

FINAL REPORT FOR THE STUDY ON THE DEVELOPMENT PROJECT OF THE PORT OF SORONG THE REPUBLIC OF INDONESIA

MAY, 1981



JAPAN INTERNATIONAL COOPERATION AGENCY

SDF
81-101

**FINAL REPORT FOR THE STUDY
ON THE DEVELOPMENT PROJECT OF
THE PORT OF SORONG
THE REPUBLIC OF INDONESIA**

1980

International Development
International Development
International Development
International Development

国際協力事業団	
受入 月日 84. 5. 20	108
登録No. 06053	61.7
	SDF

PREFACE

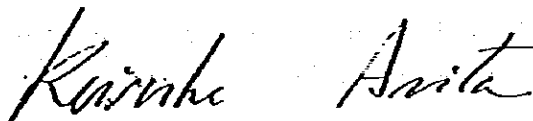
In response to a request of the Government of the Republic of Indonesia, the Japanese Government decided to conduct a survey on the Development of the Port of Sorong Project and entrusted the survey to the Japan International Cooperation Agency. The J.I.C.A. sent to Indonesia a survey team headed by Mr. Masao Ohno, Executive Director of the Overseas Coastal Area Development Institute of Japan in May, 1980.

The team had discussions on the project with the officials concerned of the Government of Indonesia, and conducted a field survey. After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

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

May, 1981



Keisuke Arita
President

Japan International Cooperation Agency

LETTER OF TRANSMITTAL

Mr. Keisuke Arita
President
Japan International Cooperation Agency

Dear Sir:

It is my great pleasure to submit herewith a report for the Study on the Development Project of the Port of Sorong of the Republic of Indonesia.

In order to make the masterplan and examine the feasibility of the development project, the Japanese study team conducted a principal survey for 82 days from May 20, 1980, at the request of the Japan International Cooperation Agency. The findings of this survey were discussed to make the master plan and study the feasibility of the Sorong Port Development Project, and compiled into this report.

During the field survey and the preparation of this report, the Japanese study team transferred the technical knowledge to the Indonesian counterparts through on-the-job training, and the valuable information pertaining to the project reached us through discussions with the officials concerned.

On behalf of the Japanese study team and myself I would like to express my deepest appreciation to the Government of the Republic of Indonesia, for their generous cooperation and assistance and warm hospitality extended to the team during its stay in Indonesia.

My indebtedness is also great to the Japan International Cooperation Agency, the Ministry of Transport, the Ministry of Foreign Affairs, and the Japanese Embassy in Indonesia, who have given us valuable suggestions and assistance in the field survey and in the preparation of this report.

May, 1981

Sincerely yours,



Masao Ohno, Project Manager,
Japanese Study Team for the
Development Project of the Port
of Sorong
Executive Director, The Overseas
Coastal Area Development Institute
of Japan

1. The first part of the document is a list of names and addresses of the members of the committee.

2. The second part of the document is a list of names and addresses of the members of the committee.

3. The third part of the document is a list of names and addresses of the members of the committee.

4. The fourth part of the document is a list of names and addresses of the members of the committee.

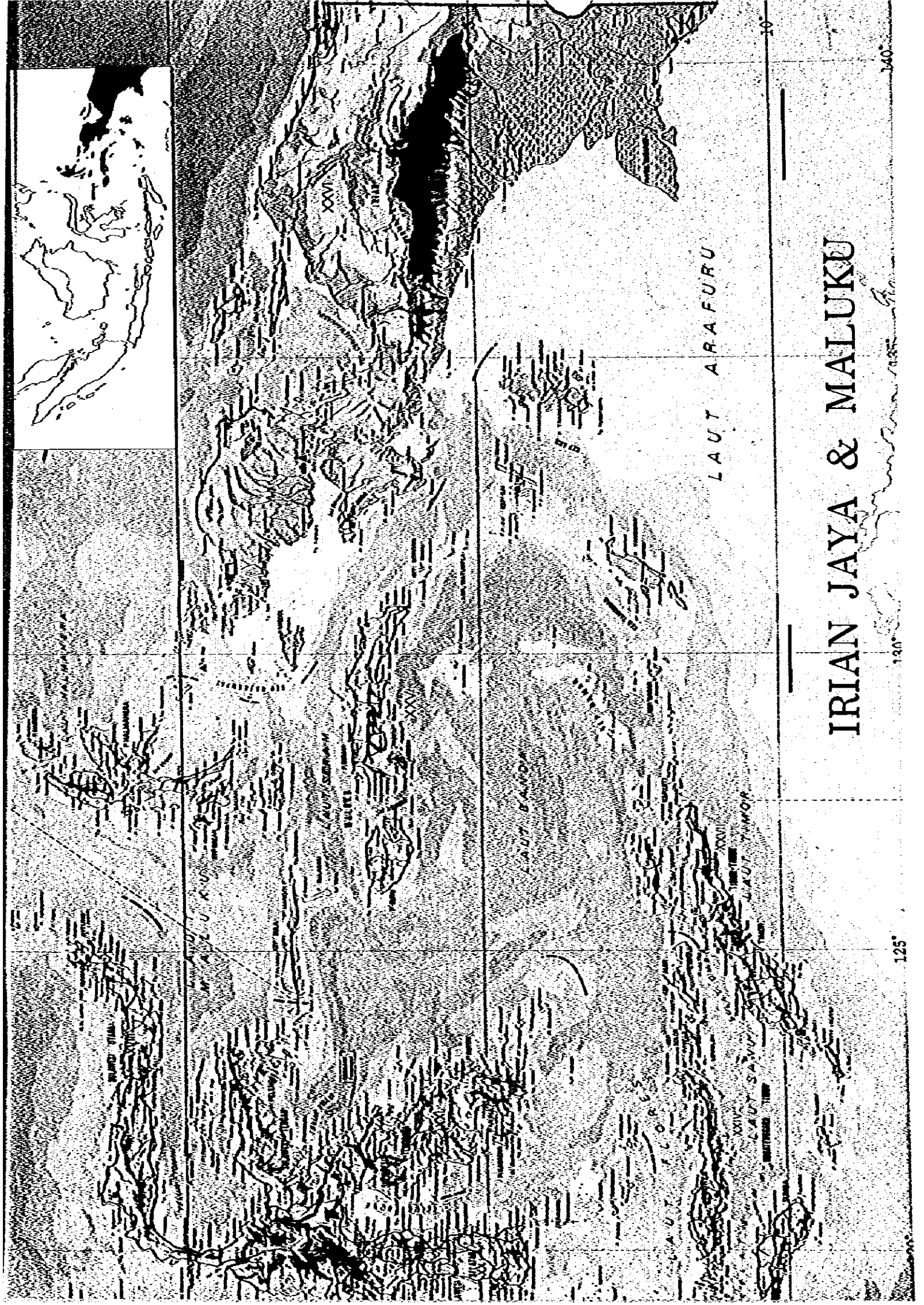
5. The fifth part of the document is a list of names and addresses of the members of the committee.

6. The sixth part of the document is a list of names and addresses of the members of the committee.

7. The seventh part of the document is a list of names and addresses of the members of the committee.

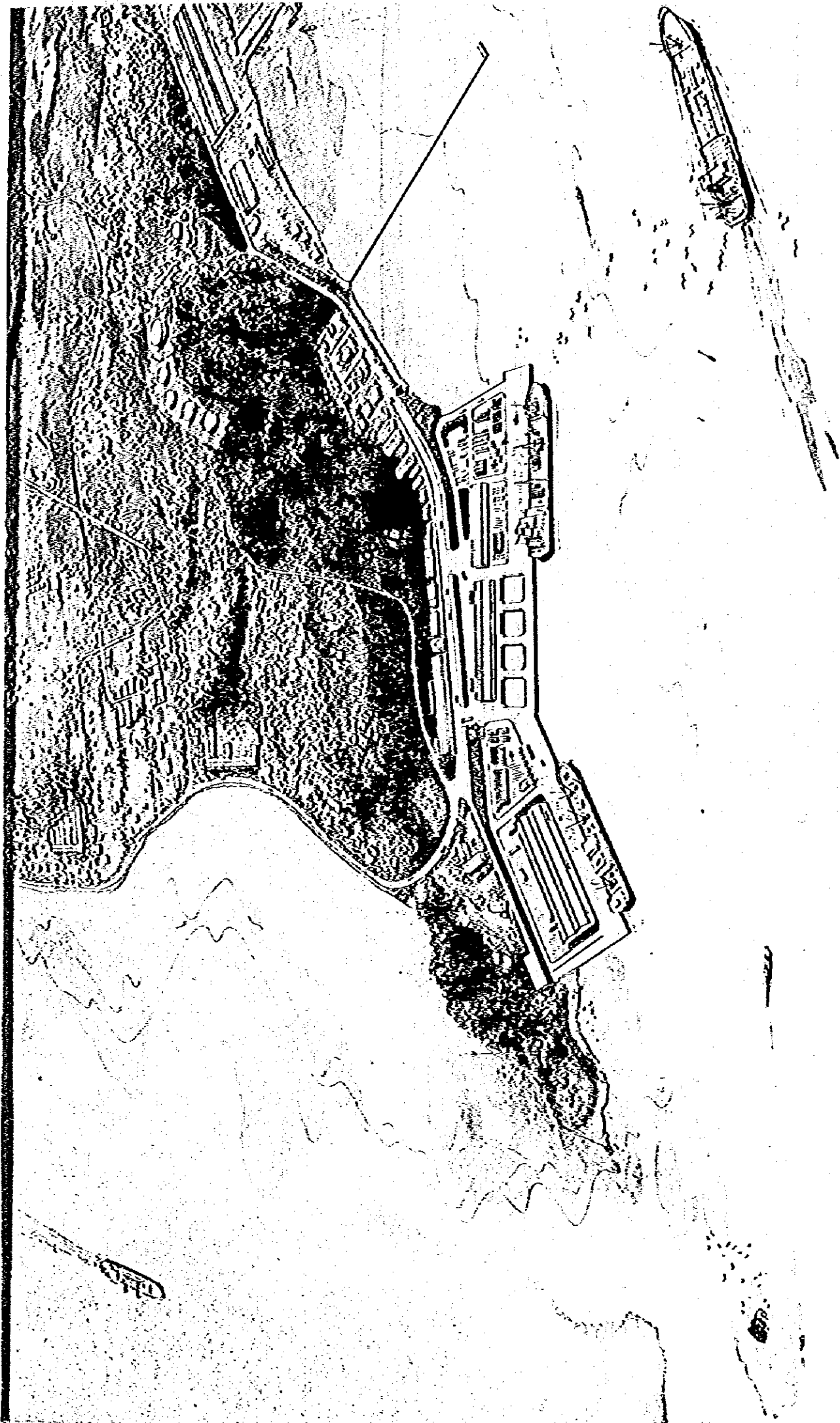
8. The eighth part of the document is a list of names and addresses of the members of the committee.

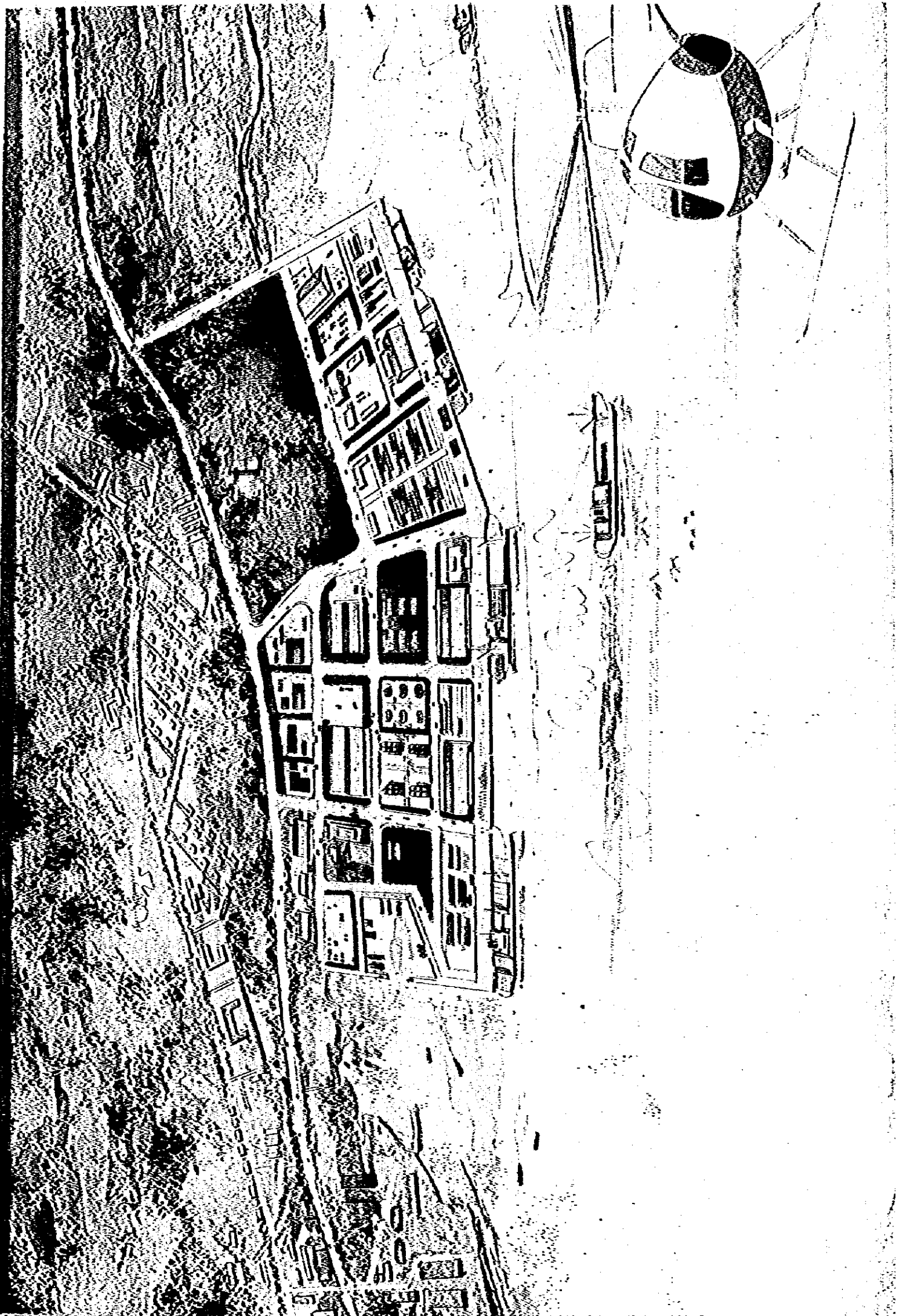
9. The ninth part of the document is a list of names and addresses of the members of the committee.



IRIAN JAYA & MALUKU







ABBREVIATIONS, ACRONYMS & INDONESIAN WORDS

AAGR	: average annual growth rate
ADPEL	: Administratur Pelabuhan (Port Administrator)
B/C Ratio	: benefit/cost ratio
BL	: barrel (1 barrel = 0.159 kℓ)
BAPPEDA	: Badan Perencanaan Pembangunan Daerah (Provincial Development and Planning Board)
BAPPENAS	: Badan Perencanaan Pembangunan Nasional (National Development and Planning Board)
BH	: borehole
BPP	: Badan Pengusahaan Pelabuhan (Port Management Office)
BPSD	: Barrel per Stream Day
Bupati	: Governor or Mayor
CBS	: Central Bureau of Statistics (Biro Pusat Statistik)
DBS	: District Bureau of Statistics
Desa	: town or village
DGSC	: Directorate General of Sea Communications
DPU	: Dinas Pekerjaan Umum (District Public Works)
DWT	: deadweight tons
Ex	: export
FUNDWI	: Fund of the United Nations for Development of West Irian
FUNDWI-30	: Coastal and River Transportation Project of FUNDWI
FRR	: financial rate of return
GDP	: gross domestic product
GRDP	: gross regional domestic product
HP	: horse power
HWL	: high water level
IGGI	: Inter-governmental Group on Indonesia
Im	: import
IRR	: internal rate of return
JICA	: Japan International Cooperation Agency
Kabupaten	: sub-provincial administrative district (county)
KANWIL HUBLA	: Kantor Wilayah Perhubungan Laut (District Office of Sea communications)
Kecamatan	: the third (sub-Kabupaten) administrative district in a province
KEPPEL	: Kepala Pelabuhan (Chief of Port)

Kota	: city or town
Kotamadya	: special designated city
L	: loading
LWS	: Low Water Spring
MSL	: Mean Sea Level
PAM	: Perusahaan Air Minum (office of water supply)
pcu	: passenger car unit
Pelita III	: The Third Comprehensive National Development Plan
PERTAMINA	: Perusahaan Pertambangan Minyak dan Gas Bumi Negara (National Oil and Gas Enterprise)
Perintis	: Pioneer Services (shipping services introduced in 1975 and supported by central government subsidy)
PLN	: Perusahaan Umum Listrik Negara (Electric Power Supply Authority)
RLS	: Regular Liner Services of interisland shipping
Rp	: Rupiah
SPT	: standard penetration test
STP	: Statistik Pelabuhan (Port Statistics)
UKA	: Usaha Karya (Labor Unit)
UL	: unloading
UN	: United Nations
UNDP	: United Nations Development Program
UN \$: United States dollar
Y	: yen

CONTENTS

PREFACE

LETTER OF TRANSMITTAL

CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

Page

Chapter 1.	OUTLINE OF THE STUDY	
1.1.	Background and Objectives	1
1.2.	Study Procedure	2
1.3.	Member of the Study	3
1.4.	Organizations Visited by the Team	4
Chapter 2.	OUTLINE OF IRIAN JAYA AND MALUKU	
2.1.	Study Area	7
2.2.	Population	7
2.3.	Natural Conditions	19
2.4.	Industrial Structure	27
Chapter 3.	OUTLINE OF TRAFFIC IN IRIAN JAYA AND MALUKU	
3.1.	Sea Transportation	41
3.2.	Land Transportation	93
3.3.	Air Transportation	97
Chapter 4.	SORONG AS THE DIRECT HINTERLAND OF THE PORT	
4.1.	Outline of Sorong	103
4.2.	Development Potential	109
4.3.	Town Planning	118
Chapter 5.	PORT OF SORONG	
5.1.	Management and Operation	133
5.2.	Facilities and Utilization	139
Chapter 6.	NATURAL CONDITIONS	
6.1.	Geographical Features	149
6.2.	Meteorological Conditions	149

6.3.	Sea and Geotechnical Conditions	152
Chapter 7.	FUNDAMENTAL CONCEPT FOR DEVELOPMENT	
7.1.	Charactor of the Port	179
7.2.	Distribution Service Area	188
Chapter 8.	DEMAND FORECAST	
8.1.	Population	195
8.2.	Regional Activities	202
8.3.	Port Activities	232
Chapter 9.	HANDLING CAPACITY AND PORT CONGESTION	
9.1.	Past Record of Cargo Handling Capacity	267
9.2.	Future Cargo Handling Capacity	267
9.3.	Analysis of Present Conditions	269
9.4.	Congestion in 1985	278
9.5.	Improvement of Cargo Handling Efficiency	285
Chapter 10.	PORT MASTER PLAN AND MEDIUM TERM PORT DEVELOPMENT PROGRAM	
10.1.	Scale of Port Development	287
10.2.	Selection of the Site for Expansion	293
10.3.	Proposed Master Plan	301
10.4.	Medium Term Port Development Program for 1985	311
Chapter 11.	DESIGN AND COST ESTIMATE	
11.1.	Conditions for Design and Cost Estimate	315
11.2.	Design of Main Facilities	317
11.3.	Construction Schedule	326
11.4.	Cost Estimate	328
Chapter 12.	ECONOMIC ANALYSIS	
12.1.	Method of Analysis	333
12.2.	Estimation of Benefits	333
12.3.	Estimation of Costs	338
12.4.	Evaluation	340

Chapter 13. FINANCIAL ANALYSIS

13.1. Method of Analysis	345
13.2. Estimation of Revenues	346
13.3. Estimation of Costs	348
13.4. Income Statement and Source and Application of Funds	355
13.5. Evaluation	357

Appendix

LIST OF FIGURES

Figure No.		Page
2.1.1.	Location of Irian Jaya and Maluku	8
2.2.1.	Administrative Area and Population of Irian Jaya	11
2.2.2.	Administrative Area and Population of Maluku	12
2.3.1.	Topographical Conditions in Irian Jaya	20
2.3.2.	Meteorological Conditions in Selected Places in Irian Jaya (1977)	23
2.3.3.	Topographical Conditions in Maluku	25
3.1.1.	Location of Ports in Irian Jaya and Maluku	43
3.1.2.	Location of Port Facilities	47
3.1.3.	Trend of Cargo Volume in Indonesia	55
3.1.4.	Trend of Cargo Volume and GDP in Indonesia	57
3.1.5.	Trend of Foreign Trade Cargo Volume in Indonesia	59
3.1.6.	Trend of Cargo Volume Handled at Ports of Irian Jaya (Loading and Unloading)	66
3.1.7.	Percentage of Cargo Volume at Major Ports (Unloading Cargo)	67
3.1.8.	Trend of Passenger Flows in Irian Jaya	77
3.1.9.	Fluctuation of Passenger Flow by Month	78
3.1.10. (1)	RLS Shipping Routes in the Study Area (N-Routes)	81
3.1.10. (2)	RLS Shipping Routes in the Study Area (P and S - Routes)	82
3.1.11. (1)	Perintis Routes in Maluku (Base Port: Ambon)	86
3.1.11. (2)	Perintis Routes in Irian Jaya (Base Port: Jayapura, Sorong, Merauke)	87
3.1.12.	Statistical Maritime Regions in Indonesia	89
3.2.1.	Location of Roads in Irian Jaya and Maluku	96
3.3.1.	Air Traffic in Indonesia	98
3.3.2.	Passenger Traffic by Month	98
3.3.3.	Location of Airports in Irian Jaya and Maluku	102
4.1.1.	Administrative Area in Kabupaten Sorong	101
4.1.2.	Organization Chart of Kabupaten Sorong	106
4.1.3.	Location of Kota Sorong	107
4.2.1.	Forestry Area	115

4.3.1.	Organization Chart of District Public Works (DPU)	118
4.3.2.	Proposed Land Use Plan by Hari Murthi	120
4.3.3.	Present Land Use in Kota Sorong (1976)	122
4.3.4.	Present Road Network in Kota Sorong	124
4.3.5.	Traffic Distribution by Hour	126
4.3.6.	A Structure of the Old Provincial Road	127
4.3.7.	Alignment of Water Supply Pipes	131
5.1.1.	Chart of Affiliated Organizations of Port Operations at the Port of Sorong	134
5.1.2.	Organization Chart of Sorong Port Administration	136
5.2.1.	The Port Area at the Port of Sorong	140
5.2.2.	The Port Area and Approach Channel	141
5.2.3.	Existing Port Facilities	143
6.2.1.	Wind Direction and Speed	150
6.2.2.	Monthly Average Rainfall	151
6.3.1.	Frequency of Each Rank of Waves	155
6.3.2.	Islands Surrounding the Port of Sorong	156
6.3.3.	Hydraulic Survey and Location of Borings	161
6.3.4.	Depth of the Sea	163
6.3.5. (1)	Boring Log (BH No. 1)	168
6.3.5. (2)	Boring Log (BH No. 2)	169
6.3.5. (3)	Boring Log (BH No. 3)	170
6.3.5. (4)	Boring Log (BH No. 4)	171
6.3.5. (5)	Boring Log (BH No. 5)	172
6.3.5. (6)	Boring Log (BH No. 6)	173
6.3.6.	Seabed Substrata Cross Section	175
6.3.7.	Major Shallow Earthquakes around Sorong	177
7.1.1.	Amount and Ratio of Cargo Origin Transported by Perintis (1978-79) ...	182
7.1.2.	Location of Sea Port in the Study Area	183
7.2.1.	Type of the Port Distribution Service Area	189
7.2.2.	Port Related Area by Kecamatan	191
7.2.3.	Port Distribution Service Area for Domestic Trade	194
8.3.1.	Basic Concept of Micro Estimation	237

8.3.2.	Flow of Cargo	262
9.3.1.	Overall Length and Number of Shipcalls	270
9.3.2.	Cumulative Frequency of Arriving Ships	271
9.3.3.	Ship Dealing Capacity and Berth Occupancy Ratio in 1979	274
9.3.4.	Number of Berthing Ships and Estimated Berthing Time	276
9.3.5.	Cumulative Frequency of Berthing Time	277
9.4.1. (1)	Relation Between ρ and $\mu \cdot Wq$ [M/M/S]	280
9.4.1. (2)	Relation Between ρ and $\mu \cdot Wq$ [M/D/S]	281
9.5.1.	Pallet Sling System	285
10.1.1.	Existing Open Storage	291
10.2.1.	Prospective Site	294
10.3.1.	Typical Section of the Access Road	303
10.3.2.	Master Plan of Sorong Port (2000)	307
10.3.3. (1)	Land Use Plan of West Wharf (2000)	309
10.3.3. (2)	Land Use Plan of East Wharf (2000)	310
10.4.1.	Layout of Port Facilities	313
11.2.1.	Open-Type Wharf with Vertical Piles-Steel Pile (Pane-A)	319
11.2.2.	Steel Pipe Type Quaywall (Pane-B)	320
11.2.3.	Caisson Type Quaywall (Pane-C)	321
11.2.4.	Open-Type Wharf with Battered Piles-Concrete Pile (Pane-D)	322
11.2.5.	Plan of Port Facilities	325

LIST OF TABLES

Table No.		Page
Table 2.1.1.	Area and Population of Indonesia by Province in 1978	9
Table 2.2.1.	Population Growth 1930-1978	10
Table 2.2.2.	Area and Population of Irian Jaya by Kecamatan in 1978	13
Table 2.2.3.	Area and Population of Maluku by Kecamatan in 1978	16
Table 2.2.4.	Government Transmigration Program up to 1978	18
Table 2.3.1.	Mean Temperature in Irian Jaya Province (1977)	21
Table 2.3.2.	Amount of Rainfall in Irian Jaya Province (1977)	21
Table 2.3.3.	Duration of Sunshine in Irian Jaya Province (1977)	22
Table 2.3.4.	Mean Relative Humidity in Irian Jaya Province (1977)	22
Table 2.3.5.	Area of Main Islands in Maluku Province	26
Table 2.3.6.	Average Temperature in Ambon in 1978	26
Table 2.3.7.	Rainfall in Maluku Province	27
Table 2.4.1.	Per Capita GRDP (1975 Constant Price)	27
Table 2.4.2.	Comparison of Industrial Structure by GRDP (1975 Constant Price)	28
Table 2.4.3.	GRDP of Maluku Province (1975 Constant Price)	29
Table 2.4.4.	GRDP of Irian Jaya Province (1975 Constant Price)	30
Table 2.4.5.	Dry Land Paddy	31
Table 2.4.6.	Wet Land Paddy	31
Table 2.4.7.	Total of Dry Land Paddy and Wet Land Paddy	31
Table 2.4.8.	Maize	32
Table 2.4.9.	Cassava	32
Table 2.4.10.	Sweet Potato	32
Table 2.4.11.	Peanuts	32
Table 2.4.12.	Soybean	33
Table 2.4.13.	Production of Estate Crops	34
Table 2.4.14.	Forest Land as of 1978	35
Table 2.4.15.	Production of Logs	35
Table 2.4.16.	Production of Sawn Timber	35
Table 2.4.17.	Export of Logs	36

Table 2.4.18.	Production of Fish	36
Table 2.4.19.	Size of Fisheries Management in 1977	36
Table 2.4.20.	Export of Fish	37
Table 2.4.21.	Production of Meat in 1978	37
Table 2.4.22.	Per Capita Consumption of Meat (1977)	37
Table 2.4.23.	Number of Livestock in Maluku	38
Table 2.4.24.	Number of Livestock in Irian Jaya	38
Table 2.4.25.	Production of Crude Oil	39
Table 2.4.26.	Number of Companies and Employees	39
Table 3.1.1.	List of Ports in Maluku and Irian Jaya	42
Table 3.1.2.	Grade of Harbour Master	44
Table 3.1.3.	Grade of Port Administrator or Chief of Port	45
Table 3.1.4.	Existing Quay at the Major Ports	46
Table 3.1.5.	Existing Equipments (1979)	53
Table 3.1.6.	Existing Open Storage	54
Table 3.1.7.	Existing Warehouses	54
Table 3.1.8.	Cargo Loading and Unloading at Ports in Indonesia	56
Table 3.1.9.	Foreign and Domestic Trade Cargo flows in Indonesia	58
Table 3.1.10.	Foreign Trade Cargo flows in Indonesia	60
Table 3.1.11.	Export (crude oil and other commodities)	61
Table 3.1.12.	Domestic Trade Cargo flow in Indonesia	62
Table 3.1.13.	The Average Annual Growth Rate of GDP and Cargo Volume	63
Table 3.1.14.	Trend of Cargo Volume Handled at Ports of Irian Jaya	65
Table 3.1.15.	Percentage of Cargo Volume at Major Ports in Irian Jaya, (1974-'79)	67
Table 3.1.16.	Ship Call and Cargo Amount by Kinds of Shipping in Some Major Ports, (1974-'79)	69
Table 3.1.17.	Average DWT and Cargo Volume by Ship	73
Table 3.1.18.	Trend of Passenger Disembarking/Embarking in Irian Jaya	76
Table 3.1.19.	The Differences between Embarkation and Disembarkation	77
Table 3.1.20.	RLS Shipping Routes in the Study Area	80
Table 3.1.21.	Perintis Shipping Routes in the Study Area	81
Table 3.1.22.	Interregional Cargo Flow in the Study Area by RLS (1977)	91

Table 3.1.23.	Interregional Cargo Flow by Perintis (1978/79)	92
Table 3.2.1.	Length and Density of Road in Indonesia	94
Table 3.2.2.	Type and Condition of Road (1978)	95
Table 3.3.1.	Air Traffic in Indonesia	97
Table 3.3.2.	Domestic Air Traffic by Province (1978)	99
Table 3.3.3.	Origin and Destination of Passenger Traffic by Air (1978)	100
Table 3.3.4.	List of Airports used by Civil Aviation in Irian Jaya and Maluku	101
Table 4.1.1.	Population in Kota Sorong by Desa	105
Table 4.1.2.	Population by Age Group in Kota Sorong in 1975	108
Table 4.1.3.	Population by Occupational Condition in Kota Sorong in 1975	108
Table 4.2.1.	Area of Estate Crops in Kabupaten Sorong	109
Table 4.2.2.	Area of Coconut Estate by Kecamatan in Kabupaten Sorong (1979)	110
Table 4.2.3.	Planned Estate Crops in Pelita III in Kabupaten Sorong	111
Table 4.2.4. (1)	Agricultural Activities (1975-1979)	112
Table 4.2.4. (2)	Agricultural Activities (1975-1979)	112
Table 4.2.4. (3)	Agricultural Activities (1975-1979)	113
Table 4.2.4. (4)	Agricultural Activities (1975-1979)	113
Table 4.2.5.	Demand of Main Foods and Farm Area to Meet the Demand (Estimated in 1979)	114
Table 4.2.6.	Budget for the Development Program	116
Table 4.2.7.	Wood Production in Kabupaten Sorong	116
Table 4.2.8.	Exports of Marine Products	117
Table 4.2.9.	Fishery Production at Sorong	117
Table 4.3.1.	Length of Roads in Kabupaten Sorong (1979)	123
Table 4.3.2.	Traffic Survey in front of DPU on Monday, September 11, 1979	125
Table 4.3.3.	Traffic Survey in front of DPU on Tuesday September 10, 1979	125
Table 4.3.4.	Traffic Survey in front of BBP on Saturday, June 14, 1980	126
Table 4.3.5.	Equivalent Passenger Car Unit	128
Table 4.3.6.	Present Car Ownership in Kabupaten Sorong (1980)	129
Table 4.3.7.	Electricity Generating Capacity of PLN X of Sorong	130
Table 5.1.1.	Number of Employees at the Port of Sorong	135
Table 5.1.2.	Main Port Charge	137

Table 5.1.3.	Revenue and Expense of Sorong Port	138
Table 5.2.1.	Present Condition of Main Public Port Facilities	139
Table 5.2.2.	Mooring Facilities in the Port of Sorong	142
Table 5.2.3.	Revetment, Buklhead and Shipway at the Port of Sorong	145
Table 5.2.4.	Transit Sheds, Warehouses and Open Storage at the Port of Sorong	145
Table 5.2.5.	Equipment (Mobil Crane, Forklift, Water Truck) at the Port of Sorong ...	146
Table 5.2.6.	Tugboats and Pilot Boats at the Port of Sorong	146
Table 6.2.1.	Frequency of Wind Speed (1965–1975)	150
Table 6.2.2.	Atomospheric Pressure, Temperature and Humidity (1966–1975)	151
Table 6.3.1.	Visual Wave Observation (June 3 to July 16, 1980)	153
Table 6.3.2.	Wave Estimation by S.M.B. Method	157
Table 6.3.3.	Tial Current	159
Table 6.3.4.	Tidal Range	159
Table 6.3.5.	Outline of Sounding	160
Table 6.3.6.	Outline of Soil Investigation	165
Table 6.3.7.	Detail Position of Each Borehole	166
Table 7.1.1.	Inter-regional Flow of Dry Cargo in the Study Area (by RLS)	180
Table 7.1.2.	Interregional Cargo Flow by Perintis (1978/79)	181
Table 7.1.3.	Inter-island Total Flow of Cargo (1976)	185
Table 7.1.4.	Socio-economic Indices in Maluku and Irian Jaya	186
Table 7.1.5.	Evaluation of Potentials for Terminal Port	187
Table 7.2.1.	Population of Port Related Areas in Irian Jaya by Kabupoten	190
Table 7.2.2.	Population and Distance from Sorong Port	192
Table 8.1.1.	Results of Population Forecast	195
Table 8.1.2.	Population Forecast 1979–2000	196
Table 8.1.3.	Population Growth Rates of Indonesia by Regions (1986–2001)	199
Table 8.1.4.	Distribution of Population by Kabupaten in 1978	200
Table 8.1.5.	Estimated Governmental Transmigration Programs 1979–2000	201
Table 8.1.6.	Distribution of Transmigration Sites after 1984	201
Table 8.2.1.	Main Indexes of Per Capita Consumption (Kg/Capita/Year)	203
Table 8.2.2.	Main Indexes of Applicable Unit Price	204
Table 8.2.3.	Composition of GRDP by Sector	205

Table 8.2.4.	Per Capita GRDP	205
Table 8.2.5.	Programmed Average Annual Growth Rate by Industrial Sector	206
Table 8.2.6.	Forecast GRDP of Irian Jaya	207
Table 8.2.7.	Development of Harvest Area for Wet Land Paddy	208
Table 8.2.8.	Number of Program Transmigrants	208
Table 8.2.9.	Forecast Harvest Area of Paddy	208
Table 8.2.10.	Yield Rate of Paddy	209
Table 8.2.11.	Forecast Production of Paddy	209
Table 8.2.12.	Rice Production and Consumption	209
Table 8.2.13.	New Developed Area by Food Crop	210
Table 8.2.14.	Forecast Harvested Area by Food Crop	210
Table 8.2.15.	Yield Rate by Food Crop	210
Table 8.2.16.	Forecast Production of Food Crops	211
Table 8.2.17.	Per Capita Consumption of Food Crops	211
Table 8.2.18.	Food Crop Production and Consumption Balance	211
Table 8.2.19.	Production & New Development Area of Estate Crops during Pelita III ...	212
Table 8.2.20.	Development of Harvest Area for Estate Crops	213
Table 8.2.21.	Harvest Area by Estate Crops	214
Table 8.2.22.	Yield Rate by Estate Crops	214
Table 8.2.23.	Forecast Production by Estate Crops	215
Table 8.2.24.	Forecast Balance between Production and Consumption for Estate Crops	215
Table 8.2.25.	Forecast Number of Livestock	216
Table 8.2.26.	Forecast Livestock Slaughtered	216
Table 8.2.27.	Per Capita Livestock Consumption Rate	217
Table 8.2.28.	Balance between Livestock Production and Consumption	217
Table 8.2.29.	Production of Logs and Sawn Timber	217
Table 8.2.30.	Production of Forestry Products	218
Table 8.2.31.	Production and Consumption of Fishery	218
Table 8.2.32.	Forecast Production and Consumption of Fishery	219
Table 8.2.33.	Forecast Production of Crude Oil	219
Table 8.2.34.	Production of Oil Products and Treated Crude Oil in 2000	220

Table 8.2.35.	Forecast GRDP of Maluku Province	221
Table 8.2.36.	Forecast Harvest Area for Paddy in 1983	222
Table 8.2.37.	Number of Transmigrants & Reselling Population	222
Table 8.2.38.	Forecast Harvest Area of Paddy	223
Table 8.2.39.	Yield Rate of Paddy	223
Table 8.2.40.	Forecast Production of Paddy	223
Table 8.2.41.	Planned Harvest Area by Food Crop in 1983	224
Table 8.2.42.	Forecast Harvest Area by Food Crop	224
Table 8.2.43.	Forecast Yield Rate by Food Crops	225
Table 8.4.44.	Forecast Production of Food Crops	225
Table 8.2.45.	Planned Development of Estate Crop Area during Pelita III	226
Table 8.2.46.	Forecast Harvest Area by Estate Crops	226
Table 8.2.47.	Forecast Yield Rate for Estate Crops	227
Table 8.2.48.	Forecast Production by Estate Crops	227
Table 8.2.49.	Production Plan for Livestock	228
Table 8.2.50.	Forecast Number of Livestock	228
Table 8.2.51.	Forecast Number of Slaughtered Livestock	228
Table 8.2.52.	Yield Rate of Meat per Animal	229
Table 8.2.53.	Forecast Production of Meat	229
Table 8.2.54.	Production of Logs and Sawn Timber	229
Table 8.2.55.	Forecast Production of Forestry Products	230
Table 8.2.56.	Planned Production and Consumption of Fishery Products	230
Table 8.2.57.	Forecast Production and Consumption of Fishery Products	230
Table 8.2.58.	Planned Production of Nickel Ore	231
Table 8.3.1.	Basic Data Series of Irian Jaya and the Port of Sorong	232
Table 8.3.2.	Forecast by Elasticity of Average Annual Growth Ratio	234
Table 8.3.3.	Forecast by Corelation between GRDP and Cargo Flow	235
Table 8.3.4.	Forecast by Standard of Living	236
Table 8.3.5.	Results of Cargo Flow Forecast	236
Table 8.3.6.	Basic Indices of Port Distribution Service Area	238
Table 8.3.7.	Rice	239
Table 8.3.8.	Wheat Flour and Sugar	240

Table 8.3.9.	Cargo Traffic through the Port (Marine Products)	241
Table 8.3.10.	Livestock	242
Table 8.3.11.	Other Crops	244
Table 8.3.12.	Estate Crops	245
Table 8.3.13.	Sawn Timber	249
Table 8.3.14.	Machinery	251
Table 8.3.15.	Vehicles	252
Table 8.3.16.	Cement	253
Table 8.3.17.	Fertilizer	254
Table 8.3.18.	Production and Consumption of Logs and Sawn Timber in Irian Jaya	256
Table 8.3.19.	Crude Oil Production and Treatment	257
Table 8.3.20.	Fuel Oil	257
Table 8.3.21.	Projection of Cargo Traffic through the Port of Sorong	258
Table 8.3.22.	Comparison of Forecast Traffic	259
Table 8.3.23.	Ratio of Six Major Ports	259
Table 8.3.24.	Volume of Cargo Handled at 6 Major Ports (1985)	260
Table 8.3.25.	Basis Data Series of Passenger Flow	262
Table 8.3.26.	Results of Passenger Flow Forecast	262
Table 8.3.27.	Cargo Flow by Kinds of Ship	263
Table 8.3.28.	Forecast of Calling Vessels (Public Wharves)	264
Table 8.3.29.	Number of Ships Using Private Mooring Facilities	265
Table 9.1.1.	Cargo Throughput 1974 to 1979	267
Table 9.2.1.	Average DWT Singapore to West Irian	268
Table 9.2.2.	Port Handling Target Values of Throughput of Wharf	268
Table 9.3.1.	Number of Ships and Staying Time	272
Table 9.3.2.	Equivalent Number of Berths	273
Table 9.4.1.	Average Staying Time (1985)	283
Table 9.4.2.	Probability of State of Berths in Sorong Port (1985)	283
Table 9.4.3.	Cargo Volume/Ship	284
Table 10.1.1.	Cargo Volume Handled at Public Wharves	287
Table 10.1.2.	Cargo Volume by Kinds of Trade	287
Table 10.1.3.	Required Berth Length by Route	288

Table 10.1.4.	Cargo Volume Handled at Transit Shed and Open Storage	289
Table 10.2.1 (1)	Present Situation and Plan of Waterfront Area	295
Table 10.2.1 (2)	Present Situation and Plan of Water Surface Area	296
Table 10.2.1 (3)	Natural Conditions	297
Table 10.2.1 (4)	Construction Work	297
Table 10.3.1.	Growth Rate of GRDP and Population	302
Table 10.3.2.	Basin for Small Crafts	304
Table 10.3.3.	Land Utilization of Port Area (2000)	305
Table 10.4.1.	Land Utilization in the New Wharf	311
Table 11.1.1.	Design Conditions for Wharf in Medium Term Port Development Program	315
Table 11.1.2.	Conditions of Construction/Cost Estimate for Port Facilities	316
Table 11.2.1.	Comparison Table	317
Table 11.3.1.	Construction Schedule for Medium Term Port Development Program	327
Table 11.4.1.	Construction Cost of Medium Term Port Development Program	329
Table 11.4.2.	Construction Cost of Medium Term Development Program by Each Year (1982-1984)	330
Table 11.4.3. (1)	Construction Cost of New Wharf (Open-Type Wharf with Vertical Piles-Steel Pile)	331
Table 11.4.3 (2)	Construction Cost of New Wharf	332
Table 12.2.1.	Reduction of Ship Staying Hour	334
Table 12.2.2.	Transportation Cargo Volume within Service Area	334
Table 12.2.3.	Average Distance from Sorong Port to Other Ports	335
Table 12.2.4.	Comparison of Required Number of Service Trips by Type	335
Table 12.2.5.	Estimated Volume of Diversion Cargo in 1985	336
Table 12.3.1.	Project Cost Used in Economic Analysis	338
Table 12.3.2.	Fuel, Power and Water Cost	339
Table 12.3.3.	Maintenance Cost for New Facilities	339
Table 12.4.1.	Cost Benefit Table (Discount Ratio = 12.0%)	341
Table 12.4.2.	Cost Benefit Table (Discount Ratio = 12.0%)	342
Table 12.4.3.	IRR Calculation Table (IRR = 18.6%)	343
Table 12.4.4.	IRR Calculation Table (IRR = 12.6%)	344
Table 13.1.1.	Loan Condition of Long Term Loan	346

Table 13.1.2.	Depreciation Rate and Life Cycle by Facility	346
Table 13.2.1.	Total Revenues of the Port of Sorong in 1985	347
Table 13.3.1.	Port of Sorong, Personnel Staff in 1985	349
Table 13.3.2.	Personnel and Administration Cost in 1985	350
Table 13.3.3.	Operation Cost in 1985	350
Table 13.3.4.	Maintenance Cost in 1985	350
Table 13.3.5.	Fixed Assets of Existing Facility	351
Table 13.3.6.	Fixed Assets of New Construction Facility	351
Table 13.3.7.	Fixed Assets Schedule	352
Table 13.3.8.	Long Term Loan Schedule	354
Table 13.4.1.	Income Statement of Sorong Port	355
Table 13.4.2.	Source and Application of Funds of Sorong Port	356
Table 13.5.1.	FRR Calculation Table : Case 2 FRR = 3.2%	359
Table 13.5.2.	FRR Calculation Table : Case 3 FRR = 0.0%	360
Table 13.5.3.	FRR Calculation Table : Case 4 FRR = 4.8%	361
Table 13.5.4.	FRR Calculation Table : Case 5 FRR = 3.3%	362
Table 13.5.5.	FRR Calculation Table : Case 6 FRR = 9%	363

CONCLUSION AND RECOMMENDATION

CONCLUSION

1. Objectives

In order to develop Irian Jaya Province with abundant natural resources such as petroleum, mineral and forestry, it is essential to improve and upgrade the Port of Sorong to the terminal port of the province with sufficient cargo handling ability, taking advantage of its strategically favorable position in the westernmost part of the province.

2. Character of the Port

After careful study of topographical and meteorological conditions, socio-economic activities, and transport system of the province as well as the governmental development programs, and repeated discussions with the authorities related, the development policy of the Port of Sorong has been determined as follows:

The port of Sorong will be the terminal port of foreign trade for the whole province, and for domestic trade, it will be the distribution center of cargo flows between islands within the western and central part of the province.

3. Target years

The improvement of the port will be carried out in two stages. The guideline of the 1st stage is the Medium Term Development Program and that of the 2nd stage is the Master Plan. Their target years are 1985 and 2000 respectively.

4. Medium term development program

The main part of the Medium Term Development Program is the construction of a new wharf which will be adjacent to the existing Concrete Wharf. The new wharf is 180 m long and 10 m deep, an open-type wharf with vertical steel piles. Total amount of the investment is 9,617 thousand dollars, including the physical contingency of 15 percent.

5. Master plan

Improvement of the existing Wooden Wharf and construction of a new 6-berth wharf are the main tasks of the Master Plan. A new set of wharfs will be built on the southeastern side of the estuary of the Klademak River; it is 2 km away from the public wharf.

6. Economic analysis

The project is expected to bring about reduction of the demurrage cost through alleviation of port congestion, reduction of sea transportation cost through concentration of port facilities, and reduction of the handling cost through construction of a new transit shed. According to our economic analysis, such improvements will generate 18.6 percent of IRR.

Thus, the project is certain to prove economically feasible.

7. Financial analysis

Our financial analysis indicates that 3.2 percent of FRR can be secured under the current tariffs if 41 percent of the total construction cost is covered by Indonesia's National

Development Fund. In this case, no difficulty is foreseen concerning the payment of overseas loans and financing of the project.

RECOMMENDATION

1. Surveying base rocks for designing a new pier

On the west side of the planned new wharf, the base rocks lie near the surface of the sea, which significantly affects the structure and shape of the wharf. It is necessary, therefore, to carefully survey their shape, depth and mechanical properties prior to a detailed design, in order to ensure safety and workability.

The most appropriate structure and materials, especially the pile material, should be selected to make the work process simple and steady.

2. Establishing maintenance program for facilities in the local ports

Sorong Port is planned to be the center of feeder service for local ports in Irian Jaya. Therefore, these ports should also be improved both in quality and quantity to cope with a large amount of cargoes. However, many reinforced concrete structures in the local ports suffer from severe damages, such as rusting of steel bars and exfoliation of coverings, and are urgently in need of repair work.

It is necessary to make a maintenance and repair program for the port facilities as soon as possible.

3. Smooth supply of water and bunker oil

In spite of the sufficient water supply capacity at the public wharf, it sometimes takes a long time to supply water to ships. This is because of the shortage of water supply into the port, or muddy water during rainy days. Then, the ships are forced to delay their departure. The supply of bunker oil is not sufficient, either. It is recommended that BPP should make further efforts to secure sufficient amount of clean water and bunker oil for the future.

4. Prohibition of disorderly development in the port

In order to smoothly carry out port improvement and administration in the future, it is desirable to ban and remove, if necessary, inappropriate facilities from the port area designated by the Master Plan.

To make sure of the future prosperity of the Port of Sorong, therefore, it is necessary to claim and secure the port area.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for ensuring transparency and accountability in financial operations. This section also highlights the role of internal controls in preventing fraud and errors.

2. The second part of the document focuses on the implementation of robust risk management strategies. It outlines various risk assessment techniques and provides guidance on how to identify, measure, and mitigate potential risks. The text stresses the need for a proactive approach to risk management to protect the organization's assets and reputation.

3. The third part of the document addresses the importance of effective communication and reporting. It discusses the need for clear and concise communication channels and the role of regular reporting in keeping stakeholders informed. This section also touches upon the importance of data security and the need for strong cybersecurity measures to protect sensitive information.

4. The fourth part of the document discusses the importance of continuous improvement and innovation. It encourages organizations to regularly evaluate their processes and systems to identify areas for improvement and to embrace new technologies and practices. This section also highlights the importance of fostering a culture of innovation and learning within the organization.

5. The fifth part of the document discusses the importance of ethical conduct and corporate social responsibility. It emphasizes the need for organizations to adhere to high ethical standards and to be transparent in their operations. This section also touches upon the importance of contributing to the community and the environment through various social responsibility initiatives.

6. The sixth part of the document discusses the importance of talent management and development. It outlines strategies for attracting, retaining, and developing top talent. This section also highlights the importance of providing ongoing training and development opportunities to ensure that employees are equipped with the skills and knowledge needed to succeed in a rapidly changing business environment.

7. The seventh part of the document discusses the importance of financial management and budgeting. It provides guidance on how to develop a realistic budget and how to monitor and control expenses. This section also touches upon the importance of maintaining a strong financial position and the need for regular financial reviews.

8. The eighth part of the document discusses the importance of legal and regulatory compliance. It outlines the key legal and regulatory requirements that organizations must adhere to and provides guidance on how to ensure compliance. This section also highlights the importance of staying up-to-date on changes in the legal and regulatory landscape.

9. The ninth part of the document discusses the importance of strategic planning and execution. It outlines the process of developing a clear and actionable strategy and provides guidance on how to execute that strategy effectively. This section also touches upon the importance of regular strategic reviews and the need for flexibility in response to changing market conditions.

10. The tenth part of the document discusses the importance of customer relationship management and service excellence. It outlines strategies for building strong relationships with customers and for providing exceptional service. This section also highlights the importance of gathering customer feedback and using it to improve the organization's offerings.

SUMMARY

SUMMARY

I. FUNDAMENTAL CONCEPT FOR DEVELOPMENT

1. In order to determine future functions of the Port of Sorong, the present cargo flows by RLS and PERINTIS in the study area were analysed. Five ports of Sorong, Jayapura, Merauke, Ambon and Ternate were studied and compared to assess their potentiality as the future terminal port of Irian Jaya and Maluku Provinces. The study was made from the viewpoints of strategic location in transportation scheme, natural conditions, economic activities and degree of accumulation of central administrative functions.

2. The results of the analysis are summarized as follows:

- (1) There is scarcely any cargo flow between the two provinces.
- (2) They are too large to be served by one terminal port, the Port of Ambon.
- (3) It is desirable to develop another terminal port in the eastern part of the study area.
- (4) The Port of Sorong is the most suitable candidate for a new terminal port.

3. The Port of Sorong is expected to have the following functions:

- (1) Distribution center of the central and western part of Irian Jaya for domestic trade, and that of the whole province for foreign trade.
- (2) Log and timber loading point.
- (3) Oil loading point.

II. FORECAST IN THE PORT ACTIVITY

1. Two different methods, namely the macro and the micro forecasts, are used to estimate the volume of cargo flow through the Port in 1985 and 2000. The total amount of cargoes is computed on the bases of the future GRDP and population by the macro method, and the amount of cargoes by trade and by commodity is calculated by the micro method, i.e., by subtracting the consumption from the production of the area.

2. If the present marine transport policy continues to be effective and the service area of the Port of Sorong is the whole province for foreign trade and the central and western part of the province for domestic trade, the volume of cargo handling at the Port of Sorong is estimated to be 300,000 tons in 1985 and 1,100,000 tons in 2000 by either forecasting method.

3. The number of passengers who travel through the Port is estimated 15,000 to 16,000 in 1985, and 20,000 to 30,000 in 2000.

4. The number of ships calling at the Port is estimated 610 (excluding small ships for local trade) in 1985, assuming that the size of the average vessels in 1985 is equivalent to that of the biggest vessel that ever called at the Port in the past (Table S-2).

5. The population and GRDP forecast in the study area, upon which the traffic forecasts are based, are shown in Table S-3 to S-5.

Table S-1 Projection of Cargo Traffic Through the Port of Sorong

	1979 (Tons)						1985 (x10 ³ Tons)						2000 (x10 ³ Tons)					
	Foreign Trade		Domestic Trade		Total		Foreign Trade		Domestic Trade		Total		Foreign Trade		Domestic Trade		Total	
	UL	L	UL	L	UL	L	UL	L	UL	L	UL	L	UL	L	UL	L	UL	L
Foodstuffs																		
Rice	11,695		725	4,123	16,543				15	12	27				51	38	89	
Wheat			356	69	425				3	3	6				5	4	9	
Sugar			1,510	10	1,520				9	7	16				13	10	23	
Marine Prod.		6,138	5,131	200	11,469			5		7	12			20		25	45	
Livestock		70	235		305				1	1	2				1	1	2	
Other Crops	*	"	"	"	"	"				43	43				21	27	48	
Estate Crops	"	"	"	"	"	"	25		21		46		97		81		178	
Sawn Timber			419	634	1,053				1		1				95	146	241	
Machinery			1,279	100	1,379				10	8	18				26	20	46	
Vehicles			620		620				26	21	47				51	40	91	
Chemical Prod.																		
Cement			2,192	486	2,678				14	11	25				38	30	68	
Fuel Oil			7,992	938	8,930													
Fertilizer			"	"	"				27	19	46				57	39	96	
Others	15,862	974	21,381	9,579	47,796				3	8	11			23	71	70	164	
Total	27,557	7,182	41,840	16,139	92,718		30	130	130	140	300		140	510	510	450	1,100	
Logs (M ³)		50,830	168	691			50			5			50			48		
Petroleum (x 10 ³ KL)																		
Crude Oil		3,199					5,100											
Others			62					20						71				

Note: 1. Figures for 1979 are based on STP of Sorong.

2. * are included in others.

3. Figures for 1985 and 2000 have been rounded off to the nearest 1,000 tons, or if less than 1,000 tons, raised to 1,000 tons.

Table S-2 Calling Vessels (Public wharves)

Route	Average Type (DWT)		Ship Calls (No.)	
	1985	2000	1985	2000
Foreign Trade	8,500	10,000	10	50
Inter-region	2,400	5,000	355	920
Feeder Line Service	760	1,000	245	1,930
Total	—	—	610	2,900

Table S-3 Results of Population Forecast

	1985		2000		Annual Growth Rate	
	Population	%	Population	%	'78-'85	'78-2000
Indonesia	160,159	100.0	210,234	100.00	2.3	2.0
Irian Jaya	1,300	0.8	1,882	0.9	2.4	2.5
Jayapura	162.6	(13)	263.3	(14)	2.6	3.1
T. Cendrawasih	86.0	(7)	112.8	(6)	2.1	1.9
Manokwari	101.1	(8)	184.5	(10)	3.6	3.8
Sorong	152.5	(12)	217.6	(12)	2.6	2.5
Fak-Fak	63.3	(5)	83.0	(4)	2.1	1.9
Merauke	185.7	(14)	259.6	(14)	2.3	2.3
Jayawijaya	264.3	(20)	346.9	(18)	2.0	1.9
Y. Waropen	63.3	(5)	90.9	(5)	2.1	2.3
Paniai	218.2	(16)	323.4	(17)	2.5	2.6
Maluku	1,540	1.0	2,229	1.1	2.6	2.6
M. Utara	441.6	(29)	613.8	(28)	2.2	2.2
M. Tengah	606.7	(39)	935.7	(41)	3.5	3.1
K. Ambon	93.3	(6)	123.4	(6)	1.7	1.8
M. Tenggara	279.8	(18)	373.9	(17)	1.7	1.9
Halmahera T.	118.6	(8)	182.2	(8)	4.5	3.4

Note: () indicates share of population within a province.

Table S-4 Forecast GRDP of Irian Jaya

(1975 Constant Prices)
(x 10⁶ US\$)

Sector	1978		1985		2000		AAGR	
		%		%		%	1978-1985	1978-2000
Food crops	11.534	17.2	247.271	27.0	621.021	33.1	12.0	8.2
Estate crops	2.119	0.3	10.575	1.2	36.255	1.0	25.8	14.0
Livestock	27.322	4.2	33.032	3.6	47.851	2.5	2.7	2.5
Forestry	3.054	0.5	9.345	1.0	87.405	4.6	17.0	16.5
Fishery	12.879	2.0	32.365	3.5	75.175	4.1	14.0	8.4
Agriculture Total	156.908	24.2	332.588	36.3	867.707	46.2	11.3	8.1
Petroleum	377.915	59.0	377.915	41.3	485.315	25.9	-	1.2
Others	6.135	0.1	11.580	1.3	23.160	1.2	9.5	6.2
Mining Total	384.050	59.1	389.495	42.6	508.475	27.1	2.0	1.3
Manufacturing & Industry	3.418	0.6	5.024	0.5	13.103	0.7	9.8	6.3
Others	102.758	16.1	187.067	20.6	487.870	26.0	9.0	7.3
Grand Total	647.134	100	914.174	100	1,877.155	100	5.1	5.0

Table S-5 Forecast GRDP of Maluku Province

(1975 Constant Prices)
(x 10⁵ US\$)

Sector	1978		1985		2000		AAGR	
		%		%		%	1978-1985	1978-2000
Food crops	63.174	21.2	149.596	23.9	364.324	29.6	27.2	8.3
Estate crops	54.494	18.2	64.630	10.3	86.972	7.1	2.5	2.2
Livestock	1.914	0.7	2.747	0.4	4.800	0.4	5.5	4.1
Forestry	22.434	7.5	34.324	5.5	30.936	2.5	6.3	1.5
Fishery	30.802	10.3	62.035	9.9	142.398	11.5	10.5	7.2
Agriculture Total	172.818	57.9	313.332	50.0	629.430	51.1	8.9	6.1
Mining	5.479	1.8	33.039	5.3	38.519	3.1	29.3	9.3
Manufacturing & Industry	3.211	1.1	6.624	1.1	13.308	1.1	10.9	6.7
Others	117.117	39.2	273.791	43.6	550.046	44.7	13.0	7.3
Grand Total	298.625	100	626.786	100	1,231.303	100	11.2	6.7

III. PORT CONGESTION ANALYSIS AND CARGO HANDLING

1. The main factors involved in port congestion are the number of arriving ships, the number of berths, and the cargo handling capacity. If the exact average length, berthing time and cargo handling time of calling ships are available, and if Poisson's Distribution is taken for the arrival time distribution and either Poisson's or Regular Distribution is adopted for the berthing time distribution, port congestion can be numerically represented by applying the queuing theory.

2. On the assumption that the average cargo handling time is 16 hours and the average berthing time is 23.8 hours, the port congestion in 1985 is estimated as follows: in case of a 430 m wharf ($S = 5$), the average waiting time is 2.2 – 3.8 hours, and with a 250 m wharf ($S = 3$), the average waiting time is 50.4 – 100.8 hours.

3. The big difference in the average waiting time indicates that the construction of a new wharf of 180 m in length can effectively resolve the port congestion in and after 1985.

4. The planned 180 m wharf will be able to handle 300,000 tons of cargo in 1985. This means that its cargo handling capacity per 1 m is 700 tons, which approximates the target figure of Pelita III.

5. Refer to Table S – 7 for further information concerning port congestion.

Table S-6 Average Staying Time (1985)

Model		S = 5		S = 3		Difference in average staying time (hr)
		$\lambda = 1.966, \mu = 0.672$ $\rho = 0.588$		$\lambda = 1.966, \mu = 0.672$ ($\rho = 0.9^*$)		
[M/M/S]	Average number of staying ships : L	2.3		10.2		
	Average number of waiting ships : Lq	0.3		8.3		
	Average staying time : W	1.16 day	27.6 hr	5.2 day	124.6 hr	97.0
	Average waiting time : Wq	0.16 day	3.8 hr	4.2 day	100.8 hr	
[M/D/S]	Average number of staying ships : L	2.2		6.1		
	Average number of waiting ships : Lq	0.18		4.1		
	Average staying time : W	1.1 day	26.0 hr	3.1 day	74.2 hr	48.2
	Average waiting time : Wq	0.09 day	2.2 hr	2.1 day	50.4 hr	

Note: $\rho=0.98$ is theoretically obtained for $S=3, \lambda=1.966$ and $\mu=0.672$, but $\rho=0.9$ is used taking the more realistic port situation into account.

Table S-7 Probability of State of Berths in Sorong Port (1985)

S = 5 $\lambda = 1.966$ $\rho = 0.588$	[M/M/S]		[M/D/S]	
	Cumulative probability	Probability of state	Cumulative probability	Probability of state
State of berths being unoccupied	0.05	0.05	0.05	0.05
State of one ship berthing	0.20	0.15	0.20	0.15
State of two ships berthing	0.42	0.22	0.38	0.18
State of three ships berthing	0.62	0.20	0.63	0.25
State of four ships berthing	0.79	0.17	0.80	0.17
State of five ships berthing	0.86	0.07	0.903	0.103
State of one ship waiting	0.925	0.065	0.957	0.054
State of two ships waiting	0.957	0.05	0.982	0.025
State of three ships waiting	0.976	0.019	0.993	0.011

IV. MASTER PLAN AND MEDIUM TERM DEVELOPMENT PROGRAM

1. The Port needs to be equipped with quaywalls with the total length of 432 m in 1985 and 1,465 m in 2000, in order to handle the estimated cargo traffic as shown in Table S-8.

2. It is necessary to prepare a waterfront utilization plan, classifying the waterfront of Sorong Port and its vicinity into a port zone, a fishery zone and a recreation zone in order to coordinate diverse demands, which are duly made from various sectors because of the high potentiality of the area.

3. It is desirable to allocate the port zone between Nujew Point and the Remu River considering the present arrangement of port facilities, topographical features and utilization patterns of both land and sea areas.

4. The Master Plan is shown in Fig. S-1.

A new one-berth wharf will be constructed and the old Wooden Wharf will be replaced by a new one in the West Wharf.

In the East Wharf, a marginal-type wharf with six berths will be built toward the southeast direction from the estuary of the Klademak River.

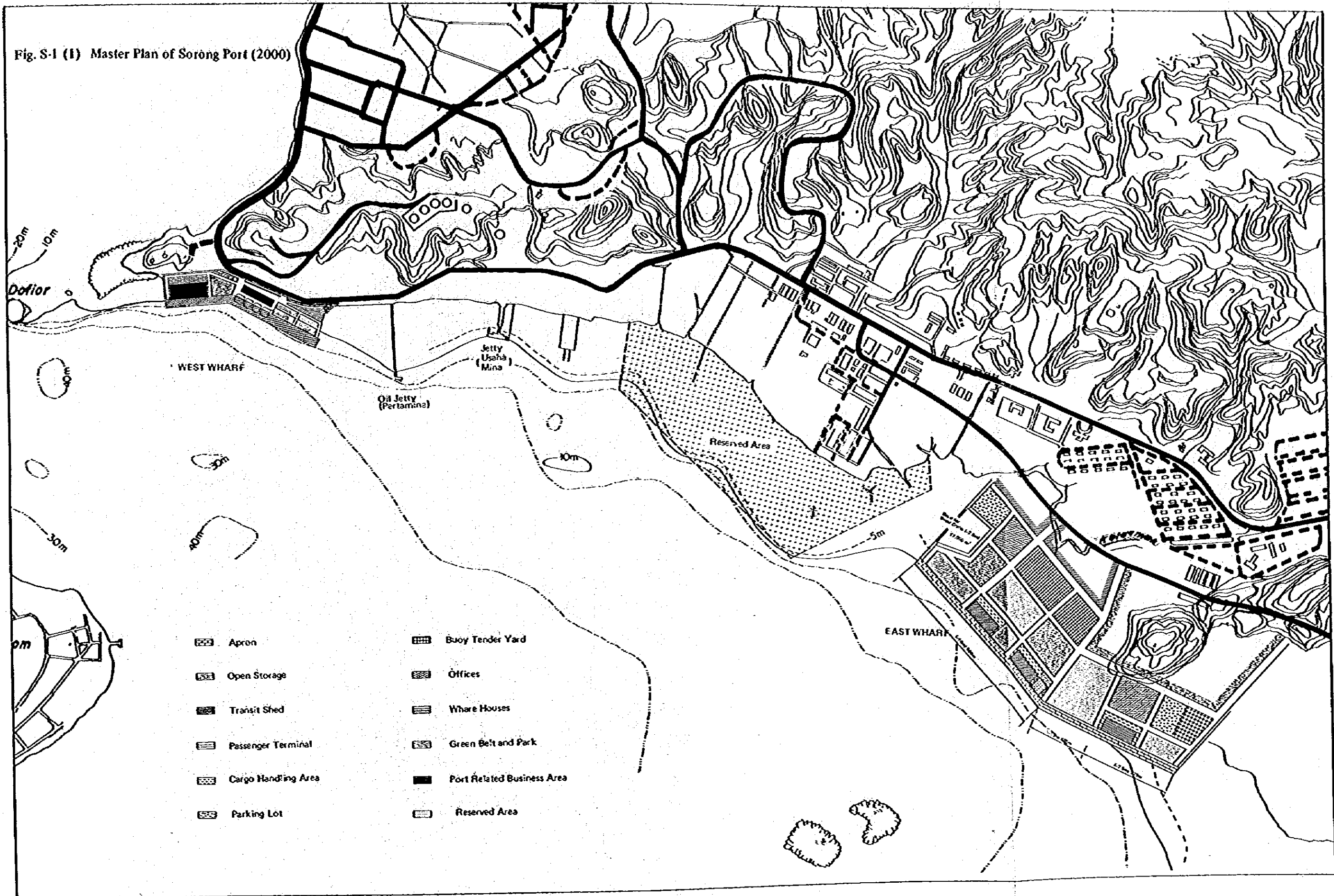
5. The Medium Term Development Program consists of constructing a new wharf with a shed next to the existing Concrete Wharf and purchasing a tugboat, two forklifts and others.

The plan is shown in Fig. S-2.

Table S-8 Required Length of Berths

		Cargo Volume (10 ³ tons)	Vessel Size (DWT)	Water Depth (m)	Handling Capacity (t/m)	Berth Length (m)	
1985	Total	300	15,000	-10.0	700	432	
2000	Foreign Trade	140	15,000	-10.0	900	185 (185x1)	
	Domestic Trade	Inter-region	560	15,000	-10.0	900	740 (185x4)
		Feeder Service	400	5,000	-7.5	800	540 (135x4)
	Total	1,100			900	1,465	

Fig. S-1 (I) Master Plan of Sorong Port (2000)



The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice. This not only helps in tracking expenses but also ensures compliance with tax regulations.

In the second section, the author outlines the various methods used to collect and analyze data. This includes both primary and secondary research techniques. The primary research involves direct observation and interviews, while secondary research involves analyzing existing data sources.

The third section focuses on the statistical analysis of the collected data. It describes the use of various statistical tests to determine the significance of the findings. The author also discusses the limitations of these tests and the need for careful interpretation of the results.

Finally, the document concludes with a summary of the key findings and their implications. It suggests that the data indicates a strong correlation between the variables studied, which has important implications for the field of research.

Fig. S-1 (2) Land Use Plan of West Wharf (2000)

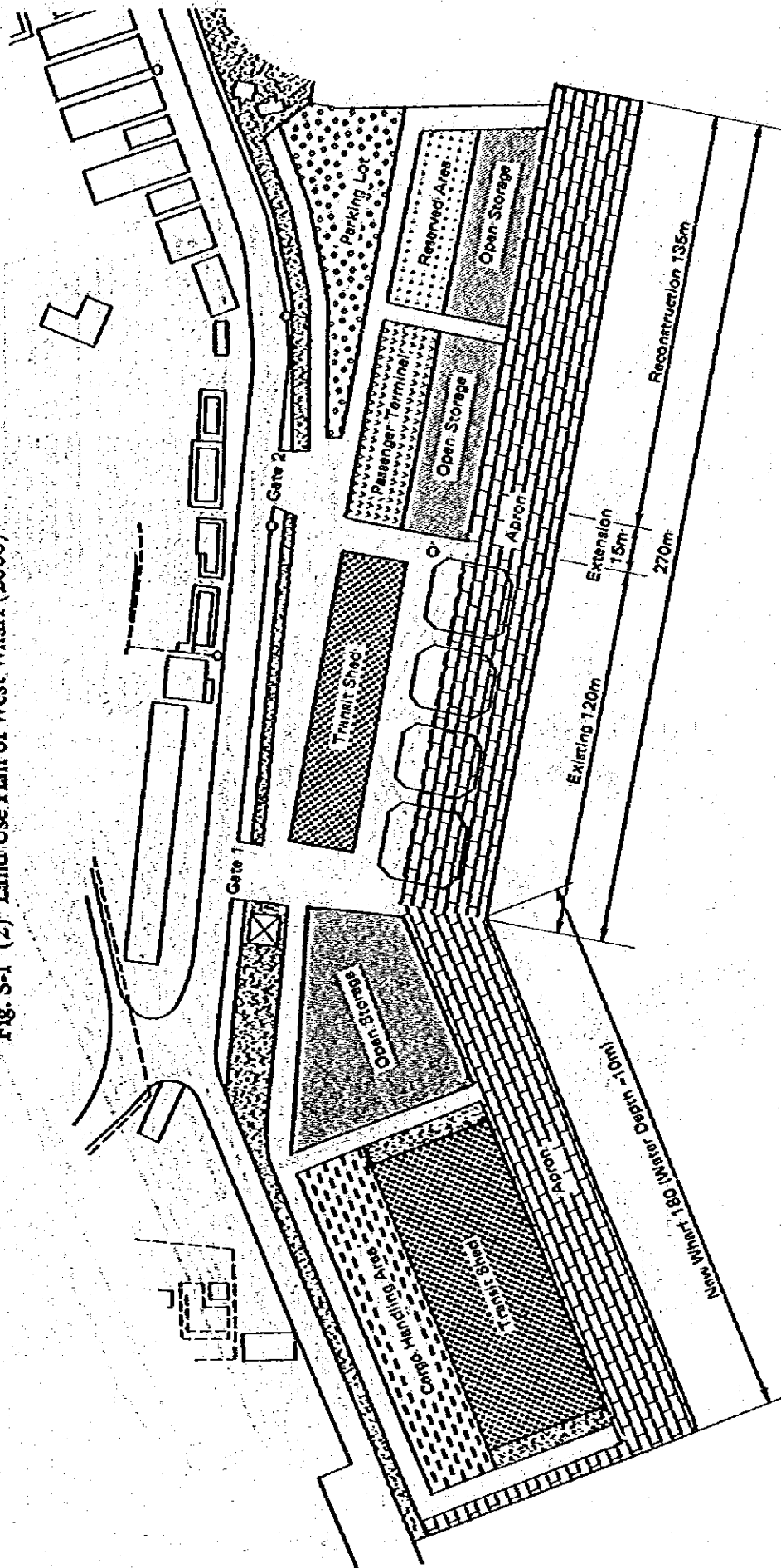
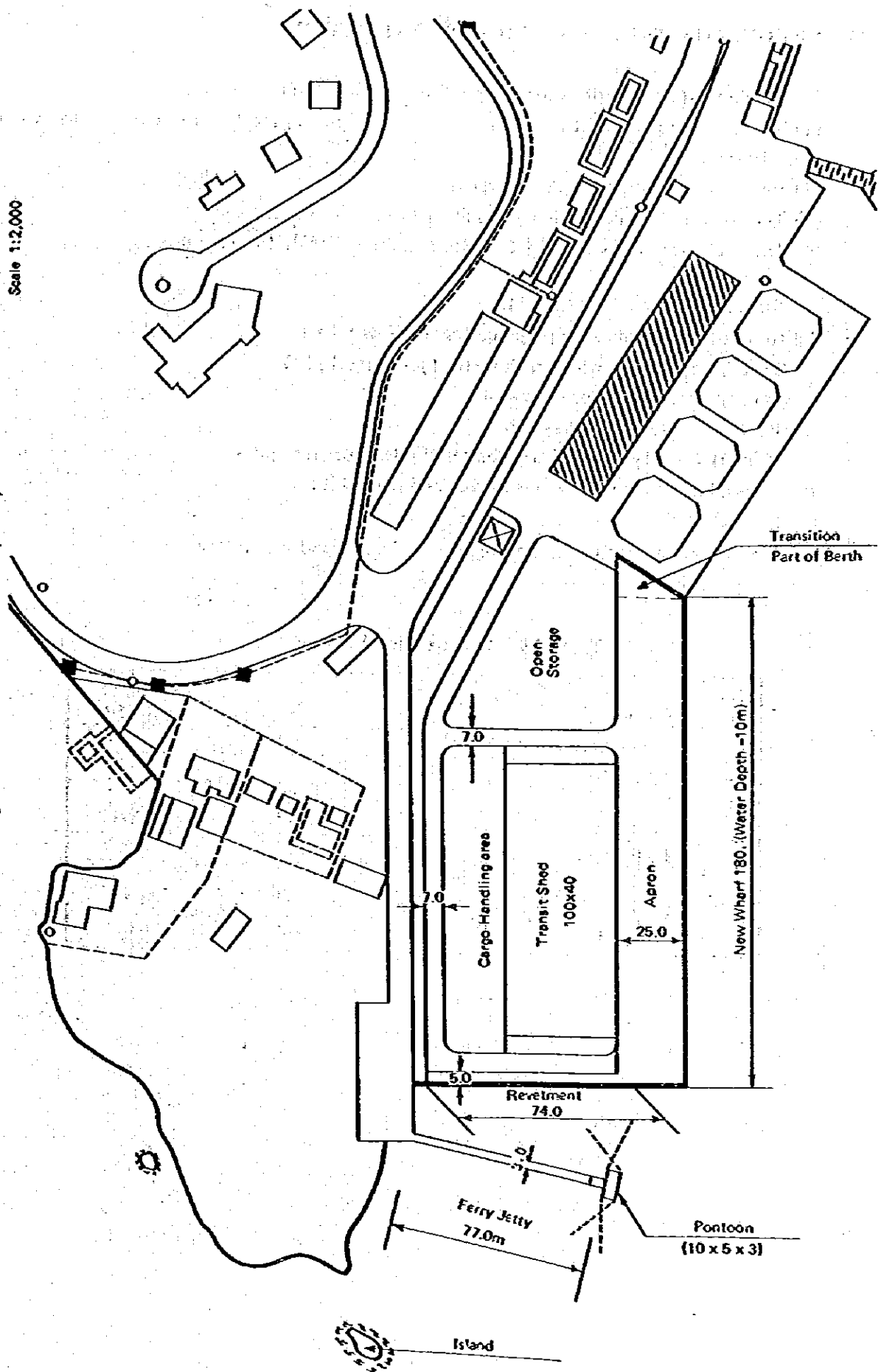


Fig. S-2 Plan of Port Facilities (1985)

Scale 1:2,000



V. DESIGN, CONSTRUCTION AND COST ESTIMATION

1. Fundamental Conditions for Design, Construction and Cost Estimation

- (1) The top elevation of the wharf is +3.5 m and the water depth in front of the wharf is -10.0 m.
- (2) Reclamation is made by dump trucks.
- (3) The construction period is 3 years from 1982 to 1984.
- (4) The exchange rate is 1 US\$ = 625 Rp. and the prices of 1980 are used.

2. Structural Type of a New Wharf

4 different trial designs were prepared for the New Wharf.

(Plan A) open-type wharf with vertical piles (steel pile)

(Plan B) steel pipe type quaywall

(Plan C) caisson type quaywall

(Plan D) open-type wharf with battered piles (concrete pile)

Plan A is adopted for the reasons of cost and workability.

3. The volume of construction during the project period is as follows:

Table S-9 Construction Volume

No.	Facility	Unit	Quantity
1	New Wharf	m	180
2	Transition Part of Berth	m ²	144
3	Ferry Jetty	m	77
4	Revetment	m	74
5	Reclamation	m ³	53,000
6	Transit Shed	m ²	4,000
7	Building	m ²	30
8	Road	m ²	4,273
9	Pavement	m ²	6,614

4. Construction Schedule

The construction schedule is as follows:

Table S-10 Construction Schedule for Medium Term Development Program

Item	1982	1983	1984	1985
New wharf, Transitional Part of Berth Ferry Jetty, Others				
Revetment, Reclamation				
Transit Shed, Building				
Road, Pavement				
Water Supply, Electric Power Supply Navigation Aids				
Cargo Handling Equipment, Service Vessels				
Mobilization / Demobilization				
Engineering Study				
Supervision				

5. Cost Estimation

Project Cost is as follows:

Table S-11 Project Cost of Medium Term Development Program

(1,000 US\$)

Item	Local Currency	Foreign Currency	Total
Construction works	2,995	3,698	6,693
Cargo Handling Equipment, Service Vessels	0	711	711
Sales Tax (5%)	150	0	150
Engineering Study	229	344	573
Supervision	143	215	358
Physical Contingency	471	661	1,132
Price Contingency	598	844	1,442
Total	4,586 (41.4%)	6,473 (58.6%)	11,059 (100%)

- Notes:
1. Construction Works are shown in Table S-9
 2. Cargo Handling Equipment are two forklift (2.5 ton).
 3. Service Vessels are one tugboat (800HP) and one speedboat (185HP).
 4. Physical Contingency is 15 percent.
 5. Price Contingency is 15 percent.

VI. ECONOMIC ANALYSIS

1. Economic analysis of this project is conducted on the basis of the construction costs, \$9,585,000 (Rp. 5,490,625,000), and the benefits listed below.

Evaluation is made by computing the IRR and the B/C Ratio. The discount rate of 12 percent, which is used by the Indonesian Government for evaluating port projects, is applied to the B/C Ratio calculation.

2. This project is expected to bring the following benefits:

- (1) Reduction of demurrage costs through resolving congestion at Sorong Port.
- (2) Reduction of voyage costs through transferring the cargo transportation from RLS to PERINTIS in the service area of Sorong Port.
- (3) Reduction of cargo handling cost through constructing a new shed in the reclaimed land.
- (4) Increase in the efficiency of port cargo handling and decrease in damaged cargoes through the provision of proper terminal facilities.
- (5) Reduction of accidents of ships when entering or leaving the port through introducing a tugboat and navigation aids.
- (6) Contribution to regional development
 - a) facilitation of the development of natural resources
 - b) improvement of urban functions

The total computable benefits, i.e., the summation of Items (1), (2) and (3) is \$2,350,000 per year.

3. Evaluation

IRR : 18.6 percent
B/C Ratio : 1.45

These figures show that this project is feasible. This project is significant because it is focused on the development of West Irian, the least developed region of Indonesia. Judging from the present conditions around the Sorong area, it can be said that this project will have a considerable impact on the promotion of the regional development in the Sorong area.

VII. FINANCIAL ANALYSIS

The FRR computation is based on the construction costs (Rp. 6,912,000,000) and the operating profits of Sorong Port after 1985 (Rp. 266,000,000).

- (1) The project indicates that the FRR of 3.3 percent is obtained by raising the current level of port tariffs by 40 percent.
- (2) It also indicates that 3.2 percent of FRR will be secured under the current port tariffs, if 41 percent (since the project's local currency ratio is 41 percent) of the total construction cost is covered by the Interest-free National Development Fund.
- (3) In this case, the financial position of Sorong Port shows a deficit every year as shown in the Income Statement (Table S-12). Judging from the Source & Application Funds (Table S-13), however, no difficulty is foreseen concerning the payment of overseas loans and financing of the project.

Table S-12 Income Statement of Sorong Port

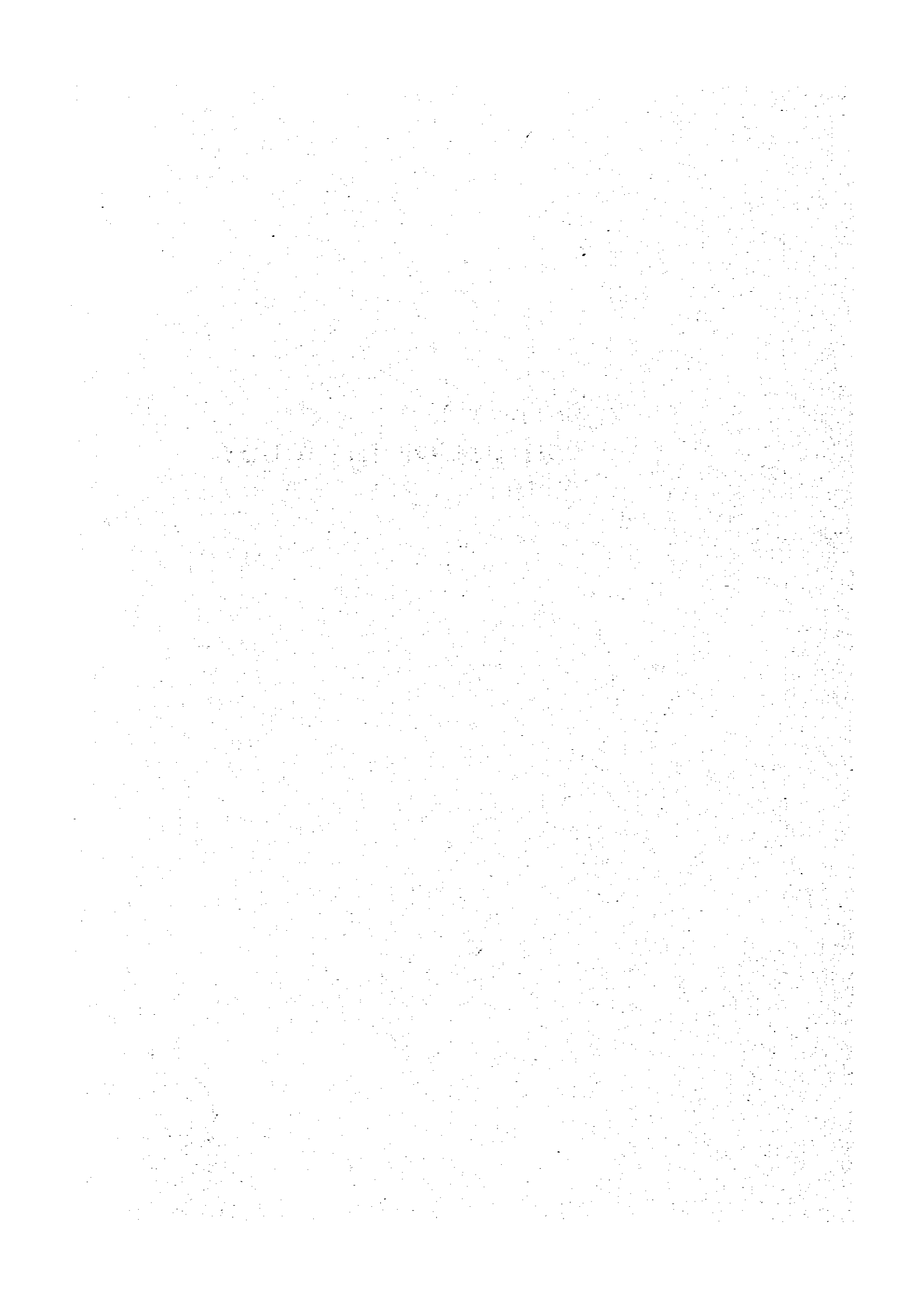
	1980	1981	1982	1983	1984	1985	1986 ? 1990	1991 ? 1995	1996 ? 2000	2001 ? 2005
Operating revenues	185	204	225	249	280	502	2,510	2,510	2,510	2,510
Operating expenses	83	85	88	92	97	236	1,180	1,180	1,180	1,180
Operating profit	102	119	137	157	183	266	1,330	1,330	1,330	1,330
Depreciation	62	62	62	65	67	198	990	990	990	990
Interest on Loan	—	—	12	87	121	121	605	584	490	389
Gross profit	40	57	63	5	▲ 5	▲ 53	▲ 265	▲ 244	▲ 150	▲ 49
Tax (45%)	18	26	28	2	—	—	—	—	—	—
National develop- ment fund reserve (30.3%)	12	17	19	2	—	—	—	—	—	—
Net profit	10	14	16	1	▲ 5	▲ 53	▲ 265	▲ 244	▲ 150	▲ 49
Operating Ratio (%)	45	42	39	37	35	47	47	47	47	47

Table S-13 Source & Application of Funds of Sorong Port

(Million Rp.)

	1980	1981	1982	1983	1984	1985	1986 ? 1990	1991 ? 1995	1996 ? 2000	2001 ? 2005
(A) Source of Funds										
Operating profit before interest and depreciation	102	119	137	157	183	266	1,330	1,330	1,330	1,330
Depreciation	62	62	62	65	67	198	990	990	990	990
Long Term Loan			409	2,497	1,140					
National Development Fund			289	1,833	744					
Total	164	181	897	4,552	2,134	464	2,320	2,320	2,320	2,320
(B) Application of Funds										
Addition to Fixed Assets			698	4,330	1,884		105	50	105	594
Interest			12	87	121	121	605	584	490	389
Principal								381	675	675
Others	30	43	47	4	5	53	265	244	150	49
Total	30	43	757	4,421	2,010	174	975	1,259	1,420	1,707
(C) Decrease/Increase of Net Current Assets	134	138	140	131	124	290	1,345	1,061	900	613
Debt Service Coverage	—	—	—	255	207	383	383	240	199	1,064
Return on Net Fixed Assets	5	7	8	9	10	3	3	4	4	5

Chapter 1.
OUTLINE OF THE STUDY



CHAPTER 1. OUTLINE OF THE STUDY

1.1. Background and Objectives

(1) Background

The Government of the Republic of Indonesia proposed a study on the port development to the IGGI meeting. The Government of Japan pledged to carry out the study on the development project of the Port of Sorong as part of its technical cooperation programs. The Government of Japan sent a contact mission to the Republic of Indonesia, and agreed to the execution of the study for the development project of the Port of Sorong.

In compliance with the Terms of Reference, the Government of Japan sent a preliminary survey mission to the Republic of Indonesia on February, 1980. The team carried out a recognition survey and the Scope of Work was signed by the Secretary of the Directorate General of Sea Communications, J.E. Habibie, and the leader of the Japanese Preliminary Survey Team, K. Kudo at Jakarta on the 1st of March, 1980.

Based on the Scope of Work, Japan International Cooperation Agency (JICA), the official agency responsible for implementation of technical cooperation programs of the Government of Japan, has organized and dispatched the study team, made up of eight members, to the Republic of Indonesia from May 20 to August 9, 1980. The Government of the Republic of Indonesia joined the study in the field of the survey on natural conditions.

(2) Objectives

1) Master Plan

The study consists of formulating a master plan for the Port of Sorong covering Irian Jaya and Maluku Provinces, whose development is largely dependent upon the development of the Port of Sorong. The plan contains the forecast of the increasing demands in sea traffic, and commodity-wise cargo volume, and lays out the port facilities in the year of 2000. Designs of facilities, cost estimate, economic and financial analysis are not included in the Master Plan.

2) Medium Term Plan

The study includes a feasibility study of the medium term development plan of the Port of Sorong with the target year of 1985.

3) Technology Transfer

The on-the-job training of three counterparts of the Government of the Republic of Indonesia is one of the objectives of this study for the purposes of the technology transfer to the Indonesian side.

1.2. Study Procedure

The study was carried out in four steps: Field survey, Phase I, Phase II and Final Phase.

(1) Field Survey

The field survey was carried out from May 20 to August 9, 1980 in the field of socio-economics, port planning and engineering. The study team presented the Inception Report and discussed study items and the schedule of the field survey with the Government of the Republic of Indonesia before commencement of the study. After the field survey, the team submitted the Provisional Report, which was reviewed and discussed by the authorities both governments in order to set up consensus on the study procedure and items. After two days of discussion, the Record of Discussion was concluded on August 6, 1980.

The following are the content of the study:

- 1) Review and analyse all the available and pertinent reports and data**
- 2) Forecast future economic activities in the study area**
- 3) Analyse present shipping characteristics and sea transportation patterns in the study area**
- 4) Investigate the present status of major ports in Irian Jaya and Maluku**
- 5) Examine and assess the functions and relations of the Port of Sorong to other major ports in Irian Jaya and Maluku**
- 6) Survey the Port of Sorong and its vicinity, including its present facilities and operation**
- 7) Estimate sea traffic through the port for the first ten years and prepare an outline of the following ten years**
- 8) Review town planning and locations of major facilities of Sorong**
- 9) Collect data on materials, machinery, labour etc. for construction of port facilities**
- 10) Survey the natural conditions of the Port of Sorong**

(2) Phase I

The study of Phase I covers the Master Plan for the port of Sorong. Based on the discussion on the Provisional Report, the Master Plan – as a guideline for the orderly development of the port – was drawn up and presented in the form of the Interim Report to the Government of the Republic of Indonesia.

(3) Phase II

The study of Phase II consists of making the medium term development plan in the target year of 1985. Some recommendation were presented in the form of the Draft Final Report at the end of the fiscal year of 1980.

(4) Final Phase

The Final Phase involves rewriting and revision of the Draft Final Report based on discussions with the Government of Republic of Indonesia. The Final Report will be submitted to the Indonesian Government early in the next fiscal year.

1.3. Member of the Study Team

(1) Member of the Study Team

The members of the team are:

Mr. Masao OHNO
(Project Director)
Executive Director
The Overseas Coastal Area
Development Institute of Japan
(OCDI)

Mr. Katsuhiko SUZUNAI
(Team Leader; Traffic Planning,
From May to August, 1980)
Director of Engineering,
OCDI

Dr. Shoichi KITAHIMA
(Team Leader; Traffic Planning,
From August, 1980 to February, 1981)
Special Advisor,
OCDI

Mr. Hideo KAYAHARA
(Deputy Team Leader;
Port Planning and Economic Analysis)
Deputy Director of Engineering,
OCDI

Mr. Kozo TANAKA
(Port Management and
Financial Analysis)
Deputy Director of Economics,
OCDI

Mr. Masayoshi TAMURA
(Regional Development)
Town Planner,
OCDI

Mr. Masayuki FUJIKI
(Structural Design and
Cost Estimate)
Structural Engineer,
OCDI

Mr. Kouki ZEN
(Geotechnical Engineering)
Senior Engineer,
OCDI

Mr. Takao KAIBARA
(Coordination)
Coordinator, Social Development
Cooperation Dept.,
Japan International
Cooperation Agency (JICA)

(2) Counterparts

Drs. Darman Asri
(Economist)

Ir. Hulahaean
(Civil Engineer)

Ir. Soeyarso
(Civil Engineer)

1.4. Organizations Visited by The Team

Methods of investigation are generally classified into interviews, field observation and collection of informative materials. Names of the cities, the authorities and organizations visited by the team for interviews and collecting informative materials are listed below:

City	Authorities and Organizations
Jakarta;	Sea Communications, Communications Department
	Home Affairs Department
	Central Bureau of Statistics
	Hydro-Oceanography Board
	Central Office of Meteorology and Geophisic
	Tanjung Priok Port Office
	Pertamina Head Office
	Advisory Team Japan

Sorong; Sorong Port Office
Bappeda, Sorong
Chief Office of Land Use, Bupati
Public Works Department, Bupati
Forestry Section, Bupati
Fishery Section, Bupati
Agriculture Section, Bupati
Estate Section, Bupati
Pertamina, Unit V
PLN (Perusahaan Umum Listrik Negara)

Jayapura; Jayapura Port Office
District Bureau of Statistics
Bappeda, Irian Jaya

Ambon; Ambon Port Office
District Bureau of Statistics
Bappeda, Ambon

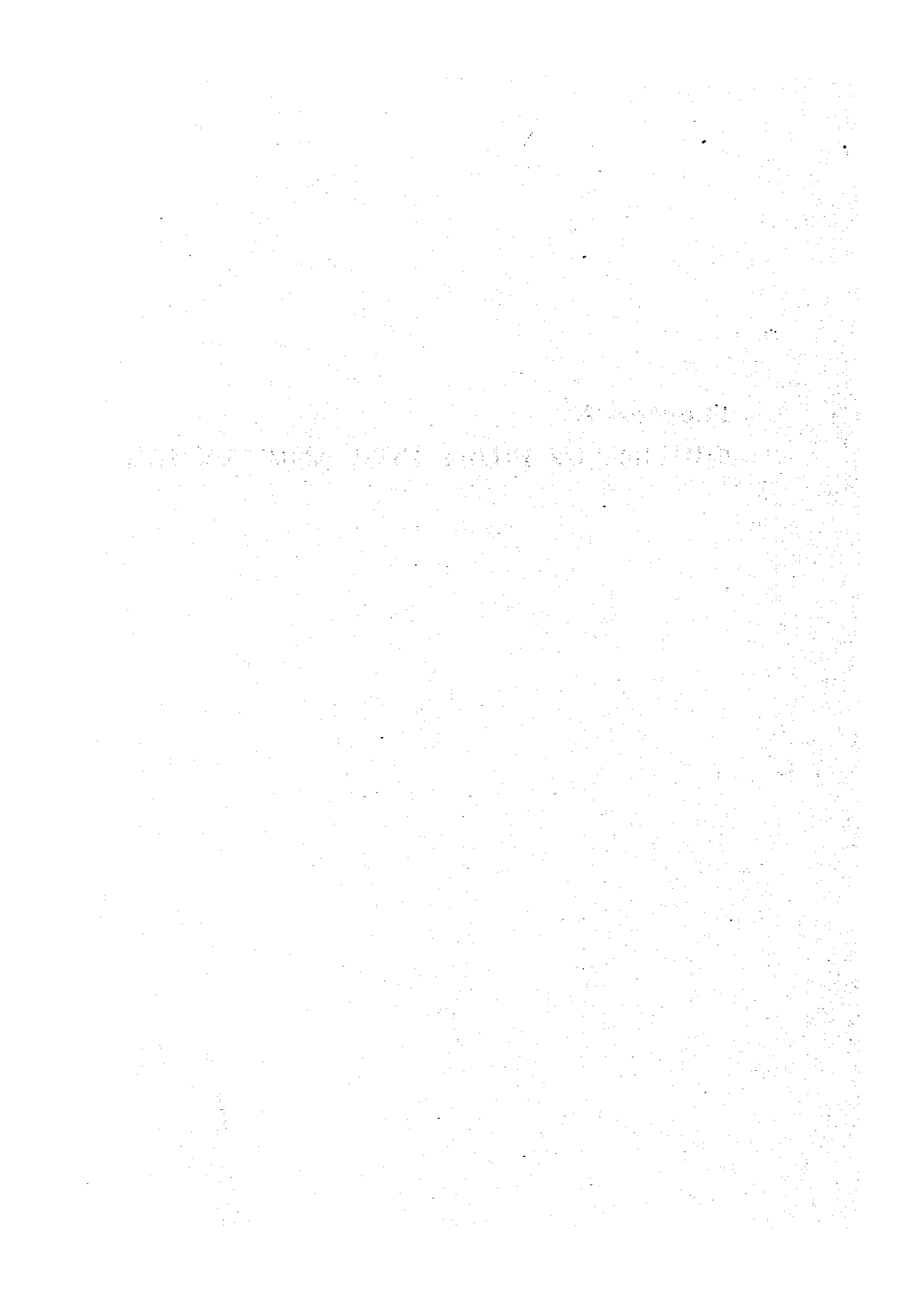
Ternate; Ternate Port Office
Bappeda, Ternate
Bupati, Ternate

Biak; Biak Port Office

Manokwari; Manokwari Port Office

Chapter 2.

OUTLINE OF IRIAN JAYA AND MALUKU



CHAPTER 2. OUTLINE OF IRIAN JAYA AND MALUKU

2.1. Study Area

Irian Jaya and Maluku Provinces are situated in the eastern part of Indonesia, as shown in Fig. 2.1.1. Irian Jaya, the easternmost Province neighboring Papua New Guinea, has the largest area¹⁾ of 422 thousand km², 21 percent of the national land area. However, the population in 1978 was 1.1 million; 0.8 percent of the national population and the population density was the lowest (2.6 persons per km²) in the nation (Table 2.1.1.).

Maluku Province, next to the Irian Jaya, has an area¹⁾ of 75 thousand km²; 3.9 percent of the national land area. The population was 1.3 million; 0.9 percent of the national population and the density was 17.6 persons per km².

The local administrative system in Irian Jaya, like other provinces in Indonesia, consists mainly of 3 hierarchical levels of organizations: Kabupaten, Kecamatan and Desa. As shown in Fig. 2.2.1. there are 9 Kabupatens, 116 Kecamatans and 2,314 Desas in this province.

Maluku, a typical province of archipelagoes, as shown in Fig. 2.2.2. is comprised of Kotamadya (City) Ambon and 4 Kabupatens, which cover 51 Kecamatans and 1,767 Desas.

2.2. Population

Table 2.2.1. shows the population growth of the past decades. On the basis of the 1971 Census, Irian Jaya Government estimates the annual population growth rate to be 2.4 percent and forecasts²⁾ the same figure during the period of Pelita III. Maluku, based on the 1971 Census, forecasts²⁾ the growth rate of 2.19 percent during 1971-76 and 2.5 percent during 1976-81.

In comparison with the recent forecasts²⁾ by the Central Bureau of Statistics (CBS), growth rates in both provinces are greater than the rate in whole Indonesia. However, they are approximately the same as those in whole outer Jawa Area.

Figs. 2.2.1 & 2. and Tables 2.2.2. & 3. show the distribution of population in 1978 by Kecamatan in both provinces.

As for Irian Jaya, the inland area of Jayawijaya shows the largest population of 222 thousands, 21 percent of the total population. Other densely populated Kabupatens are mostly situated along the northern coast of the island. Population in most Kecamatans, except Capital Kecamatan of each Kabupaten, is less than 10,000.

In Maluku, approximately half of the population is concentrated in Kotamadya Ambon (83 thousand) and its surrounding Maluku Tengah Kabupaten (478 thousand). However, population in most Kecamatans is over 10,000.

Table 2.2.4. shows the transmigrants sponsored or assisted by Government (Spontaneous). Transmigrants in each province during Pelita II were small in number; less than 1 percent of those in whole Indonesia.

1) These figures are supplied by the Central Bureau of Statistics, and do not necessarily coincide with the data of provincial Governments.

2) As described in the section of Population Forecast (8.1), most figures available are estimates or forecasts.

Table 2.1.1. Area and Population of Indonesia by Province in 1978

		Area ¹⁾		Population 1978 ²⁾		Population Density (person/km ²)
		Km ²	%	Person	%	
1.	D.I. Aceh	55,392	2.88	2,483,038	1.75	44.82
2.	Sumatra Utara	70,787	3.69	8,185,744	5.78	115.64
3.	Sumatra Barat	49,778	2.59	3,452,029	2.44	69.35
4.	Riau	94,562	4.93	2,029,442	1.43	21.46
5.	Jambi	44,924	2.34	1,243,373	0.88	27.68
6.	Sumatra Selatan	103,688	5.40	4,256,636	3.01	41.05
7.	Bengkulu	21,168	1.74	641,461	0.45	30.30
8.	Lampung	33,307	1.10	3,432,252	2.42	103.05
	Sumatra	473,606	24.67	25,723,975	18.17	54.32
9.	DKI Jakarta	590	0.03	6,805,000	4.81	11,553.90
10.	Jawa Barat	46,300	2.41	24,830,443	17.54	536.29
11.	Jawa Tengah	34,206	1.78	25,110,498	17.74	734.09
12.	D. I. Yogyakarta	3,169	1.17	2,858,029	2.02	901.87
13.	Jawa Timur	47,922	2.50	29,299,983	20.70	611.41
	Jawa & Madura	132,187	6.89	88,903,593	62.79	672.56
14.	Bali	5,561	0.29	2,549,209	1.80	458.41
15.	Nusa Tenggara Barat	20,177	1.05	2,647,810	1.87	131.23
16.	Nusa Tenggara Timur	47,876	2.49	2,759,639	1.95	57.64
17.	Timor Timur	14,874	0.78	-	-	-
	Bali & Nusa Tenggara	88,488	4.61	7,956,658	5.62	89.92
18.	Kalimantan Barat	146,760	7.65	2,446,602	1.73	16.67
19.	Kalimantan Tengah	152,600	7.95	847,835	0.60	5.56
20.	Kalimantan Selatan	37,660	1.96	2,057,815	1.45	54.64
21.	Kalimantan Timur	202,440	10.55	887,801	0.63	4.39
	Kalimantan	539,460	28.11	6,240,061	4.41	11.57
22.	Sulawesi Utara	19,023	0.99	2,080,079	1.47	109.34
23.	Sulawesi Tengah	69,726	3.63	1,106,632	0.78	15.87
24.	Sulawesi Selatan	72,781	3.79	6,282,616	4.44	86.32
25.	Sulawesi Tenggara	27,686	1.44	864,480	0.61	31.22
	Sulawesi	189,216	9.85	10,333,807	7.30	54.61
26.	Maluku	74,505	3.88	1,309,475	0.92	17.57
27.	Irian Jaya	421,981	21.39	1,111,070	0.78	2.63
	Indonesia	1,919,443	100.00	141,578,998	100.00	73.76

Source: 1) Statistical Yearbook of Indonesia 1979/81, CBS

2) Population estimate at the end of 1971 - 1981 by Region, CBS

Note: Figures on Irian Jaya and Maluku in this table have some differences from data supplied by provincial governments as shown in Table 2.2.1.

Table 2.2.1. Population Growth 1930 - 1978

	Irian Jaya 1)		Maluku 2)		Indonesia 3)		Outer Jawa 3)		Notes
	Person	Growth rate (%)	Person	Growth rate (%)	1,000 person	Growth rate (%)	1,000 person	Growth rate (%)	
1930	-		* 544,980	1.20					Census
1961	-		* 789,534		97.387		34.161		"
1971.9			* 1,089,511	3.29		2.12		2.45	"
1971.12	923,440		1,096,298		119,140.5		43,110.9		Projection
72	945,603		1,118,579			2.0			"
73	968,298	2.4	1,142,258	2.19				2.31	"
74	995,110		1,167,338						"
75	1,015,314		1,193,819						"
76	1,039,870		1,221,700		131,304.3		47,704.3		Inter censal survey
77	1,064,734	'76-'81	1,250,513	'76-'81		'76-'81		'76-'81	Projection
78	1,090,270	2.4	1,280,961	2.5		2.0		2.42	"
1981									

Sources: 1) Irian Jaya Dalam Angka 1977

2) Proyeksi Penduduk Maluku 1971-1986, 1975 District Bureau of Statistics in Maluku

3) Proyeksi Penduduk, Indonesia 1976 - 2001/1978 Central Bureau of Statistics

Note: Figures marked with * refer to Pollta III in Maluku.

Fig. 2.2.1. Administrative Area and Population of Irian Jaya

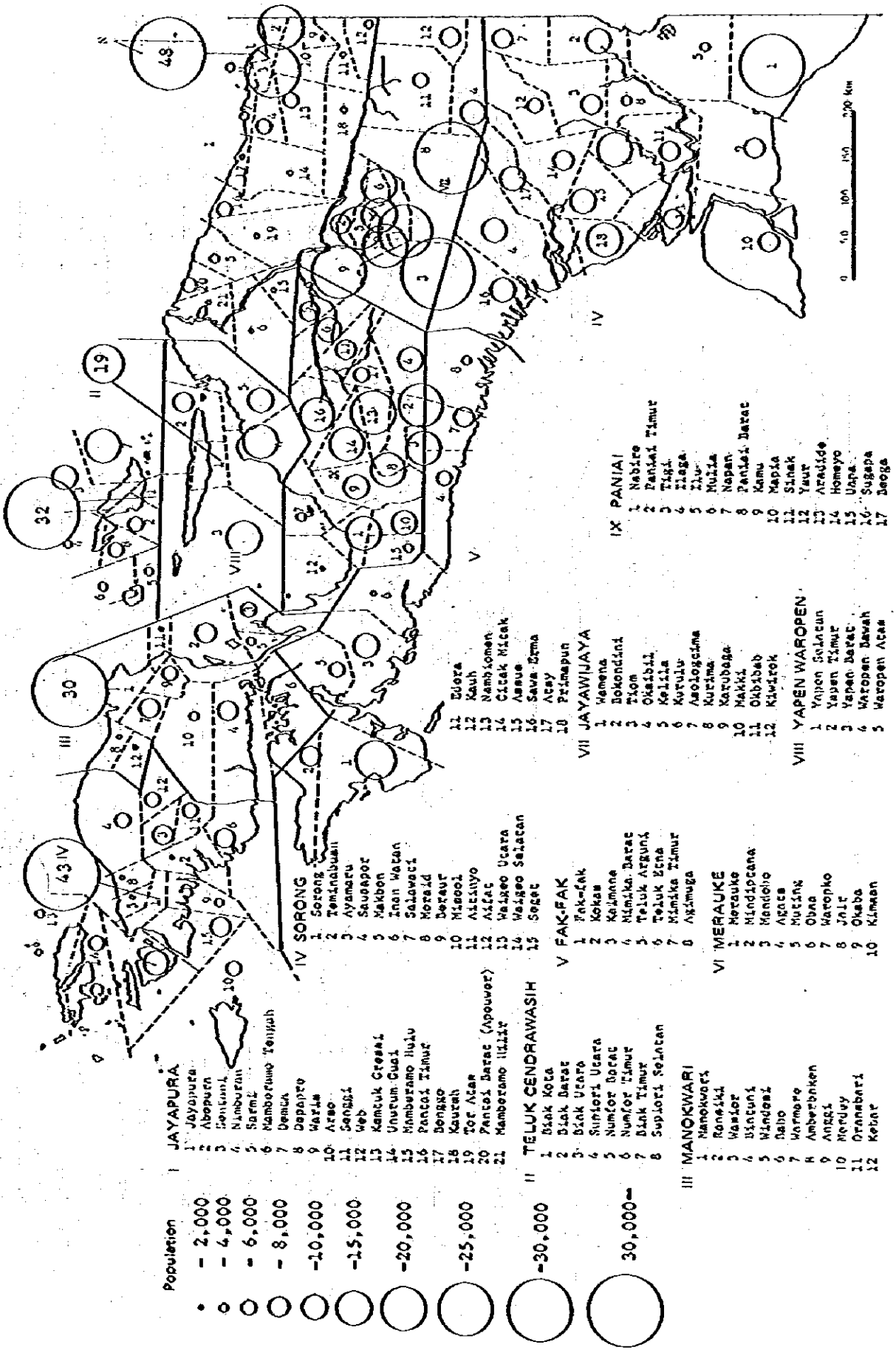


Fig. 2.2.2. Administrative Area and Population of Maluku

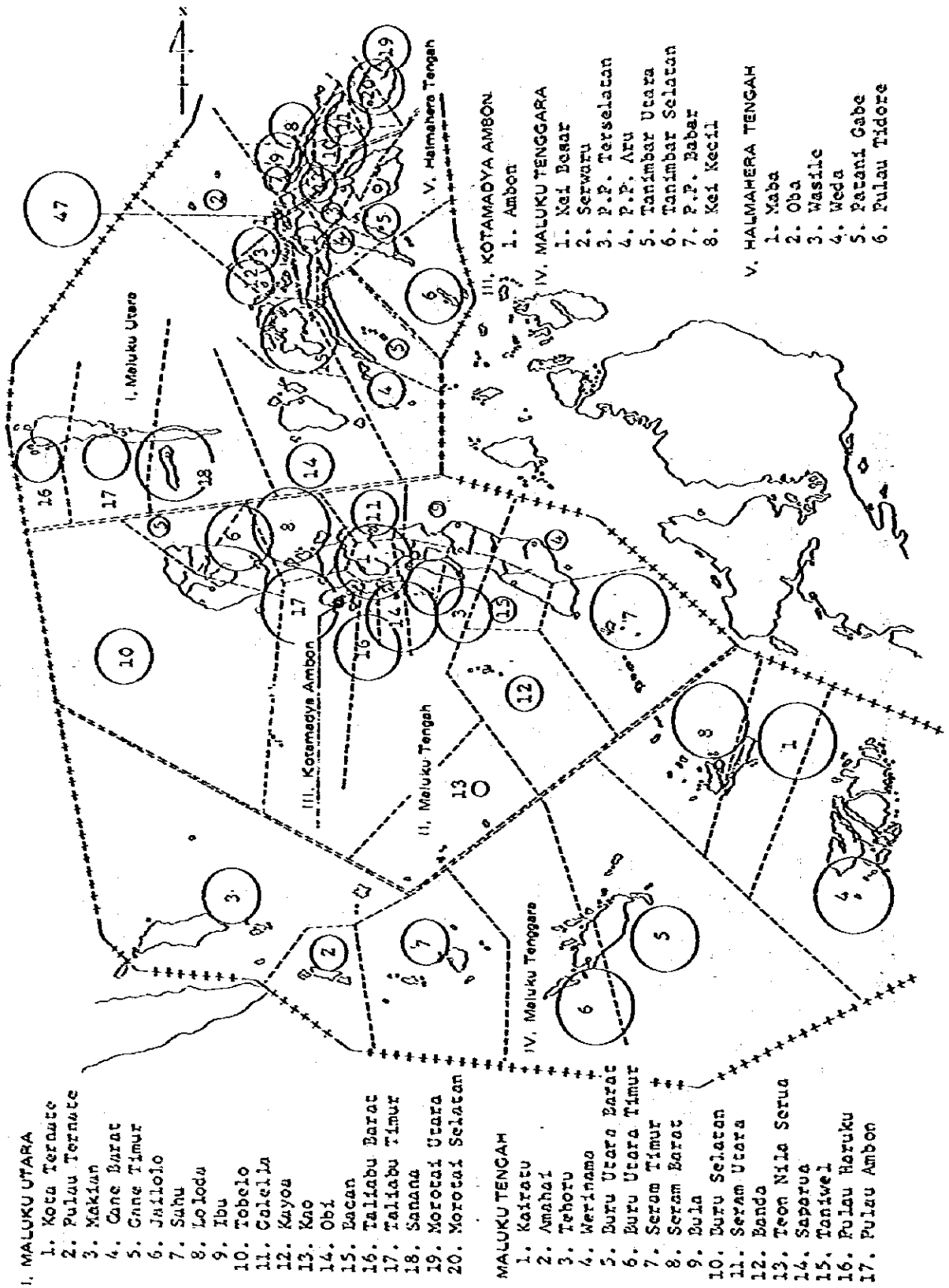


Table 2.2.2. Area and Population of Irian Jaya by Kecamatan in 1978

Kabupaten Kecamatan	Area (km ²)	Number of villages	Population	Population Density
I. JAYAPURA	48,188	119	131,110	2.72
1. Jayapura		9	47,711	
2. Abepura		6	20,214	
3. Sentani		13	21,886	
4. Nimboran		8	5,169	
5. Sarmi		5	4,052	
6. Mamberamo Tengah		3	2,179	
7. Demta		4	2,747	
8. Depapre		5	2,876	
9. Waris		3	1,043	
10. Arso		6	920	
11. Senggi		4	379	
12. Web		6	2,669	
13. Kemtuk Gressi		10	4,687	
14. Unurum Guai		4	1,069	
15. Mamberamo Hulu		4	1,929	
16. Pantai Timur		4	3,294	
17. Bonggo		4	2,045	
18. Kaureh		5	1,484	
19. Tor Atas		5	1,172	
20. Pantai Barat (Apouwer)		9	2,545	
21. Mamberamo Hilir		2	825	
II. TELUK CENDRAWASIH	4,010	71	72,204	18.06
1. Biak Kofa		19	31,906	
2. Biak Barat		7	5,092	
3. Biak Utara		9	8,025	
4. Supiori Utara		4	2,367	
5. Numfor Barat		5	3,528	
6. Numfor Timur		6	4,031	
7. Biak Timur		16	12,299	
8. Supiori Selatan		5	4,956	
III. MANOKWARI	36,773	68	78,613	2.14
1. Manokwari		9	30,145	
2. Ransiki		7	6,194	
3. Wasior		9	6,205	
4. Bintuni		5	7,286	
5. Windesi		4	2,201	
6. Babo		6	3,764	
7. Warmare		7	7,999	
8. Amberbaken		3	1,860	
9. Anggi		8	5,711	
10. Merdey		4	3,083	
11. Oransbari		3	1,936	
12. Kebar		3	2,229	

-- continued --

Kabupaten Kecamatan	Area (km ²)	Number of villages	Population	Population Density
IV. SORONG	40,549	106	122,316	3.02
1. Sorong		6	43,047	
2. Teminabuan		9	1,065	
3. Ayamuru		12	8,205	
4. Sausapor		8	5,317	
5. Makbon		4	2,213	
6. Inan Watan		12	7,785	
7. Salawati		6	10,140	
8. Moraid		4	1,939	
9. Beraur		3	4,045	
10. Misool		6	4,573	
11. Aitinyo		9	5,074	
12. Aifat		9	5,376	
13. Waigeo Utara		6	2,546	
14. Waigeo Selatan		8	5,503	
15. Seget		4	5,902	
V. FAK-FAK	44,566	55	53,548	1.20
1. Fak-Fak		11	16,852	
2. Kokas		8	6,141	
3. Kaimana		8	8,821	
4. Mimika Barat		6	5,324	
5. Teluk Arguni		7	4,065	
6. Teluk Etna		3	1,698	
7. Mimika Timur		8	7,084	
8. Aginuga		4	3,023	
VI. MERAUKE	123,220	135	152,802	1.24
1. Merauke		15	25,308	
2. Mindiptana		11	8,632	
3. Mandobo		10	7,095	
4. Agats		10	8,656	
5. Muling		4	2,758	
6. Obaa		11	11,445	
7. Waropko		14	7,526	
8. Jair		9	3,522	
9. Okaba		9	5,890	
10. Kimaan		8	6,272	
11. Edera		9	7,973	
12. Kauh		7	4,555	
13. Nambiyomen		8	7,085	
14. Citak Mitak		10	6,079	
15. Assue		10	8,969	
16. Sawa Erma		10	9,297	
17. Atsy		10	8,990	
18. Primapun		18	12,750	

- continued -

Kabupaten Kecamatan	Area (km ²)	Number of villages	Population	Population Density
VII. JAYAWIJAYA	47,960	117	222,331	4.64
1. Wamena		7	24,623	
2. Bokondini		5	7,106	
3. Tiom		17	36,382	
4. Oksibil		8	9,373	
5. Kelifa		11	15,581	
6. Kurulu		5	12,219	
7. Asologoima		7	14,958	
8. Kurima		16	53,644	
9. Karubaga		18	24,389	
10. Maggi		10	13,086	
11. Okbibab		4	4,731	
12. Kiwirok		4	6,239	
VIII. YAPEN WAROPEN	18,994	43	53,249	2.80
1. Yapen Selatan		10	19,245	
2. Yapen Timur		9	6,645	
3. Yapen Barat		6	11,208	
4. Waropen Bawah		10	12,839	
5. Waropen Atas		8	3,312	
IX. PANIAI	46,400	142	177,928	3.83
1. Nabire		9	11,996	
2. Paniai Timur		11	19,690	
3. Tigi		15	14,556	
4. Ilaga		8	9,225	
5. Ihu		8	7,302	
6. Mulia		12	9,925	
7. Napan		5	2,662	
8. Paniai Barat		8	13,971	
9. Kamu		11	19,259	
10. Mapia		6	8,424	
11. Sinak		8	7,218	
12. Yaur		3	1,555	
13. Aradide		11	19,328	
14. Homeyo		8	11,786	
15. Uapa		5	3,518	
16. Sugapa		8	12,169	
17. Beoga		6	5,374	
Total Irian Jaya	410,660	856	1,064,101	2.59

Sources: Persiapan Sensus Penduduk 1980, Pemetaan Desa, Kantor Sensus & Statistik, Propinsi Irian Jaya.

Table 2.2.3. Area and Population of Maluku by Kecamatan in 1978

Kabupaten Kecamatan	Area (km ²)	Number of villages	Population	Population density
I. KOTAMADYA AMBON	4.2	8	82,903	19,738
1. Kota Ambon				
II. MALUKU TENGAH	28,616	539	477,904	16.70
1. Pulau Ambon	756	51	146,112	193.26
2. Saparua	202	25	43,056	213.14
3. Pulau Haruku	289	12	23,189	80.23
4. Banda	53	12	13,953	263.26
5. Teon Nila Serua	29	16	5,370	185.17
6. Amahai	2,067	22	22,477	10.87
7. Kairatu	3,102	37	27,918	9.00
8. Tehoru	622	20	20,737	33.33
9. Weinama	204	34	6,899	33.81
10. Seram Timur	640	37	43,659	68.21
11. Seram Utara	33	49	14,885	451.06
12. Taniwel	792	34	9,628	12.15
13. Seram Barat	788	77	48,854	61.99
14. Buia	3,500	8	5,361	1.53
15. Buru Utara Timur	434	36	29,322	67.56
16. Buru Utara Barat	1,066	15	7,852	7.36
17. Buru Selatan	299	54	21,652	72.41
III. MALUKU TENGGARA	27,486	499	248,530	9.04
1. Kei Kecil	3,683	109	57,232	525.06
2. Kei Besar	501	111	39,563	356.42
3. Pulau Pulau Aru	8,629	122	37,980	311.31
4. Tanimbar Utara	2,307	43	29,701	690.72
5. Tanimbar Selatan	3,629	32	33,412	1,044.12
6. P. P. Terselatan	4,686	55	19,302	350.94
7. P. P. Babar	2,467	56	17,327	309.41
8. Serwaru	1,506	26	13,978	537.61
IV. MALUKU UTARA	22,377	593	380,060	16.98
1. Kota Ternate	15	10	47,066	3,137.73
2. Pulau Ternate	45	20	7,279	161.75
3. Makian	45	20	16,415	364.77
4. Gane Barat	1,000	28	12,186	12.18
5. Gane Timur	700	13	7,541	10.77
6. Jailolo	1,000	47	23,044	23.04
7. Sahu	400	29	9,138	22.84
8. Loloda	1,750	43	15,940	9.10
9. Ibu	700	39	15,076	21.53
10. Tobelo	1,250	29	27,318	21.85
11. Galella	700	23	15,365	21.95
12. Kayoa	150	30	18,370	122.46
13. Kao	2,050	38	11,149	5.43

- continued -

Kabupaten Kecamatan	Area (km ²)	Number of villages	Population	Population density
14. Obi	2,250	20	15,583	6.92
15. Bacan	3,322	71	34,977	10.52
16. Taliabu Barat	1,050	20	15,271	14.54
17. Taliabu Timur	2,500	16	15,472	6.18
18. Sanana	1,500	50	31,899	21.26
19. Morotai Utara	1,000	17	11,122	11.12
20. Morotai Selatan	950	30	22,055	23.21
V. HALMAHERA TENGAH	8,981	103	87,354	9.73
1. Pulau Tidore	150	27	32,088	213.92
2. Oba	1,400	15	16,333	11.66
3. Wasile	3,066	15	8,686	2.83
4. Weda	1,700	15	8,241	4.84
5. Maba	2,550	18	10,389	4.07
6. Patani Gabe	250	13	10,616	42.46
Total Maluku	87,464	1,742	1,276,751	14.60

Sources: 1. Maluku dalam angka 1978, pp. 3-4.

2. Registrasi Penduduk Propinsi Maluku, 1978.

Notes: 1. Area by Kabupaten is adopted from source 1 pp. 13, but area by Kecamatan from Source 1 pp. 3-4.

2. Population by Kabupaten is the data from source 2 pp. 1, but data by Kecamatan from source 2 pp. 2-127.

Table 2.2.4. Government Transmigration Program up to 1978

	Irian Jaya Tups ¹⁾		Maluku ²⁾ Tups & Tups		Transmigration whole Indonesia ³⁾													
					Total Gov't sponsored				Tups ^{a)}				Tups ^{b)}				Spontaneous	
	families	persons	families	persons	families	persons	families	persons	families	persons	families	persons	families	persons	families	persons		
Up to 1968	285	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Up to 1969	-	-	257	888	-	-	-	-	-	-	-	-	-	-	-	-		
Pelita I 1969																		
70			50	233	4,171	18,870	2,000	9,276	1,024	4,529	1,147	5,065						
71			100	479	11,314	51,918	2,300	10,146	4,500	21,426	4,514	19,943						
72	160		200	1,000	21,412	101,881	1,300	6,193	6,300	29,817	15,812	65,876						
73	100		350	1,712	36,897	172,669	5,600	25,615	11,824	55,772	21,473	90,884						
74	200		200	595	11,000	46,613	1,700	7,255	9,300	39,358	-	-						
75	100				8,100	34,985	500	2,016	4,850	20,343	7,750	12,626						
76	110				13,910	63,237	800	3,617	9,860	44,560	3,250	15,060						
77	90				22,500	99,453	3,250	14,315	19,250	85,138	-	-						
78	500		200	595	25,079	110,818	3,450	15,170	21,358	94,319	271	1,329						
Total	1,045		807	3,850	-	-	-	-	-	-	-	-						
Grand Total	1,045		807	3,850	-	-	-	-	-	-	-	-						
Ave. Persons/family		*4.68 ⁴⁾	*4.77															
Target in Pelita II	2,500		5,000															
Implementation Rate	*20%		*4%															

Sources: 1) Pelita III in Irian Jaya; pp 15.16-17

2) Pelita III in Maluku; p. XIV-12

3) Statistical Year Book of Indonesia 1978/79

4) Irian Jaya Dalam Angka 1977

Note: * shows figures calculated by the study team.

a) Indicates transmigration places with unconventional irrigations.

b) Indicates transmigration places with conventional irrigations.

c) Indicates spontaneous transmigrants, only assisted in operation by the Government.

2.3. Natural Conditions

(1) Irian Jaya Province

Irian Jaya Province occupies the easternmost part of Indonesia, extending from 0° to 9° South and from 130° to 141° East. The province faces the South Pacific Ocean and Arafuru Sea, as shown in Figure 2.3.1. and its area is 410,660 km².

The Maoke mountains extending from east to west in the central part of the province are the highest mountains in Indonesia, most of them are over 3,000 m above the sea level, and the top of the highest mountain Puncak Jaya is of 5,030 m in height.

From this area, many rivers run into flat regions. In the lower reach of the southernmost coastal areas, especially in the Merauke Kabupaten area, rivers form huge swamps.

On the other hand, there are only two swampy areas along the northern coastal area; Kabupaten of Jayapura, Yapen Waropen and Paniai. One is in Napan and the other is around the estuary of the river Mamberamo, which is the longest river extending its high reaches east and west in the mountainous area. This is because Van Rees and other mountains, which are mostly 1,000 m to 2,000 m in height, are aligned just behind the northern coast.

Kabupaten Jayawijaya and a part of Paniai are situated in a huge hollow area between these two mountains.

West part of Irian Jaya island, shaped like a head of a bird, belongs to Sorong and Manokwari Kabupaten. There is also a mountainous area in the northern part, in which the highest mountain is Kwoka (3,000 m).

In addition to the huge Irian Jaya island, there are many islands in Irian Jaya Province especially in Teluk Cendrawasih, Yapen Waropen and Sorong Kabupatens.

75 percent (310,000 km²) of the total land area is covered by forest. Only 3,468 km² (0.8 percent) is cultivated for agriculture and plantation.

Tables 2.3.1. - 4. and Fig. 2.3.2. show the meteorological conditions of major places in Irian Jaya Province. These places, excluding Wamena in high land, show mean temperatures of approximately 27°C, and variations are quite small throughout a year. The amount of rainfall in Nabire is 3,578 mm and many other places also have the rainfall over 2,000 mm.

Fig. 2.3.1. Topographical Conditions in Irian Jaya

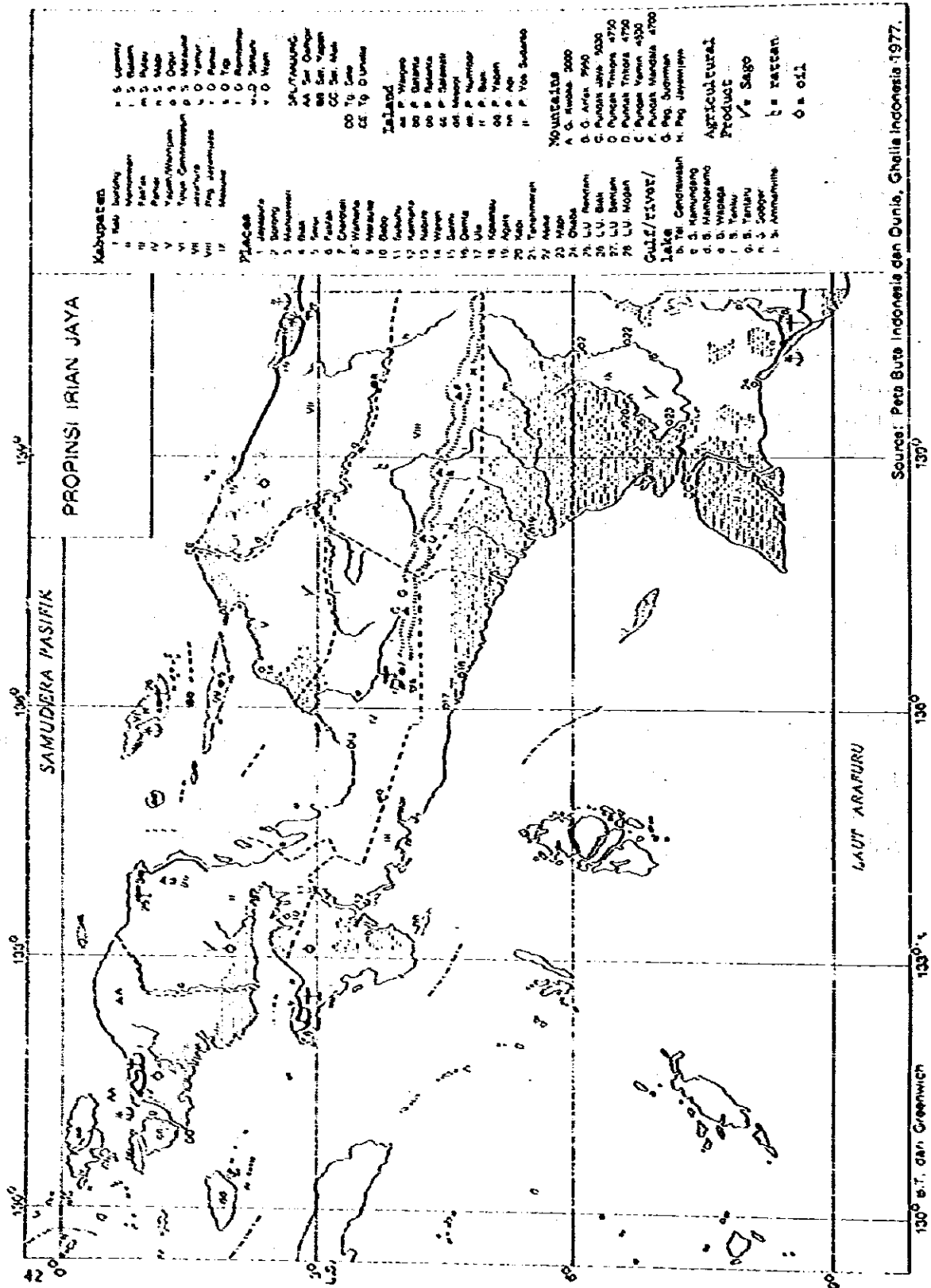


Table 2.3.1. Mean Temperature in Irian Jaya Province (1977)

Location	Height above the sea level	Annual average	(°C)														
			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.			
Sentani	88	26.8	26.6	26.3	26.9	26.9	26.9	26.8	26.4	26.4	26.4	26.4	26.3	27.2	26.8	27.3	27.4
Biak	12	26.5	26.2	26.1	26.5	26.7	26.7	26.7	26.2	26.2	26.3	26.3	25.9	27.1	26.9	27.2	26.4
Nabire	10	26.9	26.6	27.2	27.0	26.9	26.9	26.4	26.4	26.4	26.4	26.4	26.2	27.0	27.4	27.8	27.4
Sorong	3	27.5	27.5	27.5	28.4	25.1	26.8	26.2	26.8	26.8	26.2	26.2	28.3	27.5	27.7	-	-
Wamena	1,550	-	19.1	19.7	-	-	-	-	-	-	-	-	-	-	-	-	-
Merauke	3	26.2	26.6	27.3	26.8	26.2	26.8	26.2	24.9	24.2	24.2	24.2	24.2	25.4	26.9	27.7	27.2
Ransiki	20	27.1	-	-	26.8	26.8	27.2	26.8	-	-	-	-	26.9	27.4	26.9	27.7	27.2

Source: Irian Jaya dalam Angka 1977 PP 15-16

Table 2.3.2. Amount of Rainfall in Irian Jaya Province (1977)

Location	Total	(mm)											
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Sentani	1,978	176	158	369	295	99	70	115	112	55	248	45	236
Biak	2,513	193	215	194	177	251	270	218	291	157	56	246	245
Nabire	3,578	345	363	436	474	260	202	243	350	128	148	134	495
Sorong	*) 2,103	102	156	239	257	267	492	90	205	173	122	-	-
Fak-Fak	2,959	333	160	194	199	260	232	575	377	94	306	101	228
Wamena	2,239	286	330	138	119	209	135	210	218	204	115	137	138
Merauke	1,270	418	173	176	222	87	15	12	9	19	1	12	126
Ransiki	*) 958	-	118	227	117	119	-	-	90	79	13	118	77

Source: Irian Jaya dalam Angka 1977 PP 5-6

Note: Figures marked with *) lack some data.

Table 2.3.3. Duration of Sunshine in Irian Jaya Province (1977)

Location	Annual average	(%)											
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Sentani	47.8	46	42	38	50	42	27	65	44	59	58	50	53
Biak	49.3	30	36	47	54	54	51	53	42	75	50	55	45
Nabire	59.1	48	47	54	61	66	62	-	47	59	69	67	70
Sorong	-	-	-	-	-	-	-	-	-	-	-	-	-
Wamena	55.5	-	-	52	61	56	50	54	50	56	56	56	64
Merauke	59.9	48	48	68	41	63	57	45	48	65	84	85	67
Ransiki	-	-	-	-	-	-	-	-	-	60	54	-	-

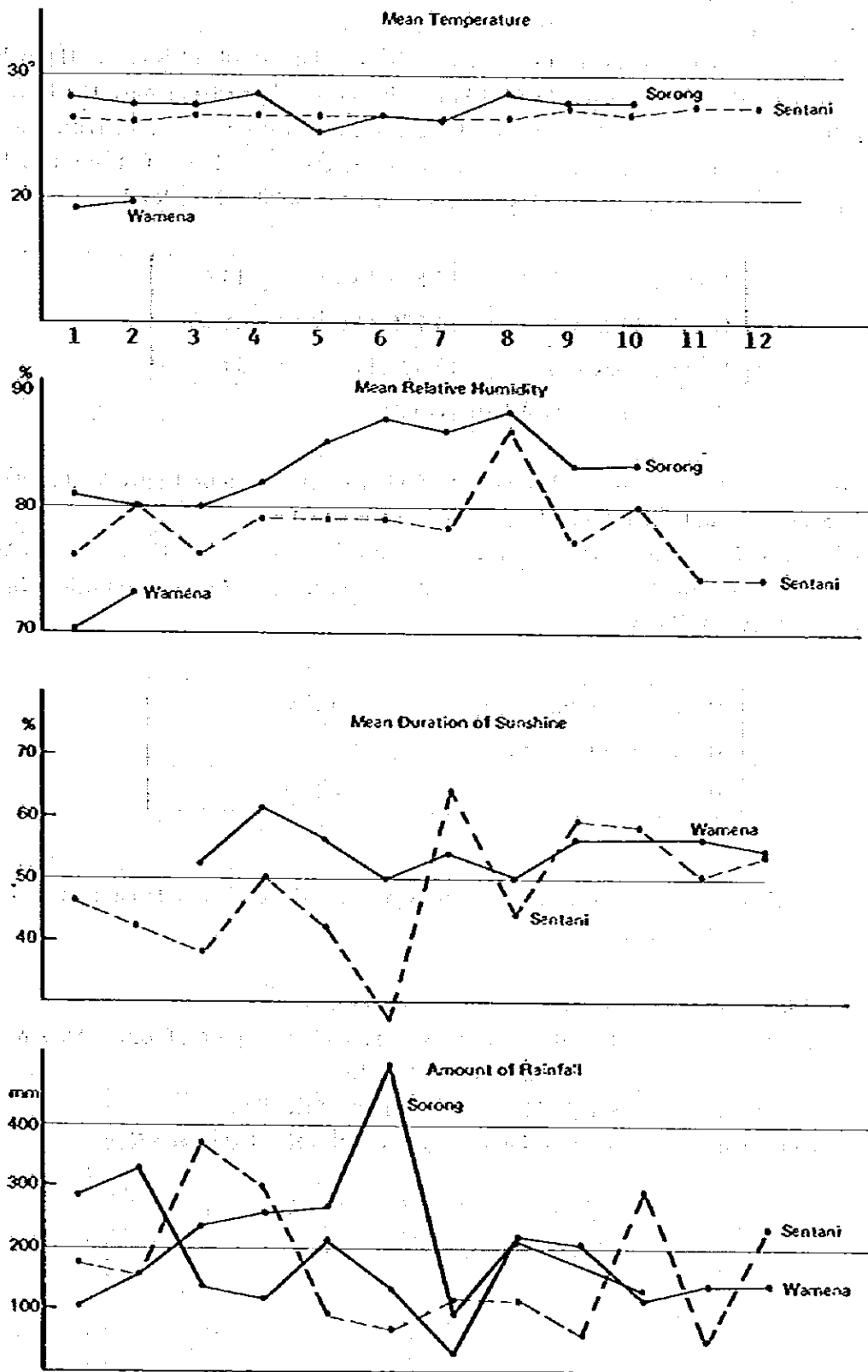
Source: Irian Jaya dalam Angka 1977

Table 2.3.4. Mean Relative Humidity in Irian Jaya Province (1977)

Location	Annual average	(%)											
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Sentani	78.2	76	80	76	79	79	79	78	86	77	80	74	74
Biak	85.3	85	86	85	85	86	87	86	86	83	85	83	86
Nabire	78.5	79	80	77	78	80	81	-	80	78	77	76	78
Sorong	83.4	81	80	80	82	85	87	86	87	83	83	-	-
Wamena	-	70	73	-	-	-	-	-	-	-	-	-	-
Merauke	82.8	85	83	81	84	82	83	85	84	81	77	80	79
Ransiki	77.0	-	-	78	78	77	-	-	80	71	71	80	81

Source: Irian Jaya dalam Angka 1977

Fig. 2.3.2. Meteorological Conditions in Selected Places in Irian Jaya (1977)



(2) Maluku Province

Maluku Province consists of over one thousand islands of various sizes, 85,728 km² of these islands are situated in the 765,272 km² area of Banda sea, Aluku sea, Seram sea and Halmahera sea from 3° North to 8°20' south and from 120° to 130° East.

Table 2.3.5. shows the areas of 15 main islands. The largest island is either Halmahera or Seram island with the area of over 18,000 km². However, other islands have the land area of less than 10,000 km². Most of these island were formed with volcanic activities and some volcanoes are still active. Therefore, there are many mountains and few flat areas in Maluku province. However, most of the mountains are less than 1,000 m above sea level.

Flat area	12,516.3 km ²	14.6%
Gentle hill area	24,175.3 km ²	28.2%
Mountainous area	49,026.4 km ²	57.2%

Source: Pelita III in Maluku p.IV - 37

Most rivers are small and short. Rivers with 50 km length are found only in the islands of Halmahera, Seram, Buru, Obi, Talibu, Mangole, Tanimbar and Aru.

Tables 2.3.6. & 2.3.7. show the meteorological conditions of Maluku. The climate in Maluku is the oceanic tropical climate, and consists of dry and wet seasons. Average conditions in a year in Ambon are shown as follows:

Mean temperature	26.3 C°
Duration of sunshine	67.5%
Humidity	83.5%

Although each region has a local climate, it is not greatly different from that in Ambon, except in the amount of rainfall:

- Less than 1,000 mm : Weter island and its surroundings.
- 1,000 – 2,000 mm : Ternate, Babar, Aru Tanimbar, a part of Buru, Sula & Bacon islands and around Tobelo.
- 2,000 – 3,000 mm : Seram, Morotai and a part of Kei Kecil.
- more than 3,000 mm : Ambon, Lease, Kei Besar, Kei Kecil, Aru and Kao.

Table 2.3.5. Area of Main Islands in Maluku Province

Kabupaten	Name of Island/Archipelago	Area (km ²)
Maluku Tengah	1. Pulau Ambon	761 ¹⁾
	2. Pulau Seram dan P.P. Sekitarnya	18,625
	3. Pulau Buru	9,000
	4. Kepulauan Banda	44
	5. Kepulauan Lease	190
Maluku Tenggara	1. Kepulauan Aru	6,325
	2. Pulau Wetar	3,624
	3. Pulau Yanadana	5,085
Maluku Utara ²⁾	1. Pulau Halmahera	18,000 ³⁾
	2. Pulau Ternate	65
	3. Pulau Tidore	116
	4. Pulau Taliabu	4,360
	5. Pulau Obi	3,780
	6. Pulau Morotai	1,800
	7. Pulau Bacan	5,700
Total		77,476

Source: Maluku Dalam Angka 1979 p. 3

Note: 1) Includes Kotamadya Ambon

2) Includes Halmahera Tengah

3) The Area is over 18,000 km²

Table 2.3.6. Average Temperature in Ambon in 1978

Month	Temperature °C					
	07:00	13:00	18:00	Mean	Maximum	Minimum
January	24.4	30.2	28.3	27.1	—	7
February	25.0	30.1	28.3	27.3	—	—
March	24.0	30.0	28.7	26.7	—	—
April	23.9	29.8	28.5	26.5	—	—
May	24.3	29.5	28.3	26.6	—	—
June	23.5	28.3	27.0	25.6	—	—
July	23.3	28.0	26.6	25.4	—	—
August	23.8	27.2	25.9	25.2	—	—
September	23.3	27.3	27.5	26.1	—	—
October	24.1	28.8	27.4	26.1	—	—
November	25.0	29.8	28.2	26.5	30.9	23.9
December	24.3	30.3	28.4	26.8	—	—

Source: Maluku Dalam Angka 1979 p. 3

Table 2.3.7: Rainfall in Maluku Province

Location		Height above sea level (m)	1975	1976	1977	1978
Ambon	F	—	4,657	2,379	1,908	3,836
	D	—	178	133	108	169
Bula	F	—	2,933	1,354	452	1,382
	D	—	147	85	53	83
Tidore	F	—	2,505	1,306	1,934	2,878
	D	—	156	89	179	130
Ternate/Babullah	F	25	2,879	1,861	1,471	2,306
	D	25	280	139	124	140
Kao	F	—	1,462	—	—	—
	D	—	158	—	—	—
Woreli	F	—	1,509	532	444	1,163
	D	—	56	44	22	79

Source: Maluku dalam Angka 1978 p. 6

Notes: F indicates amount of rainfall in mm.

D indicates number of rainy days.

2.4. Industrial Structure

2.4.1. GRDP in Maluku and Irian Jaya Province

As shown in Table 2.4.2, "Comparison of Industrial Structure by GRDP", the GRDP of Irian Jaya shows considerably high values compared with that of Maluku. This is due to the high GRDP in the petroleum sector. The share of the agriculture sector excluding the petroleum sector shows the value of 58.3 percent in 1978, which is nearly equivalent to the value of 57.9 percent in Maluku. It can be said that the major industry is agriculture in both provinces. But, in the agriculture sector, GRDP in Maluku shows higher values in forestry and estate crops compared with that of Irian Jaya.

As shown in Table 2.4.1, "Per Capita GRDP", both provinces show the same value in per capita GRDP excluding the petroleum sector in 1973. But the difference increased in 1978. This is because the activity of the petroleum sector caused increases in other sectors in Irian Jaya.

Table 2.4.1. Per Capita GRDP (1975 Constant Price)

	1973	1975	1978	AAGR 1973-1978
Maluku	184	198	228	4.4%
Irian Jaya	237 (178)	481 (198)	582 (242)	20 % (6.3%)

Source: Derived from the tables "GRDP of Maluku Province" and "GRDP of Irian Jaya Province".

Note: Figures in the parentheses show values excluding the petroleum sector.

Table 2.4.2. Comparison of Industrial Structure by GRDP
(1975 Constant Price)

(x10⁶ US\$)

Sector	Province	1973		1975		1978		AAGR	
			%		%		%	'73-'78	'75-'78
Forestry	Maluku	35.848	16.8	15.820	6.6	22.434	7.5	▲ 9.8	12.3
	Irian Jaya	1.130	0.5	1.599	0.3	3.054	0.5	22.0	24.1
Fishery	Maluku	26.561	12.4	25.850	10.7	30.802	10.4	3.0	6.0
	Irian Jaya	22.291	9.6	13.207	2.7	12.879	2.0	▲12.0	▲ 0.8
Livestock	Maluku	1.345	0.6	1.422	0.6	1.914	0.6	7.3	10.4
	Irian Jaya	15.005	6.5	10.927	2.2	27.322	4.2	13.0	36.0
Estate crops	Maluku	30.482	14.3	55.713	23.1	54.494	18.2	12.0	0.7
	Irian Jaya	1.269	0.5	1.351	0.3	2.119	0.3	10.8	16.0
Others	Maluku	43.059	20.2	53.917	22.3	63.174	21.2	8.0	5.4
	Irian Jaya	72.181	31.0	93.815	18.9	111.534	17.2	9.1	5.9
Agriculture Total	Maluku	137.295	64.3	152.722	63.3	172.818	57.9	4.7	4.2
	Irian Jaya	111.876	48.1	120.899	24.4	156.908	24.2	7.0	9.1
Petrokem	Maluku	—	—	—	—	—	—	—	—
	Irian Jaya	57.627	24.7	291.913	58.8	377.915	59.0	46.0	9.0
Others	Maluku	3.729	1.7	5.452	2.3	5.479	1.8	8.0	0.1
	Irian Jaya	105	0.1	532	0.1	6.135	0.1	125.5	23.4
Mining total	Maluku	3.729	1.7	5.452	2.3	5.479	1.8	8.0	0.1
	Irian Jaya	57.732	24.8	292.445	58.9	384.050	59.1	46.0	9.5
Manufacturing & Industry	Maluku	1.917	0.9	2.616	1.1	3.211	1.1	10.9	7.1
	Irian Jaya	2.141	1.2	2.642	0.5	3.418	0.6	9.8	9.0
Others	Maluku	70.500	33.1	80.470	33.3	117.117	39.2	10.7	13.0
	Irian Jaya	58.848	25.9	80.147	16.2	102.758	16.1	12.0	8.6
Grand Total	Maluku	213.441	100	241.260	100	298.625	100	7.0	7.4
	Irian Jaya	232.597	100	496.133	100	647.134	100	22.7	9.2

Source: Statistic Office in Maluku Province & Statistic Office in Irian Jaya Province

Table 2.4.3. GRDP of Maluku Province
(1975 Constant Price)

(x10⁶ US\$)

Sector \ Year	1973	1974	1975	1976	1977	1978
Agriculture	74.886	104.048	111.052	128.683	139.828	119.582
Forestry	35.848	21.104	15.820	20.259	22.706	22.434
Fishery	26.561	26.493	25.850	28.026	28.694	30.802
Total	137.295	151.645	152.722	176.968	191.228	172.818
Mining & Quarrying	3.729	2.729	5.452	5.641	5.287	5.479
Manufacturing & Industry	1.917	3.396	2.616	3.832	2.192	3.211
Electricity, Gas & Water Supply	.044	.141	.298	.373	.452	.597
Construction	2.594	3.639	4.380	6.436	10.242	13.298
Wholesale & Retail Trades	38.979	48.244	39.619	46.821	51.036	48.316
Transport & Communication	6.318	7.048	7.793	8.797	12.125	12.637
Banking & Other Financing	.987	1.387	1.379	1.342	1.725	1.949
Ownership of Dwelling	6.583	6.733	6.909	7.067	7.407	7.590
Public administration & Defence	11.314	9.107	16.677	21.113	25.856	29.109
Services	3.681	3.766	3.415	3.390	3.525	3.621
Grand Total	213.441	237.835	241.260	281.780	311.075	298.625

Source: Statistic Office of Maluku Province "Regional Income Maluku 1975, 1977 & 1978".

Table 2.4.4. GRDP of Irian Jaya Province
(1975 Constant Price)

(x10⁶ US\$)

Sector \ Year	1973	1974	1975	1976	1977	1978
Agriculture	88.455	96.950	106.093	118.453	123.886	140.975
Forestry	1.130	1.592	1.599	2.485	2.752	3.054
Fishery	22.291	18.502	13.207	10.546	12.647	12.879
Total	111.876	117.044	120.899	131.484	139.285	156.908
Mining & Quarrying	57.732 (0.105)	168.539 (0.307)	292.445 (0.532)	350.625 (5.466)	375.563 (5.672)	384.050 (6.135)
Manufacturing & Industry	2.141	2.152	2.642	3.146	3.335	3.418
Electricity, Gas & Water	0.105	0.123	0.125	0.131	0.158	0.180
Construction	7.064	7.398	7.743	8.045	8.371	8.554
Wholesale & Retail Trades	23.695	26.212	31.299	32.499	31.746	35.655
Transport & Communication	5.327	7.614	8.288	10.856	13.272	16.483
Banking & Other Financing	1.232	1.338	0.730	0.371	0.860	0.380
Ownership of Dwelling	1.564	2.059	2.563	3.295	2.860	3.584
Public Adm. & Defence	15.700	19.688	22.800	25.466	26.292	28.168
Service	6.161	6.311	6.599	9.972	10.554	10.834
Grand Total	232.597 (174.970)	358.478 (190.246)	496.133 (204.220)	575.890 (230.731)	612.296 (231.061)	647.134 (269.219)

Source: Statistic Office of Irian Jaya Province.

"Regional Income Irian Jaya 1971-1976 & 1978".

Note: The figure in parentheses shows values excluding the petroleum sector.

2.4.2. Main Products

(1) Production of food crops

Tables listed below show the production of food crops in Maluku and Irian Jaya Provinces. Main food in Maluku is cassava and sago, and in Irian Jaya, it is a kind of sweet potato. The ratio of paddy production in Maluku is very high compared with that in Irian Jaya. The average annual growth rate in Maluku shows the low value of 11 percent (1973 – 1978) and especially the production of wet land paddy decreased sharply from 1973 to 1978.

Table 2.4.5. Dry Land Paddy

	1973	1974	1975	1976	1977	1978
Maluku (A)	6,937 (12,566)	6,281 (11,084)	11,788 (16,963)	16,303 (23,059)	15,526 (23,165)	15,026 (22,000)
Irian Jaya (C)	286 (222)	280 (212)	262 (206)	286 (225)	304 (231)	633 (620)

Note: Figs. in () shows the area harvested (ha).

Table 2.4.6. Wet Land Paddy

	1973	1974	1975	1976	1977	1978
Maluku (B)	2,505 (1,869)	1,417 (1,033)	905 (515)	917 (502)	1,172 (522)	891 (509)
Irian Jaya (D)	777 (368)	752 (348)	720 (357)	782 (372)	788 (378)	1,735 (1,087)

Table 2.4.7. Total of Dry Land Paddy and Wet Land Paddy

	1973	1974	1975	1976	1977	1978
Maluku (A+B)	9,442 (14,435)	7,698 (12,117)	12,683 (17,475)	17,220 (23,561)	16,698 (23,687)	15,917 (22,509)
Irian Jaya (C+D)	1,063 (590)	1,032 (560)	982 (563)	1,068 (597)	1,092 (609)	2,368 (1,707)

Source: Statistical Yearbook of Indonesia

Note: The figure in parentheses shows the cultivated areas (ha).

Table 2.4.8. Maize

(Ton)

	1973	1974	1975	1976	1977	1978
Maluku	16,330 (16,406)	17,253 (16,734)	17,538 (16,224)	20,773 (19,884)	18,159 (18,380)	19,060 (18,909)
Irian Jaya	1,140 (1,558)	1,273 (1,837)	1,170 (1,728)	1,173 (1,712)	1,198 (1,759)	2,888 (2,616)

Table 2.4.9. Cassava

(Ton)

	1973	1974	1975	1976	1977	1978
Maluku	124,182 (13,702)	129,979 (13,976)	130,511 (14,186)	163,029 (17,737)	147,537 (16,393)	163,329 (16,838)
Irian Jaya	28,416 (4,376)	25,192 (3,817)	24,516 (3,553)	25,962 (3,818)	25,065 (3,686)	22,714 (3,593)

Table 2.4.10. Sweet Potato

(Ton)

	1973	1974	1975	1976	1977	1978
Maluku	49,826 (7,869)	52,637 (8,098)	53,434 (8,096)	68,341 (10,104)	60,194 (8,852)	60,214 (8,855)
Irian Jaya	316,072 (28,117)	274,074 (27,136)	247,903 (25,551)	264,600 (26,198)	260,340 (26,297)	223,850 (36,221)

Table 2.4.11. Peanuts

(Ton)

	1973	1974	1975	1976	1977	1978
Maluku	1,076 (1,837)	1,131 (1,875)	1,347 (2,405)	1,535 (2,484)	1,552 (2,586)	1,339 (2,513)
Irian Jaya	397 (817)	660 (1,121)	742 (1,184)	744 (1,223)	715 (1,176)	963 (1,786)

Source: Statistical Yearbook of Indonesia

Note: The figure in parentheses shows the cultivated areas (ha).

Table 2.4.12. Soybean

	(Ton)					
	1973	1974	1975	1976	1977	1978
Maluku	91 (160)	96 (163)	106 (175)	100 (170)	95 (169)	99 (169)
Irian Jaya	218 (275)	123 (151)	121 (157)	120 (152)	120 (154)	1,072 (1,374)

Source: Statistical Yearbook of Indonesia

Note: The figure in parentheses shows the cultivated areas (ha).

(2) Production of estate crops

As shown in the Table below, the ratio of estate crop production is very low in Irian Jaya compared with that of Maluku. Especially, the production of cloves in Maluku shows very high values. It's share in the Indonesian total is 26 percent in 1976 and 19 percent 1977.

Table 2.4.13. Production of Estate Crops

(Ton)

Kinds	Province	1974	1974	1976	1977	1978
Rubber	Maluku	—	—	—	—	—
	Irian Jaya	18 (1,271)	80 (1,271)	155 (1,286)	171 (1,245)	—
Coffee	Maluku	—	—	282 (1,344)	215 (1,610)	352 (2,040)
	Irian Jaya	46 (430)	45 (9357)	46 (368)	56 (392)	—
Cloves	Maluku	—	—	5,135 (25,252)	7,040 (16,056)	3,981 (13,031)
	Irian Jaya	— (266)	— (531)	— (946)	— (1,378)	—
Coconut	Maluku	—	—	160,453 (114,054)	157,486 (116,197)	136,014 (116,982)
	Irian Jaya	4,573 (15,659)	5,566 (14,795)	5,454 (14,974)	7,121 (16,464)	—
Cocoa	Maluku	—	—	592 (4,103)	576 (4,009)	548 (4,801)
	Irian Jaya	24 (1,647)	19 (1,260)	29 (1,266)	34 (1,407)	—
Pala (nut-meg)	Maluku	—	—	3,516 (15,310)	2,942 (14,806)	3,277 (15,018)
	Irian Jaya	653 (4,503)	653 (4,877)	652 (4,899)	800 (4,918)	—
Cotton	Maluku	—	—	87 (940)	39 (990)	171 (1,357)
	Irian Jaya	— (5,314)	— (6,363)	— (6,335)	— (8,182)	—
Cinnamon	Maluku	—	—	15 (249)	17 (256)	9 (322)
	Irian Jaya	—	—	—	—	—

Source: Maluku Dalam Angka 1979
Irian Jaya Dalam Angka 1977

Note: Figures in parentheses shows the cultivated area (ha).

(3) Forestry

Table 2.4.14. Forest Land as of 1978

	Total Area (10 ⁶ Ha)	Forest Land (10 ⁶ Ha)	Production Forest Land (10 ⁵ Ha)	Log Production in 1978 (10 ⁶ x ton)
Maluku	7.5	6.0	3.64	1.016
Irian Jaya	42.2	31.5	1.43	0.102
East Kalimantan	20.2	17.2	13.46	10.033

Source: Statistical Year Book of Indonesia 1977 - 1978.

As shown in the above table, forestry is an important industry for Maluku, with the 7.5 percent share of its GRDP in 1978. The ratio of production in Irian Jaya is very low, with the share of only 0.5 percent of its GRDP in 1978. Considering the vast forest land, increase in the future production of logs is expected in Irian Jaya. On the other hand, according to Maluku Province, the volume of logs production in future is limited to be about 1,200 thousand m³/year from the standpoint of forest conservation.

The production of sawn timber in Maluku is lower compared with that of Irian Jaya. In Irian Jaya, almost all the sawn timber is consumed within its areas.

Table 2.4.15. Production of Logs

	1975	1976	1977	1978
Maluku	721,154	825,475	977,578	1,016,281
Irian Jaya	23,268	24,378	60,694	102,033

(m³)

Source: Statistical Yearbook of Indonesia 1977 - 1978

Table 2.4.16. Production of Sawn Timber

	1975	1976	1977	1978
Maluku		5,896	1,666	2,235
Irian Jaya	10,736	11,166	18,511	20,478

(m³)

Source: Statistical Yearbook of Indonesia 1977 - 1978 for Maluku.
Pelita III in Irian Jaya for Irian Jaya.

Table 2.4.17. Export of Logs

(Ton)

	1975	1976	1977	1978
Maluku	(658,626) 788,770	(709,451) 849,640	(835,405) 1,000,490	(899,812) 1,077,620
Irian Jaya	8,281	111,093	42,340	53,490

Source: Maluku Dalam Angka 1979 & Pelita III in Maluku, Irian Jaya Dalam Angka 1977.

Note: Figures in parentheses show the value in cubic meters where 0.835 m³ = 1 ton.

(4) Fishery

Table 2.4.18. Production of Fish

(Ton)

Province	1974	1975	1976	1977	1978	AAGR (%) 1974-1978
Maluku	59,485	63,587	65,176	67,323	72,224	+5.0
Irian Jaya	12,500	9,884	9,757	12,128	—	-1.0

Source: 1. The second book of Pelita III of Maluku

2. Irian Jaya dalam angka tahun 1977.

As shown in the above, the two provinces show very different values in production of fish. The average annual of growth rate in Maluku is increasing at 5 percent whereas that of Irian Jaya is below 0 percent. The difference is caused by the size of fishery management and the kind of equipment used by fishermen in each province, as the following table indicates.

Table 2.4.19. Size of Fisheries Management in 1977

(Number)

Province	with inboard motor	with out-board motor	Plank build boat	without boat	Total
Maluku	39	390	20,236	2,546	23,211
Irian Jaya	6	378	6,505	237	7,126

Source: Statistical Yearbook of Indonesia.

Fishery is an important industry for both provinces, because in Maluku its share is 10.4 percent of the total GRDP, and 5 percent of the total GRDP in Irian Jaya without petroleum sector. As for the export, Irian Jaya is expected to increase its export volume in the future. This is shown in the following table.

Table 2.4.20. Export of Fish

Province						(Ton)
	1974	1975	1976	1977	1978	AAGR (%) 1974-1978
Maluku	6,379	5,316	6,722	5,020	5,775	- 2.5
Irian Jaya	2,464	2,645	3,550	4,493	6,577	+25.0

Source: 1. The second book of Pelita III of Maluku.
2. Irian Jaya dalam Angka tahun 1977.

The export from Maluku is decreasing annually by 2.5 percent on an average, but Irian Jaya's export is increasing at the rate of 25 percent annually. Export and production values are affected by the kinds of fish caught. In Irian Jaya, mainly around Sofong and Jayapura areas, almost all the catch is suited for export.

(5) Livestock

Table 2.4.21. Production of Meat in 1978

						(Ton)
	Cow	Buffalo	Goat	Sheep	Pig	
Maluku	404	62	56	—	612	
Irian Jaya	314	2	96	1	5,998	

Source: Statistical Yearbook of Indonesia 1977 - 1978

As shown in the above table, the consumption of meat in Irian Jaya is not small owing to the large production of pork. Per capita consumption in Irian Jaya is higher than that of the Indonesian average. Maluku shows a lower value.

Table 2.4.22. Per Capita Consumption of Meat (1977)

						(Kg/Y)
	Cow	Buffalo	Goat	Sheep	Pig	
Maluku	0.31	0.05	0.04	—	0.47	
Irian Jaya	0.28	—	0.09	—	5.40	
Indonesia	0.97	0.26	0.28	0.09	0.50	

Source: Statistical Yearbook of Indonesia 1977 - 1978.

Note: The consumption of Maluku and Irian Jaya is calculated by Study Team.

Table 2.4.23. Number of Livestock in Maluku

(Head)

	1976	1977	1978
Cow	— (2,096)	— (2,541)	26,605 (2,456)
Buffalo	— (776)	— (244)	24,807 (356)
Goat	(2,708)	(1,172)	133,294 (1,119)
Sheep	(—)	(—)	2,167 (—)
Horse	(—)	(—)	2,654 (—)
Fowl	(—)	(—)	896,000 (—)

Source: Maluku Dalam Angka 1979

Note: The figures in parentheses show slaughtered number.

Table 2.4.24. Number of Livestock in Irian Jaya

(Head)

	1976	1977
Cow	8,152	9,263
Buffalo	21	27
Goat	9,226	10,162
Sheep	76	1,086
Pig	198,715	196,617
Horse	1,104	1,679
Fowls	328,125	435,725

Source: Irian Jaya Dalam Angka 1977.

(6) Mining

Regarding mineral resources, survey for exploration and deposits have not yet been made except for nickel in Gebe of Maluku, nickel in Waigeo and Gag of Sorong area and oil exploration in the Sorong area.

The survey of possible reserves of crude oil is active in the Sorong area. It can be said that the reserve confirmation is still in the stage of survey. The current production of mineral resources includes only copper production of about 225,000 T/Y (Source: National Pelita III) at Gunung Bisi in Irian Jaya, excluding crude oil production. It seems that the oil production in the Sorong area greatly influences its economic activities.

Table 2.4.25. Production of Crude Oil

	(x10 ³ BL)				
	1975	1976	1977	1978 (Jun-Aug)	1978*
Pertamina/Klamono	183	524	514	316	395
Trend/Kasim, Jaya Walio	23,017	27,709	28,656	17,606	22,008
Phillips/Salawati	—	—	2,728	10,533	13,166
Tot x10 ³ BL (x10 ³ ton)	23,200 (3,320)	28,223 (4,040)	31,898 (4,564)	28,455 (4,072)	35,569 (5,089)

Source: Monthly Reports by MIGAS and Statistic data by Pertamina.

Note: (*) Estimated by Study Team

(7) Manufacturing

Table 2.4.26. shows the number of companies and their employees in Maluku and Irian Jaya. These companies are mostly concentrated in city areas. In Maluku, those companies with the number of 271 are concentrated at the area of Ambon and its share shows about 60 percent in 1978. However, at present, there are few big-scale and modern factories in either province. Up to 1978, there had been a dock yard in Ambon but at present it is closed down. In Sorong, Pertamina has a repairing dock yard, which local fishery companies can use.

Table 2.4.26. Number of Companies and Employees

	Province	Number of Companies			Number of Employees			Employees per Company		
		1975	1976	1977	1975	1976	1977	1975	1976	1977
Food Processing	Irian	115	124	125	436	529	606	4	4	5
	Maluku	157	167	220	660	690	880	4	4	4
Materials of Housing & Civil Work	Irian	73	79	80	1,900	1,384	1,396	26	18	7
	Maluku	55	47	55	274	182	225	5	4	4
Primary Processing of Chemistry	Irian	4	4	4	45	45	45	11	11	11
	Maluku	45	42	49	275	238	333	6	6	6
Repairing, Furniture, & Others	Irian	13	15	15	33	45	45	3	3	3
	Maluku	151	166	187	781	916	1,021	5	6	5
Service Industry	Irian	139	173	167	717	908	834	5	5	5
	Maluku	165	180	200	1,031	1,359	1,314	6	8	7
Total	Irian	344 (205)	395 (222)	391 (224)	3,131 (2,414)	2,911 (2,003)	2,926 (2,092)	9 (12)	7 (9)	7 (9)
	Maluku	573 (408)	602 (422)	539 (339)	3,021 (1,990)	3,385 (2,026)	3,773 (2,459)	5 (5)	6 (5)	7 (7)

Source: Maluku Dalam Angka 1979
Irian Jaya Dalam Angka 1977

- Note:
1. The ship yard in Maluku is not included in the above table.
 2. Service Industry includes repairing for shoes & bicycle, photo copy services, laundry and etc.
 3. Figures in parentheses excluded Service Industry.

Chapter 3.
OUTLINE OF TRAFFIC IN IRIAN JAYA
AND MALUKU

