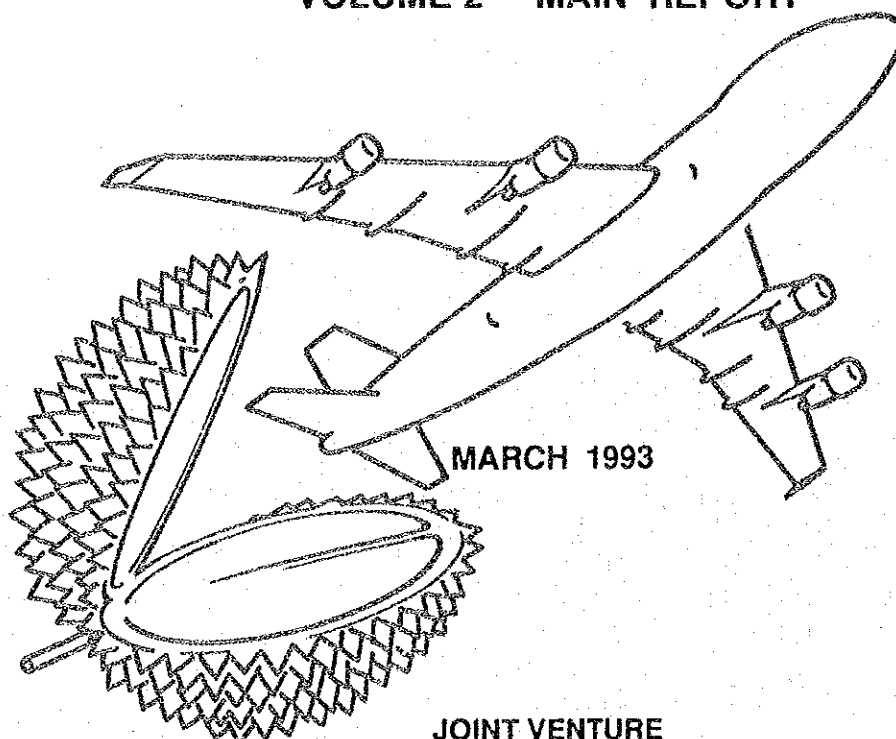


JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS  
REPUBLIC OF THE PHILIPPINES

THE STUDY ON THE DEVELOPMENT PLAN  
OF  
DAVAO INTERNATIONAL AIRPORT  
IN  
REPUBLIC OF THE PHILIPPINES

FINAL REPORT

VOLUME 2 MAIN REPORT



JOINT VENTURE  
OF  
PACIFIC CONSULTANTS INTERNATIONAL  
AND  
AERO ASAHI CORPORATION  
Tokyo, Japan

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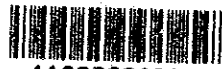
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## PREFACE

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

JICA sent to the Philippines a study team headed by Mr. Hideki Murata, Pacific Consultants International, three times between March 1992 and March 1993.

The team held discussions with the officials concerned of the Government of the Philippines, and conducted field surveys at the study area. After the team returned to Japan, further studies were made 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 our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Republic of the Philippines for their close cooperation extended to the team.

March 1993



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Kensuke Yanagiya

President  
Japan International Cooperation Agency

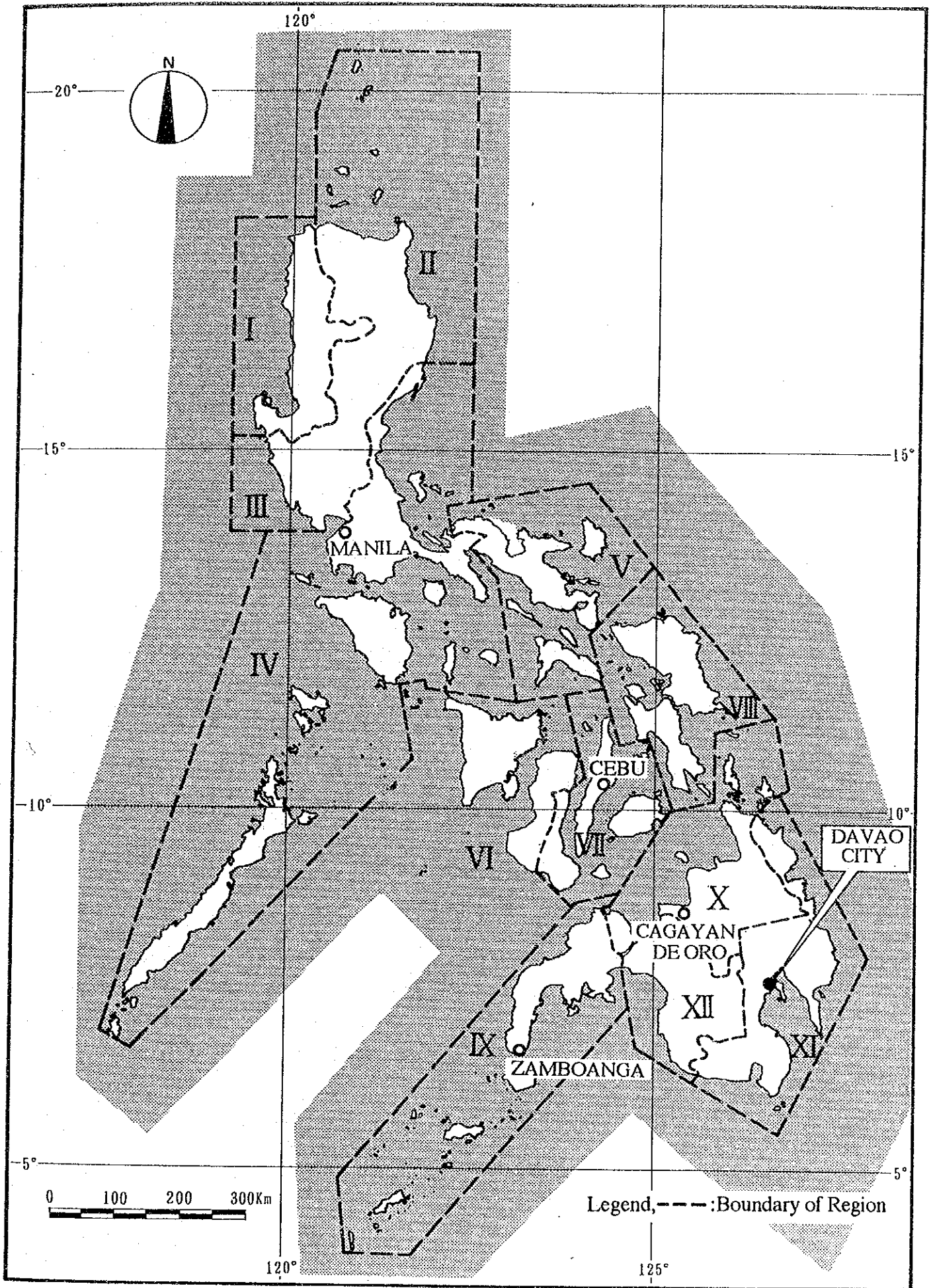






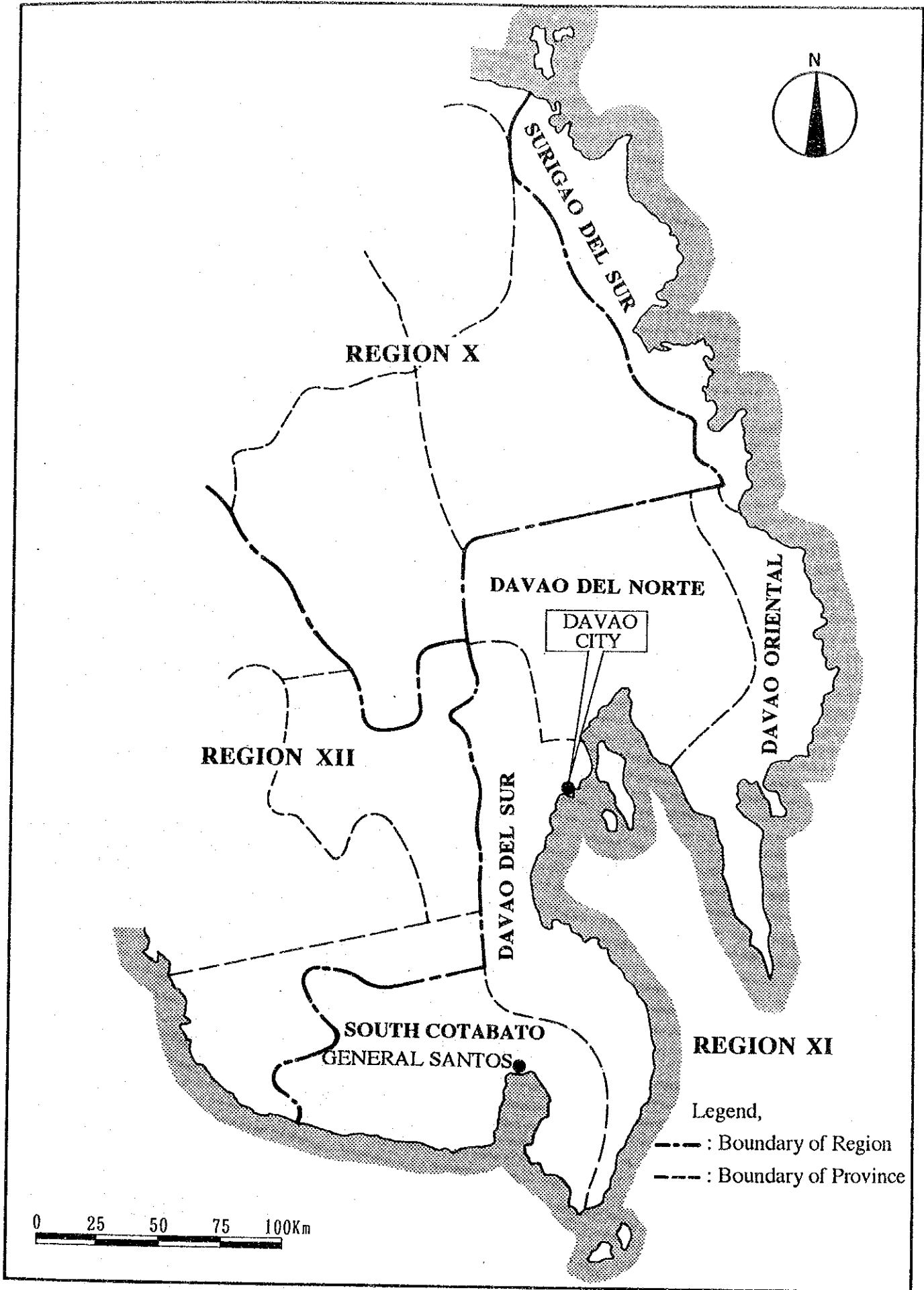
DAVAO INTERNATIONAL AIRPORT LONG-TERM DEVELOPMENT PLAN





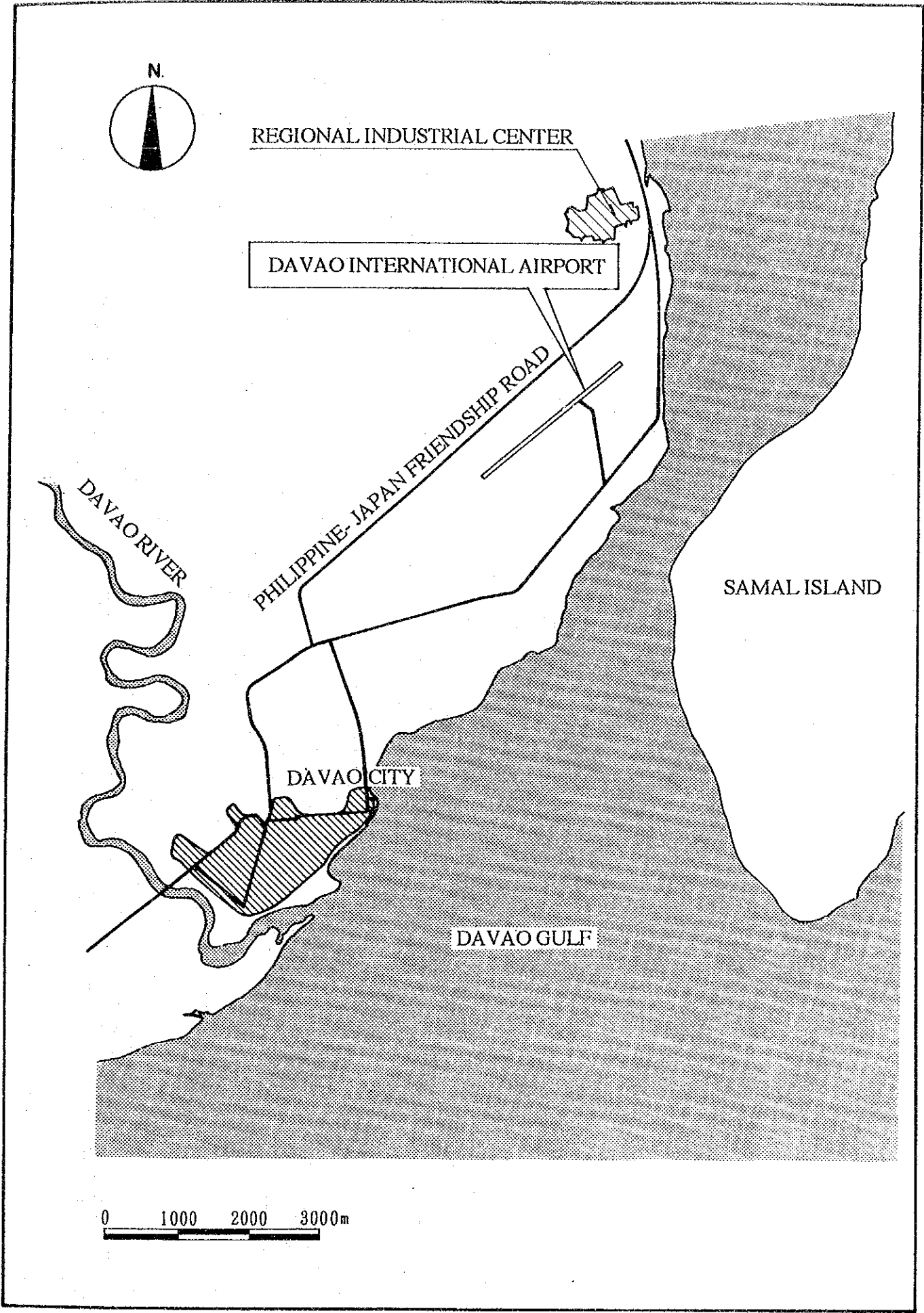
**PROJECT LOCATION MAP (1)**





**PROJECT LOCATION MAP (2)**





**PROJECT LOCATION MAP (3)**





## LIST OF ABBREVIATIONS

A300	:	Airbus 300
AFFF	:	Aqueous Film Forming Foam
AFTN	:	Aeronautical Fixed Telecommunication Network
AGL	:	Aeronautical Ground Light
AIP	:	Aeronautical Information Publication
ALS	:	Approach Lighting System
AMSL	:	Above Mean Sea Level
APP	:	Approach Control Office
ASTM	:	American Society for Testing and Materials
ATC	:	Air Traffic Control
ATO	:	Air Transportation Office
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
CBR	:	California Bearing Ratio
CCR	:	Constant Current Regulator
CIP	:	Commercial Important Person
CIQS	:	Customs, Immigration, Quarantine and Security
CTR	:	Control Zone
CVOR	:	Conventional VHF Omni-Directional Radio Range
DC10	:	McDonnell Douglas 10
DILG	:	Department of Interior and Local Government
DME	:	Distance Measuring Equipment
DOTC	:	Department of Transportation and Communications
DVOR	:	Doppler VHF Omni-Directional Radio Range
EIRR	:	Economic Internal Rate of Return
EL	:	Elevation Antenna (MLS)
ESF	:	Economic Support Fund
F50	:	Fokker 50
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)
GRP	:	Gross Regional Product
GSE	:	Ground Service Equipment
HF	:	High Frequency
HLURB	:	Housing and Land Use Regulatory Board
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

ILZ	:	Localizer Antenna (ILS)
MD-11	:	McDonnell Douglas 11
MHz	:	Mega Hertz
MLS	:	Microwave Landing System
MM	:	Middle Marker
NCR	:	National Capital Region
NDB	:	Non Directional Radio Beacon
NEDA	:	National Economic and Development Authority
NFPA	:	National Fire Protection Association
NEC	:	National Electric Code
NM	:	Nautical Mile
NPV	:	Net Present Value
OAS	:	Obstacle Assessment Surface
OECF	:	Overseas Economic Cooperation Fund
OIS	:	Obstacle Identification Surface
OLS	:	Obstacle Limitation Surface
PAGASA	:	Philippine Atmosphere Geophysical and Astronomical Services Administration
PAL	:	Philippine Airlines
PAPI	:	Precision Approach Path Indicator
PAPICON	:	Security of Philippine National Police
P-DME	:	Precision Distance Measuring Equipment
PHP	:	Philippine Pesos
PLDT	:	Philippine Long Distance Telephone Company
PMO-TP	:	Program Management Office, Transportation Project
QNH	:	Altimeter sub-scale setting to obtain elevation when on the ground
RDC	:	Regional Development Council
RWY 05	:	Runway 05
RWY 23	:	Runway 23
RX	:	Receiver
SALS	:	Simple Approach Lighting System
SID	:	Standard Instrument Departure
SSB	:	Single Side Band
TMA	:	Terminal Control Area
TWR	:	Aerodrome Control Tower
TX	:	Transmitter
USA	:	United States of America
VHF	:	Very High Frequency
VIP	:	Very Important Person
VMC	:	Visual Meteorological Condition
WECPNL	:	Weighted Equivalent Continuous Perceived Noise Level

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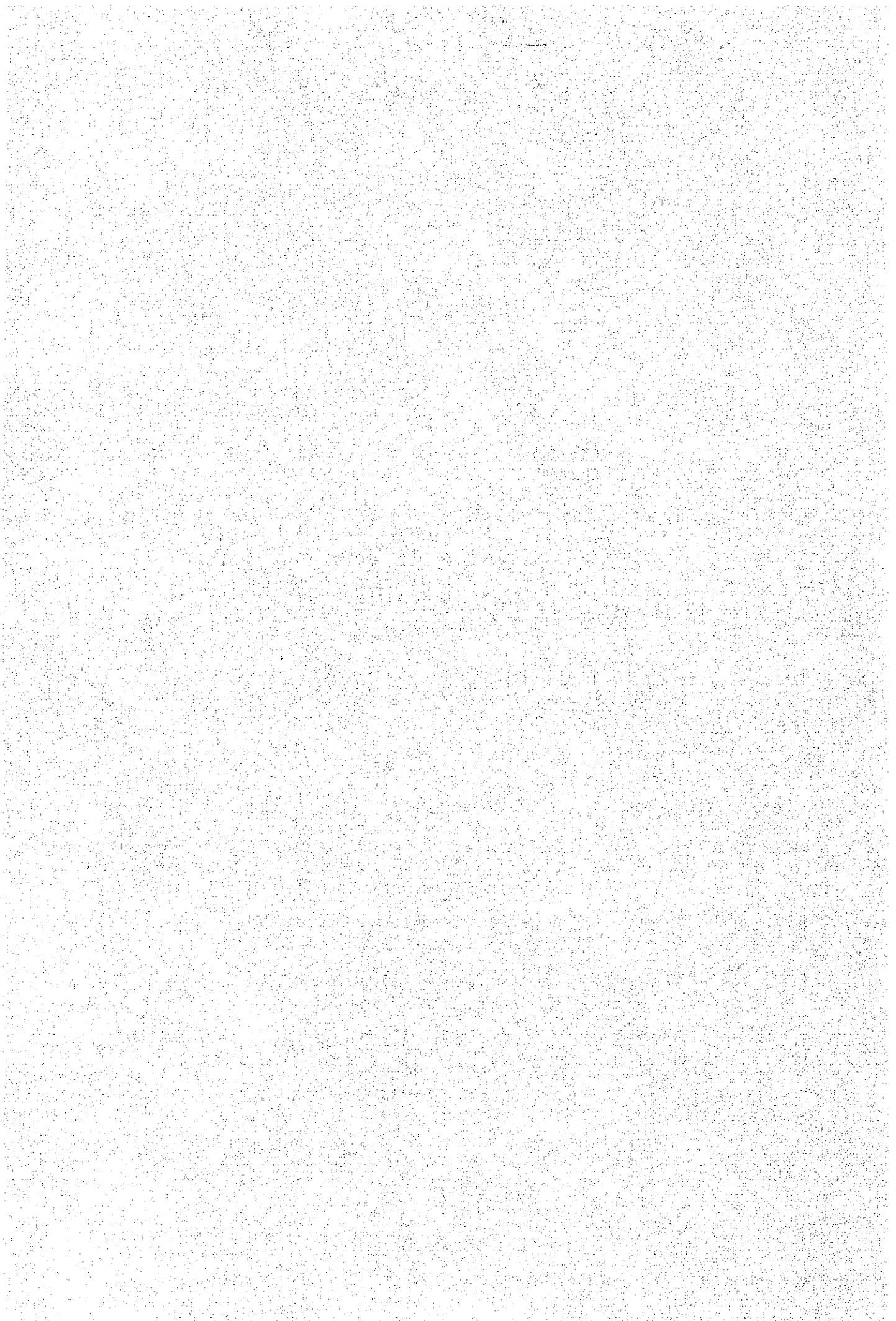
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# **CHAPTER 1 INTRODUCTION**



## CHAPTER 1 INTRODUCTION

### 1.1 Background

The Republic of the Philippines is one of the largest archipelagic countries in the world, consisting of 7,107 islands. The country has a population of 64 million. Due to the dispersion of the islands over a large area of approximately 300,000 sq km, air transportation has a vital role in transporting passengers and cargo quickly between the islands.

The country is broadly divided into three regions, i.e. Luzon, Visayas and Mindanao. Davao City is the center of administration, agro-industry and financial business in Mindanao. With its 850 thousand population, it is the second largest city next to Metro Manila.

While the Luzon region is the most developed in the country and the Visayas region has been developed positively since 1987, the Mindanao region has remained undeveloped. Accordingly, the Government of the Philippines recognizes the importance of the development of the Mindanao region from the viewpoint of a balanced national development. The development of Davao International Airport, which is expected to act as a base for development of the Mindanao region, is therefore important and indispensable from the viewpoint of national development.

While Davao International Airport is the third largest airport in the Philippines and classified as an alternate international airport by ICAO Regional Air Navigation Plan for Asia and Pacific, its existing air-side facilities and airspace do not fully meet the specifications adopted by the council of ICAO for the safety or regularity of international air navigation. The existing passenger terminal is also facing capacity shortage problems. Urgent implementation of an orderly airport development program is required to solve these problems.

In addition, the area surrounding the airport has rapidly been urbanized. Therefore, the establishment of a long-term master plan is necessary to ensure future expansion of the airport and facilities, and to harmonize the airport with the surrounding community.

### 1.2 Objectives of the Study

In order to solve these problems the Study has been carried out by the assistance of JICA. The main objectives of the Study defined by JICA are:

- a) To formulate the Master Plan for Long-Term Development of Davao International Airport at the existing site; and
- b) To evaluate technical, economic and financial feasibility of the Medium-Term Development Plan to be formulated within the framework of the Master Plan.

### 1.3 Scope of the Study

The scope of the Study was defined in the Implementing Arrangement as shown in Appendix-1.3.1 which was agreed upon between the Department of Transportation and Communications (DOTC) and the Japan International Cooperation Agency (JICA) on December 13, 1991.

In order to fully cover the Scope of the Study, 34 major study items are identified and illustrated in Figure 1.3.1 as the work flow chart of the Study.

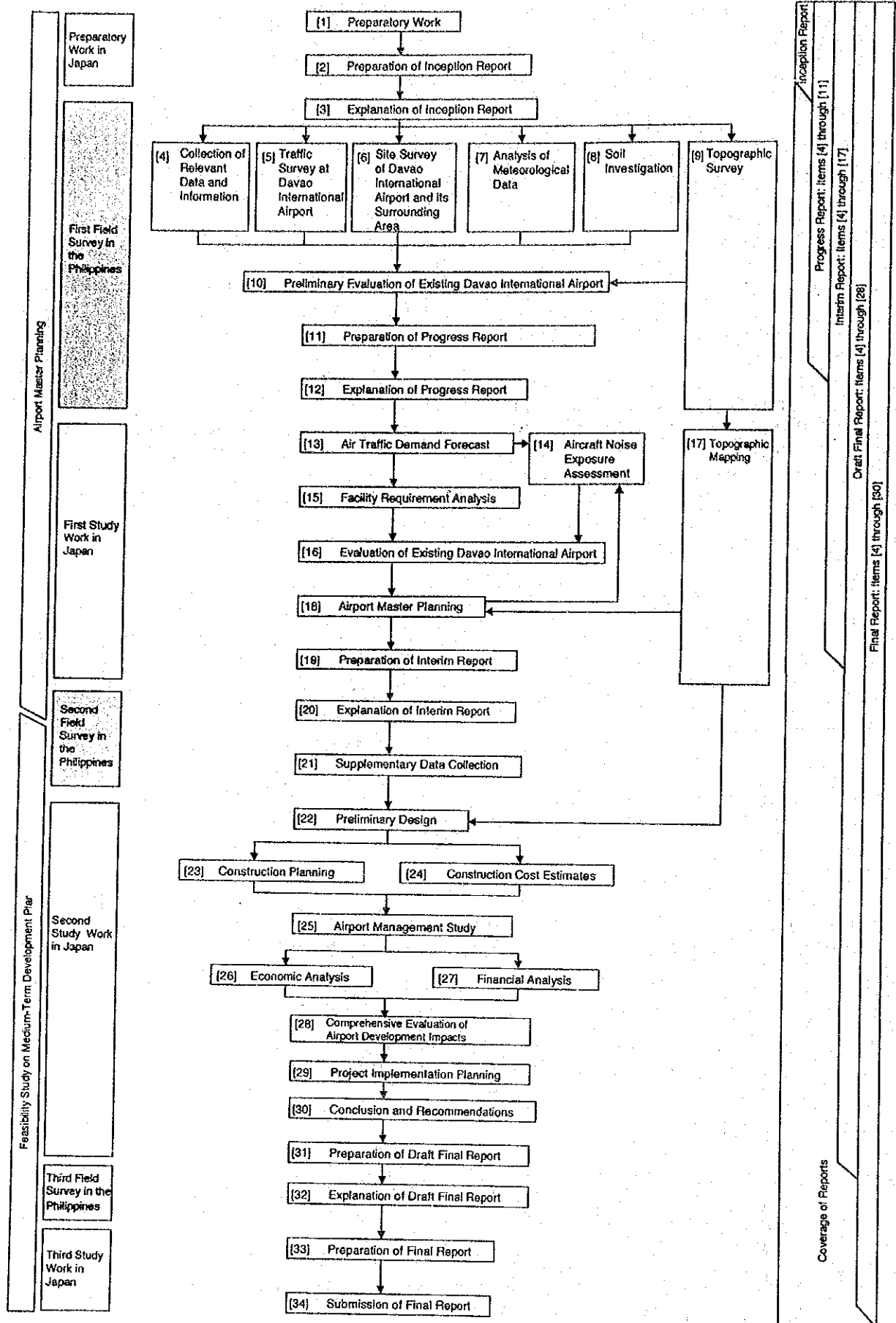


Figure 1.3.1 Work Flow Chart of Study

#### 1.4 Study Organization

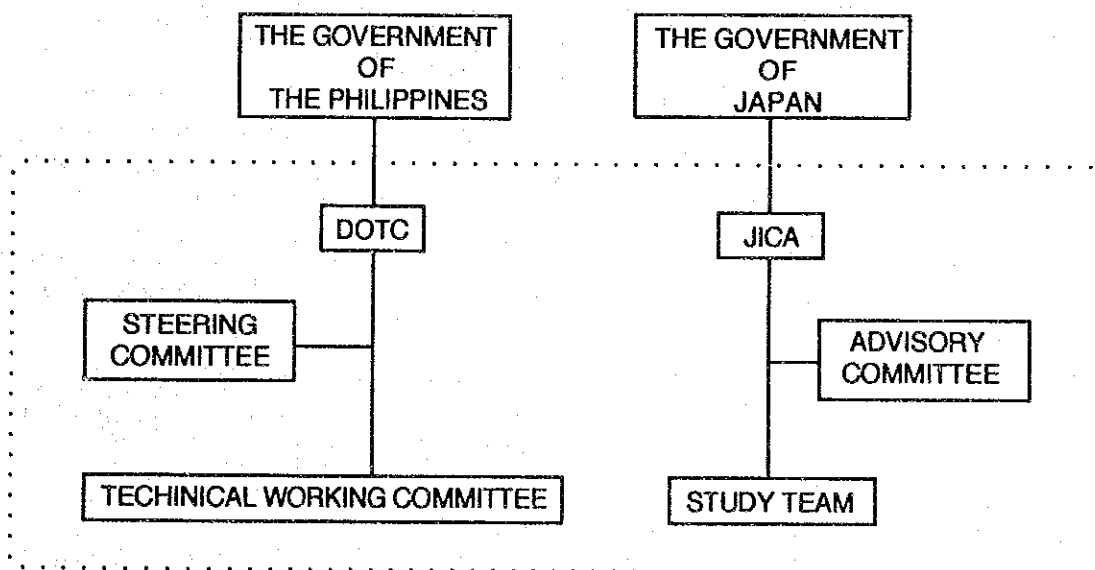
The Study is being carried out by the JICA Study Team under the direction of the Advisory Committee which has also been organized by JICA.

The counterpart of the JICA Study Team is DOTC. The DOTC has organized a Steering Committee and a Technical Working Committee.

The study is being conducted in close coordination with concerned authorities of the Government of the Philippines.

##### (1) Overall Concept of Study Organization

The overall organization frame is shown in Figure 1.3.2



**Figure 1.3.2 Overall Organization Chart**

- (2) Member of the JICA Team
- Mr. Hideki MURATA : Team Leader/Airport Planner
- Mr. Ryujirou YAMAGISHI : Traffic Forecaster/Economic Analyst
- Mr. Tadimitsu ITOH : Airways Planner/Airport Management Planner
- Mr. Kazuo HAYASHI : Airport Civil Engineer/Airport Planner
- Mr. Masashi KABURAGI : Airport Architect
- Mr. Yoshiya NIINOMI : Air Navigation System Engineer
- Mr. Yutaka YAMASAKI : Construction Planner/Cost Estimator
- Mr. Kiyoshi ARAI : Topographic Surveyor
- (3) Member of the Advisory Committee
- Mr. Norio SANAKA : Director, Aerodrome Department,  
(Chairman) Tokyo Civil Aviation Bureau,  
Ministry of Transport
- Mr. Hirotaka SATO : Deputy Director, Construction Division,  
Aerodrome Department, Civil Aviation  
Bureau, Ministry of Transport
- Mr. Kouji KITAMURA : Special Assistant to the Director, Construction  
Division, Aerodrome Department, Civil  
Aviation Bureau, Ministry of Transport
- Mr. Kenro OHTSUKA : Radio Engineering Division, Air Traffic  
Services Department, Civil Aviation Bureau,  
Ministry of Transport
- (4) JICA Coordinator
- Mr. Mutsumi NARAWA : Project Officer, First Development Study  
Division, Social Development Study  
Department, JICA
- (5) Steering Committee of the Philippines
- Mr. Gerardo C. Protacio : Assistant Secretary, ATO  
(Chairman)
- Mr. Bienvenido O. Manga : Executive Director, ATO
- Mr. Ramon V. Dumauual : Programme Director, PMO-TP
- Mr. George D. Esguerra : Director, Transportation Planning Service,  
DOTC



(6) Technical Working Committee of the Philippines

Mr. Raphael S. Lavidas	: Project Manager, DOTC
Mr. Manuel V. De Leon	: Asst. Project Manager, ATO
Mr. Florante Magdamo	: Air Space Planner, ATO
Ms. Filipina L. Larracas	: Financial Analyst, DOTC
Ms. Maria Filipinas Cabana	: Nav aids/Comms. Planner, DOTC
Ms. Elmira M. Domingo	: Airport Engineer, DOTC
Mr. Mario Garcia	: Telecom/Nav aids Specialist, ATO
Mr. Angel Rongcal	: Airport Management Planner, ATO (Davao Airport Manager)
Ms. Ruby D. Manzo	: Airport Management Planner, DOTC
Mr. Felicisimo C. Pangilinan Jr.	: Forecast/Facilities Planner, DOTC
Ms. Elsa D. Pineda	: Airport Economist, DOTC

1.5 Activities of the Study Team

1.5.1 First Field Survey in the Philippines

On April 15, 1992, the Study Team arrived in Manila, the Philippines, to carry out the two-month long First Field Survey. On April 21, 1992, the Study Team and the Advisory Committee held a meeting on the Inception Report with the representatives of the DOTC. The Inception Report was generally accepted by the DOTC. The minutes of the meeting on the Inception Report is shown in Appendix-1.5.1.

In accordance with the Implementing Arrangement of the Technical Cooperation, the Government of the Philippines has organized the Steering Committee and the Technical Working Committee.

The Study Team completed the First Field Survey in the Philippines with close cooperation of the Steering and Technical Working Committees. The major activities of the Study Team during the First Field Survey included data collection, topographic survey, soil investigation and evaluation of the existing airport.

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 DOTC in June 1992.

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

A list of data and information collected during the Study is shown in Appendix-1.5.3.

### 1.5.2 First Study Work in Japan

After returning from the Philippines, the Study Team proceeded with the First Study Work in Japan which aimed at producing an optimum master plan for Davao International Airport. The work included air traffic demand forecasts, estimation of facility requirements, evaluation of the existing facilities for future requirements and airport master planning up to 2010. The scope of the medium-term development project was also studied within the framework of the airport master plan to be finally selected from the alternatives in order to clarify the work items to be covered in the next stage of preliminary design. The Interim Report was prepared to summarize the achievement up to the First Study Work in Japan.

### 1.5.3 Second Field Survey in the Philippines

On September 1, 1992, the Study Team arrived in Manila to carry out the one-month long Second Field Survey. The Study Team and the Advisory Committee submitted the Interim Report to the DOTC and held the meeting for the presentation of the report to the DOTC on September 7, 1992.

The Study Team and the Advisory Committee assisted the DOTC in the presentation of the report to the concerned government agencies as well as the private sectors on September 8, 1992 at DOTC head office in Manila.

They also assisted the DOTC in the another presentation of the report to the local government agencies and private sectors on September 9, 1992 at Davao Airport.

The Study Team, the Advisory Committee and the DOTC conducted a supplemental field survey and hearings on September 9 and 10, 1992 in Davao. In the survey, they found out that the housing development on the northern side of Runway 05 has come much closer to the airport as compared to the previous field survey conducted at the beginning of May 1992. This housing development has been approved by the Housing and Land Use Regulatory Board (HLURB) as a low cost housing project.

On September 11, 1992 in Manila, the Study Team and the Advisory Committee discussed with the DOTC how to cope with the conflicts arising from the above new housing development with the proposed airport master plan.

The minutes of the meeting on the Interim Report are shown in Appendix-1.5.4.

After the Advisory Committee left Manila, the Study Team analysed the modification of the airport master plan to minimize the number of housing units to be relocated.

On September 24, 1992 at Air Transportation Office (ATO) in Manila, the Study Team had a meeting with the DOTC on the modification of the airport master plan. On September 28, 1992 in Davao International Airport, the Study Team and the DOTC had a meeting with regional and local officials in Davao City on the same agenda.

Based on the above meetings, the Study Team confirmed the modified airport master plan on which the succeeding feasibility study should be based, and the scope of the medium-term development project.

The contents of the above meetings are shown in Appendices-1.5.5 and 1.5.6.

#### 1.5.4 Second Study Work in Japan

After returning from the Philippines, the Study Team proceeded with the Second Study Work in Japan which aimed at carrying out a feasibility study on the medium-term development plan determined by the airport master planning. The work included preliminary design, construction planning, cost estimates, airport management study, economic and financial analyses, comprehensive evaluation of airport development impacts, implementation planning, conclusions of the whole study and recommendations to the Government of the Philippines.

A report substantially compiling all the results of the Study was prepared as the Draft Final Report.

#### 1.5.5 Third Field Survey in the Philippines

On January 21, 1993, the Study Team arrived in Manila to carry out the two-week long Third Field Survey. They submitted the Draft Final Report to the DOTC and held the meetings for the presentation of the report to the DOTC from January 22 to February 2, 1993.

The Study Team assisted the DOTC in the presentation of the report to the concerned government agencies as well as the private sectors on January 27, 1993.

On January 28, 1993, the Advisory Committee arrived in Manila. The Study Team and the Advisory Committee held a meeting for the discussion on the report with the DOTC on January 29, 1993.

On February 1, 1993, a seminar on airport planning and development was held in Davao City. In the seminar, the Study Team presented the result of the Study to the local government agencies and private sectors.

Through the above meetings and seminar, the Draft Final Report was accepted by the Philippine side.

The minutes of the meeting on the Draft Final Report is shown in Appendix-1.5.7.

#### 1.5.6 Third Study Work in Japan

After returning from the Philippines, the Study Team proceeded with the Third Study Work in Japan which aimed at finalizing the report. During the Third Study Work in Japan, the modifications of the Draft Final Report were made so as to reflect the DOTC's comments on the report.

This Final Report was completed and submitted to JICA on March 1993.

#### 1.6 Organization of the Report

The report of the Study consists of three volumes; Volume 1 Summary, Volume 2 Main Report and Volume 3 Appendices.

This Main Report comprises 14 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 Socioeconomic Environment

This chapter reviews and assesses the natural and socioeconomic environment of the Philippines including transportation and construction fields based on work item [4].

c) Chapter 3 Existing Airport and Surroundings

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 in the airport surroundings, meteorological, topographic and soil conditions which correspond to the work items [6], [7], [8] and [9] are also dealt with in this chapter.

d) Chapter 4 Air Traffic Demand Forecast

Air traffic demand forecasts, work item [13], which provide the design basis of air traffic 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 Davao International Airport

This chapter evaluates the existing Davao International Airport from the various aspects corresponding to work item [16]. A demand vs. capacity analyses clarify the usable life of each facility against future requirements.

g) Chapter 7 Airport Master Plan

This chapter produces alternative airport master plans up to 2010 based on work item [18]. The alternative airport master plans have been evaluated to select an optimum airport master plan.

h) Chapter 8 Scope of Medium-Term Development Project

This chapter, corresponding to work item [18], lists the construction work items of the medium-term development plan of the airport master plan to be finally selected from the alternatives.

i) Chapter 9 Preliminary Design

The preliminary design is carried out on the facilities of the medium-term development project. This chapter corresponds to work item [22] and designates the size, dimensions, performance and materials to be used for each airport facility.

This chapter also designates the size and dimensions of the obstacle limitation surfaces for the proposed new runway in the medium-term development.

**j) Chapter 10 Project Implementation Schedule and Cost Estimates**

This chapter, corresponds to work items [23], [24] and [29], describes the cost and implementation planning of the medium-term development project.

**k) Chapter 11 Airport Management Study**

Based on the evaluation of the present conditions of the airport management, requirements for the operation and maintenance of the facilities to be developed in the medium-term development are described in accordance with work item [25].

**l) Chapter 12 Economic and Financial Analyses**

This chapter evaluates the economic and financial impacts of the medium-term development project respectively on the national economy and the airport management based on work items [26] and [27].

**m) Chapter 13 Impacts of Airport Development on Surrounding Area**

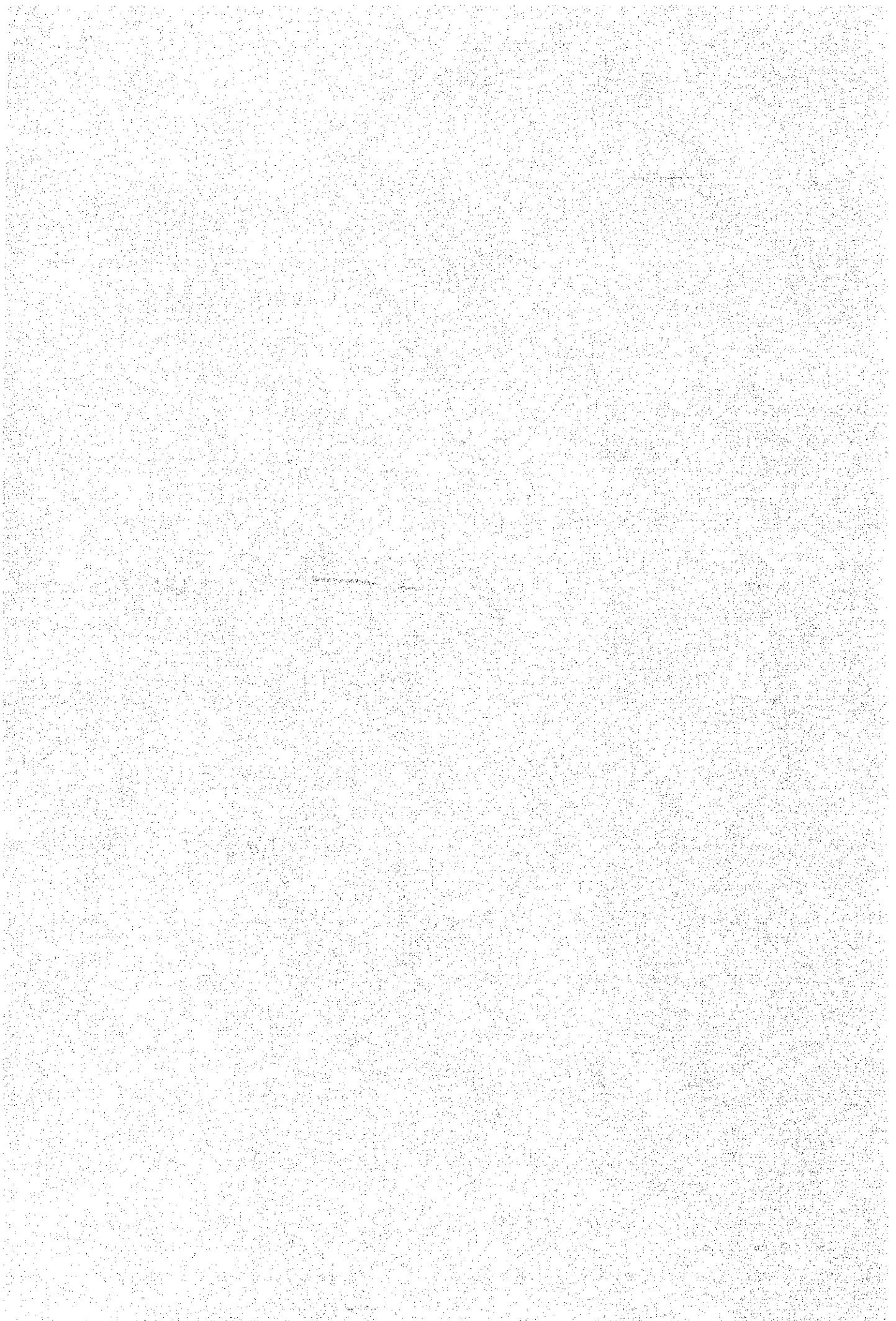
This chapter evaluates the impacts of the airport development on the surrounding area, particularly aircraft noise influence, land acquisition and relocation of the existing houses. This chapter also presents the future land use plan and evaluates the medium-term development project from the overall aspect based on work item [28].

**n) Chapter 14 Conclusions and Recommendations**

Corresponding to work item [30], the conclusions of the whole study and recommendations on how to implement the medium-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 SOCIOECONOMIC ENVIRONMENT

### 2.1 General

Air transportation plays an important role in the public welfare and socioeconomic development of a nation. This is especially true for the Philippines which consists of 7,107 islands scattered over a vast area of the western corner of the Pacific Ocean calling for the vital need of air connections between cities both domestically and internationally. As Davao International Airport is a base for the development of the Mindanao region, it is necessary to take into consideration the natural and socioeconomic environment of the nation to prepare the optimum master plan of the airport.

Thus, this chapter provides a summary of the natural and socioeconomic environment of the Philippines that might influence the Study.

### 2.2 Geographical Characteristics

#### 2.2.1 The Philippines

The Philippines is situated about 2,000 km east of Vietnam and some 15 degrees north of the equator.

It is one of the largest archipelagos in the world, consisting of 7,107 islands and stretching from 4°30' to 21°55' north latitude (some 3,000 km) and from 116°55' to 126° east longitude (some 1,700 km). To the north lies Taiwan and to the south are Kalimantan and Sulawesi in Indonesia. It faces the Pacific Ocean to the east and the South China Sea to the west.

The total land area of the Philippines is about 300,000 sq. km. The largest island is Luzon with 104,700 sq. km followed by Mindanao with 94,600 sq. km.

The Philippines lies in a volcanic chain surrounding the Pacific Ocean. Some of the volcanoes are active and earthquakes are frequent in the Philippines. The earthquake on June 26, 1990, which heavily damaged the vicinity of Baguio City, is still fresh in our memory.

The climate is oceanic and tropical. The temperature is constant all the year round at 26°C on average. Humidity ranges from 75 to 80%. There are two pronounced seasons, i.e., the rainy season from June to October and the dry season from November to May. Rainfall averages about 2,400 mm a year.

#### 2.2.2 Mindanao Island

The Mindanao Island is located at the southern part of the Philippine archipelago. This strategic location of Mindanao enables it to establish conveniently trade and cultural linkages with its neighbors, such as Indonesia, Malaysia and Australia.

Its climate is more tropical than other regions in the Philippines and stable since it is outside the typhoon belt. Its climate, therefore, makes the area ideal for agriculture, fishery, forestry, and industry.

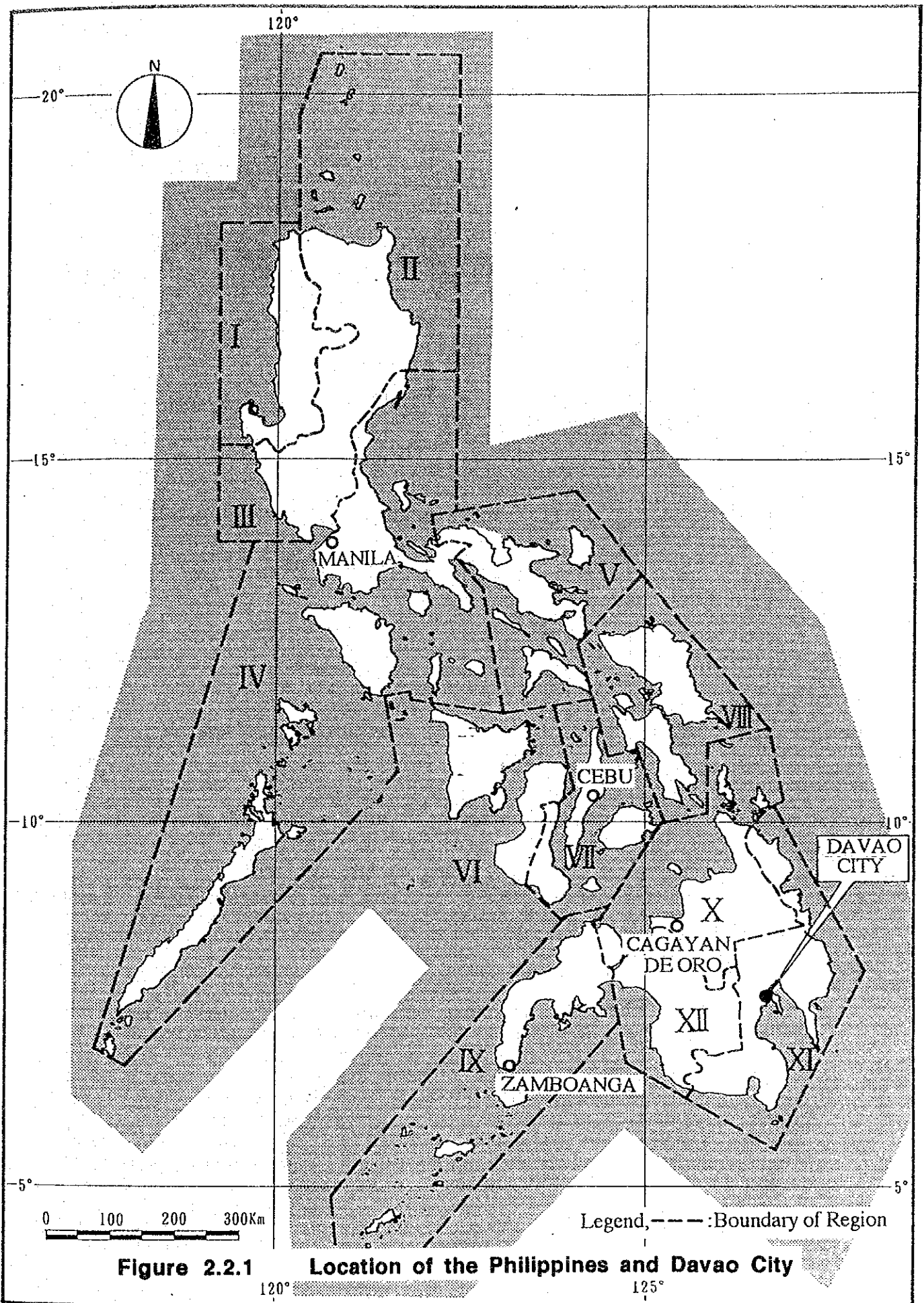
Mindanao has abundant mineral resources, such as aluminas laterite ore, copper ore, nickel and gold.

### 2.2.3 Davao City

Davao City is located on the southeastern corner of the island of Mindanao. The locations of the Philippines, and Davao City, as well as approximate air distances between Davao City and selected cities, are shown in Figure 2.2.1. The land area of the city is over 2,000 sq. km and bills itself as the "Largest City in the World". Southwest of the city, Mt. Apo rises to 2,954 m high as the highest peak in the Philippines.

The 2,800 ha national park spreading at the foot of the mountain is a scenic nature reserve featuring hot springs, waterfalls, lakes and wild orchids.

Samal Island floating in Davao Gulf, protects Davao harbor, possesses pearl farms and is the site of colorful marine life.



**Figure 2.2.1 Location of the Philippines and Davao City**

## 2.3 Socioeconomy

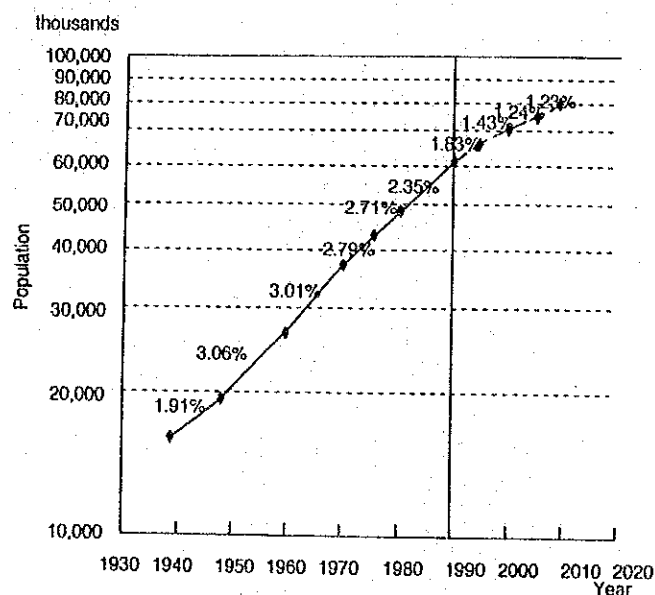
### 2.3.1 Population

#### (1) National Population

The census results of the population from 1939 until 1990 as well as the projected population is shown in Table 2.3.1 and illustrated in Figure 2.3.1.

**Table 2.3.1 Population in the Philippines  
(Census years 1939-1990 and Projections)**

Census Data & Projected Years	Census Population	
	Population (thousands)	Annual Groth Rate(%)
1939 Jan 1	16,000	
1948 Oct 1	19,234	1.91
1960 Feb 15	27,088	3.06
1970 May 6	36,684	3.01
1975 May 1	42,071	2.79
1980 May 1	48,098	2.71
1990 May 1	60,685	2.35
1995	66,416	1.83
2000	71,320	1.43
2005	75,859	1.24
2010	80,854	1.23



Figures are quoted from the revised population projections, "low assumption" prepared by the National Statistic Office (NSO) in collaboration with the Inter-Agency Committee on Population and Housing Statistics.

Source: 1991 Philippine Statistical Yearbook

**Figure 2.3.1 Population in the Philippines,  
Census Years 1939-1990**

As seen in the above table, the 1990 population of the nation was nearly 61 million. This was an increase of some 26% since 1980 with the average growth rate of 2.35% during the decade. Although this growth rate is still relatively high when compared with developed nations, it is worthwhile to note that the growth rate has been declining gradually since 1948. The 1990 census population nearly coincides with the lower case of the projected population prepared by the National Statistic Office (NSO) in 1983. Therefore, the low assumption by the NSO was adopted as the future populations for this study. As seen in the Table 2.3.1, the national population is expected to exceed 80 million in 2010.

(2) Regional Population

The population, its density and the rate of annual increase by the national administration regions are shown in Table 2.3.2. The 1990 population of Region XI, which includes Davao City, was some 4.5 million which accounted for 7.3% of the national total and ranked sixth largest among all regions as shown in Figure 2.3.2. Reflecting its second largest regional land area of 31.7 thousand sq. km, the population density of Region XI was only 141 persons per sq. km in 1990 which ranked tenth among all regions. The average annual population growth rate of Region XI, during the decade from 1980 to 1990, however, was 2.91%, the third highest among all regions.

**Table 2.3.2 Population, Population Density and Rate of Annual Increased by Region**

Region	Population			Land Area		Population Density		Annual Growth Rate	
	Population (Person)	Proportion	Rank	Area (sq.km)	Rank	Density (Person/sq.m)	Rank	Rate	Rank
NCA	7,930	13.9%	2	636.0	14	12,468.6	1	2.35%	6
CAR	1,146	2.0%	14	18,293.6	9	62.6	14	2.96%	2
Region I	3,551	6.2%	8	12,840.2	13	276.6	4	2.29%	7
Region II	2,341	4.1%	13	26,837.6	4	87.2	13	1.96%	10
Region III	6,200	10.9%	3	18,230.8	10	340.1	2	2.01%	9
Region IV	8,267	14.5%	1	46,924.2	1	176.2	7	2.59%	4
Region V	3,910	6.8%	7	17,632.5	11	221.7	6	3.06%	1
Region VI	5,393	9.4%	4	20,223.2	7	266.7	5	1.18%	13
Region VII	4,594	8.0%	5	14,951.4	12	307.3	3	1.77%	12
Region VIII	3,055	5.3%	12	21,432.7	6	142.5	9	1.95%	11
Region IX	3,159	5.5%	11	18,730.1	8	168.7	8	0.88%	14
Region X	3,510	6.1%	9	28,327.7	3	123.9	12	2.25%	8
Region XI	4,458	7.8%	6	31,692.8	2	140.7	10	2.44%	5
Region XII	3,171	5.6%	10	23,323.2	5	136.0	11	2.91%	3
Total	57,134	100.0%		287,235.8		198.9			

Note: Population and land area are based on the "1991 Philippine Statistical Yearbook".

Population density and annual growth rate are estimated based on the above-mentioned data.

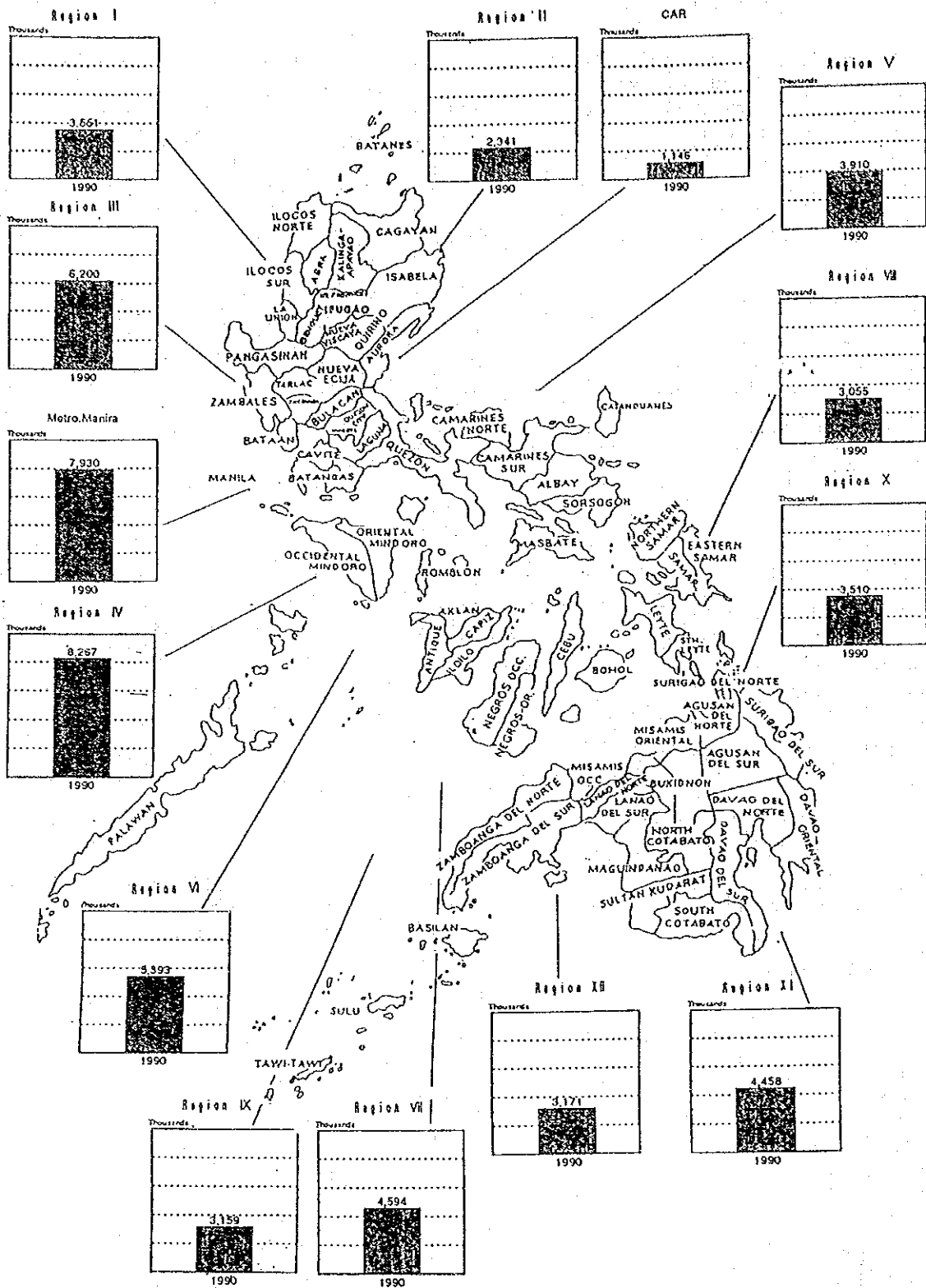


Figure 2.3.2 Population by Region in 1990

### (3) Davao Population

Mindanao Island is divided into four (4) administration regions ( Region IX through Region XII ). As mentioned earlier, Davao City belongs to Region XI which is further divided into five (5) provinces. Population, its density and annual growth rate of these five provinces are shown in Table 2.3.3. The same information for all provinces in Mindanao is presented in Appendix - 2.3.1.

**Table 2.3.3 Population of Region XI by Provinces**

Province	Item	1960	1970	1975	1980	1990
Davao del Norte (8,123 sq.km)	Population	263	443	590	725	1,055
	Pop. Density	32.4	54.5	72.6	89.2	129.8
	Ave. Growth Rate (%)	9.78	5.24	5.92	4.21	3.82
Davao del Sur (6,378 sq.km)	Population	498	785	936	1,134	1,483
	Pop. Density	78.1	123.1	146.8	177.8	232.5
	Ave. Growth Rate (%)	8.11	4.55	3.59	3.91	2.72
Davao Oriental (5,165 sq.m)	Population	133	248	299	340	395
	Pop. Density	25.8	48.0	57.9	65.8	76.5
	Ave. Growth Rate (%)	6.07	6.29	3.82	2.60	1.51
South Cotabato (7,469 sq.km)	Population	295	466	587	770	1,073
	Pop. Density	39.5	62.4	78.6	103.1	143.7
	Ave. Growth Rate (%)	9.69	4.58	4.74	5.58	3.37
Surigao del Sur (4,552 sq.km)	Population	165	259	302	378	452
	Pop. Density	36.2	56.9	66.3	83.0	99.3
	Ave. Growth Rate (%)	3.63	4.51	3.13	4.59	1.80
Total of Region XI	Population	593	973	1,188	1,488	1,920
	Pop. Density	101.5	167.3	202.8	251.9	319.5
	Ave. Growth Rate (%)	19.39	15.38	11.69	12.77	6.68

Source: 1991 Philippine Statistical Yearbook

Note: Population and land area are based on the "1991 Philippine Statistical Yearbook". Population density and annual growth rate are estimated based on the abovementioned data.

As seen in the Table 2.3.3, most provinces of Region XI maintained a constant high population growth rate in the past. Transmigration from the northern part of the nation is said to be a major contributor for the above. Davao City, capital of Region XI, is located in Davao del Sur Province. The population of Davao del Sur Province ranked first in 1990 among five provinces of Region XI. Its population growth rate during the period of 1980 to 1990 was 2.72%.

Besides the above-mentioned transmigration to Mindanao, increasing urbanization brought forth by transmigration from rural areas, is quite conspicuous recently at major cities in the Philippines. This phenomenon is clearly seen in Table 2.3.4 "Population, Population Density and Rate of Annual Increase in Major Cities".

**Table 2.3.4 Population, Population Density and Rate of Annual Increase in Major Cities**

Major City	Land Area (sq. m)	1948 (Oct. 1)	1960 (Feb. 15)	1970 (May 6)	1975 (May 1)	1980 (May 1)	1990 (May 1)
<b>(1) Population (Thousands)</b>							
Cagayan de Oro	412.8	52	68	128	165	227	340
Cebu	280.9	168	251	347	413	490	610
Davao	2,211.3	111	226	392	485	610	850
General Santos	423.0	13	53	66	91	149	250
Metro Manila	636.0	1,569	2,462	3,967	4,970	5,926	7,930
Zamboanga	1,414.7	103	131	200	265	344	442
<b>(2) Population Density (Person/sq. m)</b>							
Cagayan de Oro	412.8	126.0	164.7	310.1	399.7	549.9	823.6
Cebu	280.9	598.1	893.6	1,235.3	1,470.3	1,744.4	2,171.6
Davao	2,211.3	50.2	102.2	177.3	219.3	275.9	384.4
General Santos	423.0	30.7	125.3	203.3	215.1	352.2	591.0
Metro Manila	636.0	2,467.0	3,871.1	6,237.4	7,814.5	9,317.6	12,468.6
Zamboanga	1,414.7	72.8	92.6	141.4	187.3	243.2	312.4
<b>(3) Rate of Annual Increase (%)</b>							
		1948 (Oct 1)	1960 (Feb 15)	1970 (May 6)	1975 (May 1)	1980 (May 1)	1990 (May 1)
			11.38	10.22	4.99	5	10
Cagayan de Oro			2.39	6.39	5.22	6.59	4.12
Cebu			3.59	3.22	3.55	3.48	2.21
Davao			6.45	5.54	4.36	4.69	3.37
General Santos			13.15	4.85	1.14	10.36	5.31
Metro Manila			4.04	4.78	4.62	3.58	2.96
Zamboanga			2.14	4.23	5.81	5.36	2.54

Note: Population and land area are based on the "1991 Philippine Statistical Yearbook".  
Data Source: 1991 Philippine Statistical Yearbook

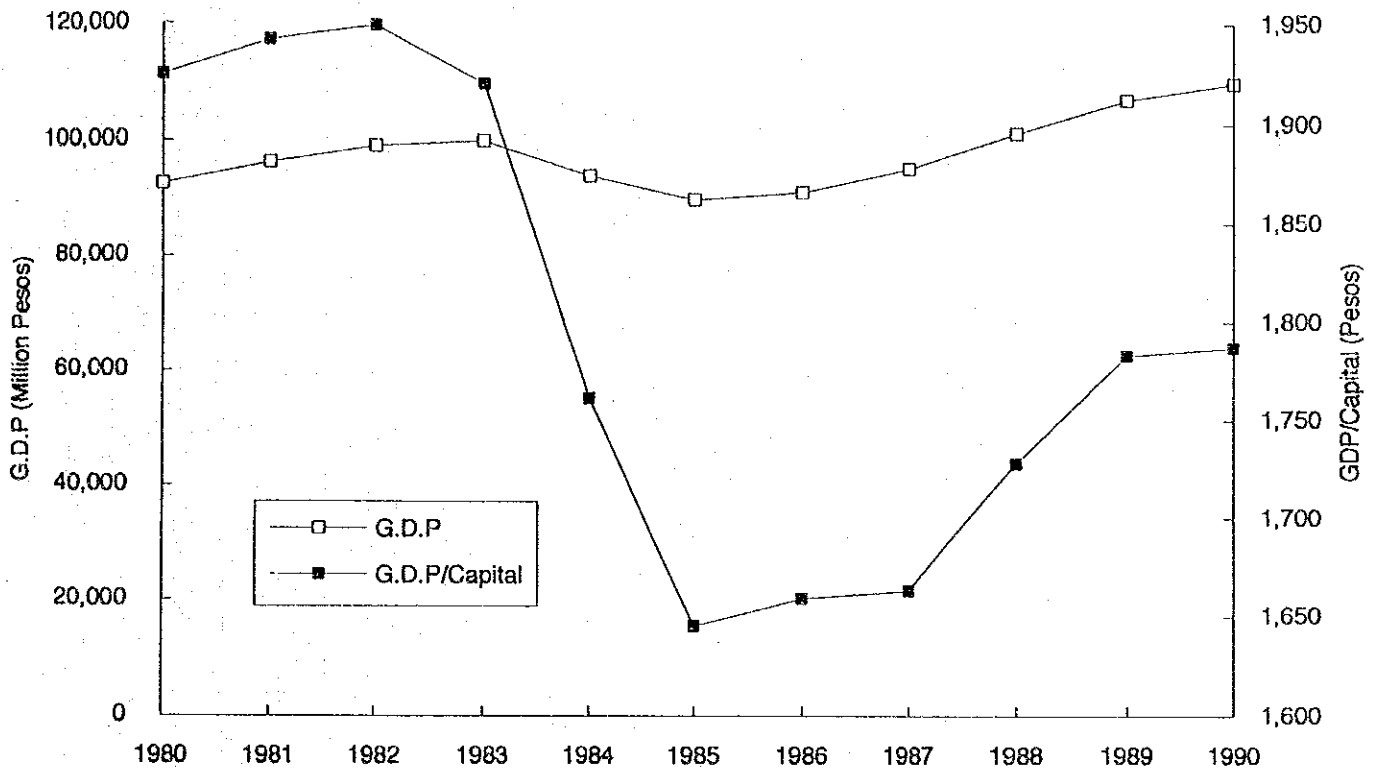
It is quite interesting to note in the Table 2.3.4 that despite of its relatively low provincial population, Davao City's population of 850 thousands in 1990 ranked second largest in the nation. The 1990 figure of Davao City was 1.4 times of Cebu City, 1.9 times of Zamboanga City, 2.5 times of Cagayan de Oro City and 3.4 times of General Santos City. While the total population is larger, population density of Davao City is next to the lowest reflecting its world's largest city area. It is also noticeable from the table that the population increase rate of Cebu has been relatively lower among the major cities; thus it lost its second largest position to Davao City during the 1960s, whereas that of the major cities in Mindanao stood at higher sides. In fact, while Cebu's population increased only 1.7 times during the twenty years from 1970 to 1990, those of Cagayan de Oro, Davao, General Santos and Zamboanga grew 2.65, 2.17, 2.9 and 2.2 times respectively during the same period. Although the population of General Santos City is still much smaller than that of Davao City, its growth rate has been remarkable since 1975. Development of fishery industries, including its related industries, such as canneries and processing plants (Annual amount of fish catch at General Santos is 85 ~ 90% of the total catch in Region XI), is said to be the major contributing factor for the growth.



## 2.3.2 Production

### (1) Gross Domestic Product (GDP)

The gross domestic product (GDP) of the Philippines in 1990 was estimated at 109,890 million pesos or US\$ 4,396 million. Estimated per capita income in 1986 was US\$ 580. Past trend of GDP is shown in Figure 2.3.3.



**Figure 2.3.3 Past Trend of GDP of Constant Price of 1972**

The economy of the Philippines became very stagnant after the second oil crisis in 1979 and was forced to declare a moratorium in 1983. As a result, the GDP marked a negative growth in 1984 and 1985 as seen in the Table 2.3.5. After Aquino took over the Government in February 1986, the economy uptrended and recovered gradually until 1990. Due to a series of natural disasters and the oil price rise caused by Gulf War Crisis in 1990, the growth rate of the GDP in 1990 slowed down to 2.5%.

### (2) Structure of National Product

The structure of the national product is shown in Figure 2.3.4. As seen in the Figure 2.3.4, the primary industries (agriculture, fishery and forestry), industrial and service sectors represent some 27%, 33% and 40% of the total national products respectively in 1990. It is worthwhile to note that the industrial sector that went through a period of stagnation from 1984 to 1986 showed gradual recovery since 1987.

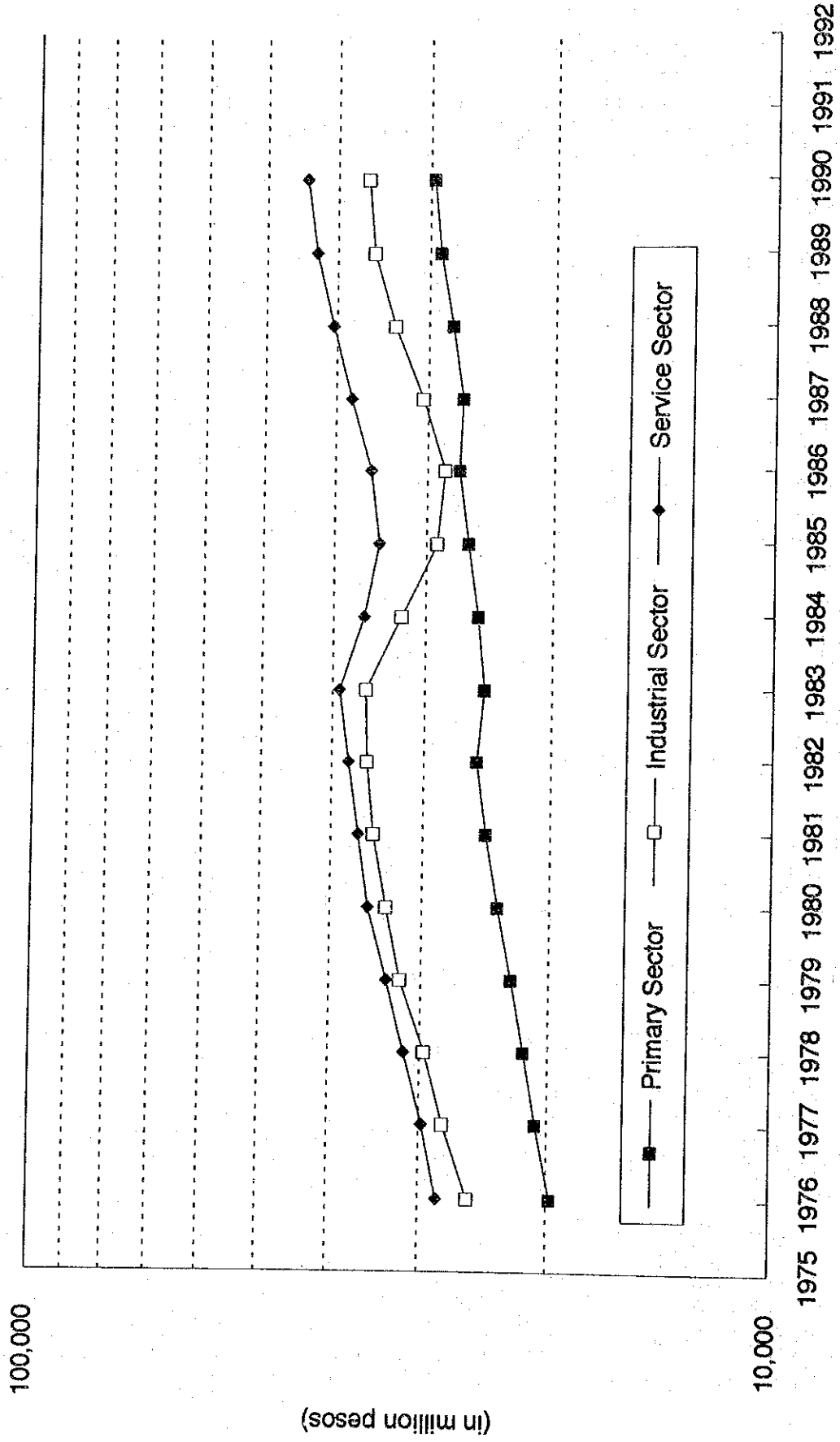


Figure 2.3.4 Gross National Product

(3) Structure of Regional Production

Gross domestic product by region is tabulated in Table 2.3.5.

**Table 2.3.5 Gross Domestic Product by Region  
(In million pesos at constant prices of 1972)**

Region	Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	*Ratio
NCR, Metro Manila		30,579	31,626	32,494	29,242	26,670	26,204	28,425	31,058	33,256	109%
%		32	32	33	31	30	29	30	31	31	
I. Ilocos Region		3,769	3,983	4,052	3,903	4,006	4,266	4,296	4,534	4,702	125%
%		4	4	4	4	4	5	5	4	4	
II. Cagayan Valley		2,649	2,668	2,594	2,408	2,372	2,291	2,301	2,388	2,455	93%
%		3	3	3	3	3	3	2	2	2	
III. Central Luzon		8,309	8,607	8,469	7,808	7,665	7,374	7,669	8,164	8,791	106%
%		9	9	8	8	9	8	8	8	8	
IV. Southern Tagalog		13,178	13,507	13,591	13,367	12,916	13,609	13,171	13,774	14,384	109%
%		14	14	14	14	14	15	14	14	13	
V. Bicol Region		3,152	3,212	3,336	3,171	3,117	3,057	3,147	3,332	3,437	109%
%		3	3	3	3	3	3	3	3	3	
Subtotal (Region I - V)		31,057	31,977	32,042	30,657	30,076	30,597	30,584	32,192	33,769	109%
%		32	32	32	33	33	34	32	32	32	
VI. Western Visayas		7,821	8,218	7,972	7,564	6,581	6,345	6,608	6,913	7,154	91%
%		8	8	8	8	7	7	7	7	7	
VII. Central Visayas		6,999	6,970	7,034	6,687	6,200	6,476	6,989	7,514	8,086	116%
%		7	7	7	7	7	7	7	7	8	
VIII. Eastern Visayas		2,286	2,337	2,336	2,203	2,271	2,712	2,958	3,069	3,121	137%
%		2	2	2	2	3	3	3	3	3	
Subtotal (Region VI - VIII)		17,106	17,525	17,342	16,454	15,132	15,533	16,555	17,498	18,361	107%
%		18	18	17	18	17	17	17	17	17	
IX. Western Mindanao		3,355	3,383	3,405	3,203	3,259	3,363	3,631	3,784	3,977	119%
%		3	3	3	3	4	4	4	4	4	
X. Northern Mindanao		4,645	4,784	4,611	4,651	4,819	5,003	5,267	5,620	5,937	128%
%		5	5	5	5	5	5	6	6	6	
XI. Southern Mindanao		5,987	6,169	6,424	6,300	6,418	6,700	7,121	7,330	7,655	128%
%		6	6	6	7	7	7	7	7	7	
XII. Central Mindanao		3,479	3,535	3,604	3,420	3,511	3,775	3,792	3,970	4,190	120%
%		4	4	4	4	4	4	4	4	4	
Subtotal (Region IX-XII)		17,466	17,871	18,044	17,574	18,007	18,846	19,811	20,704	21,759	125%
%		18	18	18	19	20	21	21	20	20	
National Total		96,208	98,999	99,920	93,927	89,885	91,181	95,373	101,449	107,144	111%
		100	100	100	100	100	100	100	100	100	

Note\*: Ratio of the 1989 GDP's over 1981

Figures may not add up to total due to rounding.

Revised estimates as of December 1990

Revision of the series is going on.

Source: Economic and Social Statistics Office, National Statistical Coordination Board.

From the Table 2.3.5, the following points are worthwhile noting:

- a) Metro Manila, the National Capital Region (NCR), contributed to the GDP slightly over 30% of the total every year except for the years 1985 through 1987 when it was slightly less than 30%. This clearly reflects a strong economic concentration in NCR.

- b) Contribution to the GDP by the Luzon region (Region I - V), Visayas region (Region VI - VIII) and Mindanao region (Region IX - XII) in 1989 were approximately 32%, 17% and 20% respectively. Contributions by the Luzon region and NCR accounted for over 60% reflecting heavy development efforts directed in the Luzon region; and
- c) While the ratio of 1989 GDP's over 1981's at national level was some 110%. Those of NCR and the Luzon Region were similar or less except for the Ilocos Region. Those of the Visayan and Mindanao Regions were higher than the national average. For example, those of the Eastern Visayas Region, Northern Mindanao Region (Cagayan de Oro) and Southern Mindanao (Davao) were 137%, 128% and 128% respectively. This fact reflects the latest efforts of the Government to develop those regions.

(4) Domestic Products of Region XI by Sector

Gross regional domestic products of Region XI by industrial sectors for the years 1985 to 1989 is shown in Table 2.3.6. During this period it has grown about 1.2 times higher than national average.

**Table 2.3.6 Domestic Products of Region XI by Sector  
(in thousands pesos at constant 1972 prices)**

Industry		Year				
		1985	1986	1987	1988	1989
1 .	Primary Sector (Agriculture, Fishery & Forestry )	3,189	3,315	3,381	3,390	3,475
	(%)	50	50	47	46	45
2 .	Industry (Mining and Quarrying)	986	1,022	1,265	1,390	1,514
	(%)	15	15	18	19	20
3 .	Service Sector (Transportation)	2,243	2,341	2,474	2,550	2,665
	(%)	35	35	35	35	35
Gross domestic Product		6,419	6,678	7,120	7,330	7,655
(%)		100	100	100	100	100

Source: Economic and Social Statistics Office, National Statistical Coordination Board.

From the Table 2.3.6 it is apparent that the primary industry, i.e. agriculture, fishery and forestry, is the major contributor accounting for nearly 50% of the total regional domestic products. It should be noted here, however, the industrial sector, especially manufacturing, is rapidly growing as a result of industrialization efforts by the Government.

(5) Employment of Davao City, by Major Sector

There are no statistics readily available for domestic products of Davao City. Instead, the available figures indicating the trend of the employment status of Davao City is shown in Table 2.3.7.

**Table 2.3.7 Employment of Davao City by Major Sector**

	19 70		19 80		19 88		Ratio 1988/1980
	Number	Proportion	Number	Proportion	Number	Proportion	
1.Primary	54,000	42.5%	65,000	37.1%	68,000	25.0%	1.1
2.Secondary	45,000	35.4%	37,000	21.1%	73,000	26.8%	2.0
3.Tertiary	28,000	22.0%	73,000	41.7%	131,000	48.2%	1.5
Total	127,000	100.0%	175,000	100.0%	272,000	100.0%	1.5

Source:NCSO

Although the reasons are unclear for the nearly 20% drop of employment in the secondary sector and a threefold increase of employment in the tertiary sector during the decade between 1970 and 1980, the growth rate of primary sector employment was already lower than that of total employment during the same period. This transition in the employment status from the traditional primary sector to secondary / tertiary sectors is more conspicuous during the 1980's. As seen in the Table 2.3.7, primary sector employment in 1988 was only one quarter of the total, reflecting Davao City's urbanization development. It should also be noted that the total employment increased 1.5 times during the period of 1980 to 1988.

The degree of effect of this recent rapid urbanization on air traffic demand is difficult to quantify. However, it is obvious that the growing modern business environment in Davao City would create a positive effect on the future business air traffic demands at Davao International Airport.

2.3.3 External Trade and Balance of Payments

(1) National Level

As seen in Appendix- 2.3.2 "Philippines Export Major Commodity Groups", the traditional export items have been products of the primary sector, such as coconut products, sugar, fruit, logs/lumber, and minerals, in the past. In the late 1980s, however, the major foreign exchange earners are the light industries producing miscellaneous manufactured goods. Imported commodities vary over a wide range. However, petroleum, industrial equipment and wheat may be the three major items. Major trade partners are the United States, Japan and the European Economic Community for both imports and the exports and Middle East countries for petroleum imports as seen in Appendix - 2.3.3.

The trade balance of the Philippines is shown in Table 2.3.8

**Table 2.3.8 Foreign Trade of the Philippines  
(F.O.B. Values in million U.S. dollars)**

Year	Total Trade	Exports			Imports			Balance of Trade Unfavorable
		Value	Percent of Total Trade	Average Exchange Rate (P/U.S.\$)	Value	Percent of Total Trade	Average Exchange Rate (P/U.S.\$)	
1980	13,515	5,788	43%	7	7,727	57%	8	-1,939
1981	13,666	5,720	42%	8	7,946	58%	8	-2,225
1982	12,688	5,720	45%	8	7,667	60%	9	-2,646
1983	12,492	5,005	40%	11	7,487	60%	11	-2,481
1984	11,460	5,391	47%	17	6,070	53%	17	-679
1985	9,740	4,629	48%	19	5,111	52%	19	-482
1986	9,885	4,842	49%	20	5,044	51%	20	-202
1987	12,457	5,720	46%	21	6,737	54%	21	-1,017
1988	15,234	7,074	46%	21	8,159	54%	21	-1,085
1989	18,240	7,821	43%	22	10,419	57%	22	-2,598
1990	20,392	8,186	40%	24	12,206	60%	24	-4,020

Source: National Statics Office

The amount of export value that dropped during the stagnant economy of 1985 and 1986 showed recovery in 1987 and has been growing steadily ever since. In 1990, the export value increased only by 4.7% due to the decreased export prices of primary products. On the other hand, because of adverse effects, such as increased oil prices due to the Gulf Crisis and the increased amount of grain import due to drought, the value of imports also increased in 1990. As a result, the 1990 balance of trade marked consecutive deficits for the last seventeen years. The accumulated trade debt, was recorded as being US\$ 3,943 million in 1990. In addition to the 1989 moratorium, IMF as well as Japan, U.S.A. and the World Bank agreed to provide the Philippines with US\$ 3,300 million in grant aid.

(2) Balance of Payments

The balance of payments during 1981 through 1990 is shown in Table 2.3.9. The economy in the Philippines suffered from a long-lasting vicious cycle of recessions brought forth by skyrocketing petroleum prices in 1973 and a weakened industrial sector. Increased international interest rates in the world financial community during those years also had adverse effects on the Philippines who had borrowed heavily from foreign sources. As a result, the balance of payments faced a real crisis in 1983.

**Table 2.3.9 Balance of Payments: 1981 to 1990**  
(in million U.S. dollars)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
<b>Current transactions</b>										
A. Merchandise trade	-2,224	-2,646	-2,482	-679	-482	-202	-1,017	-1,085	-2,598	-4,020
B. Non-merchandise trade	-309	-1,040	-740	-855	26	783	-	80	303	618
C. Transfer (donations, etc.)	472	488	472	236	379	441	573	775	830	714
<b>Total</b>	<b>-2,061</b>	<b>-3,200</b>	<b>-2,750</b>	<b>-1,298</b>	<b>-77</b>	<b>1,022</b>	<b>-444</b>	<b>-230</b>	<b>-1,465</b>	<b>-2,688</b>

Source: Central Bank of the Philippines

The economic recovery program launched in late 1984 aimed to achieve external and internal stability and restore normal economic growth. The annual inflation rate which hit over 60% in 1983 was gradually brought down through 1984 and 1985 and the balance of payments was greatly improved due to drastic cutbacks in imports as well as lowered petroleum prices. However, a large amount of accumulated debt still constrains the Government to cut back its public expenditures.

(3) Balance of Trade by Port in Region XI

The balance of trade by port in Region XI is shown in Table 2.3.10. As seen in the Table 2.3.10, the balance of trade at all four ports has been positive representing a favorable trade balance in those years. It is worthwhile to note that Davao port's shares amounts to 56% of the Region XI's total trade every year, reflecting the leading role of Davao City in Region XI.

**Table 2.3.10 Balance of Trade by Port in Region XI**  
(In million dollars)

PORT	Export	Import	Total	Balance	Share
DAVAO	201.9	43.9	245.8	158.0	56.3%
GENERAL SANTOS	87.7	46.1	133.8	41.6	30.6%
BISLIG	17.5	9.1	26.6	8.4	6.1%
MATI	30.4	0.0	30.4	30.4	7.0%
REGION XI	337.5	99.1	436.6	238.4	100.0%