36,355 million bahts or 32.9 % from European tourists (see **Table 2.4.3** and **Table 2.4.4**).

There was a decline in number of tourist arrivals in 1991 due to the effects of the Persian Gulf War (Aug. 1990-Feb. 1991).

Table 2.4.3 Revenue from International Tourism, 1990

Country of Residence	Number of Arrivals	Share	Average Length of Stay	Average Expenditure	Revenue	Share
	(persons)	(%)	(days)	(bahts/person /day)	(million bahts)	(%)
The Americas	367,778	6.9	7.52	3,027	8,373	7.6
Europe	1,229,957	23.2	10.85	2,724	36,355	32.9
Middle East	94,921	1.8	9.95	2,565	2,423	2.2
Africa	32,207	0.6	7.85	2,451	620	0.6
Asia & Pacific	3,306,414	62.4	5.58	3,164	58,373	52.8
South Asia	267,583	5.0	6.17	2,682	4,429	4.0
Total	5,298,860	100.0	7.06	2,956	110,572	100.0

Source: Thailand Tourism Statistical Report, Tourism Authority of Thailand

Table 2.4.4 International Tourist Arrivals and Tourism Revenue in Thailand (1970 - 1991)

	Number of Tourist Arrivals (persons)	Annual Growth Rate (%)	Revenue from Tourism (million bahts)	Annual Growth Rate (%)
1970	628,671		2,175	
1971	638,738	1.6	2,214	1.8
1972	820,758	28.5	2,718	22.8
1973	1,037,737	26.4	3,457	27.2
1974	1,107,392	6.7	3,852	11.4
1975	1,180,075	6.6	4,538	17.8
1976	1,098,442	-6.9	3,990	-12.1
1977	1,220,672	11.1	4,607	15.5
1978	1,453,839	19.1	8,894	93.1
1979	1,591,455	9.5	11,232	26.3
1980	1,858,801	16.8	17,765	58.2
1981	2,015,615	8.4	21,455	20.8
1982	2,218,429	10.1	23,879	11.3
1983	2,191,003	-1.2	25,050	4.9
1984	2,346,709	7.1	27,317	9.0
1985	2,438,270	3.9	31,768	16.3
1986	2,818,092	15.6	37,321	17.5
1987	3,482,958	23.6	50,024	34.0
1988	4,230,737	21.5	78,859	57.6
1989	4,809,508	13.7	96,386	22.2
1990	5,298,860	10.2	110,572	14.7
1991	5,086,899	-4.0	100,004	-9.6

Source: Thailand Tourism Statistical Report, Tourism Authority of Thailand

2.4.2 Tourism Sector in Phuket

In 1990 Bangkok, Pattaya, Hat Yai, Chiang Mai and Phuket were the five biggest cities in terms of number of international guest arrivals to accommodation establishments in Thailand (see Table 2.4.5). Phuket was the fifth in rank, receiving 1,064 thousand arrivals or about 11 % of the total guest arrivals to accommodation establishments of the country.

Figure 2.4.1 shows tourist arrivals to accommodations of the five major cities during the 1986-1990 period. The share of foreign guests was relatively high in Bangkok and Pattaya and the increase rate of guest arrival was highest in Phuket. In Phuket the share of Thai tourists was higher until 1985, however, there was a rapid increase of foreign tourists in 1986 and the share of foreign arrivals amounted to twice as much as that of Thai in 1990.

The growth rate of the number of rooms in Phuket were highest among the five cities during the 1985-1990 period as shown in Figure 2.4.2, which increased over three times from 1985 to 1990. Moreover the average occupancy rate of accommodations kept growing in spite of the rapid increase in number of rooms.

Table 2.4.5 Number of Accommodation Establishments, Rooms and Guest Arrivals to Five Major Cities (1986-1990)

		1986	1987	1988	1989	1990	Av. annual growth 1986-90
Bangkok	Establishment	97	113	116	123	131	7.8%
	Rooms	22,576	24,124	25,605	27,117	28,845	6.3%
	Foreign	2,743,180	3,777,845	4,664,299	3,701,991	3,579,651	6.9%
	Thai	494,488	591,461	220,652	109,154	179,001	-22.4%
	Total arrival	3,237,668	4,369,306	4,884,951	3,811,145	3,758,652	3.8%
	Share	50%	51%	49%	42%	40%	
	Occupancy	61%	74%	78%	88%	78%	
Chiang Mai	Establishment	181	205	224	248	263	9.8%
	Rooms	6,877	7,182	8,227	9,474	10,893	12.2%
	Foreign	268,129	352,376	418,249	501,873	576,559	21.1%
	Thai	442,078	475,290	527,630	579,634	559,803	6.1%
	Total arrival	710,207	827,666	945,879	1,081,507	1,136,362	12.5%
	Share	11%	10%	10%	12%	12%	
	Occupancy	54%	56%	56%	56%	54%	
Pattaya	Establishment	193	201	259	316	324	13.8%
	Rooms	10,764	11,262	14,297	18,097	22,005	19.6%
	Foreign	633,624	1,012,181	1,255,517	1,293,847	1,251,981	18.6%
	Thai	300,343	405,270	471,508	398,354	329,322	2.3%
	Total arrival	933,967	1,417,451	1,727,025	1,692,201	1,581,303	14.1%
	Share	14%	16%	17%	18%	17%	
	Occupancy	55%	62%	63%	58%	54%	
Phuket	Establishment	141	150	161	203	207	10.1%
	Rooms	4,754	6,551	7,988	12,259	13,160	29.0%
	Foreign	253,731	334,889	509,322	523,013	737,617	30.6%
	Thai	223,223	212,060	216,851	287,001	326,646	10.0%
	Total arrival	476,954	546,949	726,173	810,014	1,064,263	22.2%
	Share	7%	6%	7%	9%	11%	
	Occupancy	57%	59%	61%	63%	63%	
Hat Yai	Establishment	68	71	73	79	83	5.1%
	Rooms	5,212	5,643	5,779	6,233	7,107	8.1%
	Foreign	445,362	601,718	705,721	758,759	747,847	13.8%
	Thai	333,113	428,556	463,934	556,360	638,931	17.7%
	Total arrival	778,475	1,030,274	1,169,655	1,315,119	1,386,778	15.5%
	Share	12%	12%	12%	14%	15%	
	Occupancy	57%	65%	62%	61%	60%	
Other area	Establishment	1,989	2,060	2,418	2,498	2,663	7.6%
	Rooms	66,814	69,377	73,824	74,973	86,583	6.7%
	Foreign	184,994	216,054	187,223	254,031	306,610	13.5%
	Thai	195,446	209,379	285,983	190,679	172,426	-3.1%
	Total arrival	380,440	425,433	473,206	444,710	479,036	5.9%
	Share						
	Occupancy						
Total	Establishment	2,669	2,800	3,251	3,467	3,671	8.3%
	Rooms	116,997	124,139	135,720	148,153	168,593	9.6%
	Foreign	4,529,020	6,295,063	7,740,331	7,033,514	7,200,265	12.3%
	Thai	1,988,691	2,322,016	2,186,558	2,121,182	2,206,129	2.6%
	Total arrival	6,517,711	8,617,079	9,926,889	9,154,696	9,406,394	9.6%
		100%	100%	100%	100%	100%	

Source: Thailand Tourism Statistical Report, Tourism Authority of Thailand

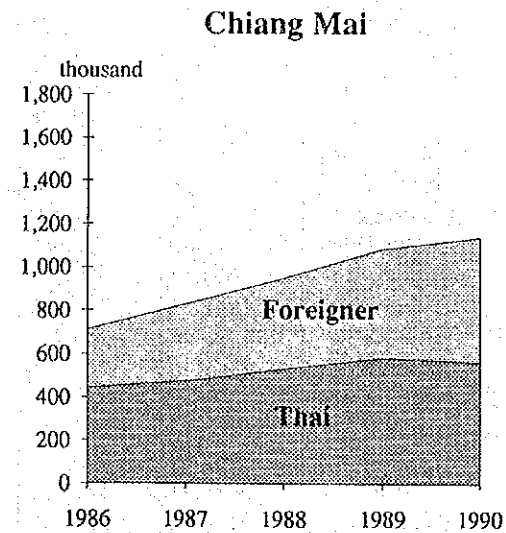
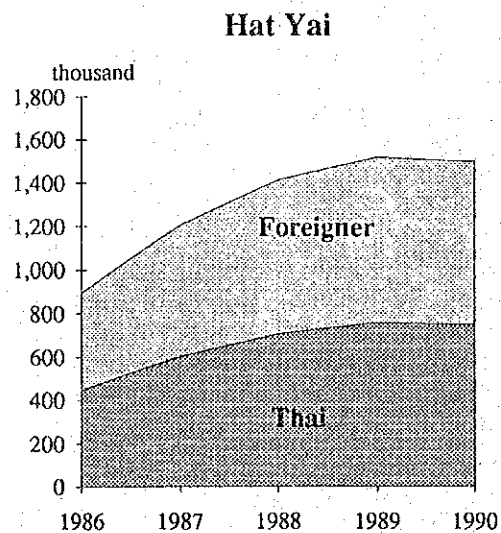
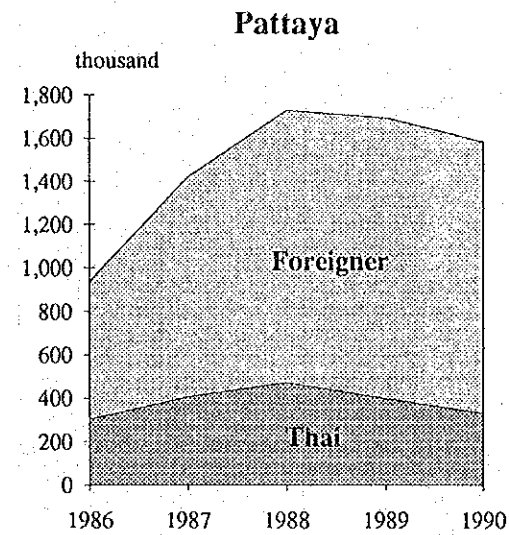
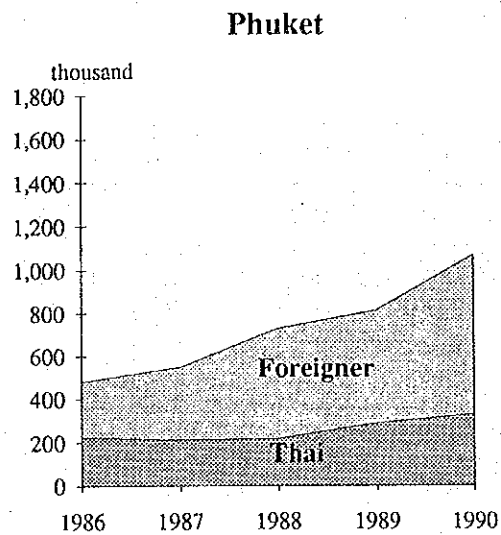
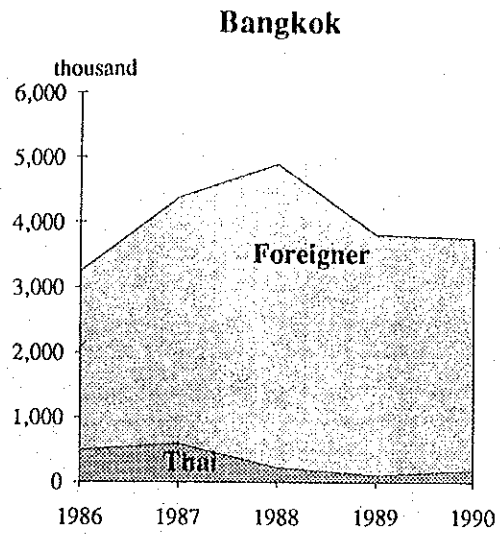
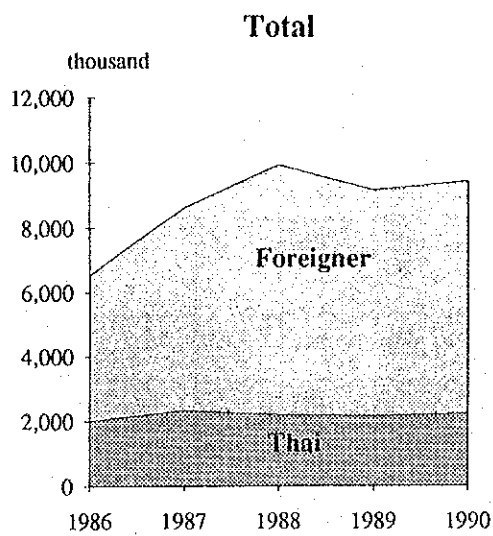


Figure 2.4.1 Guest Arrivals to Accommodation Establishments in Major Cities

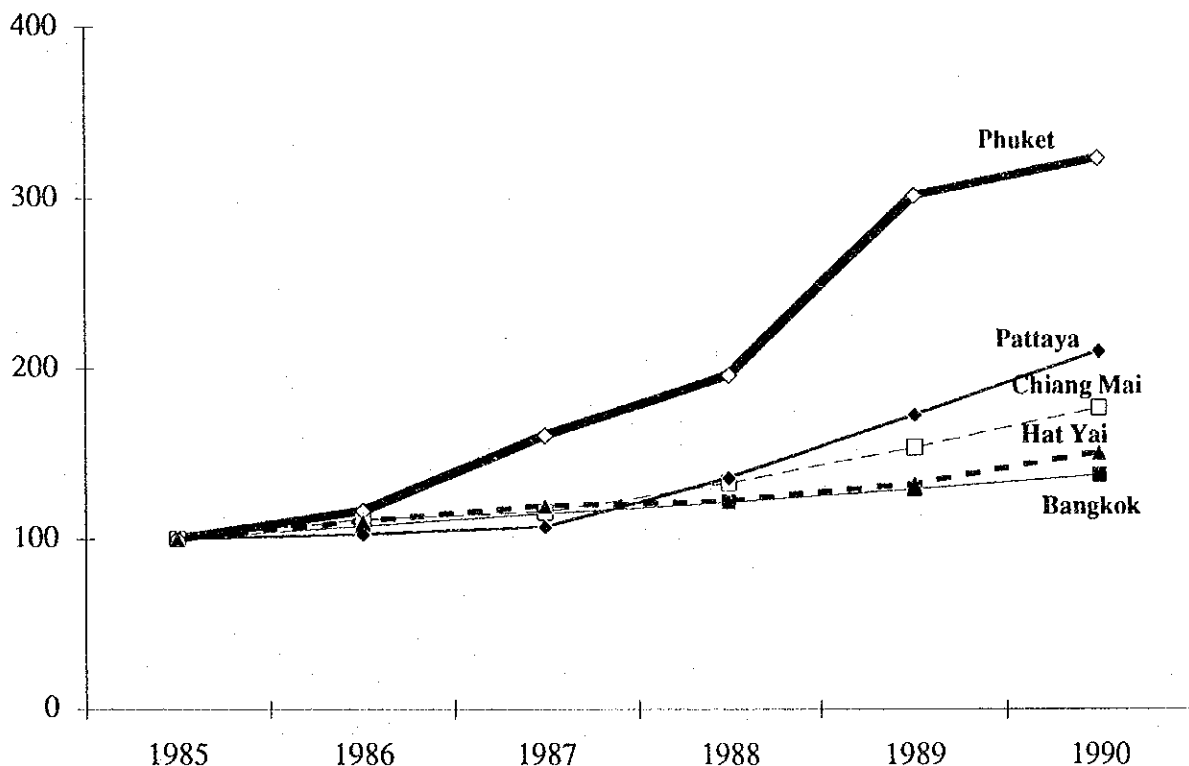


Figure 2.4.2 Change in Number of Rooms in Major Cities (1985=100)

In Phuket, as mentioned above, rapid growth of tourist arrivals took place due to the increase of foreign tourists, which supported the establishment of new accommodations from 1986, and during the late 1980s its growth was highest in Thailand.

2.4.3 Tourism Resources and Facilities in Phuket

(1) Tourism Resources

Phuket is well-known as an international marine resort and providing various tourism facilities both to international and domestic tourists.

The best beaches of Phuket lie on the island's western coast facing the Andaman Sea, extending from Mai Khao near the airport to Rawai at the southern tip of Phuket island (see **Figure 2.4.3**).

(2) Accommodation Establishments in Phuket

The turning point of tourism development in Phuket was probably reached when the Club Mediterranean was established at Kata Beach, followed by the construction of Phuket Yacht Club on Nai Harn. This marked the end to the period of cheap bungalows which started in the early '70s and lasted for a decade.

The number of accommodation establishments are given in **Table 2.4.6** and indicated in **Figure 2.4.3**.

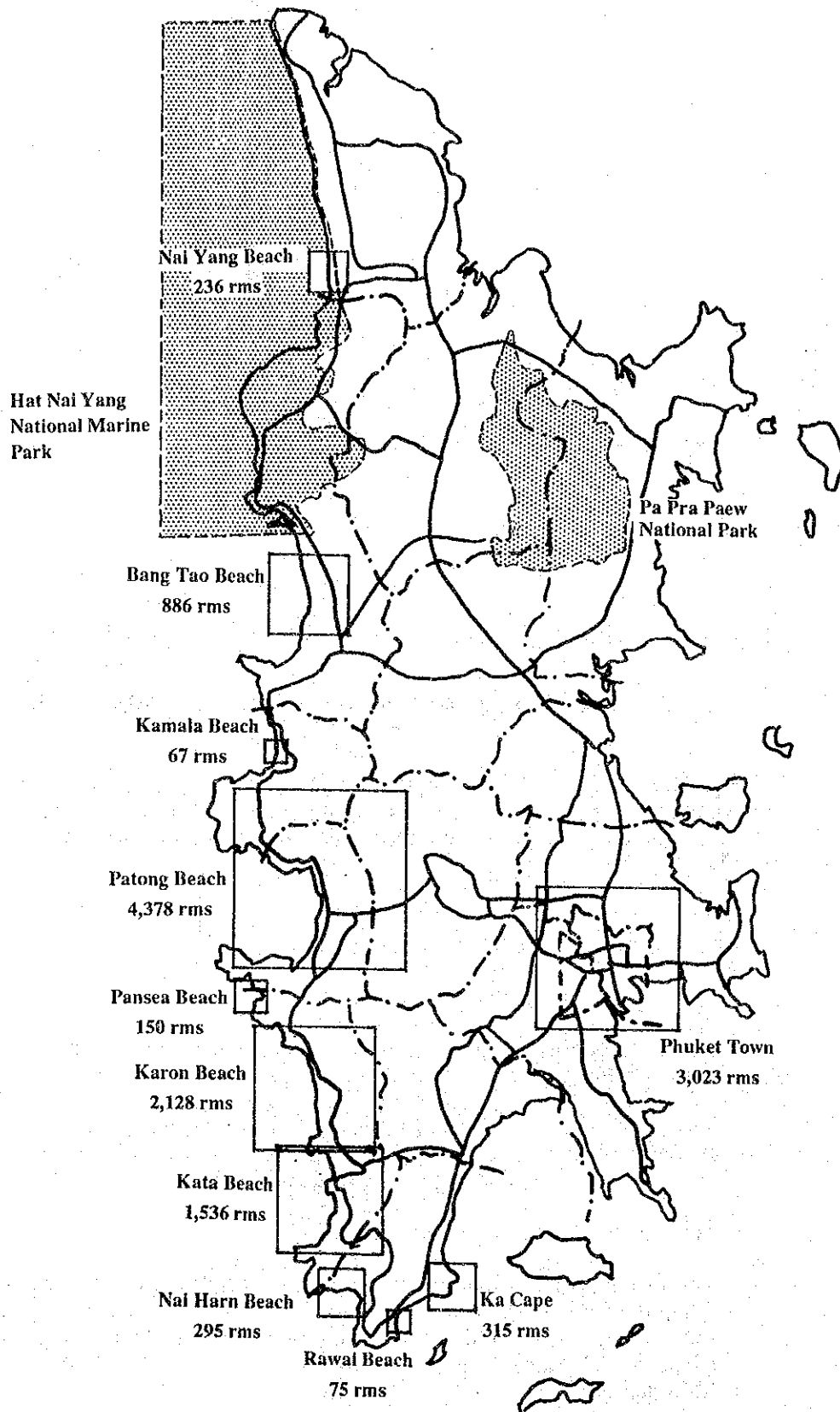


Figure 2.4.3 Major Beaches and Number of Rooms in Phuket, 1991

Table 2.4.6 Accommodation Establishments and Number of Rooms in Phuket, 1991

	Number of Accommodation Establishments	Number of Rooms
Phuket Town	46	3,023
Kamala Beach	2	67
Kata Beach	34	1,536
Karon Beach	28	2,128
Nai Yang Beach	4	236
Nai Harn Beach	8	295
Bang Tao Beach	5	886
Patong Beach	74	4,378
Pansea Beach	2	150
Mittrapab Beach	3	73
Rawai Beach	4	75
Ka Cape	2	315
Others	10	381
Totals	222	13,543

Source: Accommodation & Bus Information in Phuket, 1991
Tourism Authority of Thailand

2.4.4 Tourist Characteristics

(1) International Tourist Arrivals by Nationality

The share of tourist arrivals from Asia and Pacific was 62.4 % and that from Europe was 23.2 % of the total international arrivals to Thailand in 1990. On the other hand, in Phuket the share of European arrivals and that of Asian and Pacific arrivals were almost the same as shown in **Table 2.4.7**. Phuket is an attractive destination for European tourists to Thailand and Europe and the Asia & Pacific is the main market for Phuket tourism. Taiwanese, German and the English were at the top three among the international visitors to Phuket in 1990.

Table 2.4.7 Tourist Arrivals by Nationality, 1990

Nationality	Number of Arrivals to Thailand		Number of Arrivals to Accommodations in Phuket	
	(persons)	Share (%)	(persons)	Share (%)
The Americas	367,778	6.9	40,909	5.5
Europe	1,229,957	23.2	326,081	44.2
Middle East	94,921	1.8	1,982	0.3
Asia & Pacific	3,306,414	62.4	337,028	45.7
South Asia	299,790	5.6	31,617	4.3
Total	5,298,860	100.0	737,617	100.0

Source: Thailand Tourism Statistical Report, Tourism Authority of Thailand

(2) International Tourist Arrivals by Month

Figure 2.4.4 shows seasonal fluctuations in the tourist arrivals to accommodations in 1990. Two peaks, one from November to April and another in July and August, are distinguished. The share of European tourists is high from November to February and that of tourists from the Asian and Pacific regions is high for July and August. **Table 2.4.8** shows tourist arrivals to Phuket by month and nationality in 1990.

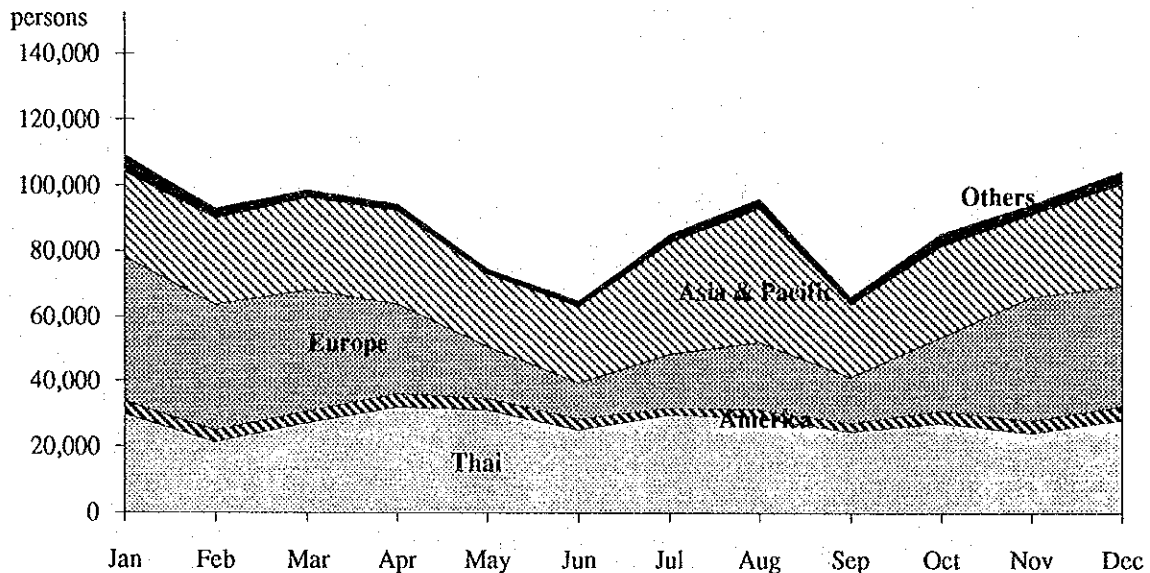


Figure 2.4.4 Tourist Arrivals to Accommodation Establishments in Phuket by Month, 1990

(3) Purpose of Travel

Table 2.4.9 shows the purpose of travel to Thailand and Phuket for international tourists. Almost 90 % of the total international arrivals visited Thailand for Holiday purposes and the tourists traveling to Phuket for holidays was 95.19 % among foreign tourists and 58.75 % among Thai tourists. The share of business was relatively high among the Thai tourists to Phuket.

Table 2.4.9 Purpose of Travel, 1990

	International Travelers		Thai Travelers
	to Thailand	to Phuket	to Phuket
Holiday	89.65 %	95.19 %	58.75 %
Business	7.54 %	2.94 %	19.70 %
Others	2.81 %	1.87 %	21.55 %

Source: Thailand Tourism Statistical Report, Tourism Authority of Thailand

(4) Length of Stay

Compared with other destinations in Thailand, the average length of stay per person is relatively long in Phuket. It increased to 4.9 days in 1990 from 3.6 days in 1986.

Table 2.4.8 Guest Arrivals to Accommodation Establishments in Phuket by Nationality and Month, 1990

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	share
Thailand	29,632	21,107	27,041	31,800	30,805	24,833	29,395	28,554	24,348	26,906	24,017	27,928	326,646	30.7%
USA	2,703	2,252	2,056	3,061	2,799	2,888	1,527	2,152	1,881	2,931	2,532	3,366	30,148	2.8%
Canada	1,074	1,317	1,496	1,055	781	485	570	430	625	893	1,110	925	10,761	1.0%
The Americans	3,777	3,569	3,552	4,116	3,580	3,373	2,097	2,582	2,506	3,824	1,642	4,291	40,909	3.8%
Austria	2,498	2,189	1,919	1,370	550	374	834	502	465	1,214	1,680	1,759	15,354	1.4%
Belgium	562	410	378	332	174	140	546	318	314	382	487	579	4,622	0.4%
Denmark	294	336	239	153	94	123	279	209	97	181	192	325	2,522	0.2%
France	4,820	3,836	4,223	2,445	1,684	664	1,494	2,154	708	1,402	2,874	2,989	29,293	2.8%
Germany	14,651	11,997	13,634	9,042	3,959	2,514	3,806	3,309	2,917	5,006	12,983	13,463	97,281	9.1%
Italy	8,080	6,932	4,831	3,022	2,270	1,316	1,468	5,571	2,378	3,263	4,013	5,222	48,366	4.5%
Netherlands	792	735	609	634	491	330	638	429	336	665	1,141	959	7,759	0.7%
Sweden	1,515	917	1,158	1,053	366	413	839	286	651	1,116	1,617	1,670	11,601	1.1%
Switzerland	4,794	4,341	3,058	2,383	934	685	1,125	881	851	1,924	3,956	3,701	28,633	2.7%
UK	6,779	7,210	7,396	7,530	5,484	4,501	5,622	7,231	5,374	7,716	9,250	6,557	80,650	7.6%
Europe	44,785	38,905	57,445	27,964	16,006	11,069	16,651	39,890	14,091	22,869	38,193	37,228	326,081	30.6%
Australia	6,348	4,223	3,986	5,473	4,209	3,533	5,439	4,747	4,618	5,317	4,228	4,301	56,422	5.3%
Hong Kong	5,045	5,129	5,409	4,158	4,379	4,654	7,429	7,854	3,032	4,023	4,161	6,568	61,841	5.8%
Japan	3,094	2,830	4,057	2,929	2,508	2,029	3,917	6,286	4,169	3,225	2,586	2,798	40,428	3.8%
New Zealand	366	166	170	309	335	308	450	547	426	489	245	212	4,023	0.4%
Taiwan	6,913	10,275	10,610	10,492	6,469	7,292	12,287	16,364	7,141	10,221	8,301	10,910	117,275	11.0%
Malaysia	1,673	1,189	1,460	1,598	2,031	1,788	1,835	1,424	1,213	1,876	2,980	1,408	20,475	1.9%
Singapore	2,260	2,599	2,468	3,389	2,650	4,287	2,815	3,695	2,082	2,802	2,735	4,782	36,564	3.4%
Asia & Pacific	25,699	26,411	28,160	28,348	22,581	23,891	34,172	49,917	22,683	27,953	25,236	30,979	337,028	31.7%
Middle-East	161	100	96	113	160	136	493	83	95	135	235	173	1,982	0.2%
Others	4,927	2,755	2,277	1,978	1,593	1,447	2,000	2,795	2,227	3,552	2,721	3,603	31,617	3.0%
Total	108,981	92,845	98,571	94,259	74,605	64,740	85,008	95,821	65,948	85,239	94,044	104,202	1,064,263	100.0%
	10.2%	8.7%	9.3%	8.9%	7.0%	6.1%	8.0%	9.0%	6.2%	8.0%	8.8%	9.8%	100.0%	