

REPUBLIC OF INDONESIA

STUDY REPORT
ON
THE EXPANSION PROJECT
OF
THE PORT OF BALIKPAPAN

NOVEMBER 1979

JICA LIBRARY



1054966[5]

JAPAN INTERNATIONAL COOPERATION AGENCY

山形電力事業団	
給 5413.46	2/28
登録No. 504832	76.7
	SSDF

PREFACE

In response to a request of the Government of the Republic of Indonesia, the Government of Japan decided to conduct a feasibility study on the Expansion Project of the Port of Balikpapan and entrusted the study to the Japan International Cooperation Agency (JICA), which is responsible for the implementation of technical cooperation programs of the Government of Japan.

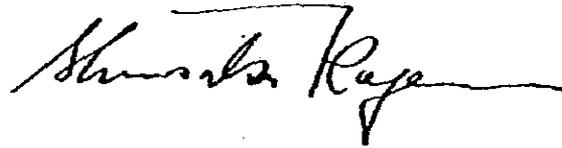
In February 1979 JICA despatched to Indonesia a survey team headed by Mr. Katsuhiko Suzunai, Director of the Overseas Coastal Area Development Institute of Japan to conduct a field survey with the cooperation of organizations concerned of the Government of Indonesia.

After completion of the field survey, the survey team analysed and evaluated the findings and data obtained, discussed with Indonesian officials concerned and have completed this report.

I hope that the report will serve to promote Indonesia's economic development through the expansion of the Port of Balikpapan and contribute to the strengthening of the ties of friendship between our two countries.

I wish to express my sincere appreciation to the Government and the people concerned to Indonesia for their cooperation extended to the survey team.

November, 1979



Shinsaku Hogen
President
Japan International Cooperation Agency
Tokyo, Japan

LETTER OF TRANSMITTAL

**Mr. Shinsaku Hogen
President
Japan International Cooperation Agency**

Dear Sir;

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

In order to make the masterplan and examine the feasibility of the expansion project, the Japanese study team headed by myself conducted a principal survey for 37 days from last February 1, at the request of the Japan International Cooperation Agency. The findings of this survey was discussed to make the masterplan and study the feasibility of the Balikpapan Port expansion project, and this is its report.

In the stage of the survey, the Japanese study team joined efforts with the Indonesian counterpart team to make a thorough end-to-end settlement of all major problems. As a result, the Japanese study team and the Indonesian Authority in charge reached an agreement on many points.

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 unlimited 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, that have given us valuable suggestions and assistance in the field survey and in preparation of this report.

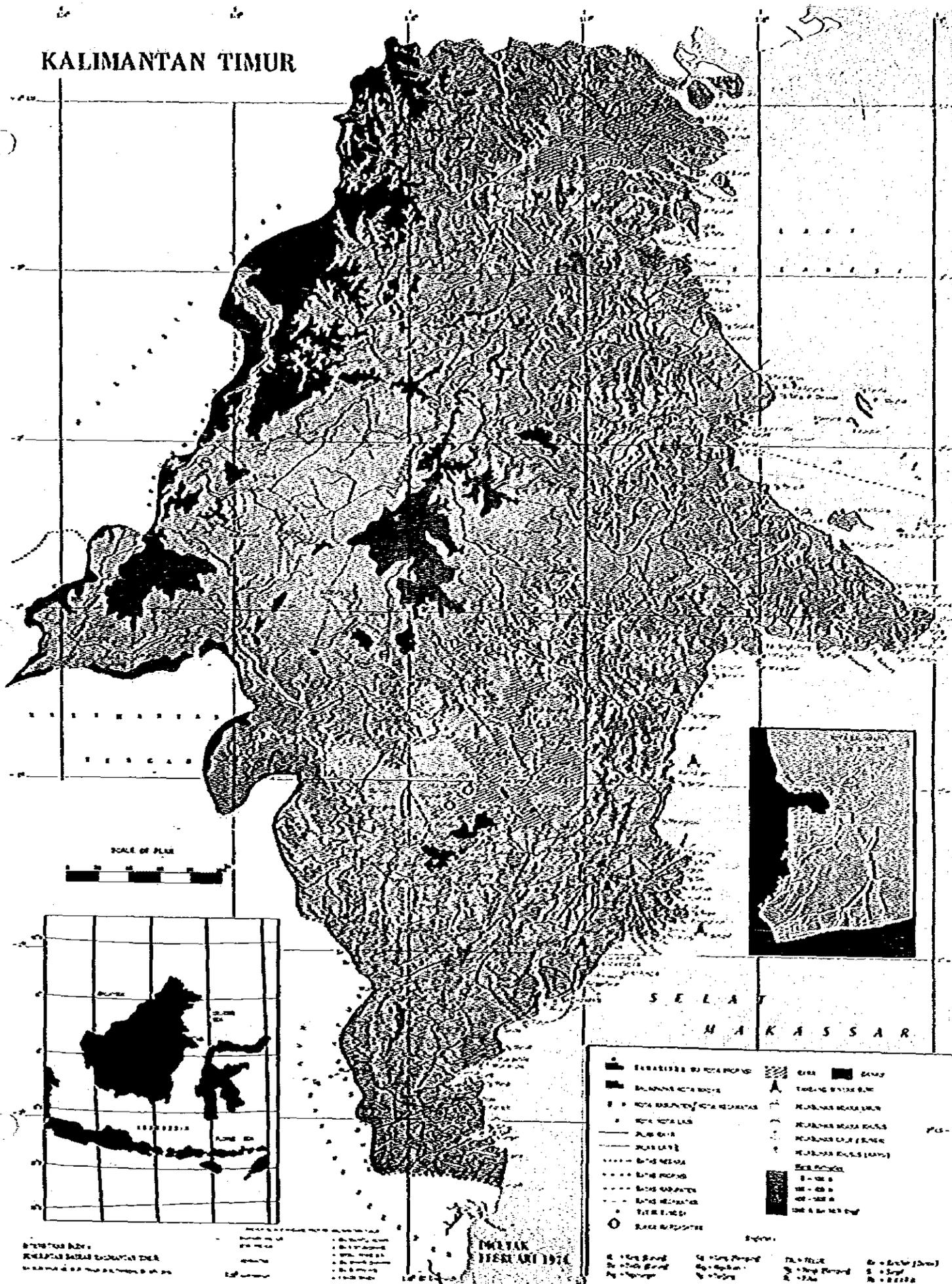
Sincerely yours,



November, 1979

**Katsuhiro Suzunai, Head,
Japanese Study Team for the Expansion
Project of the Port of Balikpapan
(Director of Engineering, The Overseas
Coastal Area Development Institute of Japan)**

KALIMANTAN TIMUR

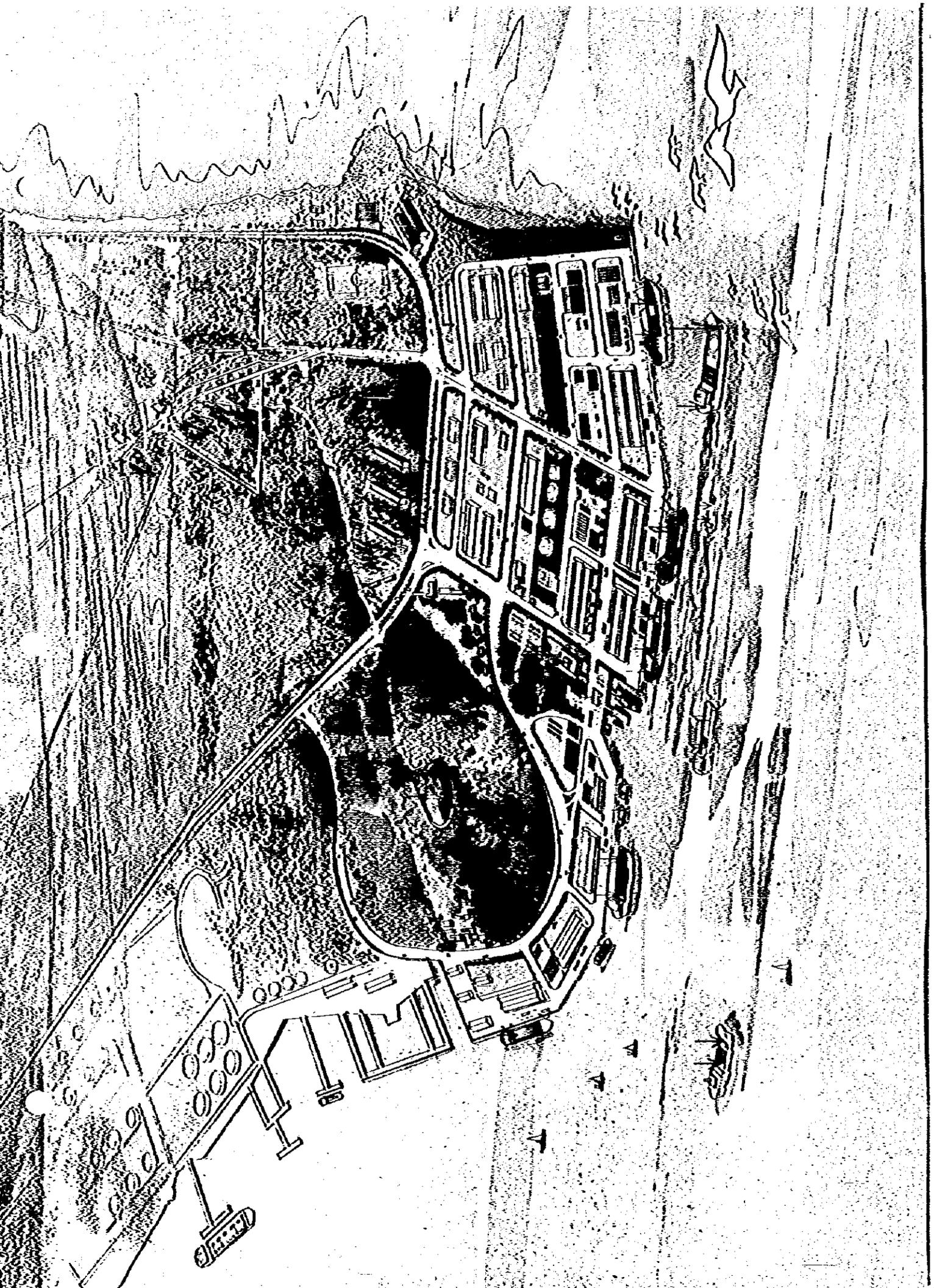


SCALE OF PLAN



	PERBATASAN ADMINISTRASI		1000 - 2000
	PERBATASAN PROVINSI		2000 - 3000
	PERBATASAN KABUPATEN		3000 - 4000
	ALIRAN AIR		4000 - 5000
	JALAN		5000 - 6000
	KERETA API		6000 - 7000
	KOTA		7000 - 8000
	KOTA KECIL		8000 - 9000
	DESA		9000 - 10000
	PERAIRAN		10000 +

MAY 1974



CONTENTS

Preface

Letter of Transmittal

Contents

List of Tables

List of Figures

Summary

Conclusion and Recommendation

Chapter 1	Introduction of the Study	1
	1-1 Background of the Study	1
	1-2 Items and Method of the Study	1
	1-3 Organization of the Study	3
Chapter 2	Present Situation in East Kalimantan	5
	2-1 Present State of Area and Population	5
	2-2 Present Situation of Production	13
	2-3 Present Transport Characteristics	44
Chapter 3	Natural Environment of Balikpapan	51
	3-1 Topography and Geological Features	51
	3-2 Meteorological and Sea Conditions of Balikpapan	63
	3-3 Soil and Earthquake Conditions of Balikpapan	97
Chapter 4	Present Situation of the Port of Balikpapan	113
	4-1 Administration and Operation	113
	4-2 Present Condition of Port Facilities	118
	4-3 Present Situation of Port Activities	128
Chapter 5	Fundamental Conception for Development	147
	5-1 Arrangement Plan and Service Area of Ports in East Kalimantan	147
	5-2 Adaptability of the Port of Samarinda as a Deep Water Port	154
	5-3 Characters of the Port of Balikpapan	158
	5-4 Direction of the Development of the Port of Balikpapan	160

Chapter 6	Projection of the Port Traffic	165
	6-1 Prospect for Regional Activities.....	165
	6-2 Projection of Cargo Volume Handled in the Port of Balikpapan	193
	6-3 Projection of Calling Vessels	214
	6-4 Projection of the Number of Passengers.....	219
Chapter 7	Long-Term Development Plan	221
	7-1 Scale of the Port	221
	7-2 Arrangement Plan of Port Facilities and Utilization Plan of the Bay of Balikpapan	228
	7-3 The Use of Balikpapan Bay after 2000	247
Chapter 8	Short-Term Development Plan	253
	8-1 Scale of the Port	253
	8-2 Arrangement Plan of Port Facilities	253
Chapter 9	Construction Program	257
	9-1 Fundamental Conditions for Design, Construction and Cost Estimate	257
	9-2 Comparative Design and Other Facilities	261
	9-3 Construction Schedule	280
	9-4 Cost Estimate	280
Chapter 10	Port Administration and Operation	287
	10-1 Administration System of the Port of Balikpapan	287
	10-2 Cargo Operation.....	293
Chapter 11	Economic Analysis	297
	11-1 Premises and Procedure for Economic Analysis	297
	11-2 Estimation of Costs	298
	11-3 Estimation of Benefits	299
	11-4 Evaluation	307
Chapter 12	Financial Analysis	311
	12-1 Purpose of Financial Analysis	311
	12-2 Revenue.....	312
	12-3 Expenditure.....	314
	12-4 Payability Situation and Earning Position	321
	12-5 Financial Evaluation.....	327

Chapter 13 Environment Assessment	331
13-1 Atomospheric Pollution	331
13-2 Water Pollution	331
13-3 Oil Pollution	332

LIST OF TABLES

TABLE NO.		
Table S-1	Projected Population of East Kalimantan	ii
Table S-2	Forecast of GRDP in East Kalimantan	iii
Table S-3	Forecast of GRDP per capita in East Kalimantan	iii
Table S-4	Projection of Cargo Traffic through the Port of Balikpapan	iv
Table S-5	Projection of General Cargo Volume Handled at ADPEL in the Port of Balikpapan	iv
Table S-6	Required Public Berth Length and Berth Number at 2000	v
Table S-7	Required Public Berth Length and Berth Number at 1985	v
Table S-8	Main Facilities	vi
Table S-9	Construction Schedule for Short Term Development Plan	vi
Table S-10	Construction Cost of Short Term Development Plan	vii
Table S-11	Estimate of the Number of Staff, the Port of Balikpapan in the Future	vii
Table S-12	Required Equipment by Year	viii
Table S-13	Statement of Revenue and Expenditure from New Investments	ix
Table S-14	Statement of Revenue and Expenditure of Overall Balikpapan Port (new facilities and existing facilities)	ix
Table S-15	F.R.R. by Case	x
Table S-16	Financial Fixed Ratio	x
Table 2-1	Population and Its Density by Province, Indonesia, 1975	6
Table 2-2	Population Growth and Density of East Kalimantan	7
Table 2-3	Population of Indonesia, 1961-1975	8
Table 2-4	Population Increase, East Kalimantan, 1970-1977	8
Table 2-5	Population by Kabupaten/Kotamadya, East Kalimantan, 1976	10
Table 2-6	Population Increase in Kabupaten Kutai	10
Table 2-7	Transmigrants Settled (East Kalimantan)	11
Table 2-8	Output of Food Crops, Estate Crops, Fishery Products, Livestock Products, East Kalimantan in 1976	13
Table 2-9	GRDP in East Kalimantan at 1973 Constant Price	14
Table 2-10	GRDP per capita in East Kalimantan at 1973 Constant Price	14
Table 2-11	GRDP per capita in Indonesia at 1973 Constant Price	14
Table 2-12	GRDP and GRDP per capita of Crude Oil Sector in East Kalimantan	15

Table 2-13	GRDP by Sectors in East Kalimantan at 1969 Constant Price	16
Table 2-14	GRDP by Sectors in East Kalimantan at 1973 Constant Price	16
Table 2-15	GRDP per capita by Sector in East Kalimantan at 1973 Constant Price	17
Table 2-16	Output of Food Crops, Indonesia (1)	18
Table 2-17	Output of Food Crops, East Kalimantan	18
Table 2-18	Output of Food Crops, Indonesia (2)	20
Table 2-19	Output of Food Crops, Indonesia (3)	22
Table 2-20	Output of Food Crops, Indonesia (4)	24
Table 2-21	Output of Food Crops, Indonesia (5)	26
Table 2-22	Output of Food Crops, Indonesia (6)	28
Table 2-23	Output of Food Crops, Indonesia (7)	30
Table 2-24	Output of Food Crops, Indonesia (8)	32
Table 2-25	Output of Estate Crops, Indonesia	32
Table 2-26	Exports of Estate Crops, Indonesia	33
Table 2-27	Output of Estate Crops, East Kalimantan	33
Table 2-28	Forestry at Present, East Kalimantan	39
Table 2-29	Output of Sea and Land Fishery, Indonesia, 1973	40
Table 2-30	Fishery Output, East Kalimantan	40
Table 2-31	Output of Meat, Eggs and Milk, Indonesia	41
Table 2-32	Output of Meat, Eggs and Milk, East Kalimantan	41
Table 2-33	Consumption of Meat, East Kalimantan	41
Table 2-34	Crude Petroleum Production in East Kalimantan	42
Table 2-35	Production of Petroleum Products at Balikpapan Refinery Plant	42
Table 2-36	Natural Gas Production in East Kalimantan	43
Table 2-37	Number of Manufactories & Employees in East Kalimantan	43
Table 2-38	Terminals on Inland Waterways, 1977	45
Table 2-39	Length and Density of Roads (1972)	46
Table 2-40	Road Condition in East Kalimantan, 1977	47
Table 2-41	Roads by Class and Surface, East Kalimantan, 1976	47
Table 2-42	Airports in East Kalimantan	49

Table 3-1	Area of East Kalimantan by District	51
Table 3-2	Main Rivers in East Kalimantan	52
Table 3-3	Geology of the Area of Balikpapan	61
Table 3-4	Wind Data and Presumption of Wave Height	67
Table 3-5	Frequencies of Wind Direction and Velocity	69
Table 3-6	Wind Data of Balikpapan (Jan. 1978)	72
Table 3-7	Harmonic Constants of Tidal Level	73
Table 3-8 (1)	Wind Data and Presumption of Wave Height (Jan. 1978)	79
Table 3-8 (2)	" (Feb. 1978)	80
Table 3-8 (3)	" (Mar. 1978)	81
Table 3-8 (4)	" (Apr. 1978)	82
Table 3-8 (5)	" (May 1978)	83
Table 3-8 (6)	" (Jun. 1978)	84
Table 3-8 (7)	" (Jul. 1978)	85
Table 3-8 (8)	" (Aug. 1978)	86
Table 3-8 (9)	" (Sept. 1978)	87
Table 3-8 (10)	" (Oct. 1978)	88
Table 3-8 (11)	" (Nov. 1978)	89
Table 3-8 (12)	" (Dec. 1978)	90
Table 3-9 (1)	Presumption of Wave Height (H _{1/3} , (A), All Directions)	91
Table 3-9 (2)	Presumption of Wave Height (H _{1/3} , (B), All Directions)	92
Table 3-10 (1)	Presumption of Wave Height (H _{1/3} , (A))	93
Table 3-10 (2)	Presumption of Wave Height (H _{1/3} , (B))	93
Table 3-11	Presumption of Wave Height at Balikpapan Bay	94
Table 3-12	Percentage Frequencies of Waves at Makassar Strait	95
Table 3-13	Percentage Frequencies of Waves at the Entrance of Balikpapan Bay	96
Table 3-14	Frequencies of Southerly Monsoon	97
Table 3-15	Maximum Appearances of High Waves	97
Table 4-1	Number of Employees	115
Table 4-2	Major Operations and Number of Operators	115
Table 4-3	Port Charge System	116
Table 4-4	Revenue & Expenses of ADPEL Balikpapan	118
Table 4-5	Present Condition of Main Public Port Facilities	118
Table 4-6	Mooring Facilities in the Port of Balikpapan in 1979	120

Table 4-7	Revetment Bulkhead and Slipway in the Port of Balikpapan in 1979	125
Table 4-8	Transit Sheds, Warehouses and Open Storages in the Port of Balikpapan in 1979	125
Table 4-9	Equipment in the Port of Balikpapan in 1979	126
Table 4-10	Tugboats, Pilotboats and Others in the Port of Balikpapan in 1979	126
Table 4-11	Trend of Cargo Flow by Region in Indonesia (1970 ~ 1976)	130
Table 4-12	Cargo Flow and Its Share by Region in Indonesia in 1976	131
Table 4-13	Trend of Cargo Flow by Major Port in Kalimantan (1970 ~ 1977)	133
Table 4-14	Trend of Cargo Flow by Major Port in East Kalimantan (1970 ~ 1977)	135
Table 4-15	Trend of Cargo Flow by Trade in the Port of Balikpapan (1966 ~ 1978)	136
Table 4-16	Share of Cargo Flow by Trade in the Port of Balikpapan (1966 ~ 1978)	136
Table 4-17	Cargo Flow by Trade, by Commodity in the Port of Balikpapan (1978)	137
Table 4-18	Trend of General Cargo Flow by Trade in the Port of Balikpapan (1966 ~ 1978)	138
Table 4-19	Trend of General Cargo Flow by Trade, by Facility in the Port of Balikpapan (1966 ~ 1978)	139
Table 4-20	Cargo Volume Handled in the Port of Balikpapan by Commodity, by Facility (1978)	141
Table 4-21	Trend of Cargo Flow by Trade in the Port of Samarinda (1973 ~ 1978)	143
Table 4-22	Share of Cargo Flow by Trade in the Port of Samarinda (1973 ~ 1978)	143
Table 4-23	Trend of General Cargo Flow by Trade in the Port of Samarinda (1973 ~ 1978)	143
Table 4-24	Trend of General Cargo Flow by Trade in the Port of Samarinda (1973 ~ 1978)	144
Table 4-25	Cargo Flow by Trade, by Commodity in the Port of Samarinda (1978)	144
Table 4-26	Trend of Passenger Embarkation and Disembarkation in the Port of Balikpapan	145
Table 4-27	Calling Vessels at the Port of Balikpapan in 1978	145
Table 4-28	Average Ship Size and Average Ship Cargo Load Handled per Ship Call at the Port of Balikpapan	146
Table 4-29	Average Ship Staying Duration, Mooring Time & Cargo Handling Time per Vessel in the Port of Balikpapan	146

Table 5-1	Population and Its Growth of Each Port Service Area	153
Table 5-2	Projected Population of Each Port Service Area	154
Table 5-3	Comparison of Samarinda and Balikpapan as a Deep Water Port	155
Table 5-4	Engineering Evaluation on Prospective Sites	162
Table 6-1	Forecast of GRDP per capita in East Kalimantan	165
Table 6-2	Forecast of GRDP in East Kalimantan	166
Table 6-3	Projected Production of Food Crops in East Kalimantan	166
Table 6-4	Estimated Production of Estate Crops, East Kalimantan	167
Table 6-5	Projection of Forestry in East Kalimantan	167
Table 6-6	Projection of Population Increase, East Kalimantan	168
Table 6-7	Prospect of Average Annual Growth Rate of GDP per capita in Indonesia (1)	168
Table 6-8	Prospect of Average Annual Growth Rate of GDP per capita in Indonesia (2)	169
Table 6-9	Forecast of GRDP per capita in East Kalimantan	170
Table 6-10	Forecast of GRDP in East Kalimantan	170
Table 6-11	Land for Future Agricultural Development, East Kalimantan	171
Table 6-12	Harvested Area of Food Crops, Indonesia	175
Table 6-13	Production of Food Crops, Indonesia	176
Table 6-14	Production of Food Crops in East Kalimantan, 1976	177
Table 6-15	Food Balance Sheet, Indonesia (1974)	178
Table 6-16	Intake of Calorie, Protein, Fat in Several Countries in Asia in 1974 (per capita per day)	179
Table 6-17	Production of Food Crops in East Kalimantan and Comparison of Productivity with Other Province (1976)	181
Table 6-18	Projected Production of Food Crops in East Kalimantan	182
Table 6-19	Estimated Extension to Harvested Area by Crop, East Kalimantan	183
Table 6-20	Yield Rate of Estate Crops, Indonesia	184
Table 6-21	Production of Estate Crops, Indonesia	184
Table 6-22	Harvested Area of Estate Crops, Indonesia	184
Table 6-23	Yield Rate of Estate Crops, East Kalimantan	185
Table 6-24	Production of Estate Crops, East Kalimantan	185
Table 6-25	Harvested Area of Estate Crops, East Kalimantan	185
Table 6-26	Estimated Production of Estate Crops, East Kalimantan	186

Table 6-27	Consumption of Estate Crops, Indonesia	186
Table 6-28	Estimated Export plus Domestic Outward Flow of Plantation Products, East Kalimantan	187
Table 6-29	Estimated Fishery Production, East Kalimantan	188
Table 6-30	Projection of Forestry in East Kalimantan	190
Table 6-31	Production of Log and GRDP of Log's Sector in East Kalimantan	191
Table 6-32	GRDP and GRDP per capita of Crude Oil Sector in East Kalimantan	192
Table 6-33	The Plan of thermo-electric power plant scheduled to be supplied coals from East Kalimantan	192
Table 6-34	Projection of Cargo Traffic through the Port of Balikpapan	193
Table 6-35	Projection of Cargo Volume Handled in the Port of Balikpapan by commodity (1985)	195
Table 6-36	Projection of Cargo Volume Handled in the Port of Balikpapan by commodity (2000)	196
Table 6-37	Projection of General Cargo Volume Handled at ADPEL in the Port of Balikpapan	196
Table 6-38	Exports and Domestic exports of Coconut from Central Sulawesi in 1985 and in 2000	206
Table 6-39	Projection of Cargo Volume Handled in the Port of Balikpapan by commodity, by facility (2000)	209
Table 6-40	Projection of Cargo Volume Handled in the Port of Balikpapan by commodity, by facility (1985)	211
Table 6-41	Projection of General Cargo Volume Handled by ADPEL in the Port of Balikpapan, by commodity (2000)	213
Table 6-42	Projection of General Cargo Volume Handled by ADPEL in the Port of Balikpapan, by commodity (1985)	213
Table 6-43	Projection of Average Size of Vessles, by Type of Vessel, Calling at the Port of Balikpapan	214
Table 6-44	Projection of Number of Vessels by Type of Vessel, Calling at the Port of Balikpapan	215
Table 6-45	Projection of Number of Vessels by Type of Vessel, Calling at the Port of Balikpapan (Public Berths)	215
Table 6-46	Projection of the Volume of Cargo by Type of Vessel Handled at the Port of Balikpapan	216
Table 6-47	Projection of the Volume of Cargo by Type of Vessel Handled at the Port of Balikpapan (Public Berths)	217
Table 6-48	Projection of the Volume of Cargo Loaded and Unloaded at the Port of Balikpapan by Type of Vessel	217
Table 6-49	Estimation of DWT by Type of Vessel at the Port of Balikpapan	218

Table 6-50	Estimation of DWT by Type of Vessel at the Port of Balikpapan	219
Table 6-51	Number of Embarking and Disembarking Passengers at the Port of Balikpapan, and Number of Transmigrants into East Kalimantan	219
Table 7-1	Projected Cargo Throughput in the Port of Balikpapan	221
Table 7-2	Required Public Berth Length	221
Table 7-3	Estimation of the Volume of Cargo using Sheds or Open Storage Yards	222
Table 7-4	Required Area of Transit Sheds and Open Storage Yards	222
Table 7-5	Target Values of Throughput of Wharf in 1983	223
Table 7-6	Required Public Berth Length and Berth Number	230
Table 7-7	Newly Required Areas of the Transit Sheds and Open Storage Yards	231
Table 7-8	Construction Cost of Short Term Development Program to be used in Economic Analysis	232
Table 7-9	Benefits to be used in Economic Analysis	232
Table 7-10	Cost Benefit Table (In the Case of Developing Site 2)	233
Table 7-11	Cost Benefit Table (In the Case of Developing Site 4)	234
Table 7-12	Largest Size of Vessels	243
Table 8-1	Newly Required Cargo handling Equipment and Service Vessels by 1985	256
Table 9-1	Design Conditions for Foreign Trade Wharf	257
Table 9-2	Conditions of Construction/Cost Estimate for Port Terminal	257
Table 9-3	Soil Condition'	258
Table 9-4	Safety Factors	259
Table 9-5	Corrosion Rates	259
Table 9-6	Comparison of Economy (Construction Cost)	261
Table 9-7	Comparison of Workability	262
Table 9-8	Construction Schedule for Short Term Development Program	281
Table 9-9	Construction Cost of Short Term Development Program	282
Table 9-10	Construction Cost of Short Term Development Program by Each Year (1981 ~ 1984)	283
Table 9-11	Construction Cost of Foreign Trade Pier (Steel Pipe Pile Open Type Pier Design Water Depth -9.0 m)	284
Table 10-1	Personnel Staff in 1985	288
Table 10-2	Required Equipment by Year	292
Table 10-3	Employees Number by Year	293

Table 11-1	Construction Costs of Additional Public Facilities to be used in Economic Analysis	299
Table 11-2	Maintenance and Operating Costs to be Used in Economic Analysis	299
Table 11-3	Economy in Freight and Handling Charges through Direct Importation and Exportation	300
Table 11-4	Benefits Resulting from Decreased Congestion on the Wharf and Jetty for Domestic Trade	301
Table 11-5	Projection of General Cargo Volume of Foreign Trade handled by ADPEL in the Port of Balikpapan, by Commodity, by Kind of Foreign Trade (1985)	301
Table 11-6	Projection of General Cargo Volume of Foreign Trade handled by ADPEL in the Port of Balikpapan, by Commodity, by Kind of Foreign Trade (In the Case of No Expansion in 1985)	302
Table 11-7	Volume of Foreign Trade Cargo Expected to be Handled Directly with the Improvement of Balikpapan	302
Table 11-8	Saving on Freight in Unit Cost	304
Table 11-9	Total Saving in Cargo Handling Charge and Terminal Freightage at Surabaya in Unit Cost	304
Table 11-10	Expenses Saved through Direct Importation and Exportation at Balikpapan	304
Table 11-11	Projection of General Cargo Volume handled by ADPEL in the Port of Balikpapan, by Commodity (In the Case of No Expansion in 1985)	305
Table 11-12	Average Duration of Call at the Foreign Trade Wharf of Site-2	306
Table 11-13	Average Duration of Call at Kanjung Baru	306
Table 11-14	Cost Benefit Table (I.R.R. = 10.3%)	308
Table 11-15	Cost Benefit Table (Discount Rate = 8.0%)	309
Table 12-1	Depreciation Rate and Life Cycle by facilities	311
Table 12-2	Total Revenue of the Port of Balikpapan (for Existing and New Investment Facilities)	312
Table 12-3	The Revenue from New Investment	313
Table 12-4	Total Operating Expenditure (for Existing and New Investment Facilities)	314
Table 12-5	Operating Expenditure for New Investment Facilities	315
Table 12-6	Total Personnel of Balikpapan: 1977 - 85.	315
Table 12-7	Personnel required by New Investments and Those for the General Sector	316
Table 12-8	Maintenance Cost for New Facilities	317
Table 12-9	Annual Maintenance Cost for New Facilities	317

Table 12-10	Long-term Loan Schedule (Case of entire investment fund raised from abroad)	319
Table 12-11	Long-term Loan Schedule (Case of 60% foreign loan and 40% National Development Fund)	320
Table 12-12	Total Fixed Asset Schedule (for Existing and New Investment Facilities)	320
Table 12-13	Fixed Asset Schedule (for New Investment Facilities only)	321
Table 12-14	Total Statement of Revenue and Expenditure (for Existing and New Investment Facilities)	321
Table 12-15	Statement of Revenue and Expenditure of New Investment Facilities	322
Table 12-16	Discounted Financial Rate of Return (Calculation Sheet: Case I)	324
Table 12-17	Discounted Financial Rate of Return (Calculation Sheet: Case II)	325
Table 12-18	Discounted Financial Rate of Return (Calculation Sheet: Case III)	326
Table 12-19	Financial Ratios	328
Table 12-20	Statement of Changes in Financial Position	329
Table 12-21	Balance Sheet	329

LIST OF FIGURES

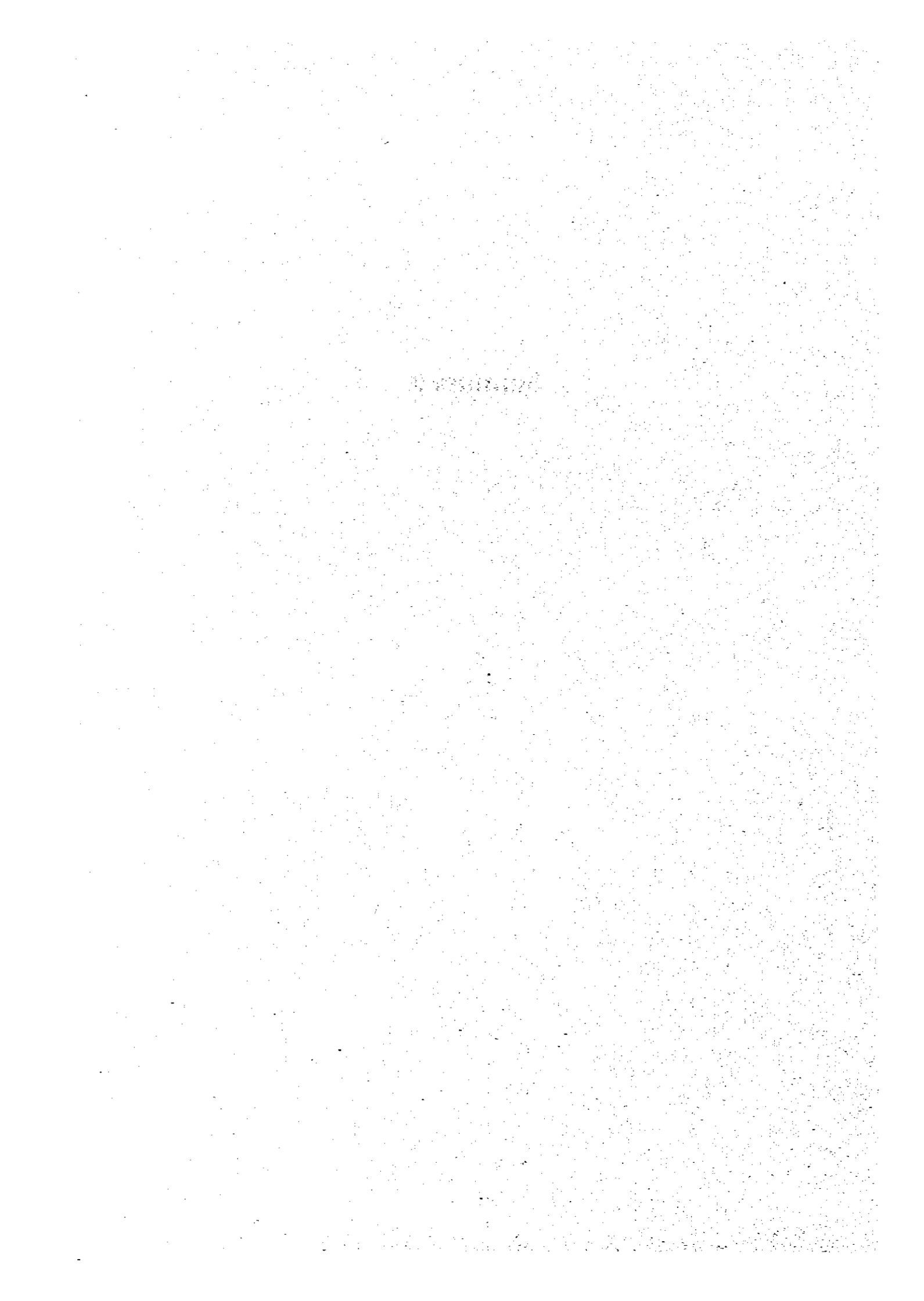
FIGURES NO:

Fig. 2-1	Transmigrants settled in East Kalimantan (1954 – 1978)	9
Fig. 2-2	Population Density of East Kalimantan	12
Fig. 2-3	Output of Wet Land Paddy, East Kalimantan (1976).....	19
Fig. 2-4	Output of Dry Land Paddy, East Kalimantan (1976).....	21
Fig. 2-5	Output of Maize, East Kalimantan (1976)	23
Fig. 2-6	Output of Cassava, East Kalimantan (1976).....	25
Fig. 2-7	Output of Sweet Potatoes, East Kalimantan (1976).....	27
Fig. 2-8	Output of Peanuts, East Kalimantan (1976)	29
Fig. 2-9	Output of Soybean, East Kalimantan (1976).....	31
Fig. 2-10	Output of Cloves, East Kalimantan (1976)	34
Fig. 2-11	Output of Coconuts, East Kalimantan (1976)	35
Fig. 2-12	Output of Rubber, East Kalimantan (1976).....	36
Fig. 2-13	Output of Pepper, East Kalimantan (1976)	37
Fig. 2-14	Output of Coffee, East Kalimantan (1976)	38
Fig. 3-1	Topography of Balikpapan Bay	53
Fig. 3-2 (1)	Detailed Chart of Contour in Site 2	55
Fig. 3-2 (2)	Detailed Chart of Contour in Site 4	57
Fig. 3-3 (1)	Cross Section (Site 2) (C – C)	59
Fig. 3-3 (2)	Cross Section (Site 2) (D – D)	59
Fig. 3-4 (1)	Cross Section (Site 4) (B – B)	60
Fig. 3-4 (2)	Cross Section (Site 4) (A – A)	60
Fig. 3-5	Geological Chart of Balikpapan and Its Vicinity	62
Fig. 3-6 (1)	Presumption of Wave Height ($H_{1/3}$, Presumption (A), 1978)	65
Fig. 3-6 (2)	Presumption of Wave Height ($H_{1/3}$, Presumption (B), 1978).....	66
Fig. 3-7	Meteorological Conditions of Balikpapan.....	68
Fig. 3-8	Wind Roses (1954 – 1965)	71
Fig. 3-9	Northerly and Easterly Components of Tidal Currents (Site 2)	74
Fig. 3-10	Current Ellipses (Site 2)	75
Fig. 3-11	Current Harmonic Analysis and Tidal Level (Site 2)	76
Fig. 3-12	Current Observation with Floats (Site 2)	77
Fig. 3-13	Seismic Zones Map of Indonesia	99

Fig. 3-14 (1)	Soil Survey Location (Site 2)	100
Fig. 3-14 (2)	Soil Survey Location (Site 4)	101
Fig. 3-15 (1)	Soil Profile (Site 2, Point No. 1)	102
Fig. 3-15 (2)	Soil Profile (Site 2, Point No. 2)	103
Fig. 3-15 (3)	Soil Profile (Site 2, Point No. 3)	104
Fig. 3-15 (4)	Soil Profile (Site 2, Point No. 4)	105
Fig. 3-15 (5)	Soil Profile (Site 4, Point No. 4')	106
Fig. 3-15 (6)	Soil Profile (Site 4, Point No. 5')	107
Fig. 3-16 (1)	Logs of Borings and Soundings (A ~ A, Site 2)	109
Fig. 3-16 (2)	Logs of Borings and Soundings (B ~ B, Site 2)	109
Fig. 3-17 (1)	Dutch Cone Penetrometer Test Result (Site 4, Point No. 1')	110
Fig. 3-17 (2)	Dutch Cone Penetrometer Test Result (Site 4, Point No. 2')	110
Fig. 3-17 (3)	Dutch Cone Penetrometer Test Result (Site 4, Point No. 3')	110
Fig. 4-1	Affiliated Organization Chart in the Port of Balikpapan	114
Fig. 4-2	Organization Chart of Balikpapan Port Administration	114
Fig. 4-3	Existing Port Facilities (1)	119
Fig. 4-4	Existing Port Facilities (2)	121
Fig. 4-5	Existing Port Facilities (3)	122
Fig. 4-6	Existing Port Facilities (4)	123
Fig. 4-7	Existing Port Facilities (5)	124
Fig. 5-1	Map of Port Service Area, East Kalimantan	149
Fig. 5-2	Map of Service Area of the Port of Balikpapan as Foreign Trade Port	152
Fig. 5-3	Prospective Sites for Development of the Port of Balikpapan	161
Fig. 6-1	Map of Development Potential	173
Fig. 6-2	Projected Traffic in the Port of Balikpapan	194
Fig. 7-1	Prospective Use of the Jetty at Kampung Baru (1985)	225
Fig. 7-2	Prospective Use of the Jetty at Kampung Baru (2000)	225
Fig. 7-3	Master Plan of the Port of Balikpapan in the year 2000	235
Fig. 7-4	Development Plan of the Bay of Balikpapan in the year 2000	237
Fig. 7-5	Volume of Motor Traffic in the Peak Hour generated from the Port in the Year 1985 (In the Case of Developing Site 2)	239
Fig. 7-6	Volume of Motor Traffic in the Peak Hour generated from the Port in the Year 1985 (In the Case of Developing Site 4)	240
Fig. 7-7	Volume of Motor Traffic in the Peak Hour generated from the Port in the Year 2000 (In the Case of Developing Site 2)	241

Fig. 7-8	Volume of Motor Traffic in the Peak Hour generated from the Port in the Year 2000 (In the Case of Developping Site 4)	242
Fig. 7-9	Activities Map in the year 2000	244
Fig. 7-10	Typical Cross Section for Roads	245
Fig. 7-11	Typical Cross Section for Berthing Facilities	246
Fig. 7-12	Development Plan of the Bay of Balikpapan after the year 2000.....	249
Fig. 7-13	Image Plan of Tg. Makasar Area after 2000	251
Fig. 8-1	Port Facilities Arrangement Plan in the year 2000.....	255
Fig. 9-1 (1)	Foreign Trade Pier (Alternative Plan-A) Standard Cross Section	263
Fig. 9-1 (2)	Foreign Trade Pier (Alternative Plan-A) Plan	264
Fig. 9-2 (1)	Foreign Trade Pier (Alternative Plan-B) Standard Cross Section	265
Fig. 9-2 (2)	Foreign Trade Pier (Alternative Plan-B) Plan	266
Fig. 9-3 (1)	Foreign Trade Pier (Alternative Plan-C) Standard Cross Section	267
Fig. 9-3 (2)	Foreign Trade Pier (Alternative Plan-C) Plan	268
Fig. 9-4 (1)	Foreign Trade Pier (Alternative Plan-D) Standard Cross Section	269
Fig. 9-4 (2)	Foreign Trade Pier (Alternative Plan-D) Plan	270
Fig. 9-5 (1)	Foreign Trade Pier (Alternative Plan-E) Standard Cross Section	271
Fig. 9-5 (2)	Foreign Trade Pier (Alternative Plan-E) Plan	272
Fig. 9-6 (1)	Service Vessels Wharf (Standard Cross Section)	275
Fig. 9-6 (2)	Service Vessels Wharf (Plan)	276
Fig. 9-7	Jetty (Kampung Baru)	277
Fig. 9-8	Temporary Revetments	278
Fig. 9-9	Plan of Port Facilities	279
Fig. 11-1	Procedure of Economic Analysis	297

Summary



SUMMARY

I. General

The Port of Balikpapan, located at the east coast of Kalimantan Island and facing the Makasar Straits, is one of the representative ports of East Kalimantan. Behind the port, there are Balikpapan City, the largest city of East Kalimantan and Samarinda City, capital of the province, connected with the Port of Balikpapan by modern highways. The port is also connected with other towns not only by roads but also by waterways. In recent years, the port has been gradually expanding its influence, with the volume of cargo handled in 1978 being about 7 million tons mostly of petroleum products, timber and general cargo. The port presently has a pier with -8m depth which is about 200 m long and a jetty for small vessels (excluding the facilities owned by PERTAMINA). The present problems for the port are how to plan and determine the development of a deep water port as a main developing port in East Kalimantan in the future as well as arranging facilities in meeting the recent increase of cargo volume.

II. The Basic Concept in the Development of the Port of Balikpapan

Presently there is no foreign trade port of suitable size with the appropriate function of handling general cargo in East Kalimantan and therefore, this region cannot sufficiently meet the required transportation demand at present. Accordingly East Kalimantan is highly dependent for secondary transportation on the foreign trade ports of Java. This affects the economic development of East Kalimantan.

In considering port development plans to cope with the situation, the basic concept is as follows after studying natural and economic conditions.

- (1) The foreign trade service areas of the port to be improved cover the total area of East Kalimantan and part of the central area of Sulawesi.
- (2) In the southern area of East Kalimantan, a center of social and economic activities of this service area, there are two major ports, the Ports of Samarinda and Balikpapan. The latter port, a natural good harbour, is more suited for a deep water port compared to the former port with restriction of long access channel.
- (3) The Port of Balikpapan has commercial function to handle mostly daily consumer goods and construction materials and industrial function to handle log and crude oil produced in the surrounding areas. It will be greatly affected by abundant coal deposit to be developed in the coastal region of East Kalimantan in the future.
- (4) As a site for expansion of the Port of Balikpapan as a commercial port in the future, the bay mouth area upto yr. 2000 and the area of Tg. Makasar thereafter are most suited and as an industrial port, part of the area of Tg. Makasar and the Penajam area are most suited.

III. Natural Conditions of the Port of Balikpapan

- (1) Balikpapan Bay is situated on the equator and directly faces the Makasar Straits. The shoal of water depth of about 5 m extends from the south western part of the entrance of the bay to the northeast.
- (2) Geologically, Balikpapan Area is composed of three layers; Kampung Baru layer, Balikpapan layer and alluvium.
- (3) The climate belongs to the tropical rain forest climate with the rainy season (from October to February) and the dry season (from May to August).
- (4) The annual rainfall is from 1,400 mm to 3,200 mm and the temperature is from 22°C to 35°C and the relative humidity is about 80%.

- (5) The atmospheric pressure is about 1,010 millibars, approximately constant throughout the year and the pressure gradient is small.
- (6) Northern monsoons blow in the rainy season and southern monsoons in the dry season but the wind is generally light.
- (7) The wave height is presumed by SMB method, to be from 1.0 m to 1.3 m for three days in 1978.
- (8) The tidal range in Balikpapan Bay is 2.83 m above the low water level and the velocity of current is estimated to be about 0.40 m/sec according to the site survey.
- (9) The soil consists of sand at the site near the existent public wharf and the bearing stratum is supposed to be about 10 m below the ground.
- (10) The expected acceleration of earthquakes in this region is about 0.1g.

IV. Projection of Population, GRDP and Cargo Handled at the Port

1. Setting the service areas

The future service areas of the Port of Balikpapan are set as follows by studying port positions, the road network and the inland waterway network and by analyzing the potential of the ports in East Kalimantan.

- (1) Service areas as a foreign trade port
The total area of East Kalimantan and the part of Central Sulawesi.
- (2) Service areas as a domestic trade port
The total areas of Balikpapan City and Pasir Country and part of the southern coast of the Mahakam River in Kutai County.

2. Projection of Population

For estimate of the population of East Kalimantan in the future, the local government of East Kalimantan and the central government made a joint study as shown in the following table. And these figures are used in this study.

Table S-1 Projected Population of East Kalimantan

(Unit: 1,000 persons)

Year	Population
1976	961
1985	1,570
2000	3,530

3. Projection of GRDP

The future GRDP and per capita GRDP of East Kalimantan are estimated in consideration of the average annual growth rate of per capita GRDP by sector in PELITA II and PELITA III and the future output of each sector as follows.

Table S-2 Forecast of GRDP in East Kalimantan

Unit: Million US\$

Sector		1976	1985	2000
Agriculture (excluded Forestry)		28.9	90.9	251.7
Industry	General	3.8	10.2	49.1
	Timber Processing	5.3	42.5	52.6
	Fertilizer	—	89.6	89.7
Construction		5.6	12.1	44.5
Transport and Communication		5.6	13.2	55.1
Miscellaneous		70.9	141.6	456.1
Sub-total		120.1	400.1	998.8
Forestry		326.7	392.5	392.5
Mining	Crude Oil	11.8	21.4	48.0
	Petroleum Refining	107.8	221.7	221.7
	Natural Gas	—	145.4	145.4
	Coal	—	—	50.1
Sub-total		446.3	781.0	858.0
Total		566.4	1,181.1	1,856.8

Note: 1973 constant price

Table S-3 Forecast of GRDP per capita in East Kalimantan

Unit: US\$

Sector		1976	1985	2000
Agriculture (excluded Forestry)		30.1	57.9	71.3
Industry	General	4.0	6.5	13.9
	Timber Processing	5.5	27.1	14.9
	Fertilizer	—	57.1	25.4
Construction		5.8	7.7	12.6
Transport and Communication		5.8	8.4	15.6
Miscellaneous		73.8	90.2	129.2
Sub-total		125.0	254.9	282.9
Forestry		340.0	250.0	111.2
Mining	Crude Oil	12.3	13.6	13.6
	Petroleum Refining	112.2	141.2	62.9
	Natural Gas	—	92.6	41.2
	Coal	—	—	14.2
Sub-total		464.5	497.4	243.1
Total		589.5	752.3	526.0

Note: 1973 constant price

4. Projection of Cargo Traffic at the Port of Balikpapan

The volume of cargo handled at the Port of Balikpapan is estimated, as shown in Table S-4, to be about 10.5 million tons in 1985 and about 16.9 million tons in 2000. The volume of cargo handled at ADPEL is estimated, as shown in Table S-5, to be about 0.6 million tons in 1985 and about 1.5 million tons in 2000.

Table S-4 Projection of Cargo Traffic through the Port of Balikpapan

Item	1976 (1,000 tons)	1978 (1,000 tons)	1985 (1,000 tons)	2000 (1,000 tons)	1985/1976		2000/1976	
					A.A.G.R.	A.A.G.R.	A.A.G.R.	A.A.G.R.
Foreign trade						%		%
Import	281	417	637	907	2.27	9.5	3.23	5.0
Export	2,348	2,530	2,937	4,256	1.25	2.5	1.81	2.5
Sub-Total	2,629	2,955	3,574	5,163	1.36	3.1	1.96	2.8
Domestic trade								
Inbound	730	1,978	3,118	7,151	4.27	17.5	9.80	10.0
Outbound	1,085	1,992	3,854	4,593	3.55	15.1	4.23	6.2
Sub-Total	1,815	3,970	6,972	11,744	3.84	16.1	6.47	8.1
Total	4,444	6,917	10,546	16,907	2.37	10.1	3.80	5.7

Note: A.A.G.R. — Average Annual Growth Rate

Table S-5 Projection of General Cargo Volume Handled at ADPEL in the Port of Balikpapan

Item	1976 (1,000 tons)	1978 (1,000 tons)	1985 (1,000 tons)	2000 (1,000 tons)	1985/1976		2000/1976	
					A.A.G.R.	A.A.G.R.	A.A.G.R.	A.A.G.R.
Foreign trade						%		%
Import	21	18	222	416	10.57	30.0	19.81	13.2
Export	3	2	123	313	41.00	51.0	104.33	21.4
Sub-Total	24	20	345	729	14.38	34.5	30.38	15.3
Domestic trade								
Inbound	81	85	186	573	2.30	9.7	7.07	8.5
Outbound	29	25	80	158	2.76	12.0	5.45	7.3
Sub-Total	110	110	266	731	2.42	10.3	6.65	8.2
Total	134	130	611	1,460	4.56	18.4	10.90	10.5

Note: A.A.G.R. — Average Annual Growth Rate

V. Long Term Plan

1. Site of the Plan

As a result of the study of the suitable site for construction of public berths in the Bay of Balikpapan, it has been determined that the most appropriate site is an area adjacent to the existing public berth. Therefore, this area is considered in drafting a long term port plan for the yr. 2000 as a target.

2. Plan of Constructing Berths

The plan of constructing foreign trade berths and domestic berths for the yr. 2000 is as follows.

Table S-6 Required Public Berth Length and Berth Number at 2000

Kind of Trade \ Item		New Required Berth (from 1980 to 2000)		
		Berth Length	Berth Number	Water Depth
Foreign Trade		700m	4 Berth	-9m and -10m
Domestic Trade	Interinsular	315m	3 Berth	-6m
	Local	150m		-4m

Note 1) The jetty for sailing vessels in the Kampung Baru area will be extended by 50 m, except the above berths. And the new jetty for sailing vessels will be constructed at Kampung Baru or Penajam.

2) The new berth of 77.6 m to be constructed in 1979 is treated as an existing facility and is not included in the table.

VI Short Term Plan

1. Plan of Constructing Berths

The plan of constructing foreign trade berths and domestic trade berths for the yr. 1985 is as follows.

Table S-7 Required Public Berth Length and Berth Number at 1985

Kind of Trade \ Item		New Required Berth (from 1980 to 1985)		
		Berth Length	Berth Number	Water Depth
Foreign Trade		330m	2 Berth	-9m
Domestic Trade	Interinsular	-	-	-
	Local and Sailing	-	-	-

Note 1) The jetty for local vessels and sailing vessels in the Kampung Baru area will be extended by 50 m, except the above berths.

2) The new berth of 77.6 m to be constructed in 1979 is treated as an existing facility and is not included in the table.

2. Fundamental Conditions for Design, Construction and Cost Estimate

(1) The objective vessel for the foreign trade wharf is a cargo vessel of 10,000 DWT or 15,000 DWT and the top elevation of the wharf is + 4.25 m and the water depth in front of the wharf is -9.0m or -10.0m.

(2) Reclamation is made with sea sand by a pump dredger.

(3) The construction period is 4 years from 1981 to 1984.

(4) The exchange rate is 1 US\$ = 625 Rupiah and the prices are based on the 1979 price.

3. A comparative design of Foreign Trade Pier

A comparative design is made on 5 plans (Alternative Plans A, B, C, D and E) for foreign trade pier.

(Alternative A): Steel pipe pile open type pier (design water depth -9.0m)

(Alternative B): Steel pipe pile open type pier (design water depth -10.0m)

(Alternative C): Concrete pile open type pier (design water depth -10.0m)

(Alternative D): Pipe-type sheet pile pier (design water depth -10.0m)

(Alternative E): Concrete caisson wharf (design water depth -10.0m)

As the result of comparison in their costs and workabilities, alternative A is adopted.

4. Main Port Facilities

Main port facilities to be constructed during the planning period are as follows.

Table S-8 Main Port Facilities

No.	Facility	Unit	Quantity
1	Foreign Trade Pier	m	330
2	Service Vessels Wharf	m	75
3	Jetty (Kampung Baru)	m	50
4	Temporary Revetment	m	815
5	Reclamation	m ³	905,000
6	Transit Shed	m ²	6,000
7	Open Storage	m ²	1,625
8	Building	m ²	30
9	Road	m ²	35,600

5. Construction Schedule

The construction schedule is as follows.

Table S-9 Construction Schedule for Short Term Development Program

Item	1981	1982	1983	1984	1985
Foreign Trade Pier, Service Vessels Wharf, Jetty	—	—	—	—	—
Temporary Revetment, Reclamation	—	—	—	—	—
Transit Shed, Open Storage, Building	—	—	—	—	—
Road, Drainage, Pavement, Others	—	—	—	—	—
Water Supply, Electric Power Supply, Navigation Aids	—	—	—	—	—
Cargo Handling Equipment, Port Service Vessels	—	—	—	—	—
Mobilization/Demobilization	—	—	—	—	—
Engineering Study (including Soil Investigation and Hydrographic Survey)	—	—	—	—	—
Supervision	—	—	—	—	—

6. Construction Cost

The construction cost is as follows.

Table S-10 Construction Cost of Short Term Development Program

Unit: 1,000US\$

Item	Local Currency	Foreign Currency	Total
Construction works	5,983	7,541	13,524
Cargo Handling Equipment/Port Service Vessels	0	1,012	1,012
Sales Tax (5%)	299	0	299
Engineering Study (including Soil Investigation and Hydrographic Survey)	115	259	374
Supervision	214	514	728
Physical Contingency (15%)	942	1,283	2,225
Price Contingency (15%)	1,133	1,593	2,726
Total	8,686	12,200	20,888
	(41.6%)	(58.4%)	(100%)

VII Administration and Operation Port

1. Administration System

The following system must be developed with a view to increasing profits and making full service corresponding to the increasing cargo and new port facilities.

(1) Manning of Operating Department

Mostly manning for pilot, boat crew and maintenance is planned. About 70 men will be employed as staff for 2 years from 1980 to 1981.

(2) The introduction of 24 hours service for pilotage and tugboat services with necessary equipment and manning will be arranged.

(3) Staffing of financial department and training are carried out to cope with the increasing volume of collection work, accounting, cost and budgetary controls due to the increase of port income.

(4) Supervisory staff and necessary equipment for ADPEL will be secured to cope with introduction of 2 shift system of cargo handling work.

Table S-11 Estimate of the Number of Staff, the Port of Balikpapan in the Future

	1979	1980	1981	1982	1983	1984	1985
Administrative & Staff Dept.	56	57	59	61	61	67	74
Operation Dept.	84	134	169	169	182	194	228
Total	140	191	228	230	243	261	302

Table S-12 Required Equipment by Year

Equip. Year	Tug boats	Pilot boats	Forklifts
1983	1 vessel introduced (Tot. 4 operating)	— (Tot. 3 operating)	1 unit introduced (Tot. 6 operating)
1984	— (Tot. 4 operating)	— (Tot. 3 operating)	— (Tot. 6 operating)
1985	1 vessel introduced (Tot. 5 operating)	1 vessel introduced (Tot. 4 operating)	2 units introduced (Tot. 8 operating)

2. Improvement of Cargo Handling Operation

- (1) Supervision of overall cargo handling work by ADPEL will be intensified by their assistance in the work, currently conducted by UKA.
- (2) Effort will be made to rationalize the method of transportation as well as to flexibly adjust the number of one gang according to kind of cargo handled for improving the stevedoring efficiency.
- (3) 2 shift system will be introduced in cargo handling service.

VIII Economic Analysis

1. Premises

The following premises were set for conducting economic analysis.

- (1) The economic analysis is to cover those short term plan to be completed by 1985 and those thereafter are to be outside the scope of economic analysis.
- (2) The berth (77.6m) for domestic trade to be constructed in 1979 is to be regarded as existing facilities and is to be excluded from the economic analysis.
- (3) The reclaimed land to be made behind the above berth of 77.6m for domestic trade is to be regarded as existing facility functioning in unity with this berth and are, therefore, not to be covered by the economic analysis.
- (4) The planned extension of the jetty in Kampung Baru is to be regarded as one of the projects to be covered by the economic analysis.

2. Cost

The following covers the costs which are subject to economic analysis under this project. A shadow price has not been applied in this study.

- (1) The cost of expansion of public facilities from 1981 to 1984, deducting sales tax and price contingency.
- (2) The cost of maintenance and operation of the expanded facilities

3. Benefits

- (1) Saving in freight and handling charges through direct importation and exportation.
- (2) Congestion at the wharf and jetty for domestic trade will be reduced.
- (3) Decrease in damage to port cargo.
- (4) Decrease in accidents in the port.
- (5) Contributions to regional development such as increased agricultural production.

Of these benefits, it is difficult to deal with (3)–(5) quantitatively. Accordingly (1) and (2) are to be analyzed quantitatively.

4. Evaluation

Assuming the project life of 25 years from 1981 to 2005 based on the above costs and benefits, its analysis will show an internal rate of return of 13.4%. Therefore, this project of developing the port as an infrastructure in socio-economic activities is considered to be feasible.

IX Financial Analysis

(1) The following shows revenue and expenditure in case the total fund required for the development is financed through overseas sources (conditions of loan: 3% p.a., the loan repayable after 10 yrs, to be fully paid in 30 yrs. the term of loan: 40 yrs.)

New investments have not achieved a commercial basis until 1985, but the earning position of overall the Port of Balikpapan including the new facilities is good. However, the port tariff shown in the following two tables remain unchanged.

Table S-13 Statement of Revenue and Expenditure from New Investments

		(Million RP.)			
Items \ Year	1983	1985	1991~1995	2001~2005	
Operating Revenue	270	1,004	5,020	5,020	
Operating Expenditure	122	349	1,745	1,745	
Operating Profit	148	655	3,275	3,275	
Depreciation	33	246	1,230	1,230	
Interest on Loan	278	392	1,763	1,110	
Profit	▲ 163	4	70	231	

Table S-14 Statement of Revenue and Expenditure of Overall Balikpapan Port
(new facilities and existing facilities)

		(Million RP.)				
Items \ Year	1977	1980	1985	1991~1995	2001~2005	
Operating Revenue	660	1,270	2,292	11,460	11,460	
Profit after depreciation and interest	175	528	595	3,171	3,824	
Net Profit after Tax and National Development Fund	(43)	130	147	783	944	
Accumulated Net Profit from 1980	—	130	691	2,209	4,017	
Loan Repayment	—	—	—	2,175	2,175	
Balance of Long Term Loan	—	—	13,055	10,880	6,530	

(2) The financial rate of return (F.R.R.) on the port revenue and investment are as follows.

Table S-15 F.R.R. by Case

	Item of Case	F.R.R.
I.	New investment facilities when 40% the development fund is covered by National Development Fund	10%
II.	Overall Balikpapan Port (new investment facilities and existing facilities) when 40% of the development fund is covered by National Development Fund	26%
III.	Overall Balikpapan Port when 100% of the development fund is financed by overseas loans.	9%

The F.R.R. of 10% is considered to be appropriate for new investments from the viewpoint of investment in the infrastructure without raising port tariff, when 40% of the development fund is covered by National Development Fund.

(3) The fixed rates for the Overall Balikpapan Port are analyzed as follows. It presupposes the financing of 100% development fund by overseas loans (loan conditions as per clause 1 above) without raising port tariff. In case 40% of the development fund for new investments is covered by National Development Fund, the following fixed rates will be further increased.

From the following fixed rates, soundness and viability of financial condition of the port can be fully confirmed.

Table S-16 Financial Fixed Ratio

Items of fixed rates	Annual average from 1991 to 1995
Working Ratio	41 %
Operating Ratio	57 %
Return on Net Fixed Assets	8 %
Interest Earned Ratio	280 %
Debt Service Coverage	171 %

Conclusion and Recommendation

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

CONCLUSION AND RECOMMENDATION

I. Conclusion

This project aims, through construction of a deep water port permitting call of foreign trade liners in East Kalimantan, to reserve a place of transit for increasing commodities and thus contribute to regional development of East Kalimantan.

Study was made of the existing ports in East Kalimantan for expansion and improvement into a deep water port. As the result, the Port of Balikpapan is found to be the best from the natural as well as socioeconomic conditions.

Formulation of the development project of the Port of Balikpapan was made in the order of first determining a long term plan for port expansion with the year of 2000 as a target and then establishing a short term plan with 1985 as a target year.

As the result, it is found that it will be possible to develop a port corresponding with the demand in 2000 on the site adjacent to the existing public berth.

The short term plan answering to the demand in 1985 is to develop the facilities concerned mainly with 2 berths for large ocean-going vessels with a total construction cost of 20.9 millions US dollars (12.2 million US dollars in foreign currency and 8.7 million US dollars in local currency), and this is found to be feasible technically as well as economically. The reasons are set forth in the following.

Balikpapan Bay has a sufficient water depth for receiving large vessels and a calm surface and is thus usable as a natural good harbor. Further the ground along the shoreline of the site adjacent to the existing public berth or the site of port development project is good enough to permit construction of the port facilities with ease. It is also easy to arrange the port land by reclamation or levelling the ground. Accordingly, from the technical point of view, it is feasible to develop and improve the Port of Balikpapan into a deep water port.

According to the result of economical analysis, if the direct benefits such as saving of freight and cargo handling cost only are taken into account, the internal rate of return is as high as 13.4% so that this project intended for development of the port as an infrastructure is considered to be feasible. In addition to such direct benefits, the project will have favorable effects on promotion of regional industries and development of cities.

From the result of the financial analysis, the financial healthiness of the port is ensured with the current rates of port tariff kept as they are when the new investment is made, and thus the financial viability is fully observed.

The Financial Rate of Return in the financial analysis of the new investment is given as 10% without raising the port fees and charges, provided 40% of the development fund accommodated from National Development Fund. Calculating the Financial Rate of Return in the financial analysis of the Port of Balikpapan as a whole or for both new investment and existing facilities, it is given as 26%.

II. Recommendation

The following recommendation lists the matters noted in the study for smooth and effective execution of the development of facilities or administration and operation of the Port of Balikpapan.

(1) Method of raising fund for achievement of the project, and the time of initiation

The expense of the project of developing 2 berths and other related facilities designed for large ocean-going vessels up to 1985 is about 21 millions US dollars. If its about 60% is accommodated by a low interest loan from overseas and the remaining about 40% by National Development Fund, the project has its financial soundness maintained. Accordingly, if it is scheduled to start the servicing of the facilities in 1985 to comply with the demand at that time, the arrangements should immediately be made for raising the required fund.

(2) Resolution of the temporary use of the berth owned by PERTAMINA

At present, the public general cargo handling volume is in excess of the capacity of the public berth owned by ADPEL. Consequently, part of the cargo is unloaded through temporary use of the berth owned by PERTAMINA. Such irregular port operation must be corrected.

(3) Improvement of the cargo handling operation

The present cargo handling volume per unit length (through-put) of the public berth in the Port of Balikpapan is of such a low value as 495 tons/meter. Then, in order to cope with the increasing cargo volume on one hand and realize the matter stated in (2) above on the other, it is required to take measures as described below for improvement of cargo handling capacity.

1) By participating in cargo handling service now carried out by UKA, the ADPEL's direction and supervision over the whole of cargo handling service should be strengthened.

2) Presently, the principal neck in cargo operation service is considered to be in the stevedoring. Thus, the number of workers per gang now fixed is to be made flexible depending on the kind of cargo, while efforts are to be exerted for effectuation of transport method.

3) Two shift system be introduced in cargo handling service.

(4) Employment of an administration system having emphasis placed on securing the revenue and improving the services.

For administration system corresponding to the increasing cargo volume and newly installed port facilities, the following measures are proposed from the point of view of placing importance on improvement of the revenue as well as services.

1) Increasing the personnel in the Operating Department for securing the revenue and improving the services (mainly pilot, boat crew, equipment maintenance, etc.).

2) Introduction of 24 hours service for pilotage and tugboat services, and corresponding provision of necessary materials and equipment and increase of personnel.

3) Securing personnel for ADPEL's direction and supervision upon introduction of the two shift system for cargo handling service, and provision of necessary materials and equipment.

4) Improving the staff of the Finance Division, and classification of the scope of administration (reinforcing the fee collecting and processing works and improvement of cost and budget controls with increasing port revenue).

5) The number of personnel of the Port of Balikpapan is not considered to be satisfactory at present. Then, a number of personnel (about 70 persons) should be employed in two years of 1980-1981 to cope with the increasing administrative load, with education and training exercised urgently.

(5) Establishment of observation system for winds and waves

Upon the available technical data, a technical analysis was conducted along the object of the study. But, it was not satisfactory in that the survey at the site was of short period on one hand and that the technical data used were by no means sufficient. Particularly, with respect to waves, there was no record of measurement available, while the records of winds used in estimation of the waves were shortcoming. Therefore, it is urgently required to form a system for observation of these phenomena at ADPEL's office and execute the observations.

(6) Effective use of the port area and securing of an efficient network of transportation to the service area

In the project, part of the port expansion land which is located along the shoreline such as the apron, shed area, open storage area, administrative area, etc., is designated as an area of direct control by ADPEL, and the remaining land is designated as port related service area, and is excluded from the area of direct control by ADPEL. However, for effective use of this port related service area, ADPEL should hold the right concerning approval of the use.

Further, according to the project, some roads are drastically developed while new roads are constructed around the port to separate the port traffic from the general traffic in 2000. This

should be carried out thorough consultation with the governmental agencies and municipal authorities administering the land transportation.

(7) Providing an opportunity of consultation with the organizations concerned for port development

As stated in (6) above, the port development involves many problems requiring consultation with the local organizations concerned. Therefore, it is particularly important to have an opportunity to hear frank opinions of, and make discussion with, the responsible persons of the provincial government and local development organizations concerning the port development. As a specific measure for such purpose, it is pertinent to provide a standing committee formed by the chiefs of the local offices of the central government agencies concerned with the development and professors and other men of knowledge and experience, including the Governor and Mayor, and also a development liaison conference by participation of the personnel engaged actually in the development works in the organizations assuming the the development to have meetings regularly.

(8) Securing the Tg. Makasar area as a port site in the future

The facilities accommodating the demands to the Port of Balikpapan up to 2000 can be met by the land adjacent to the existing public wharf. But, the land for further expansion is not available here and must be secured at other point. As a promising site, the Tg. Makasar area is preferable from the technical point of view. This area is not at all used presently and is adapted for land use allowing the port functions to be exhibited fully. At present, there is no road connecting this area with Balikpapan City, but the area is only about 13km to the existing modern highway between Balikpapan and Samarinda.

(9) Reviewing Forecasts of Future Demand against Actual Values

The forecasts of future demand in this study report are based on data obtained at the time of the field survey conducted in February 1979. Among these forecasted value, there may be some which has already proved to be different from the actual values. Therefore, it is better to review, with respect to the important numerical values, the forecast values against the actual values and correct them, as required, prior to execution of the project.

(10) Change of Seabed after Expansion and Development

The long term development plan at Site 2 is laid down upon the present sea and bottom conditions. That is, it is intended to maintain the natural condition of equilibrium so far as practicable.

From the intensities of the tidal current in the direction of the planned face line of the pier and the longshore current in the direction of shore and also the deposition near the access channel, there is little possibility of deposition produced in the water area in front of the pier.

Further, estimation of the quantity of deposition is scarcely practicable due partly to complexity of the marine phenomena but mainly to the area of reclamation at Site 2 being too small when taken against the area of the Balikpapan Bay.

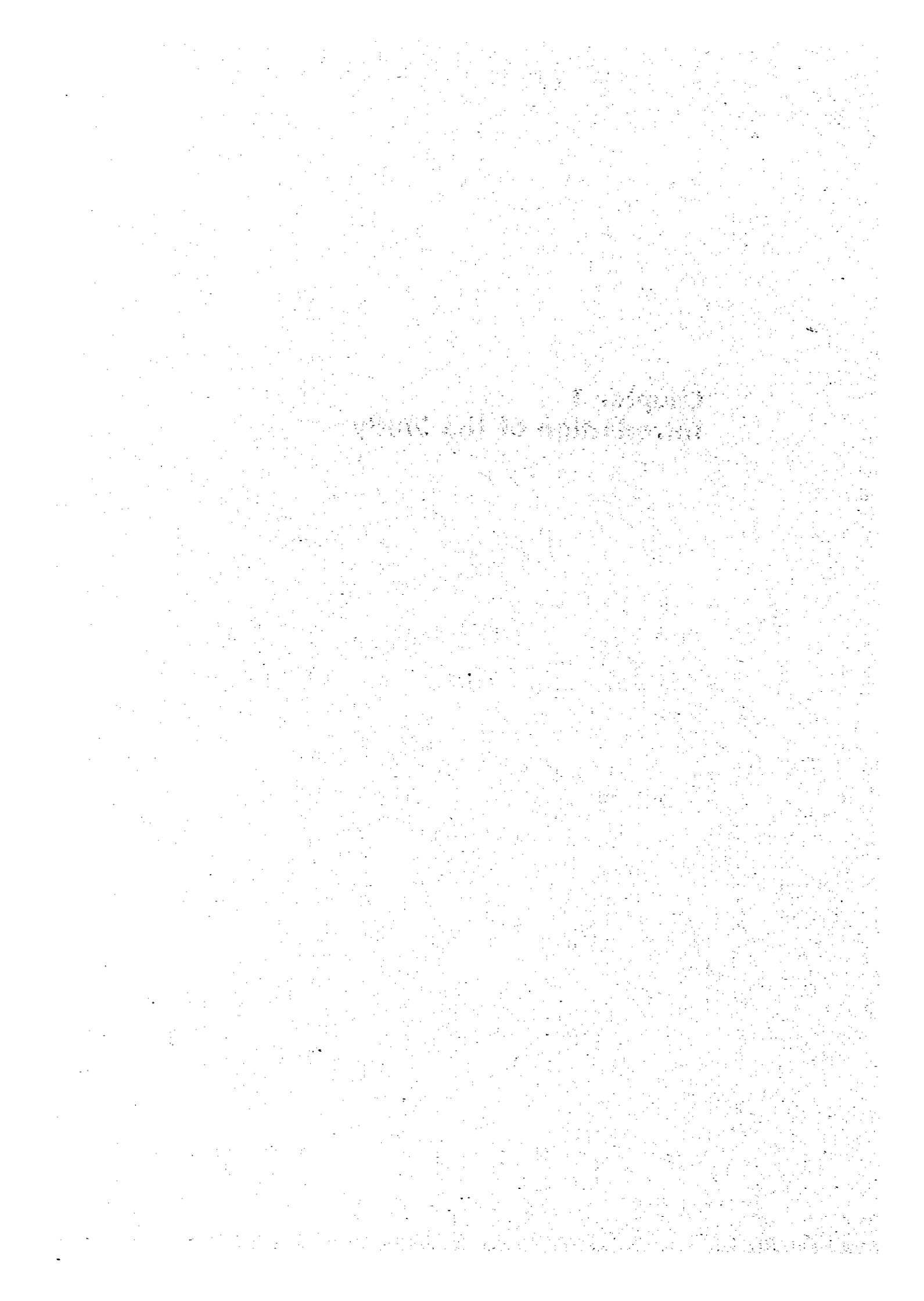
However, there is a report of considerably intensive deposition occurring in the area of sailing boat jetty in Kampung Baru which is located in a recess at the central part of the Balikpapan Bay. For this, it will be required to grasp the actual deposition upon comparison with the past survey charts and execute maintenance dredging as required.

It is to be noted here that should the port be expanded further hereafter, it would be required to make a more detailed survey and have countermeasures set up.

Anyway, it is not rare that the problem of deposition or scouring is occurring after construction of port facilities. Therefore, such problem should be looked into not as one concerned with any particular port but as one concerned with all ports of Indonesia so that effective countermeasures would be developed.

Chapter 1

Introduction of the Study



CHAPTER 1 INTRODUCTION OF THE STUDY

In response to the request of the Government of the Republic of Indonesia, the Government of Japan decided to undertake a necessary study for master planning and development program of the Port of Balikpapan as a part of its technical cooperation program.

This study aimed at formulating a master plan of the Port of Balikpapan to promote the significant growth of regional economy, mainly in East Kalimantan, and to cover the increasing demand on sea traffic through the Port, and also preparing an improvement programme of the Port for the period to 1985 including its feasibility study.

The Final Report on the study will be completed after about one month site survey, two meetings with Sea Communications, the Government of the Republic of Indonesia, on its Masterplan of Interim Report and Improvement programme of Draft final report at Jakarta.

1-1 Background of the Study

Ports are contributing greatly to the economic development in the Republic of Indonesia with archipelagos and they have been improved steadily under the 1st and 2nd Five-year National Development Programs because of their importance. Therefore, under the 3rd Five-year Program commencing this year, the port improvement project is being formulated in response to the recent trend in shipping.

On the other hand, various development projects are being carried out in various parts of Indonesia according to the characteristics of each region, though the extent of the development no doubt varies from region to region.

It is reported that because of a regional development program centering around agriculture which has been energetically carried out in East Kalimantan, the volume of cargo handled at Balikpapan is now increasing greatly. In view of such circumstances, it is now necessary to study the possibility of developing the Port of Balikpapan as the base for regional development and also as a deep sea port playing the role of the trading port for the region. Further, it is necessary to formulate long-term development at the present juncture and to plan and assess improvement work to be carried out by 1985.

The Indonesian Government made a request for the implementation of this study to the IGGI Conference. As a result, the Japanese Government has been requested to carry out the study as a part of technical assistance. Accordingly, a Japanese technical cooperation mission was sent to Indonesia last year, and the Japanese Government officially agreed to carry out the study. Following the presentation of the Terms of Reference by the Indonesian Government to the Japanese Government, the Japanese Preliminary Survey Team was sent to Indonesia at the end of last year to conduct field inspection and make necessary adjustment for the implementation of the study, discussing at the same time the Scope of Work.

In accordance with the Scope of Work signed by the two countries, the Japan International Cooperation Agency organized a Study Team of 6 experts and made it do the full scale site survey for about forty days from the 1st day of last February. Based on the available information and data, the Study Team made an interim report of Masterplan and discussed on it with Sea Communications in last May. Further, Study Team made a draft final report of Masterplan and feasibility study and discussed on it with Sea Communications in last September. Now, the final report on this whole study is submitted to the Government of the Republic of Indonesia.

1-2 Items and Method of the Study

This study consisted of the following two phases:

(1) Phase I

Published reports were reviewed to examine natural condition, social and economic situation of the port concerned and the influence zone, and a long-term forecast for the cargo volume were made. The following items were then studied to formulate a comprehensive master plan; present capacity of the port, industry and the labor force relating to the port, economic structure of the hinterland, selection of the port construction site, layout of the port facilities, access roads, management and operation of the port, project relating to the hinterland, conservation of environment.

(2) Phase II

Based on the basic concept above, the following items were studied and the short-term plan of the port has being prepared;
short term estimate of cargo volume handled by the port, port facilities, cargo handling and storage at the port, dredging and land reclamation, utilities, preliminary design of port facilities, rough cost estimation and implementation program, economic and financial analyses, improvement of existing facilities, alternative plants.

In order to conduct the above study, the followings were carried out in the Republic of Indonesia for a about 40 days.

(1) Field Survey

Field survey was carried out at the sites for the items as described below.

(i) Sites

- 1) Port of Balikpapan
- 2) Area served and/or to be served by the Port of Balikpapan
- 3) Ports related to the project
 - Port of Samarinda
 - Port of Ujunpandang
 - Port of Banjarmasin
 - Port of Surabaya
 - Port of Tg. Priok
 - Port of Sunda Kelapa

(ii) Items

- 1) Survey on natural conditions in and around the Port of Balikpapan
 - a) Sounding of water depth (Technical Advice)
 - b) Current observation (Technical Advice)
 - c) Boring and Standard penetration test (Technical Advice)
- 2) Survey on social and economic conditions on the area served and/or to be served by the Port of Balikpapan
 - a) Cities, towns and villages
 - b) Transports
 - c) Industries
- 3) Observation on the facilities and their utilization in the Port of Balikpapan and in other ports related to the Project.

(2) Interviews

(i) Central Government Authorities

- 1) Department of Communications and Tourism
- 2) Directorate General of Sea Communications
- 3) Department of Industry
- 4) Department of Agriculture
- 5) Bureau of Statistics

(ii) Local Government Authorities

- 1) East Kalimantan Province

- 2) BAPPEDA of East Kalimantan
- 3) City of Balikpapan
- (iii) ADPEL
Ports of Balikpapan, Samarinda, Banjarmasin, Ujunpandang, Surabaya, Tg. Priok and Sunda Kelapa
- (iv) KANWIL
Banjarmasin
- (v) Gajar Mada University (Yogyakarta)
- (vi) Other authorities concerned to the project
- (3) Data collection
 - (i) Port Data
 - 1) Port operations/Facilities
 - 2) Financial
 - 3) Cost Analysis
 - 4) Traffic Analysis (Ship and Cargo movements)
 - 5) Organization, systems and procedures
 - 6) Labour/Manpower
 - 7) Regulations
 - 8) Others
 - (ii) Transportation Network
 - 1) Road
 - 2) Inland waterway
 - (iii) Macro-social/economics
 - 1) Population growth including transmigration
 - 2) Production (GDP/GRDP)
 - 3) Consumption per capita
 - 4) Import and Export
 - 5) Local trade
 - 6) Industrial development
 - 7) Regional planning
 - 8) Others
 - (iv) Port Engineering Data
 - 1) Meteorological conditions
 - 2) Topographical conditions
 - 3) Soil conditions
 - 4) Hydrological conditions
 - 5) Seismic conditions

1-3 Organization of the Study

(1) Project Team for study in Japan

The Project Team for study in Japan was organized by nine (9) professionals covering the following fields;

- 1) Project Management
- 2) Port Administration
- 3) Regional Economic
- 4) Economic Analysis
- 5) Financial Analysis
- 6) Port Planning

- 7) Design of Port Facilities and Cost Estimation
 - 8) Natural Condition Study
 - 9) Urban Planning
- (2) Japanese Full Scale Survey Team in the Republic of Indonesia
- The above Japanese Survey Team was consisting of the following professionals;
- 1) Katsuhiko Suzunai (Team Head)
Port Administration
Director of Engineering, The Overseas Coastal Area Development Institute of Japan (OCDI)
 - 2) Yasuo Okada (Deputy Team Head)
Regional Economic
Deputy Director of Engineering, The Overseas Coastal Area Development Institute of Japan (OCDI)
 - 3) Kozo Tanaka
Port Operation & Financial Analysis
Senior Economist-Financial Analysis, The Overseas Coastal Area Development Institute of Japan (OCDI)
 - 4) Sosuke Hitachi
Port Planning & Urban Planning
Senior Port Planner, The Overseas Coastal Area Development Institute of Japan (OCDI)
 - 5) Akira Irie
Design & Construction
Senior Structure Engineer, The Overseas Coastal Area Development Institute of Japan (OCDI)
 - 6) Kouki Zen
Natural Conditions
Senior Soil Engineer, The Overseas Coastal Area Development Institute of Japan (OCDI)
- (3) Counterpart team of the Republic of Indonesia
- The Indonesian Counterpart Team was consisting of the following experts;
- (i) Sea Communications in Jakarta:
 - 1) Soedjanadi (Team Leader, Economist)
 - 2) Tjipto Tri Hannyanto (Economist)
 - 3) Ajiph Razifwan Anwar (Civil Engineer)
 - 4) Wahyono Bimarso (Civil Engineer)
 - 5) Supardi Inam (Economist)
 - 6) Prastowo (Special Coordinator)
 - (ii) ADPEL of Balikpapan:
 - 1) Ijas Sudikto (Port Administrator)
 - 2) Ali Syahbana (ex-Secretary)
 - 3) A. Kadir Jaelani (Secretary)
 - 4) Legimin S. (Chief of Technical Division)
 - 5) Sutjipto (Chief of Service Division)
 - 6) Umar Pabottinggi (Chief of Financial Division)
 - 7) Uhen Hermana (Chief of Traffic Section)
 - 8) Abner Simandjuntak (Special Coordinator)

Chapter 2

Present Situation in East Kalimantan

CHAPTER 2 PRESENT SITUATION IN EAST KALIMANTAN

2-1 Present State of Area and Population

The province of East Kalimantan is situated on the west side of the Straits of Makasar between 3°S. Lat. and 5°N. Lat. It has an area of 202,000km², 10.6% of the total national land area, next largest to Irian Jaya.

The population in 1975 was 885,000 or only 0.7% of the national population. However, the average rate of population growth from 1971 to 1976 was as high as 5.6% (cf. the national average rate of population growth from 1961 to 1975 was 2.2%).

Such a high population growth rate in East Kalimantan is largely attributable to a mass of transmigrants (the rate of transmigration is in excess of the goal set by government transmigration policy, one of the important policies of the Indonesian government.), who number as many as 200,000, 61% of the population growth of 327,000 from 1970 to 1977.

Jurisdictions of East Kalimantan comprise two Kotamadyas (Samarinda and Balikpapan) and four Kabupatens (Bulungan, Berau, Kutai and Pasir from north to south). One Kabupaten is divided into some sub-jurisdictions called Kecamatan. The local government of the province is located in Samarinda.

With regard to the distribution of the population in these jurisdictions, the population is dense in the southern part of the province, especially with 185,000 in Samarinda and 219,000 in Balikpapan, the total of which shares 42% of the total population of the province.

East Kalimantan has an area of 202,000 km² sharing 10.6% of the whole area of national land and is thus a province having the largest area except Irian Jaya (Table 2-1).

The population in 1975 was 885,000 or only 0.7% of the national population. The population density was thus 4.4 persons/km², representing a scarcely populated province second to Irian Jaya at 2.4 persons/km², and, from the national average of 67.0 persons/km², was only about one-fifteenth (Table 2-1).

Now looking at the growth of population of East Kalimantan, there was an increase of from 730,000 to 960,000 or 1.31 times in 5 years from 1971 to 1976, annual average rate of increase during this period corresponding to 5.6% (Table 2-2).

On the other hand, when the growth of population of the whole country of Indonesia from 1961 to 1975 is checked, Java and Madura are at 2.0% in annual average growth rate, and Outer Java at 2.5%, thus East Kalimantan giving a far higher growth rate (Table 2-3).

Such a high growth rate of population of East Kalimantan is attributable to a mass of transmigrants. While the population increase from 1970 to 1977 was 327,000, natural increase accounts for only 127,000 or 39%, the remaining 200,000 or 61% being ascribed to transmigrants.

The population increase due to transmigration was comprised of 20,000 persons by regular 1977 was calculated as 2.5% average per year.

From the foregoing, the rate of natural increase in East Kalimantan during the period from 1970 to 1977 was calculated as 2.5% average per year.

Jurisdictions of East Kalimantan are comprised of four Kabupatens and two Kotamadyas, viz. Kabupatens Bulungan, Berau, Kutai and Pasir in the order of location from the north and Kotamadyas Samarinda and Balikpapan situated adjacently near the border of Kabupatens Kutai and Pasir and facing the sea, Kotamadya Samarinda being the capital of the province.

Seeing the distribution of the population in the province for these administrative sections, Samarinda has a population of 185,000 and Balikpapan a population of 219,000, totalling to 404,000. That is, 42% of the whole population of the province is concentrated in this urban area so that the population density in the other areas is as low as 2.7 persons/km² average which is approximately equal to that of Irian Jaya (2.4 persons/km² in 1975). For the population by

Table 2-1 Population and Its Density by Province, Indonesia, 1975

Province	Area (Km ²)	Population	Population Density (/Km ²)
1. D.I. Aceh	55,392	2,255,357	40.7
2. North Sumatra	70,787	7,204,421	101.8
3. West Sumatra	49,778	3,006,548	60.4
4. Riau	94,562	1,788,660	18.9
5. Jambi	44,924	1,131,301	25.2
6. South Sumatra	103,688	3,903,892	37.7
7. Bengkulu	21,168	597,897	28.2
8. Lampung	33,307	3,308,833	99.3
9. D.K.I. Jakarta	588	4,810,531	8,181.2
10. West Java	45,917	22,770,018	495.9
11. Middle Java	32,037	23,183,592	723.7
12. Yogyakarta	3,193	2,608,330	816.9
13. East Java	47,922	26,556,854	554.2
14. Bali	5,561	2,233,474	401.6
15. West Nusatenggara	20,177	2,373,214	117.6
16. East Nusatenggara	47,876	2,484,408	51.9
17. West Kalimantan	146,760	2,238,344	15.3
18. Middle Kalimantan	152,600	801,914	5.3
19. South Kalimantan	37,660	1,843,863	49.0
20. East Kalimantan	202,440*	885,402	4.4
21. North Sulawesi	19,023	1,868,922	98.2
22. Middle Sulawesi	69,726	1,023,844	14.7
23. South Sulawesi	72,761	5,601,269	77.0
24. South East Sulawesi	27,686	769,683	27.8
25. Maluku	74,505	1,251,192	16.8
26. Irian Jaya	421,981	1,025,331	2.4
INDONESIA	1,902,019	127,527,094	67.0

Source: Statistical Yearbook of Indonesia, 1976

Note: *— This figure is different from the figure in the Table 2-2. This matter depends on the source.

Table 2-2 Population Growth and Density of East Kalimantan

Kotamadya/Kabupaten Kecamatan	Area (Km ²)	Population Growth			Annual Growth Rate (%)	Population Density (1976)
		(1971)	(1976)	(1976)/(1971)		
I. KOTAMADYA SAMARINDA	2,727	137,521	185,366	1.35	6.2	68.0
II. KOTAMADYA BALIKPAPAN	946	137,340	218,806	1.59	9.7	231.3
III. KABUPATEN BULUNGAN	64,000	119,199	146,669	1.23	4.2	2.3
1. Kayan Hulu	2,700	7,689	5,527	0.70	-	2.0
2. Kayan Hilir	8,800	3,997	3,834	0.96	-	0.4
3. Leong Pujungan	8,400	4,276	3,674	0.86	-	0.4
4. Leong Pesu	3,750	4,876	5,464	1.12	2.3	1.5
5. Tanjung Palas	7,430	17,854	24,930	1.40	7.0	3.4
6. Tarakan	4,875	31,118	41,584	1.34	6.0	8.5
7. Nunukan	5,150	11,758	19,316	1.64	10.4	3.8
8. Sessayap	2,920	5,099	5,455	1.08	1.6	1.9
9. Mahau	6,525	14,130	16,289	1.15	2.8	2.5
10. Sembakung	2,720	5,222	5,275	1.01	0.2	1.9
11. Lunzis	3,600	4,578	5,030	1.10	1.9	1.4
12. Mentarang	3,200	1,853	1,810	0.98	-	0.6
13. Krayan	3,930	6,549	8,711	1.33	5.9	2.2
IV. KABUPATEN BERAU	32,700	31,954	37,547	1.18	3.4	1.1
1. Tanjung Redeb	35	9,402	11,304	1.20	3.7	323.0
2. Gunung Tabur	2,570	4,954	5,588	1.13	2.5	2.2
3. Sembakung	2,835	4,042	5,168	1.28	5.1	1.8
4. Segah	2,600	842	1,370	1.63	10.3	0.5
5. TaS Sayan	9,150	6,642	8,147	1.23	4.2	0.9
6. Kelay	7,969	1,623	1,786	1.10	1.9	0.2
7. Pulau Derawan	7,550	4,449	4,184	0.94	-	0.6
V. KABUPATEN KUTAI	90,937	250,492	307,437	1.23	4.2	3.4
1. Tenggazong	926	15,081	22,759	1.51	8.6	24.6
2. Loa Kulu	1,310	12,336	13,537	1.10	1.9	10.3
3. Loa Janan	952	9,143	15,894	1.74	11.7	16.7
4. Sebelu	1,044	6,092	9,001	1.48	8.2	8.6
5. Muara Kaman	2,679	9,973	10,379	1.04	0.8	3.9
6. Muara Pahu	2,566	17,958	10,799	0.60	-	4.2
7. Muara Mantai	505	10,770	11,981	1.11	2.1	23.7
8. Muara Wahau	7,770	4,825	6,908	1.43	7.4	0.9
9. Muari Abalcong	5,126	10,664	12,434	1.14	2.7	2.4
10. Muara Bengkal	2,925	7,631	8,725	1.14	2.7	3.0
11. Jampang	994	6,098	6,946	1.14	2.7	7.0
12. Leong Irian	5,587	11,776	15,560	1.32	5.7	2.8
13. Melak	916	10,722	11,725	1.09	1.7	12.8
14. Boegan	2,245	5,083	5,139	1.01	0.2	2.3
15. Payinggahan	124	2,965	3,150	1.06	1.2	23.4
16. Muara Lawa	996	2,893	5,412	1.87	13.3	5.4
17. Keuchan	783	6,278	7,003	1.12	2.3	8.9
18. Kembang Janggut	2,042	7,200	7,615	1.06	1.2	3.7
19. Barong Tegek	835	7,919	13,568	1.71	11.3	16.2
20. Tobang	7,150	3,952	4,661	1.18	3.4	0.7
21. Leong Pahangai	3,718	4,592	4,244	0.92	-	1.1
22. Sangkulirang	7,509	8,769	15,554	1.77	12.1	2.1
23. Leong Begun	11,748	3,617	3,590	0.99	-	0.3
24. Anggana	505	11,947	15,647	1.31	5.6	31.0
25. Bontang	7,905	10,447	21,036	2.01	15.0	2.7
26. Muara Badak	1,252	6,030	14,505	2.41	19.2	11.6
27. Kota Bangsa	2,273	15,656	17,058	1.08	1.6	7.5
28. Damai	2,434	7,753	7,956	1.03	0.6	3.3
29. Leong Agari	5,170	2,271	2,353	1.04	0.8	0.5
30. Beatus Besar	995	1,950	2,278	1.14	2.7	2.2
VI. KABUPATEN PASIR	20,049	57,192	64,436	1.13	2.5	3.2
1. Tanah Grogot	1,397	12,697	14,327	1.13	2.5	10.3
2. Kuro	1,700	5,308	5,225	0.98	-	3.1
3. Leong Ilis	1,838	5,075	5,741	1.13	2.5	3.1
4. Leong Kali	3,637	9,230	10,593	1.15	2.8	2.9
5. Waru	1,772	5,913	8,145	1.38	6.7	4.6
6. Batu Sogang	2,597	3,390	3,300	0.97	-	1.3
7. Muara Kocua	2,276	3,308	3,858	1.17	3.2	1.7
8. Pasir Belengkong	1,100	6,953	7,312	1.05	1.0	6.6
9. Tanjung Aru	3,723	5,318	5,935	1.12	2.3	1.6
GRAND TOTAL	211,350 ^a	733,698	960,461	1.31	5.6	4.5

Source: Data on East Kalimantan 1974/77

Note: a - This figure is different from the figure in the Table 2-1. This matter depends on the source.

Table 2-3 Population of Indonesia, (1961-1975)

(Unit: 1000 persons)

Year	Java and Madura	Outer Java	Indonesia
1961	63,226	34,161	97,387
1962	64,357	34,900	99,257
1963	65,534	35,687	101,221
1964	66,757	36,514	103,271
1965	68,028	37,386	105,414
1966	69,345	38,300	107,645
1967	70,708	39,256	109,964
1968	72,118	40,259	112,377
1969	73,575	41,305	114,880
1970	75,079	42,390	117,469
1971	76,629	43,520	120,149
1972	78,356	44,759	123,115
1973	80,077	46,011	126,088
1974	81,801	47,282	129,083
1975	83,534	48,576	132,110
1975/1961	1.32	1.42	1.36
Annual Growth Rate (%)	2.0	2.5	2.2

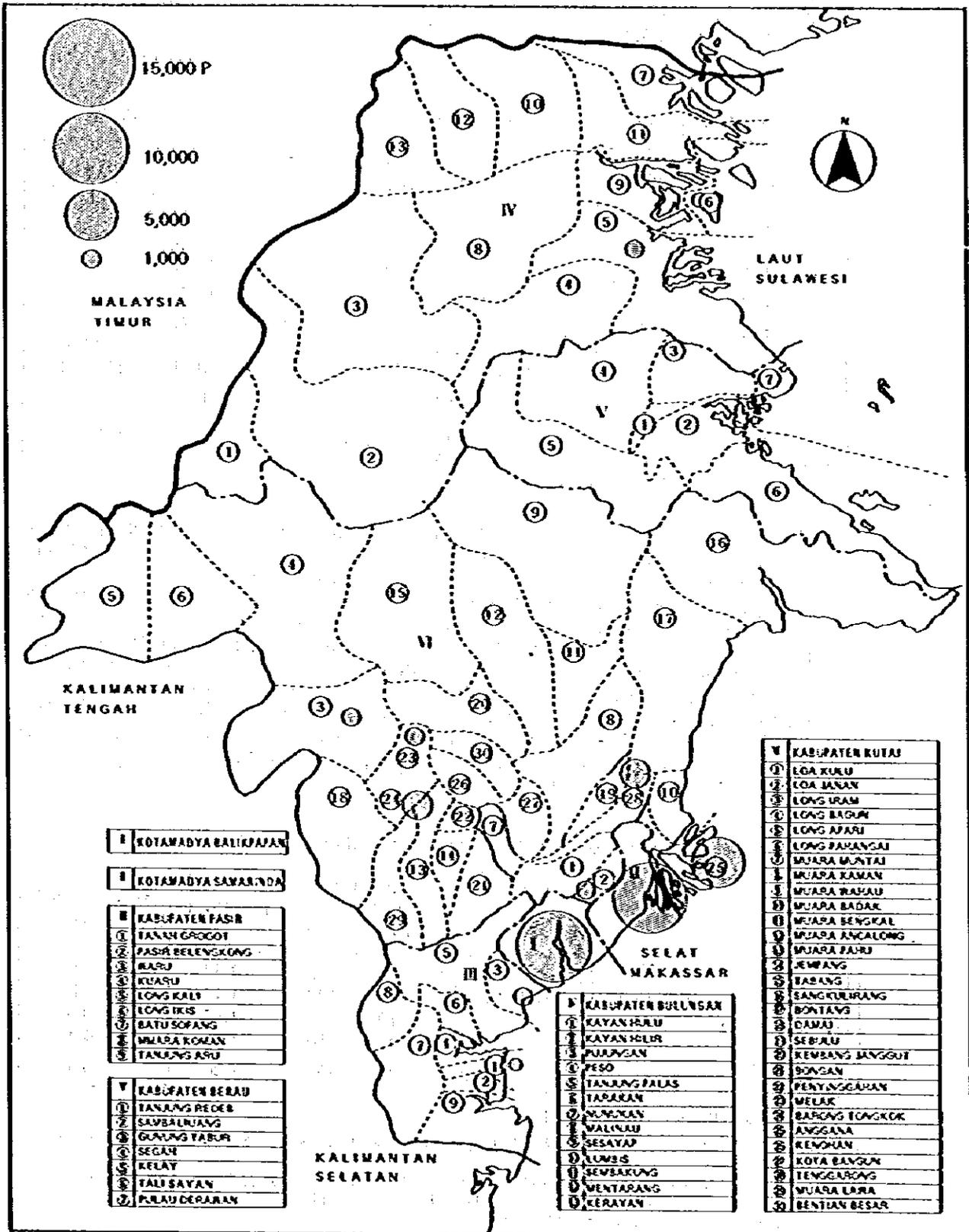
Source: Statistical Pocketbook, 1976

Table 2-4 Population Increase, East Kalimantan, 1970-1977

Year	Population	Population Increase				Grand Total
		Transmigration			Natural Increase	
		Regular	Spontaneous	Sub-total		
1970	681,466	653	46,825	47,478	15,204	62,682
1971	744,148	1,599	7,609	9,508	16,602	26,110
1972	770,258	3,354	15,494	18,848	17,184	36,032
1973	806,290	3,693	29,039	32,732	17,988	50,720
1974	857,010	2,608	10,468	13,076	19,120	32,196
1975	889,206	1,106	50,311	51,417	19,838	71,255
1976	960,461	6,811	19,868	26,679	21,428	48,107
1977	1,008,568					
TOTAL		20,124	179,614	199,738	127,364	327,102

Source: BAPPEDA, East Kalimantan

Fig. 2-1 Transmigrants Settled in East Kalimantan (1954-1978)



Kabupaten, about 307,000 persons corresponding to 55% of the population of 556,000 outside the urban area are living in Kabupaten Kutai which is extending over the central to southern part of the province. Thus, when the province is taken as a whole, the population is scarce in the mountainous northern part, while about 80% of the total population settles in the southern part where are around river basins (Table 2-5, Fig. 2-2).

Table 2-5 Population by Kabupaten/Kotamadya, East Kalimantan, 1976

Kabupaten/Kotamadya	Population in 1976 (x 1,000)		Area (x 1,000 Km ²)	
Bulungan	147	184 (19.2%)	64.0	96.7 (45.8%)
Berau	37		32.7	
Kutai	307	775 (80.8%)	91.0	114.6 (54.2%)
Samarinda	185		2.7	
Balikpapan	219	64	0.9	20.0
Pasir	64		20.0	
TOTAL	959	(100%)	211.3	(100%)

Source: Data on East Kalimantan 1976/77

Now seeing the characteristics of the distribution of population in reference to the geographic features of Kabupaten Kutai, they may be generally described below with respect to the Mahakam River in the basin of which settles the largest portion of the population in this area.

The area extending on the south side of the Mahakam River had the largest population settled in Kutai. But, since 1971, the population growth has been low, and in Kecamatan Muara Pahu, the population is decreasing sharply. On the other hand, the area in the north of the Mahakam River was smaller in the accumulation of population than the area on the south side of the river. But, since 1971, the growth has been great, and the population of transmigration is settling mainly in this northern area. Kecamatans Sangkulirang and Bontang situated along the coast are still small in the population but are recording a population increase over the northern area of the Mahakam river respectively. The inland area is very small both in the population and growth of population and is forming a most backward area (Tables 2-6 and 2-7).

Table 2-6 Population Increase in Kabupaten Kutai

Area	Population (x 1,000)		1976/1971	Annual Growth Rate (%)
	1971	1976		
(1) Area along northern bank of Mahakam River	68	93	1.37	6.5
(2) Area along southern bank of Mahakam River	111	127	1.14	2.7
(3) Coastal area	19	37	1.95	14.0
(4) Inland area	45	50	1.11	2.1
TOTAL	243	307	1.26	4.7

Source: Data on East Kalimantan 1976/77

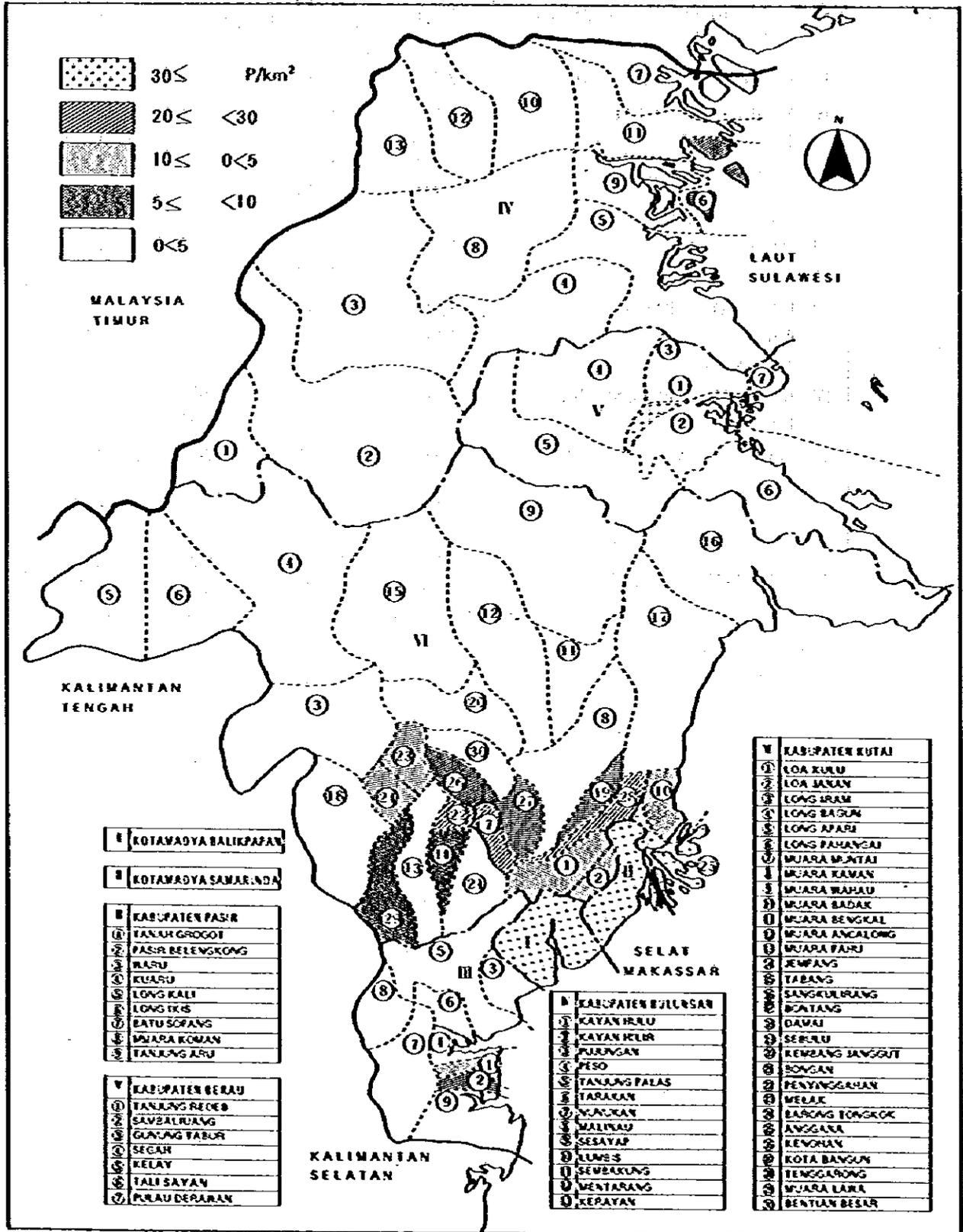
- Note: (1) Comprises Anggana, Muara Badak, Tenggarong, Sebuku, Muara Kaman, Bentan Besar, Kenohan and Melak.
 (2) Comprises Loa Janani, Loa Kulu, Kota Bangun, Muara Muntai, Penyinggahan, Bongon, Jempang, Muara Pahu, Barong Tegakok, Muara Lawa, Damai and Long Iram.
 (3) Comprises Sangkulirang and Bontang.
 (4) Comprises Muara Wahu, Muara Bengkal, Muara Ancalong, Tabang, Kembang Jaragut, Long Bagan, Long Pahangai and Long Apuri.

Table 2-7 Transmigrants Settled (East Kalimantan)

KODYA/KABUPATEN/KECAMATAN	1954~1968	PELITA-II 1969~1973	PELITA-III 1974~1978	TOTAL 1954~1978
I. KOTAMADYA SAMARINDA	3,915	5,584	1,373	10,872
II. KABUPATEN KUTAI	8,534	5,651	398	14,583
1. Loa Janan	986	502	—	1,488
2. Anggana	2,989	2,488	—	5,477
3. Long Iram	856	79	—	935
4. Barong Tongkok	2,267	—	—	2,267
5. Melak	1,436	—	—	1,436
6. Tenggarong	—	2,582	398	2,980
III. KABUPATEN PASIR	1,516	249	460	2,225
1. Waru	1,516	—	—	1,516
2. Tanah Grogot	—	249	460	709
IV. KABUPATEN BULUNGAN	—	425	481	906
Tanjung Paras	—	425	481	906
V. KOTAMADYA BALIKPAPAN	5,352	591	4,320	10,263
TOTAL	19,317	12,500	7,032	38,849
Average Annual Transmigration	19,317/15 = 1,288	12,600/5 = 2,500	7,032/5 = 1,406	38,849/25 = 1,554

Source: Data on East Kalimantan

Fig. 2-2 Population Density of East Kalimantan



2-2 Present Situation of Production

The main industries of East Kalimantan are forestry, oil mining, agriculture and fishery, with forestry and oil mining being of particular importance.

Per capita GRDP in East Kalimantan in 1976 was US\$589.6, which exceeded the national average. The contribution from forestry was US\$340.0, and petroleum (oil mining and refining) US\$124.50. Excepting these two industries, per capita GRDP in East Kalimantan in 1976 was only US\$125.0 (in 1973 value).

Forestry is conducted in productive forests of 129,000km², of a total of about 173,000km² of forest area which occupies 85% of the total area of East Kalimantan, producing about 9.2 million m³ logs in 1976. Of those logs, about 8.2 million m³ was being exported overseas as logs, and the rest was partly processed into sawn timber and plywood for consumption in the province as well as for those of other provinces. Logs are also being shipped to other provinces of the country.

In the oil sector, about 152 million barrels (about 24 million kl) of crude oil were produced in 1977, of which about 2 million kiloliters was refined in the refineries in Balikpapan for domestic consumption and the rest was exported in crude oil.

Table 2-8 shows output by commodity in agriculture, fishery and livestock in 1976. This output is primarily used for domestic consumption, but self-sufficiency of main staples is not being achieved.

Table 2-8 Output of Food Crops, Estate Crops, Fishery Products, Livestock Products, East Kalimantan in 1976

(Unit: 1,000 t)

Commodity	Food Crops						
	Wetland Paddy	Dryland Paddy	Maize	Cassava	Sweet Potatoes	Peanuts	Soybeans
Output	61.7	55.0	2.6	40.9	7.8	0.6	0.9
Commodity	Estate Crops					Fishery Production	
	Cloves	Coconut	Rubber	Pepper	Coffee	Sea Fishery	Inland-water Fishery
Output	0.01	7.8	0.5	0.6	0.7	35.9	22.5
Commodity	Livestock Products						
	Meat	Eggs	Milk				
Output	0.6*	1.0*	0.01*				

Source: Data on East Kalimantan, 1976/77

PELITA-II, East Kalimantan

Note: * Output in 1973

2-2-1 GRDP at Present

According to the data of the East Kalimantan government, the GRDP of the province in 1976 was US\$730.1 million at the 1973 value, of which petroleum shared US\$289.6 million, making GRDP other than petroleum US\$440.5 million (Table 2-9).

Table 2-10 shows the trend of per capita GRDP obtained by dividing the GRDP in Table 2-9 by population.

According to Table 2-10, the per capita GRDP of East Kalimantan in 1976 was US\$766.4 at the 1973 value, of which petroleum shared US\$301.4 and others US\$465.0.

Table 2-11 shows the trend of per capita GRDP in the whole of Indonesia. For 1976 it shows US\$145 to 166.

Table 2-9 GRDP in East Kalimantan at 1973 Constant Price

(Unit: Million US\$)

Sector \ Year	1971	1972	1973	1974	1975	1976
Oil Sector	31.1	28.3	111.7	149.5	186.7	289.6
Other Sector	228.2	276.8	354.4	337.4	386.7	446.8
Total	259.3	305.1	466.1	486.9	573.4	736.4

Source: Kecamatan Miskin Di Kalimantan Timur 1978/1979

Table 2-10 GRDP per capita in East Kalimantan at 1973 Constant Price

(Unit: US\$)

Sector \ Year	1971	1972	1973	1974	1975	1976
Oil Sector	42.4	36.7	138.9	174.4	210.0	301.4
Other Sector	310.9	359.0	440.8	393.7	435.5	465.0
Total	353.3	395.7	579.7	568.1	645.0	766.4

Table 2-11 GRDP per capita in Indonesia at 1973 Constant Price

(Unit: US\$)

Source \ Year	1971	1972	1973	1974	1975	1976
A	111	119	129	136	139	145
B	118	128	139	134	143	166

Source: A: Statistical Yearbook of Indonesia, 1976/77
 B: Strategic Variable in Indonesia by Mr. Smitro

As shown in Table 2-10 and 2-11, the per capita GRDP of East Kalimantan shows very high values compared with the national per capita GRDP. One reason is due to its very high value of GRDP in petroleum, and another is also due to its very high value in forestry (in Table 2-9 and 2-10, GRDP in forestry is included in other sectors).

From the foregoing, East Kalimantan, statistically speaking, seems very rich compared with the national average. Yet, judging from the standard of living of the inhabitants, it does not seem to be as much higher than the national average as the figures indicate. The reason may be attributed to the method of calculating GRDP connected with the production of crude oil. In this respect, the following needs to be considered.

The GDP value of crude oil production in East Kalimantan is not equivalent to total consumption value (or total expenditure value) or total distribution value in the province.

Thus, the total amount of consumption (or expenditure) or distribution, due to the production activity of crude oil and reduced directly to the economic activities in this area, is calculated as follows;

The amount obtainable by dividing the export price of crude oil throughout Indonesia by total population of Indonesia is taken as the export price per capita, which is presumed the actual GDP per capita of crude oil sector in Indonesia. And this GDP per capita of crude oil sector in Indonesia is considered to be equal to GRDP per capita of crude oil sector in East Kalimantan. Therefore, the value by multiplying the above export price per capita by total population of East Kalimantan is obtained as GRDP of a crude oil sector in this area.

This means that the whole nation of Indonesia receive equally the national (or domestic) income produced = national (or domestic) income expended = national (or domestic) income distributed accruing from crude oil production and, at the same time, that the whole inhabitants in East Kalimantan receive similar benefits equally in crude oil sector.

Thus, per capita GRDP and the GRDP from crude oil in East Kalimantan in 1976 were obtained as US\$12.3 and US\$11.8 million respectively at the 1973 value (Table 2-12).

Table 2-12 GRDP and GRDP per capita of Crude Oil Sector in East Kalimantan

Item	Year	1973	1976
(1) Export volume of crude oil in Indonesia (Thousand ton)		49,438	59,268
(2) Export amounts of crude oil in Indonesia (Million US\$)		1,383	5,652
(3) Population of Indonesia (Million Persons)		126	135
(4) = (2)/(3) GDP per capita of crude oil sector in Indonesia at current price (US\$)		11.0	41.8
(5) GDP per capita of crude oil sector in Indonesia at 1973 constant price (US\$)		11.0	12.3
(6) Population of East Kalimantan (Million persons)		0.80	0.96
(7) = (5) x (6) GRDP of crude oil sector in East Kalimantan at 1973 constant price (Million US\$)		8.8	11.8

Note: Derived from Statistical Yearbook of Indonesia, 1976/77 and the material of BAPPEDA, East Kalimantan

Also, the GRDP and per capita GRDP from petroleum refining in 1976 were calculated from the amount of refining in the refineries at Balikpapan as US\$107.8 million and US\$112.2 respectively (in the 1973 value).

Therefore, the GRDP and per capita GRDP for petroleum in 1976 are adjusted by adding crude oil production to refinery production as follows: GRDP = 11.8 + 107.8 = 119.6 million dollars; per capita GRDP = 12.3 + 112.2 = 124.5 dollars. (both at the 1973 value)

Next, the 1976 GRDP and per capita GRDP of other sectors than petroleum are studied.

The most recent data for GRDP and per capita GRDP for other sectors than petroleum in East Kalimantan in 1976 is only available for 1971. (Table 2-13).

The GRDP and per capita GRDP of other sectors than petroleum in East Kalimantan in 1976 were calculated for each sector as follows.

First, the GRDP is calculated by multiplying outputs by price in agriculture, forestry and timber processing sectors where outputs are obtained. In other sectors, each GRDP is calculated by using the percentage of GRDP for each sector in 1971 in Table 2-13 and its total comes to US\$446.8, or the GRDP of other sectors than petroleum in 1976 as shown in Table 2-9. The results are shown in Table 2-14 together with GRDP in petroleum.

The per capita GRDP for each sector in 1976 as shown in Table 2-15 is obtained by dividing the GRDP of each sector in Table 2-14 with the population.

As shown in Table 2-15, the per capita GRDP in East Kalimantan in 1976, after adjusting for petroleum sector, is US\$589.5, of which forestry shares 57.7%, or US\$340.0, and petroleum 21.1%, or US\$124.5. Excluding these two sectors, the per capita GRDP is only US\$125.0 (at the 1973 value).

Table 2-13 GRDP by Sectors in East Kalimantan at 1969 Constant Price

(Unit: Million US\$)

Sector	Year	1969		1970		1971	
			%		%		%
Forestry		22.9	39	50.8	54	65.3	55
Agriculture, Fishery & Animal		14.5	25	12.4	13	12.9	11
Mining		1.5	3	1.6	2	1.5	1
Manufacturing Industry		1.1	2	1.4	1	1.8	2
Construction		1.8	3	1.8	2	2.6	2
Transport & Communication		1.3	2	1.8	2	2.6	2
Others		15.5	26	24.8	26	32.8	27
Total (Excluding oil sector)		58.6	100	94.6	100	119.5	100

Source: Data on East Kalimantan 1976/77

Table 2-14 GRDP by Sector in East Kalimantan at 1973 Constant Price

(Unit: Million US\$)

Sector	Year	1976	
			%
Agriculture		28.9	5.1
Industry	General	3.8	0.7
	Timber Processing	5.3	0.9
	Fertilizer	—	—
Construction		5.6	1.0
Transport and Communication		5.6	1.0
Miscellaneous		70.9	12.5
Sub-total		120.1	21.2
Forestry		326.7	57.7
Mining	Crude oil	11.8	2.1
	Petroleum refining	107.8	19.0
	Natural gas	—	—
	Coal	—	—
Sub-total		446.3	78.8
Total		566.4	100.0

Table 2-15 GRDP per capita by Sector in East Kalimantan at 1973 Constant Price

(Unit: US\$)

Sector	Year	1976	
			%
Agriculture		30.1	5.1
Industry	General	4.0	0.7
	Timber Processing	5.5	0.9
	Fertilizer	-	-
Construction		5.8	1.0
Transport and Communication		5.8	1.0
Miscellaneous		73.8	12.5
Sub-total		125.0	21.2
Forestry		340.0	57.7
Mining	Crude oil	12.3	2.1
	Petroleum refining	112.2	19.0
	Natural gas	-	-
	Coal	-	-
Sub-total		464.5	78.8
Total		589.5	100.0

2-2-2 Farm Agriculture at Present

(1) Wetland Paddy

The total output of wetland paddy throughout the nation was 28,300,000 tons in 1976, and the annual growth rate averaged 3.1% from 1971 to 1976. The principal production areas were Jawa and Madura, sharing 62% of the gross national output, but their annual growth rate in 1971 to 1976 was 2.4%, lower than that of the nation.

The output of Kalimantan Region in 1976 was 1,260,000 tons with an excessively low share of 4.4% in the gross national output, but the annual average growth rate stood at 6.8% in 1971 to 1976, the highest provincial rate for the nation. (Table 2-16).

On the other hand, the output of the Province of East Kalimantan stood at 62,000 tons with an excessively low share of 4.9% in the total output of Kalimantan, but the annual average growth rate was high with 7.2%, suggesting that this area has great development potentialities. (Table 2-17).

A check of the distribution of outputs in the Province of East Kalimantan indicates, as shown in Fig. 2-3, that the outputs are concentrated in the cities (Kotamadyas) of Samarinda and Balikpapan, the estuary of the Mahakam River in the county of Kutai (Kabupaten Kutai) and its basin, and the county of Pasir (Kabupaten Pasir), and the southern area encompassing these districts have a share of about 80% in the total output of East Kalimantan. In the northern area, wetland paddy is produced mainly around the coastal areas, and its output is high for the inland area of Kerayan village. A check of the output growth rates in 1971 to 1976 reveals that the growth rate was high for the city of Samarinda (Kotamadya Samarinda) and the county of Bulungan.

Table 2-16 Output of Food Crops, Indonesia (1)

(Unit: 1,000 t)

Province	Wet Land Paddy			
	1971	1976	1976/1971	AAGR (%)
Jawa & Madura	15,675	17,618	1.12	2.4
Sumatera	4,654	5,668	1.22	4.0
Kalimantan	906	1,259	1.39	6.8
Sulawesi	1,947	2,271	1.17	3.1
Maluku & Irian Jaya	3	2	0.67	—
Bali & Nusatenggara	1,123	1,464	1.30	5.4
Total of Outer Jawa	8,633	10,664	1.23	4.3
Indonesia	24,308	28,282	1.16	3.1

Source: Statistical Yearbook of Indonesia, 1976

Note: AAGR — Average Annual Growth Rate

Table 2-17 Output of Food Crops, East Kalimantan

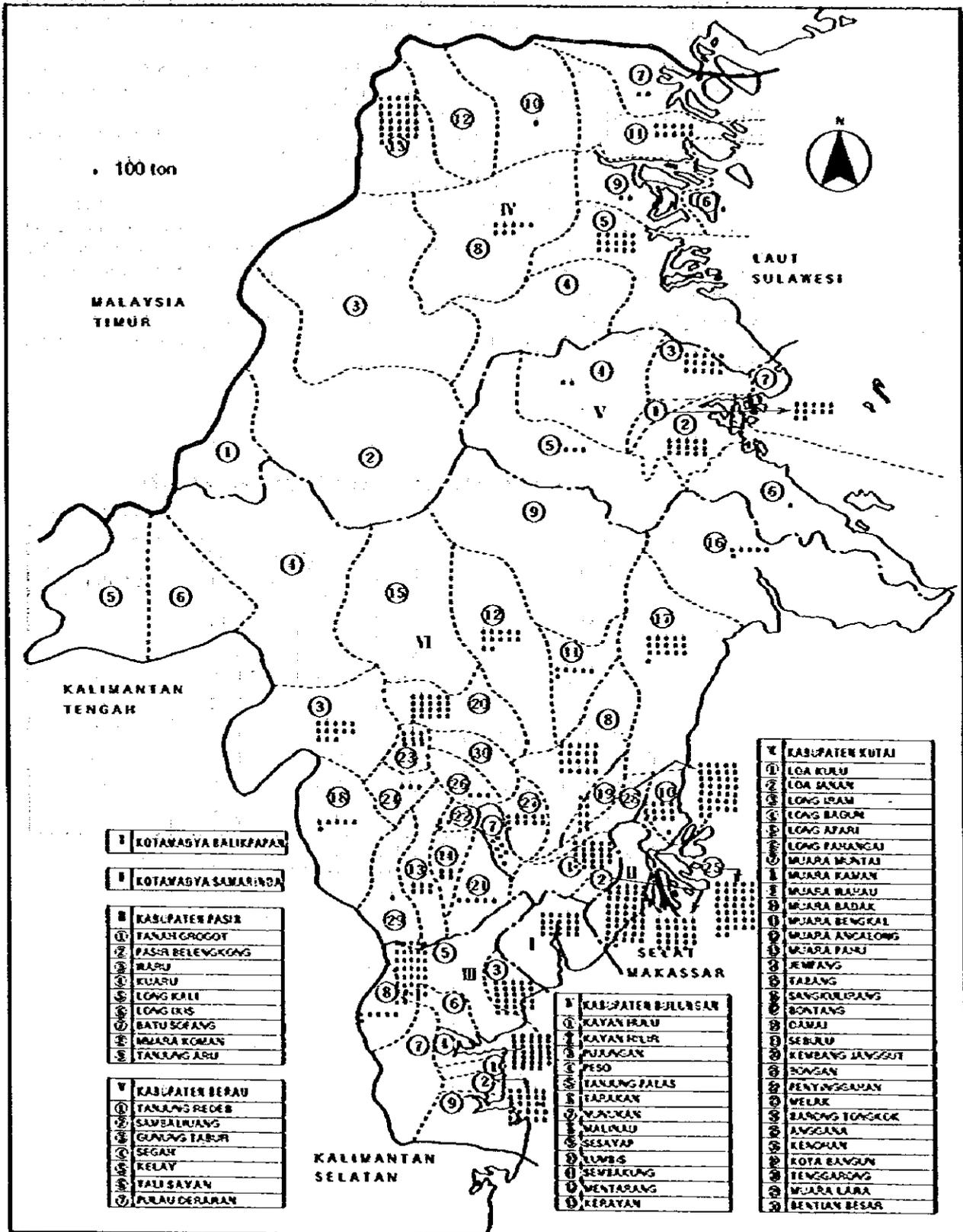
(Unit: t)

Crops	Output							1976/1970	Annual Growth Rate (%)
	1970	1971	1972	1973	1974	1975	1976		
Wetland Paddy	40,671	40,545	42,229	47,839	47,525	62,656	61,746	1.52	7.2
Dryland Paddy	54,799	55,794	61,321	34,302	61,610	57,654	55,000	1.00	0.0
Maize	—	—	1,376	1,154	1,497	1,694	2,648	1.92*	18.0
Cassava	—	—	36,845	31,928	41,000	36,622	40,865	1.11*	2.6
Sweet Potatoes	—	—	4,502	6,855	5,063	6,123	7,809	1.73*	15.0
Peanuts	—	—	126	148	177	382	592	4.70*	47.2
Soybeans	—	—	91	210	188	688	860	9.45*	75.3

Source: Data on East Kalimantan, 1976/77

Note: *1976/1972

Fig. 2-3 Output of Wetland Paddy, East Kalimantan (1976)



(2) Dryland Paddy

The gross national output of dryland paddy was 1,930,000 tons in 1976, but its output in 1971 to 1976 decreased to 0.93 times. The principal production center for the nation is Sumatera, sharing 40% of the gross national output, but its output in 1971 to 1976 dropped to 0.86 times.

The output of Kalimantan Region in 1976 was 353,000 tons, sharing 18.3% of the gross national output. The output growth rate in 1971 to 1976 averaged 5.0% a year, following Maluku and Irian Jaya in terms of growth rate. (Table 2-18)

On the other hand, the output of East Kalimantan Province stood at 56,000,000 tons, accounting for 15.9% of the total output of Kalimantan. There are signs that the output in 1971 to 1976 were levelling off. (Table 2-17)

A check of the regional distribution of outputs in East Kalimantan Province indicates, as shown in Fig. 2-4, that the major production center is the basin of the Mahakam River, and the county of Kutai shared 57.8%. Unlike the case of wetland paddy rice, considerable production is carried out in the county of Bulungan in the north, and Malinau is the most typical production center in the northern area.

A check of the output growth rates in 1970 to 1976 reveals that production increases were registered only by the country of Bulungan in the north with the average growth rate standing at 9.0% a year.

Table 2-18 Output of Food Crops, Indonesia (2)

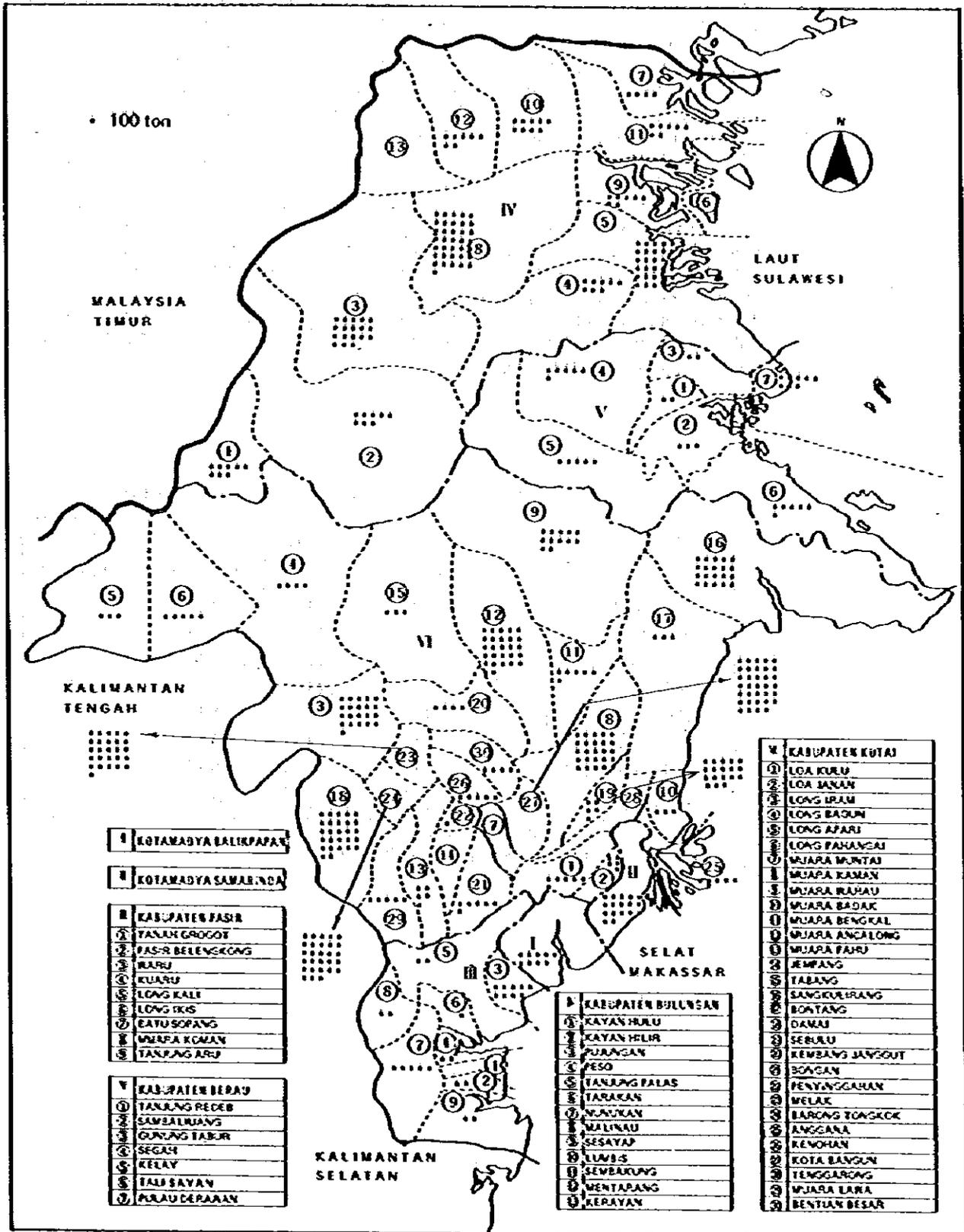
(Unit: 1,000 tons)

Province	Dry Land Paddy			
	1971	1976	1976/1971	AAGR (%)
Jawa & Madura	554	460	0.83	—
Sumatera	905	775	0.86	—
Kalimantan	276	353	1.28	5.0
Sulawesi	181	149	0.82	—
Maluku & Irian Jaya	13	22	1.69	11.0
Bali & Nusatenggara	155	171	1.10	1.9
Total of Outer Jawa	1,531	1,470	0.96	—
Indonesia	2,084	1,930	0.93	—

Source: Statistical Yearbook of Indonesia, 1976

Note: AAGR — Average Annual Growth Rate

Fig. 2-4 Output of Dryland Paddy, East Kalimantan (1976)



(3) Maize

The gross national output of maize was 2,500,000 tons in 1976, whereas the output in 1971 to 1976 was 0.96 times, suggesting that the production was levelling off. The principal production centers for the nation is Jawa and Madura, sharing 72.6% of the gross national output, but the production in these areas in 1971 to 1976 was 0.97 times, suggesting that the production was levelling off.

Kalimantan Region registered an extremely small output of 11,000 tons, and there appeared signs for a levelling-off the production in 1971 and subsequent years. (Tables 2-19)

On the other hand, the output of East Kalimantan Province in 1976 was 2,600 tons, accounting for 23.6% of the gross output of Kalimantan, but the annual average growth rate in 1971 to 1976 was high with 18.0%. (Table 2-17)

A check of the regional distribution of outputs in East Kalimantan Province suggests, as shown in Fig. 2-5, that the major production area is the basin of the Mahakam River and also that maize is produced in each northern village of the county of Kutai. The output of the cities of Samarinda and Balikpapan and the county of Kutai shared 76.9%. The output of the county of Pasir was extremely small.

A check of the growth rates in 1972 to 1976 reveals that the output of the county of Bulungan, Beran and Kutai increased but that the growth in the county of Bulungan was greatest with 47.0% on the average a year.

Table 2-19 Output of Food Crops, Indonesia (3)

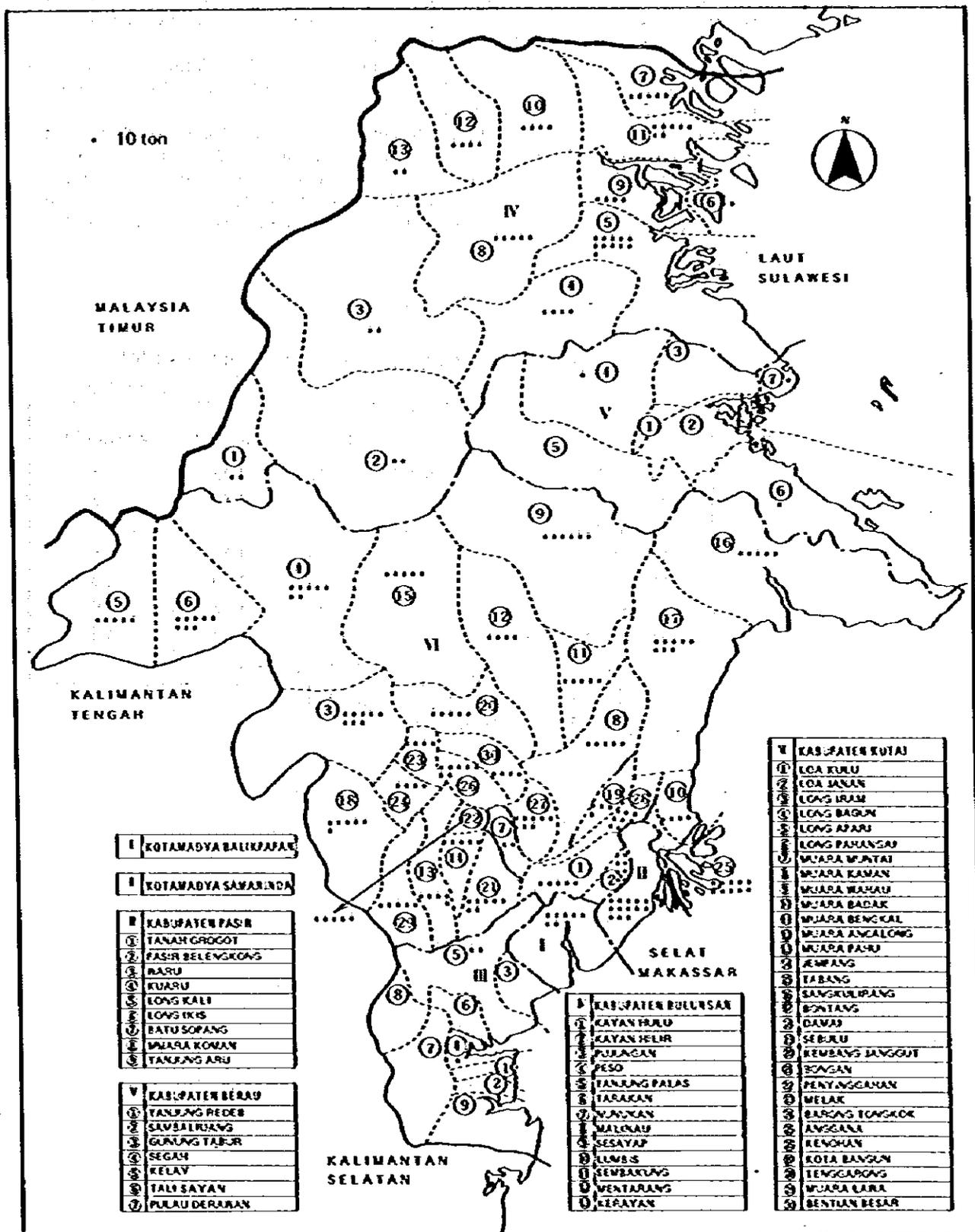
(Unit: 1,000 t)

Province	Maize			
	1971	1976	1976/1971	AAGR (%)
Jawa & Madura	1,883	1,823	0.97	—
Sumatera	180	104	0.58	—
Kalimantan	11	11	1.00	0
Sulawesi	282	343	1.22	4.0
Maluku & Irian Jaya	16	22	1.38	6.6
Bali & Nusa Tenggara	235	209	0.89	—
Total of Outer Jawa	723	689	0.95	—
Indonesia	2,607	2,512	0.96	—

Source: Statistical Yearbook of Indonesia, 1976

Note: AAGR — Average Annual Growth Rate

Fig. 2-5 Output of Maize, East Kalimantan (1976)



(4) Cassava

The gross national output of cassava was 12,500,000 tons in 1976. The annual average growth rate in 1971 to 1976 was 3.1%. The principal production centers for the nation were Jawa and Madura, sharing 73.4% of the gross national output, but the annual average growth rate stood at 2.5%, lower than the national average percentage.

The output of Kalimantan Region in 1976 stood at 273,000 tons, featuring an extremely small share of 2.2% in the gross national output. The output in 1971 to 1976 was 0.95 times, showing signs of a level-off. (Tables 2-20)

On the other hand, the output of East Kalimantan Province was 41,000 tons, 15.0% of the total output of Kalimantan. The annual average growth rate stood at 2.6%. (Table 2-17)

A check of the distribution of outputs in East Kalimantan Province indicates, as shown in Fig. 2-6, that the county of Kutai encompassing the basin of the Mahakam River is the major production center. The county of Kutai and the cities of Samarinda and Balikpapan shared 90.1%.

Table 2-20 Output of Food Crops, Indonesia (4)

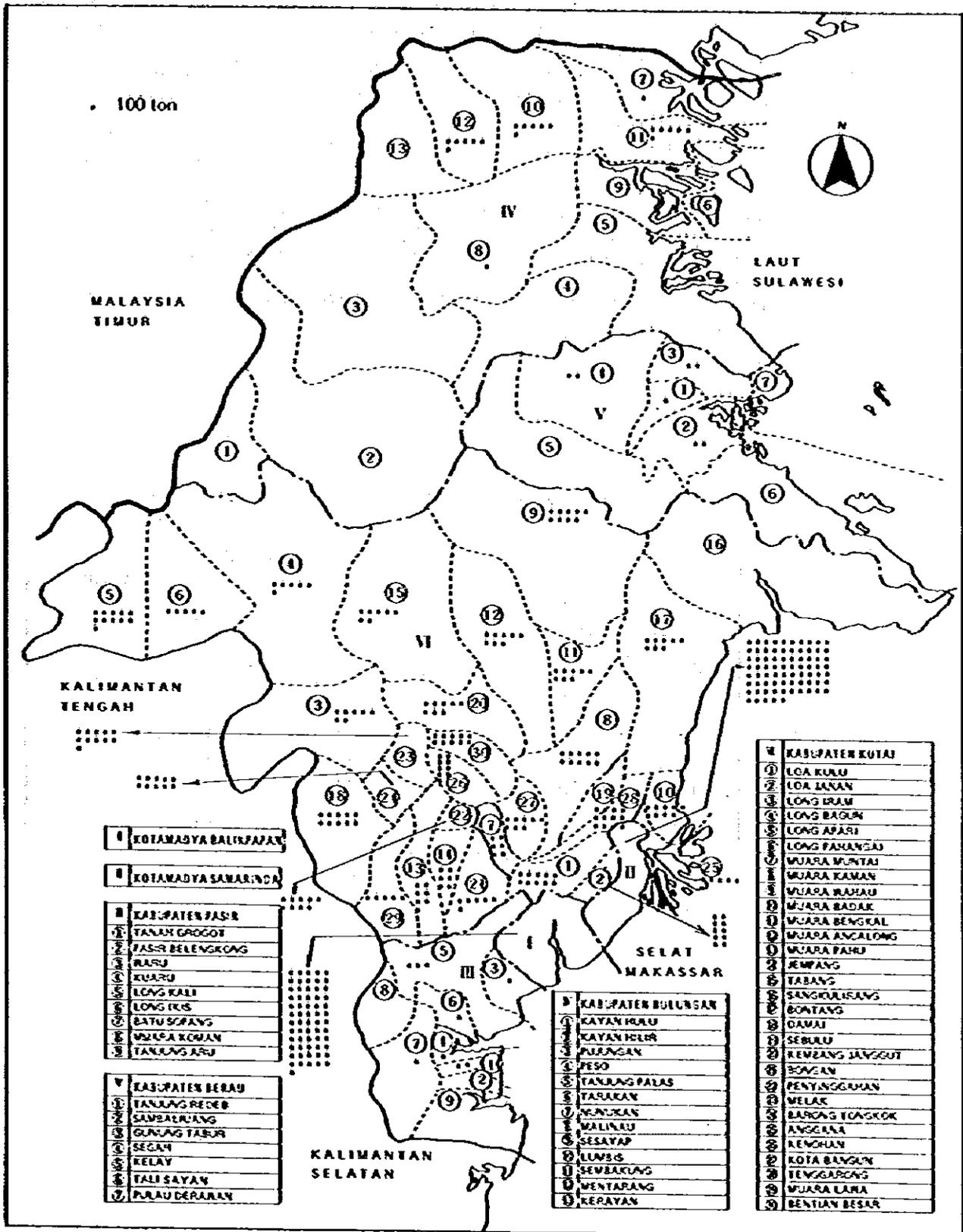
(Unit: 1,000 t)

Province	Cassava			
	1971	1976	1976/1971	AAGR (%)
Jawa & Madura	8,075	9,152	1.13	2.5
Sumatera	911	1,372	1.51	8.5
Kalimantan	288	273	0.95	—
Sulawesi	609	694	1.14	2.6
Maluku & Irian Jaya	126	189	1.50	8.5
Bali & Nusatenggara	680	787	1.16	3.0
Total of Outer Jawa	2,615	3,315	1.27	4.8
Indonesia	10,689	12,467	1.17	3.1

Source: Statistical Yearbook of Indonesia, 1976

Note: AAGR—Average Annual Growth Rate

Fig. 2-6 Output of Cassava, East Kalimantan (1976)



(5) Sweet potatoes

The gross national output of sweet potatoes was 2,400,000 tons in 1976. The annual average growth rate in 1971 to 1976 was 1.8%. The major production centers for the nation are Jawa and Madura, sharing 48.4% of the gross national output, and the annual average growth rate in 1971 to 1976 was 4.3%.

The output of Kalimantan Region in 1976 was 34,000 tons with an extremely small share of 1.4% in the national gross output, but the annual average growth rate in 1971 to 1976 was high as 6.3%. (Tables 2-21)

On the other hand, the output of East Kalimantan Province was 7,800 tons in 1976, sharing 22.9% of the total output of Kalimantan. The annual average growth rate in 1971 to 1976 was extremely high with 14.8%. (Table 2-17)

A check of the distribution of outputs in East Kalimantan Province indicates, as shown in Fig. 2-7, that the major production center is the basin of the Mahakam River and that sweet potatoes are also produced in the county of Pasir and the coastal area of the county of Bulungan.

The highest output growth rate in 1971 to 1976 was marked by the county of Kutai, averaging 25.0% a year.

Table 2-21 Output of Food Crops, Indonesia (5)

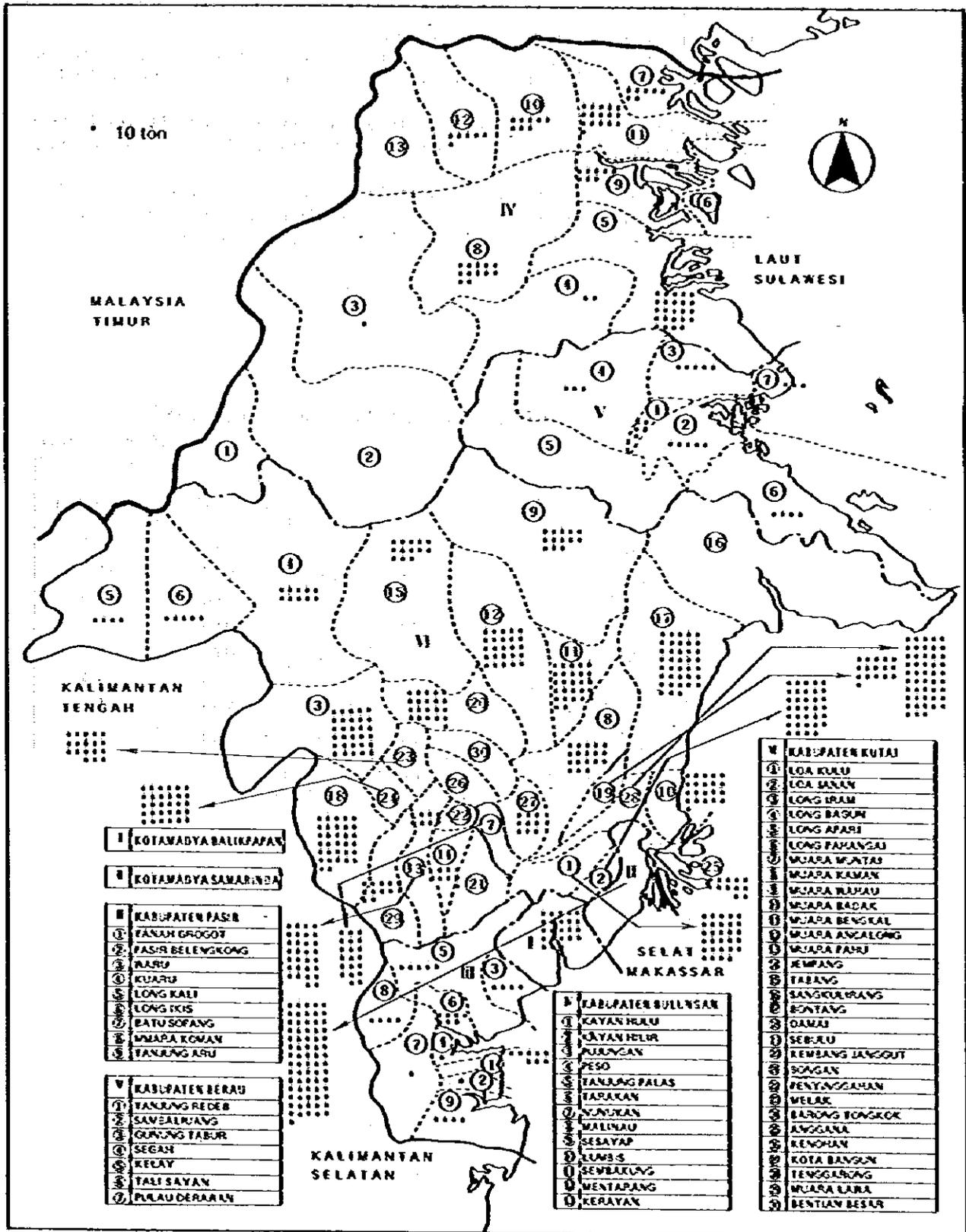
(Unit: 1,000 t)

Province	Sweet Potato			
	1971	1976	1976/1971	AAGR (%)
Jawa & Madura	947	1,171	1.24	4.3
Sumatera	315	348	1.10	2.0
Kalimantan	25	34	1.36	6.3
Sulawesi	158	170	1.08	1.5
Maluku & Irian Jaya	293	343	1.17	3.2
Bali & Nusatenggara	474	351	0.74	—
Total of Outer Jawa	1,265	1,247	0.99	—
Indonesia	2,212	2,417	1.09	1.8

Source: Statistical Yearbook of Indonesia, 1976

Note: AAGR — Average Annual Growth Rate

Fig. 2-7 Output of Sweet Potatoes, East Kalimantan (1976)



(6) Peanuts

The gross national output of peanuts was 332,000 tons in 1976, and the annual average growth was registered at 3.1%. The principal production centers for the nation were Jawa and Madura, sharing 76.8% of the gross national output. However, the annual average growth rate in 1971 to 1976 was 2.6%, lower than the national average percentage.

The output of Kalimantan Resion in 1976 was 4,000 tons with an extremely small share of 1.2% in the national output. However, the annual average growth rate was 15.0% in 1971 to 1976, the highest for all provinces in the nation. (Tables 2-22)

The output of East Kalimantan Province in 1976 was 600 tons, sharing 15.0% of the total output of Kalimantan, but the annual average growth rate in 1972 to 1976 was extremely high with 47.2%. (Table 2-17)

A check of the distribution of outputs in East Kalimantan Province indicates, as shown in Fig. 2-8, that the major production center is the basin of the Mahakam River and the output share of the county of Kutai and the cities of Samarinda and Balikpapan is 90.5%.

Table 2-22 Output of Food Crops, Indonesia (6)

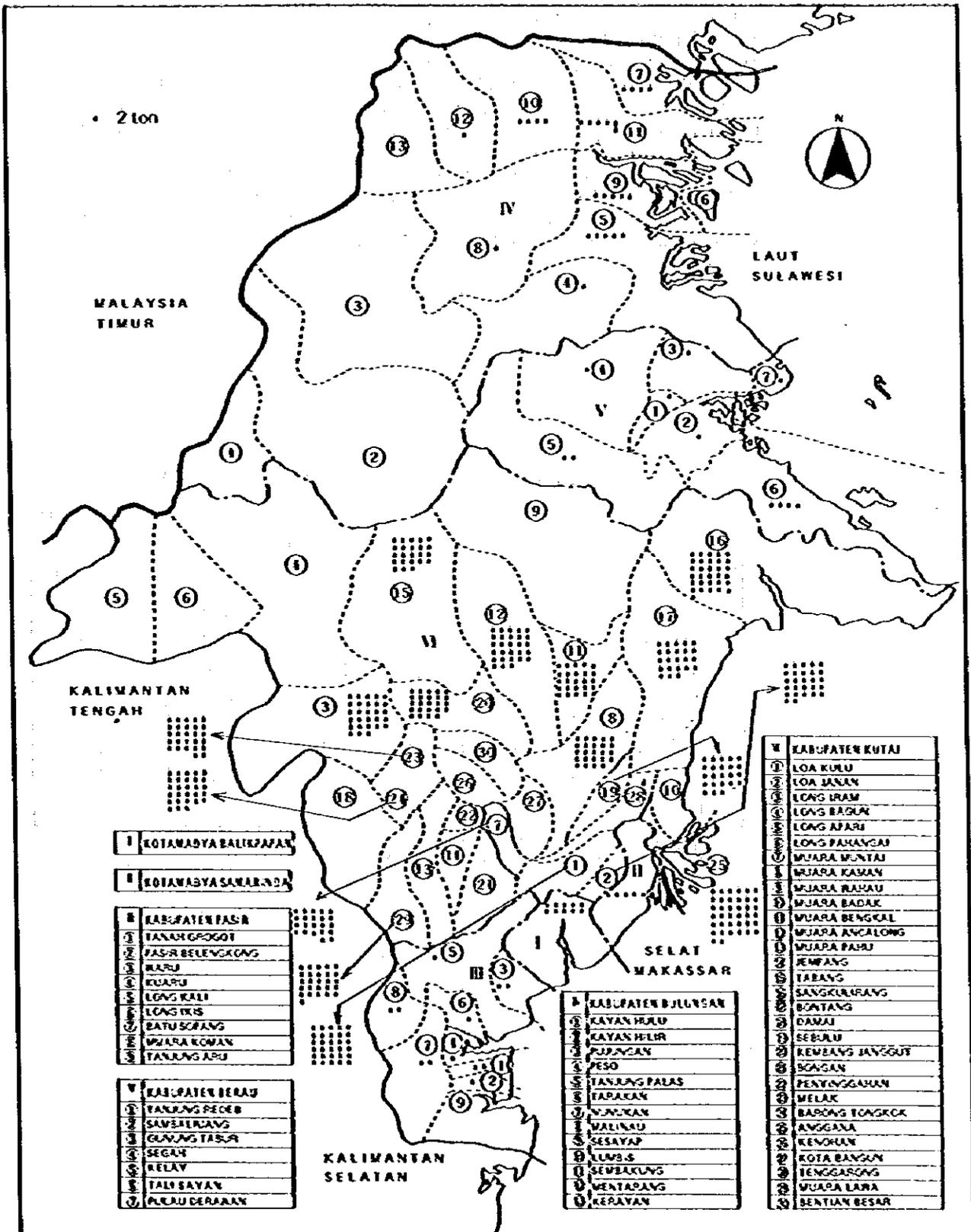
(Unit: 1,000 t)

Province	Peanut			
	1971	1976	1976/1971	AAGR (%)
Jawa & Madura	224	255	1.14	2.6
Sumatera	18	31	1.72	11.0
Kalimantan	2	4	2.00	15.0
Sulawesi	20	19	0.95	—
Maluku & Irian Jaya	3	2	0.67	—
Bali & Nusatenggara	17	21	1.24	4.4
Total of Outer Jawa	60	77	1.28	5.1
Indonesia	284	332	1.17	3.1

Source: Statistical Yearbook of Indonesia, 1976

Note: AAGR — Average Annual Growth Rate

Fig. 2-8 Output of Peanuts, East Kalimantan (1976)



(7) Soya beans

The gross national output of soya beans in 1976 was 480,000 tons, and the output in 1971 to 1976 was 0.93 times, marking a slight decrease. The principal production center for the nation is Jawa and Madura, sharing 79.2% of the gross national output, but the output in 1971 to 1976 decreased to 0.84 times.

The output of Kalimantan Region in 1976 was 2,000 tons with an extremely small share of 0.4% in the gross national output, but the annual average growth rate was 15.0%, the second highest for all provinces in the nation. (Table 2-23)

On the other hand, the output of East Kalimantan Province in 1976 was 900 tons with a high share of 45.0% in the total output of Kalimantan. The annual average growth rate in 1972 to 1976 also registered extremely high growth rate of 73.5%. (Table 2-17)

A check of the distribution of outputs in East Kalimantan Province indicates, as shown in Fig. 2-9, that the major production center is the county of Kutai encompassing the basin of the Mahakam River and the share of the county of Kutai is 89.2%.

Table 2-23 Output of Food Crops, Indonesia (7)

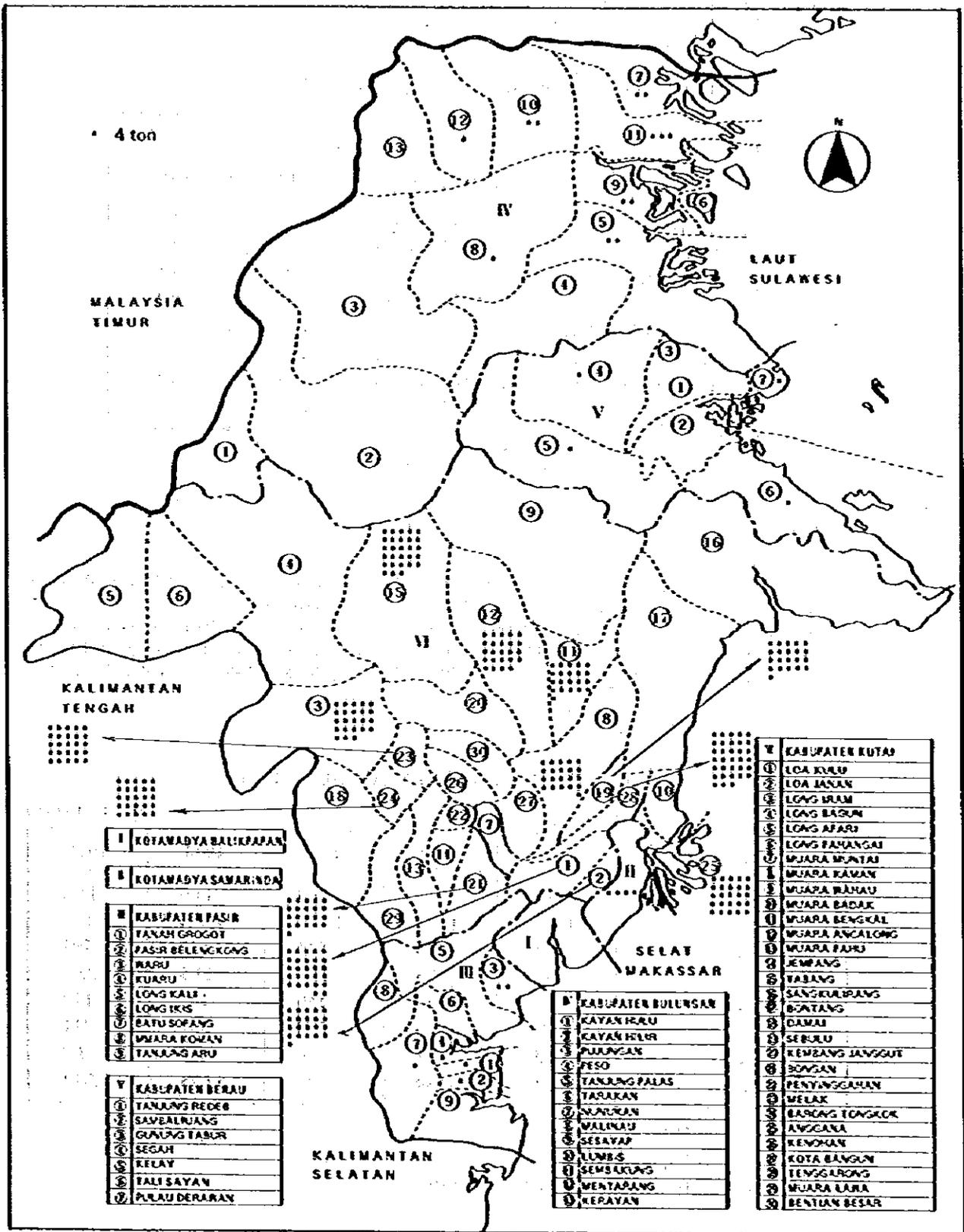
(Unit: 1,000 t)

Province	Soya beans			
	1971	1976	1976/1971	AAGR (%)
Jawa & Madura	452	380	0.84	—
Sumatera	17	43	2.53	20.0
Kalimantan	1	2	2.00	15.0
Sulawesi	4	7	1.75	12.0
Maluku & Irian Jaya	0	0	0	0
Bali & Nusatenggara	41	48	1.17	3.2
Total of Outer Jawa	64	102	1.59	9.8
Indonesia	515	480	0.93	—

Source: Statistical Yearbook of Indonesia, 1976

Note: AAGR — Average Annual Growth Rate

Fig. 2-9 Output of Soya Beans, East Kalimantan (1976)



(8) Total

Table 2-24 shows the total output of farm agriculture in each province as given in (1) to (7). According to this table, the annual average growth rate in Kalimantan is 5.1%, and this is the highest growth rate in the nation.

Table 2-24 Output of Food Crops, Indonesia (8)

(Unit: 1,000 t)

Province	Total			
	1971	1976	1976/1971	AAGR (%)
Jawa & Madura	27,810	30,859	1.11	2.1
Sumatera	7,000	8,341	1.19	3.6
Kalimantan	1,509	1,936	1.28	5.1
Sulawesi	3,201	3,653	1.14	2.7
Maluku & Irian Jaya	454	580	1.28	5.0
Bali & Nusatenggara	2,725	3,051	1.12	3.6
Total of Outer Jawa	14,891	17,564	1.18	3.4
Indonesia	42,699	48,420	1.13	2.5

Source: Statistical Yearbook of Indonesia, 1976

Note: AAGR --- Average Annual Growth Rate

2-2-3 Estate Agriculture at Present

Now looking at the estate crops in Indonesia from the aspect of output, the most distinguished was coconut with an annual output of 1,500,000 tons (as converted to copra) in 1975.

It is followed by sugar cane at 1,000,000 tons, rubber at 790,000 tons (as dry product), palm oil at 410,000 tons and coffee at 170,000 tons. Annual average growth rates of these crops in 1971 to 1975 were coconut 4.1%, sugar cane 5.4%, rubber 0.2% and palm oil 13.4%, while coffee in negative (Table 2-25).

Table 2-25 Output of Estate Crops, Indonesia

(Unit: 1,000t)

Crops	1971	1972	1973	1974	1975
Cloves 1)	11.3	15.0	27.3	15.0	14.8
Coconut 2)	1,283	1,259	1,287	1,444	1,505
Rubber 1)	786	804	844	822	793
Pepper 1)	26.7	30.8	28.5	27.5	22.9
Coffee 1)	181	181	150	159	172
Palm oil	248	269	290	351	411
Cocoa	1.8	1.8	1.8	3.4	3.9
Sugar cane 3)	834	889	820	1,025	1,030

Note: 1) Dry products

2) Copra equivalent

3) Refined sugar

Source: Statistical Yearbook of Indonesia 1976

Looking at the estate crops from the aspect of export, the most distinguished was rubber with an annual export in 1975 at 790,000 tons (100% export), followed by palm oil at 390,000 tons (95% export), coffee at 130,000 tons (76% export), tea at 46,000 tons (66% export) and copra at 33,000 tons (2.2% export), the last mentioned copra being of a high rate of domestic consumption (Table 2-26).

Seeing the destinations of these crops, rubber is to USA and Belgium; palm oil to the Netherlands, Pakistan, Japan and USA; coffee to America, the Netherlands and Japan; tea to Australia, USA and England; and copra to Japan, the Netherlands and West Germany.

Table 2-26 Exports of Estate Crops, Indonesia

(Unit: 1,000 t)

Crops	1971	1972	1973	1974	1975	1976
Rubber	789.3	774.6	890.2	840.4	788.3	811.5
Copra	77.5	42.4	44.6	—	33.0	3.9
Tea	—	44.0	39.6	55.7	45.9	47.5
Coffee	74.3	107.0	100.8	111.9	128.4	136.3
Tobacco	18.3	26.2	33.3	28.1	19.6	20.5
Palm oil	209.0	236.5	262.7	281.2	386.5	405.6
Pepper	24.2	25.7	25.6	15.7	14.5	28.8
Capok	1.2	0.7	0.2	0.2	0.6	0.1

Source: Statistical Yearbook of Indonesia, 1976/77

When the production in 1976 of the estate crops of East Kalimantan is checked, the most distinguished is coconut at 7,800 tons, and the others include coffee at 680 tons, pepper at 610 tons, rubber at 500 tons and cloves at 11 tons (Table 2-27).

Estates in East Kalimantan are managed mainly by small holders and are scattered here and there. Crop plants under cultivation with economic value at present are of rubber, pepper, coconut and coffee, but they are, for the greater part, old and are often reared from seedlings which can hardly be said to be good. Consequently, the yield is not increasing, and the quality is not good.

Increasing the yield is carried out in both aspects of rejuvenation and expansion of the existing estates. Now, the government-operated estates are furnishing good young sprouts of rubber, cloves and pepper, while in the private sector, interests are being directed toward development of large estates intended for cultivation of oil palm, cocoa and coconut. Estate crops being considered particularly from the point of view of developing large estates are oil palm and cocoa.

Fig. 2-10 to Fig. 2-14 shows the distribution of outputs of estate crops in East Kalimantan.

Table 2-27 Output of Estate Crops, East Kalimantan

(Unit: t)

Crops	1972	1973	1974	1975	1976
Cloves	1.5	1.7	5.3	5.3	11.0
Coconut	5,970	6,120	6,370	6,200	7,810
Rubber	190	820	330	310	500
Pepper	850	750	870	1,000	610
Coffee	280	260	270	500	680

Source: Data on East Kalimantan 1976/77

Fig. 2-10 Output of Cloves, East Kalimantan (1976)

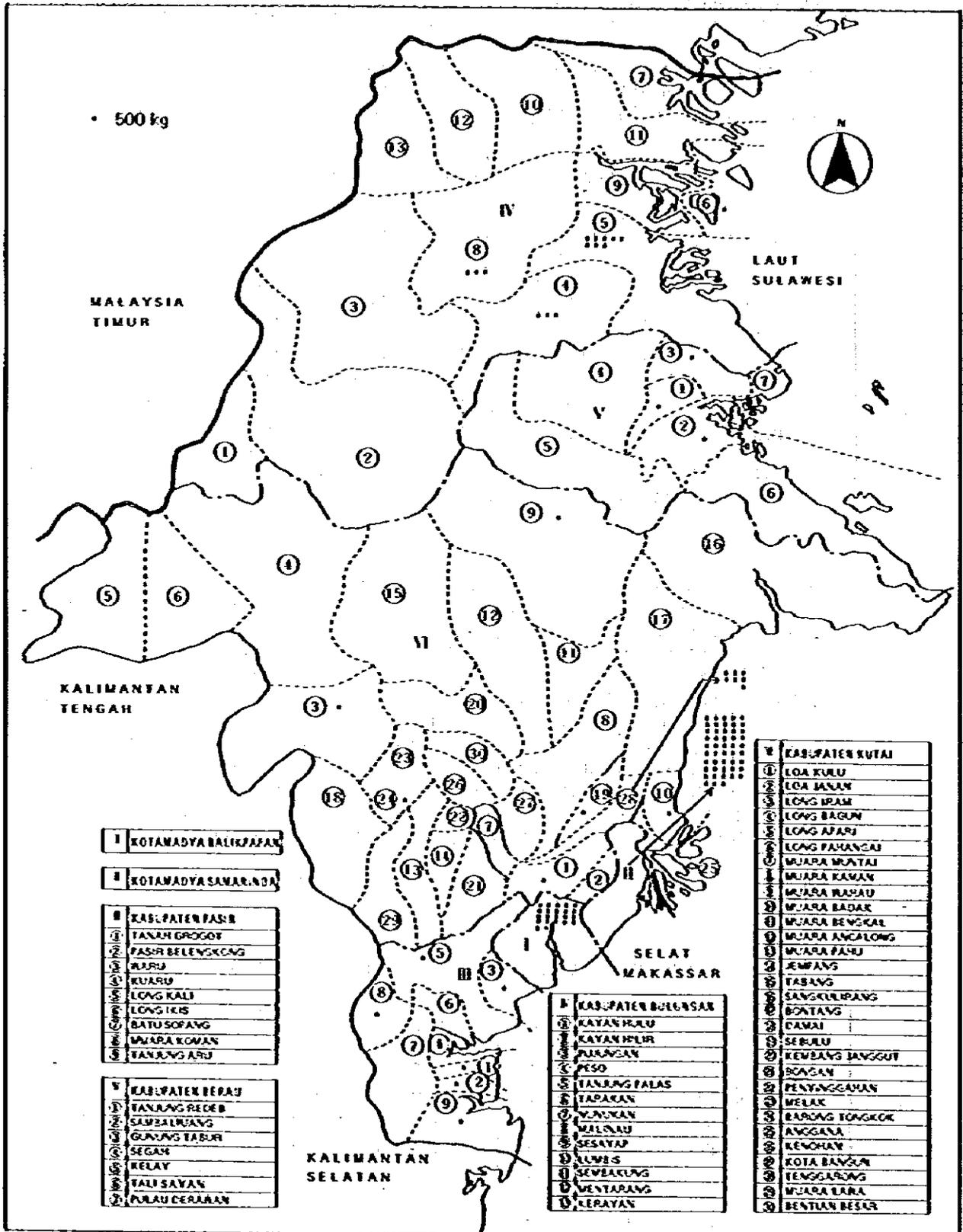


Fig. 2-11 Output of Coconuts, East Kalimantan (1976)

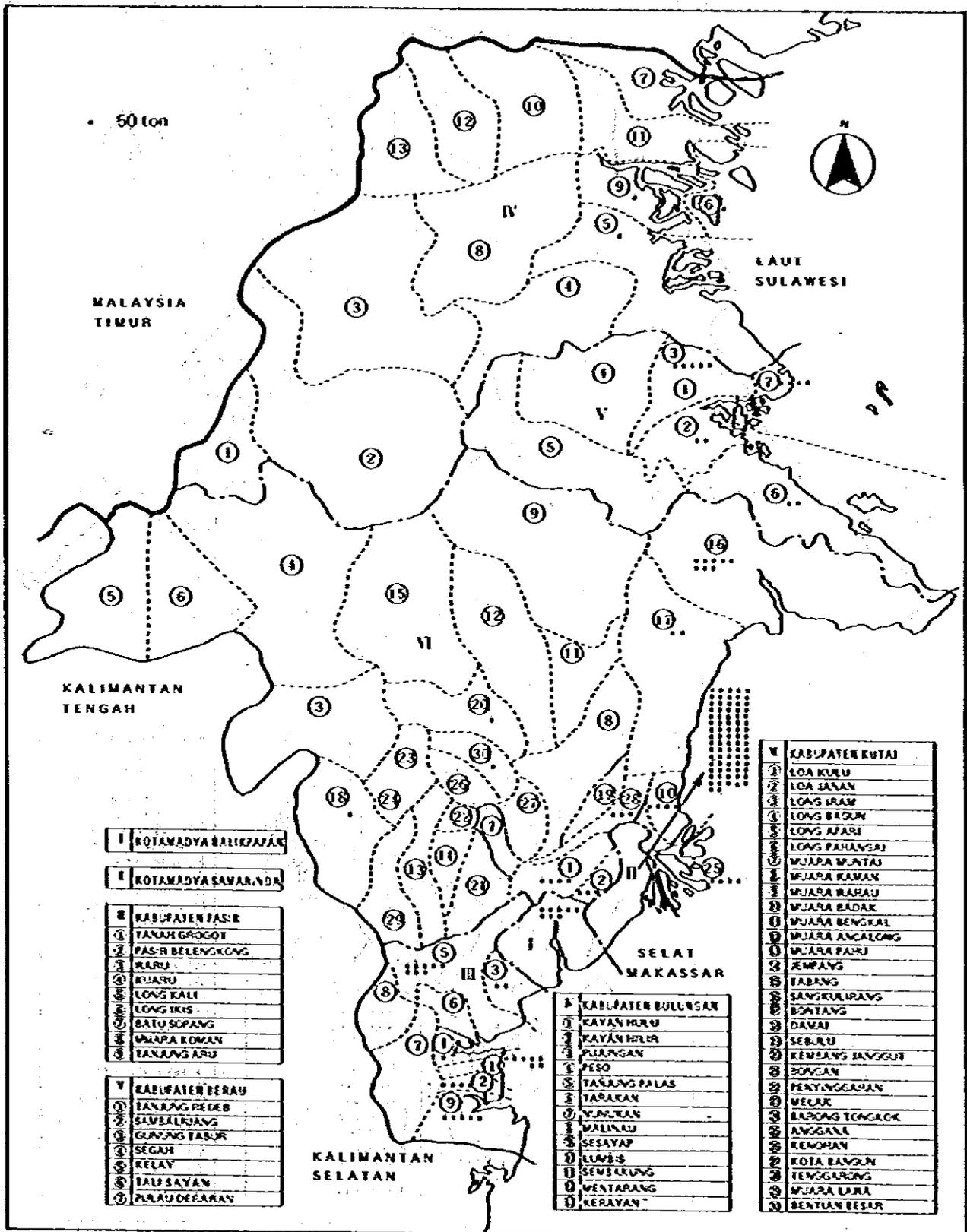


Fig. 2-12 Output of Rubber, East Kalimantan (1976)

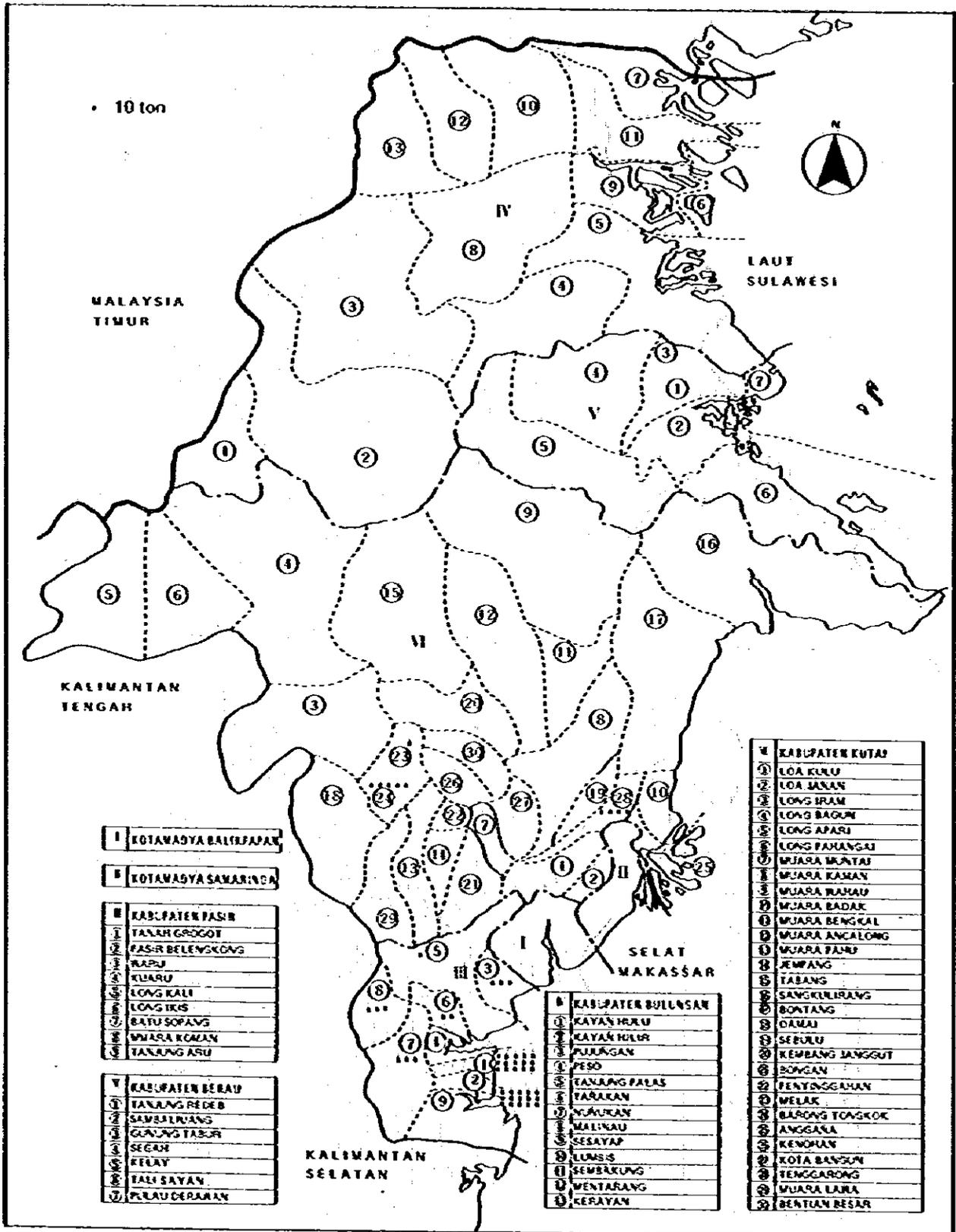


Fig. 2-13 Output of Pepper, East Kalimantan (1976)

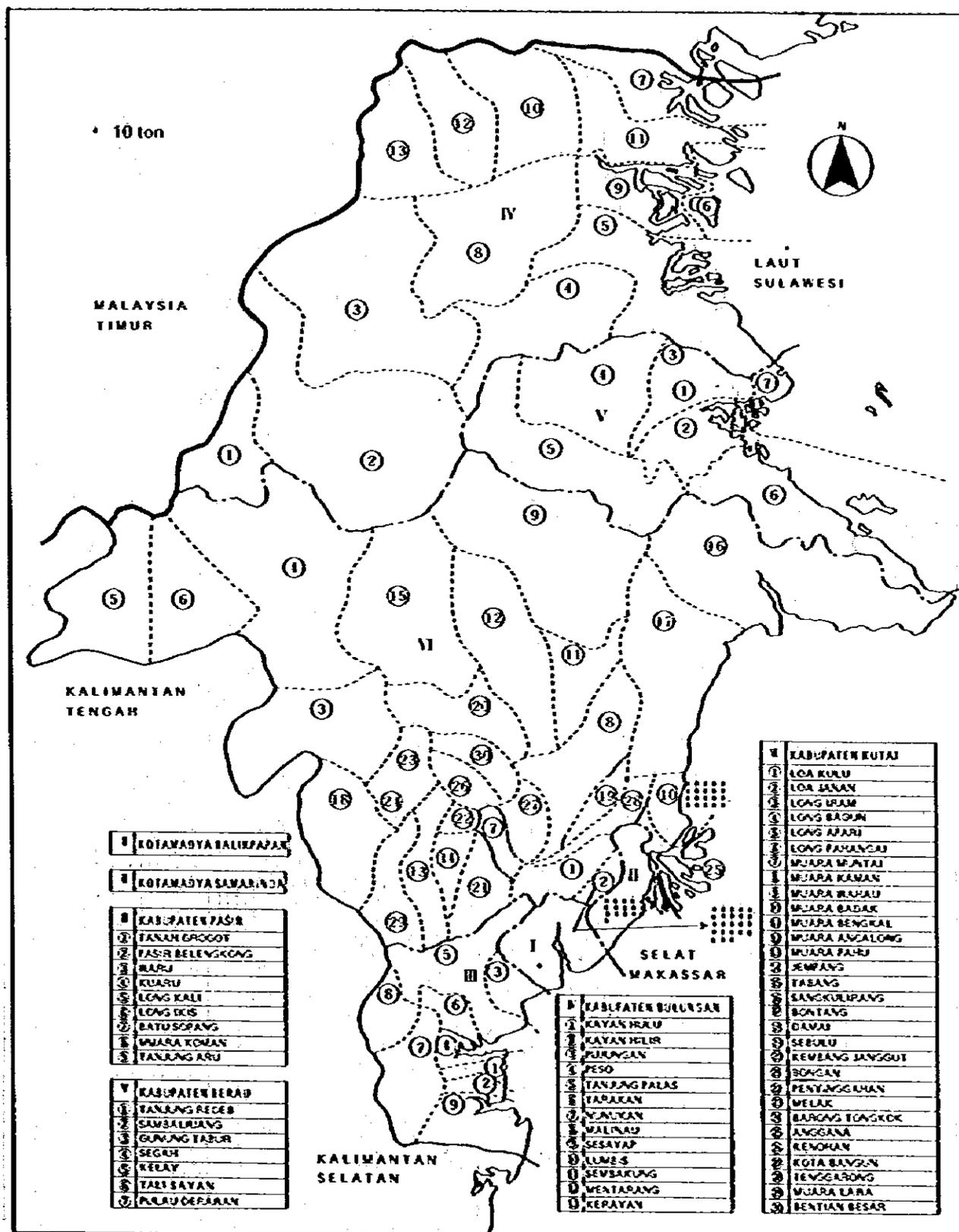
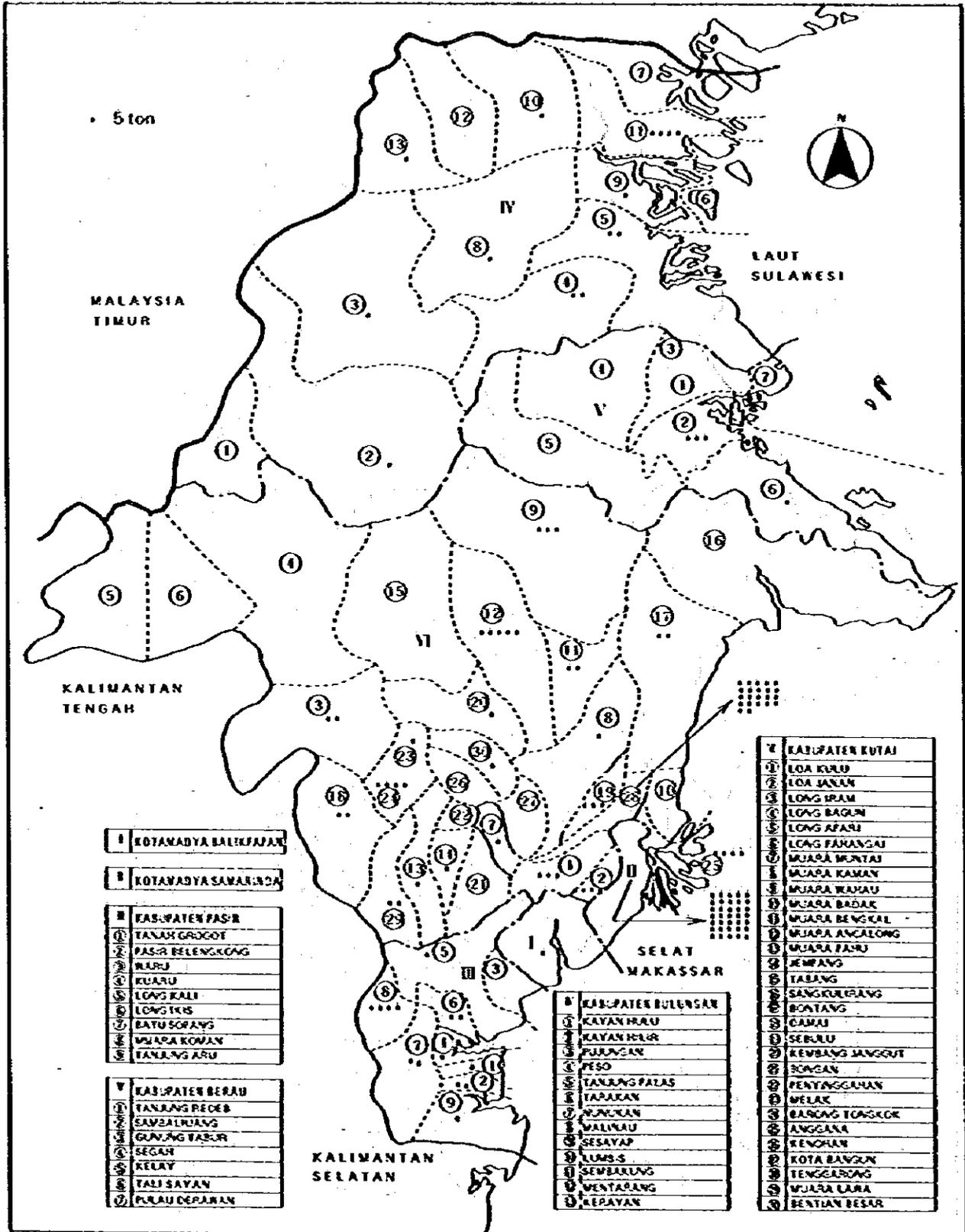


Fig. 2-14 Output of Coffee, East Kalimantan (1976)



2-2-4 Forestry at Present

Forestry is the most important industry for East Kalimantan, sharing about 60% of this Province's GRDP.

Forests measure about 17,300,000 ha., or about 85% of East Kalimantan's total area. Of them, there are 12,900,000 ha. of productive forests.

Most of the log produced from the productive forests is shipped for international and domestic markets, out of the loading points at the coast or in the each river of the Province of East Kalimantan. Some is processed into sawn timber and plywood during the course of its transportation to satisfy the domestic demand, some being exported, internationally or domestically, from each port.

The output of log from the Province of East Kalimantan in 1976 was 9,167,000m³. Without being processed, 8,211,000m³ (6,404,000 tons) of log was exported. Of the balance of 956,000m³ between the output of log and its exports, it is estimated that 538,000m³ was processed into sawn timber and plywood. Consequently, the quantity of log which is believed to have been shipped to various places in the nation is estimated: 956,000 - 538,000 = 418,000m³ (326,000 tons).

Of the 538,000m³ of processed timber, 7,000m³ is estimated to be consumed in the Province of East Kalimantan, 460,000m³ (230,000 tons) being shipped out for domestic market demand. Consequently, the quantity which was exported as processed timber is: 538,000 - (7,000 + 460,000) = 71,000m³ (36,000 tons).

Table 2-28 Forestry at Present, East Kalimantan

(Unit: 1,000 m³ based on Log)

Year	Production of Log	Log			Processed Timber			
		Export	Domestic Outbound	Total	Export	Domestic Outbound	Consumption in East Kalimantan	Total
1976	9,167	8,211	418	8,629	71	460	7	538

2-2-5 Fishery at Present

Looking at the fishery of Indonesia, the total output in 1973 was 1,300,000 tons which is itemized, on the raw fish base, to 860,000 tons by sea fishery and 440,000 tons by inland-water fishery, these constituting a proportion of about 2 : 1.

Main areas of production are Sumatera, Kalimantan and Jawa and Madura.

The annual average growth rate of output over the period of 1971 to 1973 was 2.2%, and this rate is equivalent to the growth rate of national population in the recent years, accordingly indicating that the national average per capita output of 1973, or 10.3 kg/year ($1,300 \times 10^6 / 126 \times 10^6$), is not in an increasing trend (Table 2-29).

The fishery of Kalimantan occupies an important position in the fishery production of Indonesia as stated in the above paragraph, and the fishery output of East Kalimantan in 1976 was 35,900 tons by sea fishery and 22,500 tons by inland-water fishery or both total 58,400 tons, and the output shows as high an annual average growth rate as 11.2% over the period of 1972 to 1976. Per capita fishery output of East Kalimantan in 1976 was 60.8 kg/year ($58.4 \times 10^6 / 0.960 \times 10^6$), and it will be seen that this figure exceeds greatly the national average per capita production shown in the above paragraph (Table 2-30).

Judged from the foregoing, this area is promising to become a source of supply of fishery output to the Jawa Island and other areas in the country in the future. The per capita fishery output of East Kalimantan stated in the above paragraph (60.8 kg/year), is equivalent to 167 g/day, and when checked against the per capita consumption of fishes in Japan at 95.5g (1976), this shows a considerable allowance which this area has presently for foreign and domestic exports.

Table 2-29 Output of Sea and Land Fishery, Indonesia, 1973

(Unit: 1,000t)

Region	Sea Fishery	Inland-water Fishery	Total
Jawa & Madura	147.6	125.2	272.8
Sumatera	362.8	91.3	454.1
Kalimantan	103.3	181.6	284.9
Sulawesi	141.4	33.5	174.9
Bali & Nusatenggara	38.5	4.1	42.6
Maluku & Irian Jaya	66.4	4.3	70.7
INDONESIA 1973	860.0	440.0	1,300
1972	836.3	432.6	1,268.9
1971	820.4	424.1	1,244.5
1973 1971	1.05	1.04	1.045
Average Annual Growth Rate (%)	2.4	1.9	2.2

Source: Statistical Yearbook of Indonesia, 1976/77

Note: Fresh Fish

Table 2-30 Fishery Output, East Kalimantan

(Unit: 1,000t)

Kind of Fishery	1972	1973	1974	1975	1976	$\frac{1976}{1972}$	Annual Growth Rate (%)
Sea Fishery	22.6	25.3	25.6	26.6	35.9	1.59	12.3
Inland-water Fishery	15.6	15.7	19.4	19.6	22.5	1.44	9.6
TOTAL	38.2	41.0	45.0	46.2	58.4	1.53	11.2

Source: Data on East Kalimantan, 1976/77

2-2-6 Livestock Production at Present

Livestock product produced in the whole country of Indonesia were, in 1976, meat 449,000 tons, eggs 116,000 tons, and milk, 56,500 tons, and the annual average growth rates were meat 5.8%, eggs 12.6% and milk 17.3% (Table 2-31). National per capita livestock outputs in 1976 are calculated from these following values.

$$\begin{aligned} \text{Meat} & 449 \times 10^6 / 135 \times 10^6 = 3.33 \text{ kg/year} = 9.12 \text{ g/day} \\ \text{Eggs} & 116 \times 10^6 / 135 \times 10^6 = 0.859 \text{ kg/year} = 2.35 \text{ g/day} \\ \text{Milk} & 56.5 \times 10^6 / 135 \times 10^6 = 0.419 \text{ kg/year} = 1.15 \text{ g/day} \end{aligned}$$

Table 2-31 Output of Meat, Eggs and Milk, Indonesia

(Unit: 1,000t)

Commodity	1973	1974	1975	1976	$\frac{1976}{1973}$	Annual Growth Rate (%)
Meat	379	403	435	449	1.18	5.8
Eggs	81.4	98.1	112	116	1.43	12.6
Milk	35.0	56.0	51.1	56.5	1.61	17.3

Source: Statistical Yearbook of Indonesia, 1976

The livestock products produced in East Kalimantan were, in 1973, meat 600 tons, eggs 1,025 tons and milk 8.26 tons, and the annual average growth rates in 1969 to 1973 were meat 78.0%, eggs 25.2% and milk 18.1% (Table 2-32). From these values, the per capita outputs of livestock products in East Kalimantan in 1973 are calculated as follows.

Meat	$600 \times 10^3 / 806 \times 10^3 = 0.744 \text{ kg/year} = 2.04 \text{ g/day}$
Eggs	$1,025 \times 10^3 / 806 \times 10^3 = 1.27 \text{ kg/year} = 3.48 \text{ g/day}$
Milk	$8.26 \times 10^3 / 806 \times 10^3 = 0.01 \text{ kg/year} = 0.03 \text{ g/day}$

Table 2-32 Output of Meat, Eggs and Milk, East Kalimantan

(Unit: t)

Commodity	1969	1970	1971	1972	1973	$\frac{1973}{1969}$	Annual Growth Rate (%)
Meat	59.7	151	243	419	600	10.1	78.0
Eggs	417	653	807	933	1,025	2.46	25.2
Milk	4.24	14.7	11.0	12.0	8.26	1.95	18.1

Source: PELITA-II, East Kalimantan

Table 2-33 shows the consumption of meat in East Kalimantan in 1973 was 738 tons. Thus, the difference with said output of 600 tons, or 138 tons, is considered to be the amount of meat imported domestically.

Table 2-33 Consumption of Meat, East Kalimantan

(Unit: t)

Kind of Meat	1972	1973	1974	1975	1976	$\frac{1976}{1972}$	Annual Growth Rate (%)
Cattle	241	354	311	370	400	1.66	13.5
Buffalo	68.6	86.3	93.4	173	233	3.40	35.8
Goat & Sheep	54.0	58.8	62.8	79.2	87.1	1.61	12.7
Pig	200	217	261	329	353	1.77	15.3
Poultry ¹⁾	18.2	22.0	20.0	26.5	28.6	1.57	12.0
TOTAL	582	738	748	978	1,102	1.89	14.0

Source: Data on East Kalimantan, 1976/77

Note: 1) Poultry is estimated from the number of livestock slaughtered, by the Study Team.

2-2-7 Mining at Present

Crude oil output in East Kalimantan has remarkably increased in recent years as shown in Table 2-34, reaching 151,530 thousand barrels (24,093 thousand kl) in 1977.

Part of the crude oil produced in East Kalimantan is transported to the refineries in Balikpapan and refined there; this quantity was 1,925 thousand kl in 1977, and the rest was exported as crude oil. In the refineries in Balikpapan, imported crude oil from abroad and other parts of the nation was refined, as well as the crude oil produced in East Kalimantan. In 1977, they refined as much as 3,112 thousand kl of crude oil (the refining capacity of the Balikpapan refineries is 60,000 barrels/day) (Table 2-35).

Table 2-36 shows natural gas output in East Kalimantan. It shows the remarkable growth in recent years.

Table 2-34 Crude Petroleum Production in East Kalimantan

(Unit: 1,000 barrel)

Oil Field \ Year	1974	1975	1976	1977	1978
PERTAMINA Own	5,385	5,094	6,454	6,133	7,491
Non-shareable PERTAMINA- TESORO	933	857	789	723	664
HUFFCO	835	3,872	4,801	5,728	8,351
UNION	37,017	39,070	47,404	49,922	47,644
TOTAL	825	6,895	28,726	83,713	80,576
ARCO	—	—	—	1,880	2,647
TESORO (Shareable)	1,824	2,326	4,069	3,431	2,739
Grand Total	46,819	58,114	92,243	151,530	150,112

Source: PERTAMINA (Provided by Sea Communications)

Table 2-35 Production of Petroleum Products at Balikpapan Refinery Plant

(Unit: 1,000 kl)

	1975	1976	1977
Imported Crude Oil	805	661	560
Inward Crude Petroleum	—	150	627
Crude Oil within East Kalimantan	1,271	1,324	1,925
Crude oil to be treated	2,076	2,135	3,112
Fuel oil for airplane	.96	83	104
Gasoline	244	210	370
Kerosene	421	474	706
Light oil (Diesel fuel)	620	595	808
Heavy oil	719	724	1,039
Others	20	26	37
Petroleum Products	2,120	2,112	3,064

Sources: Monthly Reports by MIGAS & Statistic Data by PERTAMINA

Table 2-36 Natural Gas Production in East Kalimantan

(Unit: 10⁶ m³)

	1975	1976	1977
PERTAMINA Own	422	419	485
IIUFFCO	492	755	2,693
TOTAL/INPEX	127	711	2,281
UNION/INPEX	708	824	1,091
UNION Own	—	284	292
Grand Total	1,749x10 ⁶ m ³	2,993x10 ⁶ m ³	6,842x10 ⁶ m ³

Source: Monthly Report by MIGAS, PERTAMINA

Regarding mineral resources without oil, the possible reserves of coals, siliceous sand, nickel and so on are confirmed.

However, the big scale development of mines has not yet commenced.

At the area of the Mahakam River, coal is produced in a very small scale by only a few of private business.

Gold is produced at the upper stream areas of the Mahakam, the Kandilo, the Kelai and the Kayan River in a conventional manner, and that is almost used for local demand.

2-2-8 Manufacture at Present

Table 2-37 shows the number of manufactories and their employees in East Kalimantan. Most of the products manufactured at those factories are consumed within the area of East Kalimantan except timber processing products. These factories, almost concentrate in city area, are very small scale and consisting of a few of employee except timber processing. At present, manufacture in East Kalimantan has been in process of its first step. However, these factories will be developed and modernized in accordance with the increase of regional population and also the growth of other sectors, such as agriculture, forestry and mining.

Regarding modern factories without the refinery plant of PERTAMINA and the LNG plant, a fertilizer plant in Bontang has been planning.

Table 2-37 Number of Manufactories & Employees in East Kalimantan

Manufacturing	Number of Manufactories			Employees	Employees per
	1974	1975	1976	1976	Manufactory
Timber processing	72	79	67	3,315	50
Primary processing of Agriculture products & cattles	40	40	27	464	17
Food	23	27	28	674	24
Repair shop	65	67	72	650	9
Materials of Housing & Civil Work	33	41	42	499	12
Furniture	62	65	45	707	16
Weaving & Hat-maker	11	11	3	296	99
Others	50	49	66	479	7
Total	355	379	350	7,084	20

Note: Refinery plant (B Balikpapan) and LNG plant are not included in the above table.

Source: Data on East Kalimantan 1976/77

2-3 Present Transport Characteristics

In Indonesia, where the nation is composed of many islands, marine transportation is extremely important. In East Kalimantan, likewise, marine transportation is the most important transportation means in the traffic system, especially in the system of transportation of goods.

The main ports of East Kalimantan, which serve as bases for marine transportation, are four and located in Nunukan, Tarakan, Samarinda and Balikpapan from north. They are connected with each other and ports in other provinces by Interinsular routes of Indonesian domestic shipping, which is called RLS (regular liner service).

From the four major ports and other loading points, primary products such as logs, crude oil and natural gas are exported by trampers. Of these four ports, RLS vessels bound for Singapore call at the Samarinda and Balikpapan to discharge construction materials, etc.

Domestic trade is carried out by Interinsular vessels (RLS), local vessels and sailing vessels. Interinsular vessels call at these main four ports and local vessels handle inland transportation through waterways (In East Kalimantan, as roads are not developed, inland waterways are important means of transportation.). Sailing vessels call at ports other than Samarinda.

With regard to land traffic in East Kalimantan, there are no good road except two lines. One of them is the road from Samarinda to Balikpapan of which the distance is about 115km. The other is the road from Penajam to Lolo whose of about 120km. Therefore, as mentioned before, inland traffic is carried out mainly by means of rivers.

Air routes for domestic airlines, mostly for passenger service, are open between Balikpapan and other provinces of Kalimantan, Java and Sulawesi with airplanes of DC9 class. Within the Province of East Kalimantan, small planes interconnect various points.

2-3-1 Sea Transport

Main ports situated along the coastline of about 1,100 km of East Kalimantan are four ports of, from north, Nunukan, Tarakan, Samarinda and Balikpapan, and these ports are connected with one another and main ports in other areas of Indonesia by the Interinsular shipping routes in regular liner service (RLS).

According to the geographical condition, East Kalimantan had its development directed mainly toward the southern part, and the northern part was lagging in development. Thus, the representative ports of East Kalimantan, that is, Ports of Samarinda and Balikpapan, are situated, apart only about 130 km over the sea, near the mouth of the Mahakam River in the basin of which the population is concentrated most densely.

Both Ports of Nunukan and Tarakan have been developing in relation mainly with oil development. They are located on islands in the northern part near the Malaysian border and have few connection with the inland as a service area. Thus, along the coast extending for about 700 km from the Port of Tarakan in the north to the Port of Samarinda in the south, there is no appreciable port facility at present except for shipping of primary products such as log and natural gas, etc.

Now looking the foregoing four major ports from the aspect of handling cargo, the largest is the Port of Balikpapan which is a port situated in Balikpapan Bay, with the handling cargo at 6,440,000 tons in 1977. The Port of Samarinda ranking next is a river port having the city of Samarinda, capital of the province, in the background, with the cargo handling in the same year at 4,133,000 tons.

Handling cargos of the other two ports are: Port of Tarakan at 2,387,000 tons; and Port of Nunukan at 136,000 tons. Thus, it will be apparent that the foregoing two ports are playing a particularly important role for the province of East Kalimantan. Especially, the Port of Balikpapan is situated in the bay which has a great water depth so that it permits approach of large vessels from the ocean with ease. Thus, it has developed as a base of storage and refinery of oil from early times. And it is the only large deep water port allowing entry of large ocean-going vessels in the province against the Port of Samarinda where the vessels have to come up the river along the channel for about 60 km.

In addition to the foregoing four ports, there are loading points, as called generally, where shipping of log and natural gas is made, along the coast of 1,100 km of East Kalimantan. But, they are

situated in natural water areas which are located close to producing centers of primary products, calm and of relatively large depth and are used conveniently for cargo handling. Thus, they have little artificial facilities. Shipping of the natural gas is made at Bontang, and that of log and processed timber is made at the water areas in the vicinities of the Ports of Balikpapan and Samarinda. As for the volume of shipment of log and processed timber, about one-half of the total shipment in this province is handled in these two ports. And the remaining is made at about 20 loading points, and among these loading points, Sangkulirang Bay is distinguished in the amount of shipment. Such loading points can be set up in nature, as desired near the producing centers of primary products and are not at all concerned with the distribution to the hinterland.

On the other hand, what is playing a very great role in the cargo transport from seashore to inland is the inland shipping in use of rivers. In East Kalimantan, there are large rivers such as, from the north, the Sekuku, the Sesayap, the Segah, the Mahakam and the Kandilo penetrating deep into the inland, and their tributaries cover the inland like a network.

In East Kalimantan where the road is very poor as described later, this inland shipping is the only means of transport of cargoes from sea to inland except the area along the road running along the coast. And there is no effective means of cargo transport available presently to further inland area precluding approach of even small boats.

Among the rivers stated above, representative is the Mahakam River. In this river, navigation up to about 300 km from the river mouth is enabled at all times so that along the rivers are located towns here and there toward the inland. In these towns are provided small terminal facilities which serve as a base of inland shipping, and they form final reaches of shipping to inland respectively (Table 2-38).

Table 2-38 Terminals on Inland Waterways, 1977

Location/Name	Length (m)	Width (m)
Samarinda/Mahakam	24	6
Samarinda/Komas	20	4
Samarinda/Sunday	11	4
Handil II	40	15
Tenggarong	100	10
Muara Kaman	10	4
Muara Muntai	10	4
Muara Pahu	12	2
Melak	10	4
Balikpapan/Pasar Baru	50	2
Grogol	120	4
Tarakan	250	3
Tanjung Selor	35	4
Berau/Tanjung Redeb	65	8
Sangkulirang	100	5
Malinau	10	4
Penajam	100	5

Source: Data on East Kalimantan, 1976/77

Now seeing the sea communication connecting the ports, loading points and river terminals stated above with the ports outside the area, the oceangoing vessels are oil tankers to the Port of Balikpapan, LNG vessels to the Port of Bontang and log carriers to the loading points, but they are trampers. As the ocean-going liners performing transport of mainly the general cargo, only the Interinsular RLS vessels connecting the four major ports in the province with Singapore are available, and the import cargoes from the other foreign countries are dependent on the secondary transport from the Ports of Surabaya and Tg. Priok. As for domestic vessels, interinsular vessels, local vessels and sailing vessels are available, and they are responsible for transport of cargoes mainly between the Ports of Surabaya, Ujungpandang and Banjarmasin outside the area and the ports in the province. The interinsular vessels are assuming the transport from the ports outside the area to the Port of Balikpapan and the other major ports, and the local vessels are assuming the transport to the main river terminals, taking advantage of their light draft. But, the sailing vessels have to utilize the wind and are, therefore, unable to sail in the rivers. Thus, they are assuming the transport to the major ports except the Port of Samarinda.

2-3-2 Land Transport

Looking the road condition by province of Indonesia, it will be seen that it differs greatly from province to province. The highest road density is seen in the Java Island, each province being 20 to 40 km per 100 km² area with D.K.I. Jakarta at an exceptionally high level. Following are the provinces of Sumatra and those of Nusatenggara, both at a level of about 10 km. In the other areas, North Sulawesi shows an especially high value at 16.2 km.

Now comparing the provinces of Kalimantan with the foregoing areas, the province of South Kalimantan at 6.2 km may be of a tolerable level, but the other provinces are at low levels of about 1 km. Particularly, East Kalimantan is at a level of only 0.4 km, ranking equally with Middle Kalimantan (0.2 km) and Irian Jaya (0.3 km), and is counted as one of the most underdeveloped provinces in the road condition. (Table 2-39)

Table 2-39 Length and Density of Roads (1972)

Province	Area (Km ²)	Length of Roads (Km)	Density of Roads (Km/Km ²)	(Km/100Km ²)
1. D. I. Aceh	55,392	5,748	0.103	10.3
2. North Sumatra	70,787	7,332	0.104	10.4
3. West Sumatra	49,778	5,325	0.107	10.7
4. Riau	94,562	2,209	0.023	2.3
5. Jambi	44,924	1,802	0.040	4.0
6. South Sumatra	103,688	8,153	0.065	6.5
7. Bengkulu	21,168			
8. Lampung	33,307			
9. D.K.I. Jakarta	588	1,317	2.360	236.0
10. West Java	45,917	8,697	0.189	18.9
11. Middle Java	32,037	11,002	0.343	34.3
12. Yogyakarta	3,193	1,169	0.366	36.6
13. East Java	47,922	10,605	0.221	22.1
14. Bali	5,561	1,744	0.314	31.4
15. West Nusatenggara	20,177	1,841	0.091	9.1
16. East Nusatenggara	47,876	4,757	0.099	9.9
17. West Kalimantan	146,760	2,027	0.014	1.4
18. Middle Kalimantan	152,600	314*	0.002	0.2
19. South Kalimantan	37,660	2,324	0.062	6.2
20. East Kalimantan	202,440	768	0.004	0.4
21. North Sulawesi	19,023	3,081	0.162	16.2
22. Middle Sulawesi	69,726	2,737	0.039	3.9
23. South Sulawesi	72,761	6,498	0.089	8.9
24. South East Sulawesi	27,686	2,056	0.074	7.4
25. Maluku	74,505	655	0.009	0.9
26. Irian Jaya	421,981	1,285	0.003	0.3
INDONESIA	1,902,019	95,463	0.050	5.0

Note: *a figure of 1971

Now taking the roads in East Kalimantan, the national and provincial roads have an approximately equal extension respectively and total to about 730 km.

Among the national roads, the road running along the coast for about 120 km from Penajam located against Balikpapan City across Balikpapan Bay to Lolo at the extreme south of the province has been the most important trunk road in the province, and it extends further from Lolo to the main cities in South Kalimantan. It may well be imagined that the road has played a very important role for so early development of the southern area of East Kalimantan.

On the other hand, the national road connecting the provincial capital Samarinda with Balikpapan in an extension of 115 km was constructed in 1977. It is a 6 m wide two lane road with asphalt pavement all the way. Presently, it has only a small volume of traffic, but along with the development of both Ports of Samarinda and Balikpapan and the area along the road, it will become a very highly important route (Table 2-40).

Table 2-40 Road Condition in East Kalimantan, 1977

Location	Length (km)	Good roads (60km/h)	Fair roads (40-60km/h)	Bad roads (20-40km/h)	Very bad roads (0-20km/h)
NATIONAL ROADS	355.7	165.0	39.9	107.1	24.6
Penajan-Lolo	120.6	50.0	32.0	38.6	-
Kuaro-Bata Aji	75.5	-	7.0	68.5	-
Lolo-Muara Bui	24.6	-	-	-	24.6
Balikpapan-Samarinda Seberang	115.0	115.0	-	-	-
PROVINCIAL ROADS	388.5	17.6	60.9	98.2	211.8
Lolo-Tanah Grogot	21.6	-	14.7	6.9	-
Balikpapan-Ma. Jawa	91.3	8.0	17.0	64.0	2.3
Dondang-Sanga Sanga	21.0	-	-	-	21.0
Samarinda-Anggana	22.6	-	-	-	22.6
Samarinda-Loa Bakun	11.4	4.7	-	-	6.7
Tenggarong-Loa Janan	31.0	-	25.2	2.0	3.8
Tenggarong-Kota Bangun	17.0	-	-	-	17.0
Melak-Mentiwan-Sekolak Darat	16.8	-	-	-	16.8
Melak-Barong Tongkok-Solak Darat-Mentiwan	30.0	-	-	-	30.0
Barong Tongkok-Tering	37.5	-	-	-	37.5
Barong Tongkok-Damai	45.0	-	-	-	45.0
Tering-Long Iram	9.0	-	-	-	9.0
Tj. Selor-Tj. Redeb	7.5	-	-	7.5	-
Tj. Redeb-Tj. Selor	12.0	-	-	12.0	-
Tj. Redeb-Tj. Bayur	9.8	-	4.0	5.8	-
Sepingan-By Pass	5.0	4.9	-	-	0.1
Total	726.2	182.6	99.9	205.3	236.4

Source: Data on East Kalimantan, 1976/77

Table 2-41 Roads by Class and Surface, East Kalimantan, 1976

Road	Road class	Length			Total (Km)	Width (m)
		soil	gravel	asphalt		
National roads		39.6	125.1	171.0	335.7	
Penajam-Lolo	III A	-	49.6	71.0	120.6	4.5
Kuaro-Batu Aji	IV	-	75.5	-	75.5	
Kuaro-Muara Bui	-	24.6	-	-	24.6	4
Balikpapan-Samarinda Seberang	II	15.0	-	100.0	115.0	6-8
Provincial roads		234.5	6.9	147.1	388.5	
Lolo-Tanah Grogot	III A	-	6.9	14.7	21.6	4
Balikpapan-Muara Jawa	III A	-	-	91.3	91.3	4
Dondang-Sanga Sanga	IV	21.0	-	-	21.0	3
Samarinda-Anggana	IV	22.6	-	-	22.6	4
Samarinda-Loa Bakun	III A	6.7	-	4.7	11.4	6
Tenggarong-Loa Janan	III A	3.6	-	27.4	31.0	4
Tenggarong-Kota Bangun	IV	17.0	-	-	17.0	3
Melak-Mentiwan-Sekolak Darat	IV	16.8	-	-	16.8	6
Melak-Barong Tongkok	IV	18.0	-	-	18.0	6
Barong Tongkok-Sekolak Darat	IV	12.0	-	-	12.0	6
Barong Tongkok-Damai	IV	45.0	-	-	45.0	4
Barong Tongkok-Tering Seberang	IV	37.5	-	-	37.5	4
Tering-Long Iram	IV	9.0	-	-	9.0	4
Tanjung Selor-Tanjung Redeb	IV	7.5	-	-	7.5	3
Tanjung Selor-Teluk Bayur	IV	12.0	-	-	12.0	4
Tanjung Redeb-Teluk Bayur	IV	5.8	-	4.0	9.8	3
Sepingan-By Pass	III A	-	-	5.0	5.0	7

Source: Data on East Kalimantan, 1976/77

Provincial roads are about 390 km in extension. The longest line is that of Balikpapan to Muara Jawa in about 90 km, while the other lines are of an extension of about 20 km located here and there to connect the adjacent towns in the province. Thus, they cannot be expected to carry out a great role in the distribution of commodities to the inland area. Further, 60% of the total extension is not paved and is not in good maintenance (Table 2-41).

2-3-3 Air Transport

In East Kalimantan, domestic air routes to the other provinces of Kalimantan and Jawa and Sulawesi Islands are opened, while because of the underdeveloped land transport network as stated above, air lines of small aircraft are operated to connect the various sites in the province with one another.

In the province, as many as 40 airports are available, but the airport permitting landing of Fokker 28 or DC 9 which is a typical type of Indonesian Domestic Airline is limited only to the Sepinggan Airport in Balikpapan City. This airport has an asphalt paved runway of a length of 1,800 m. In 1976, it recorded about 40,000 flights with about 500,000 passengers and 5,500 tons cargoes (personal baggages not included).

Except this airport, there are four airports having a runway of a length of 1,000 m or more, but the other airports are of a small scale for Cessna mainly (Table 2-42).

Table 2-42 Airports in East Kalimantan

District	Subdistrict	Name	Length (m)	Width (m)	Surface	Capacity
Balikpapan	Bpp. Utara	Sepinggan	1,800	30	Aspal Asph.	Fokker 28/DC9
Samarinda	Smd. Ilir	Temindung	790	30	Aspal Asph.	Sky-Van
Bulungan	Tarakan	Juwata	1,400	30	Aspal Asph.	Fokker 27
Bulungan	Tg. Palas	Tg. Selor	450	25	Tanah soil	Cesna
Bulungan	Tg. Palas	Mara II	600	30	Krikil Gravel	Cesna/Twin
Bulungan	Malinau	Salindung	650	25	Tanah soil	Cesna
Bulungan	Kayan Hulu	Long Nawang	400	20	Tanah soil	Cesna
Bulungan	Long Peko	Long Bia	420	25	Tanah soil	Cesna
Bulungan	Kayan Hilir	Data Dian	450	30	Tanah soil	Cesna
Bulungan	Krayan	Batu Japai [Long Bawan]	1,000	30	Tanah soil	DC 3-Ces --
Bulungan	Krayan	Lembubud	450	25	Tanah soil	Cesna
Bulungan	Krayan	Kurid	350	25	Tanah soil	Cesna
Bulungan	L. Pujungan	L. Pujungan	450	25	Tanah soil	Cesna
Bulungan	Krayan	L. Rungan	450	25	Tanah soil	Cesna
Bulungan	Krayan	Binuang	420	25	Tanah soil	Cesna
Bulungan	Tarakan	Bonyu	600	30	Coral	Sky-Van
Bulungan	Kerayan	Pa Tara	100	25	Tanah soil	Cesna
Bulungan	Lumbis	Mensalong	—	—	Tanah soil	Cesna
Berau	Tg. Redeb	Kalimarau	760	18	Asphalt	Cesna
Berau	Talisayan	Batu putih	450	25	Tanah soil	Beachcraft
Berau	Segah	Kp. Baru	450	25	Tanah soil	Cesna
Berau	Kelai	Merasa	400	25	Tanah soil	Cesna
Berau	Kelai	Merapun	350	25	Tanah soil	Cesna
Kutai	Melak	Semd. II	1,200	30	Tanah soil	DC 3
Kutai	Bontang	Tg. Santan	1,350	30	Asphalt	SKY-Van/F27
Kutai	Bontang	Sangata	600	20	Asphalt	Sky-Van
Kutai	Sangkulirang	Tg. Perak	850	30	Woodenslat	Cesna
Kutai	Tabang	Getsemani	450	20	Tanah soil	Cesna
Kutai	Ma. Anealong	Long Lces	450	30	Tanah soil	Cesna
Kutai	Ma. Bengkal.	Batuampar	600	20	Krikil Gravel	Norman Pr
Kutai	Ma. Wahau	Avedoco	600	25	Comp. sand	Norman Pr
Kutai	Barong Tongkok	Ongko Asa	350	15	Tanah soil	Cesna
Kutai	Ma. Lawa	Pendingin	150	30	Tanah soil	Cesna
Kutai	Ma. Lawa	Dilang Puti	150	30	Tanah soil	Cesna
Kutai	Bontang	Bontang	600	23	Aspal Asph.	Sky-Van
Rencana/ Planned:						
Bulungan	Tarakan	Nunukan	—	—	—	—
Pasir	Tanah Grogot	Pangerau-Panji	—	—	—	—
Kutai	L. Pagun	Ujoh Bilang	350	50	Gravel	Cesna

Chapter 3

Natural Environment of Balikpapan

1998

CHAPTER 3. NATURAL ENVIRONMENT OF BALIKPAPAN

3-1 Topography and Geological Features.

The Province of East Kalimantan, situated along the east coast of the Kalimantan Island, occupies a belt like area of 211,000km² extending from 04°23'N to 02°24'S and from 113°41'E to 119°00'E. The Province faces the Makasar Strait in the east, and is bordered by the Muratus Mountain Range in the south and by the Iban Mountain Range in the west and north. Except for the mountainous regions along the provincial boundaries, several large rivers run through hilly and flat regions, forming swamps in the lower reach and sandbars in the estuary, due to sedimentation.

Balikpapan Bay is situated in the southern part of the Province on the equator. It has a width of 5.4km, a length of 20km and the water depth of over 10m in the center, and directly faces the Makasar Strait. There is a shoal of the water depth of about 5m extending from SW to NE in the offing of the entrance of the Bay. Though several rivers run into the Bay, they are small in length and basin area compared with other rivers in the Province; sediment discharge by these rivers are therefore small.

Geologically, Balikpapan area is composed of three layers: Kampung Baru layer in the environs of Balikpapan City and around Makasar Cape, formed by alternate layers of sandstone or mudstone and silt, Balikpapan layer around Tokong Cape, formed by thin lime stone, marl, reddish brown sand and the others, and alluvium around Penajam.

3-1-1 Brief Representation of Natural Conditions of East Kalimantan

The Province of East Kalimantan is situated along the east coast of the Kalimantan Island.

In the south, the province is separated from the Province of South Kalimantan by the Muratus Mountains, and in the west, it shares the borders with the Province of Central Kalimantan at the Iban mountainous range exceeding the height of 1,000m. In the north-west and north, it is contiguous with Malaysia. In the east, there runs a coastline facing the Makasar Strait. Except for the mountainous regions along the provincial boundaries, the province of East Kalimantan presents a topography growing old with considerable progress of erosion in a height of one hundred and several tens meters or less such as Tarakan Basin in the north and Kutai Basin in the south of the Mangkalihat Cape and Pasir Basin in the south of Balikpapan.

The total area of East Kalimantan is 211,350km², and the areas of Samarinda, Balikpapan, Kutai, Bulungan, Pasir and Berdu regions are shown in Table 3-1.

Table 3-1 Area of East Kalimantan by District

District	Area (km ²)
Samarinda	2,727
Balikpapan	946
Kutai	90,937
Bulungan	64,000
Pasir	20,040
Berau	32,700
Total	211,350

In the basins of the large rivers such as the Mahakam River, there extends a flat, low and swampy land. A number of rivers run through hilly and flat regions into the Makasar Strait. Their length, width and area of basin of principal rivers in East Kalimantan are shown in Table 3-2.

Table 3-2 Main rivers in East Kalimantan

Name of River	Length (km)	Width (m)	River area (km ²)	District
S. Pasir	221		4,440	Pasir
S. Kandilo	191	200-400	3,902	Pasir
S. Telaksi	169		2,883	Pasir
S. Mahakam	920	200-1000	64,791	Kutai
S. Kedang Rantau	132		3,388	Kutai
S. Kedang Kepala	319		14,552	Kutai
S. Sangkulirang	100	200-500		Kutai
S. Berau	292		12,648	Berau
S. Segah	162	200-600	6,545	Berau
S. Kayan	576	120-170	31,564	Bulungan
S. Bahau	322		8,563	Bulungan
S. Sesayap	278	200-700	16,298	Bulungan
S. Sebakung	278	200-600	5,030	Bulungan
S. Malinau	231	200-300	3,878	Bulungan

Source: Inspection I, LLASDF, Samarinda (1977)

3-1-2 Topography of Balikpapan

Balikpapan Bay in which the Port of Balikpapan is located is situated at the southern part of East Kalimantan at 1°16'S and 116°48'E and takes the form of a strip extending north from the mouth of the bay facing the Makasar Strait as shown in Fig. 3-1. It has a width of 5.4km at the mouth and a length of about 20km from the mouth to the Balang Island. Into the bay run the rivers of Balikpapan, Riko, Wain and Sembur, but these rivers are rather minor when they are compared with the principal rivers of East Kalimantan shown in Table 3-2. The Balikpapan River runs through the tertiary Pulau Balang layer, and the Riko River through the Pulau Balang layer and the tertiary Balikpapan layer carrying much sand and mud. However, sediment discharge by these rivers is estimated to be remarkably small when taken against, for example, the Mahakam River in East Kalimantan, thus at present, a water depth of -10m or greater is maintained at near the river mouth. On the other hand, the Wain and Sembur Rivers run through the tertiary Kampung Baru layer into Balikpapan Bay and are considered to be of greater amount of sediment discharge than the foregoing two, with a shallow water depth less than -4m at the river mouth respectively. In the offing south of the entrance of Balikpapan Bay and along the east coast of the bay are extending shoals giving a water depth less than -5m, but a channel of a depth of -10m or greater runs southeast from the mouth of the bay to offing.

The eastern hinterland of Balikpapan Bay consists of a hilly land of a height less than 100m where an urban area is mainly developing. In the western part of the bay, an alluvial land extends in the back of Penadjan and along the coastline in the south. In the back of the alluvial tract stretch gentle hills, and there some of old villages are formed along a pipeline and a national road designed for jeep running from the Tanjung area to Penadjan. The north region of the Makasar Cape along the Balikpapan River is a gentle hilly land and is in a state of undevelopment.

Fig. 3-1 Topography of Balikpapan Bay



Source; Balikpapan Harbor and Approaches, Chart No. 72101, Defence Mapping Agency Hydrographic Center (1977)

Fig. 3-2 (1) Detailed Chart of Contour in Site 2

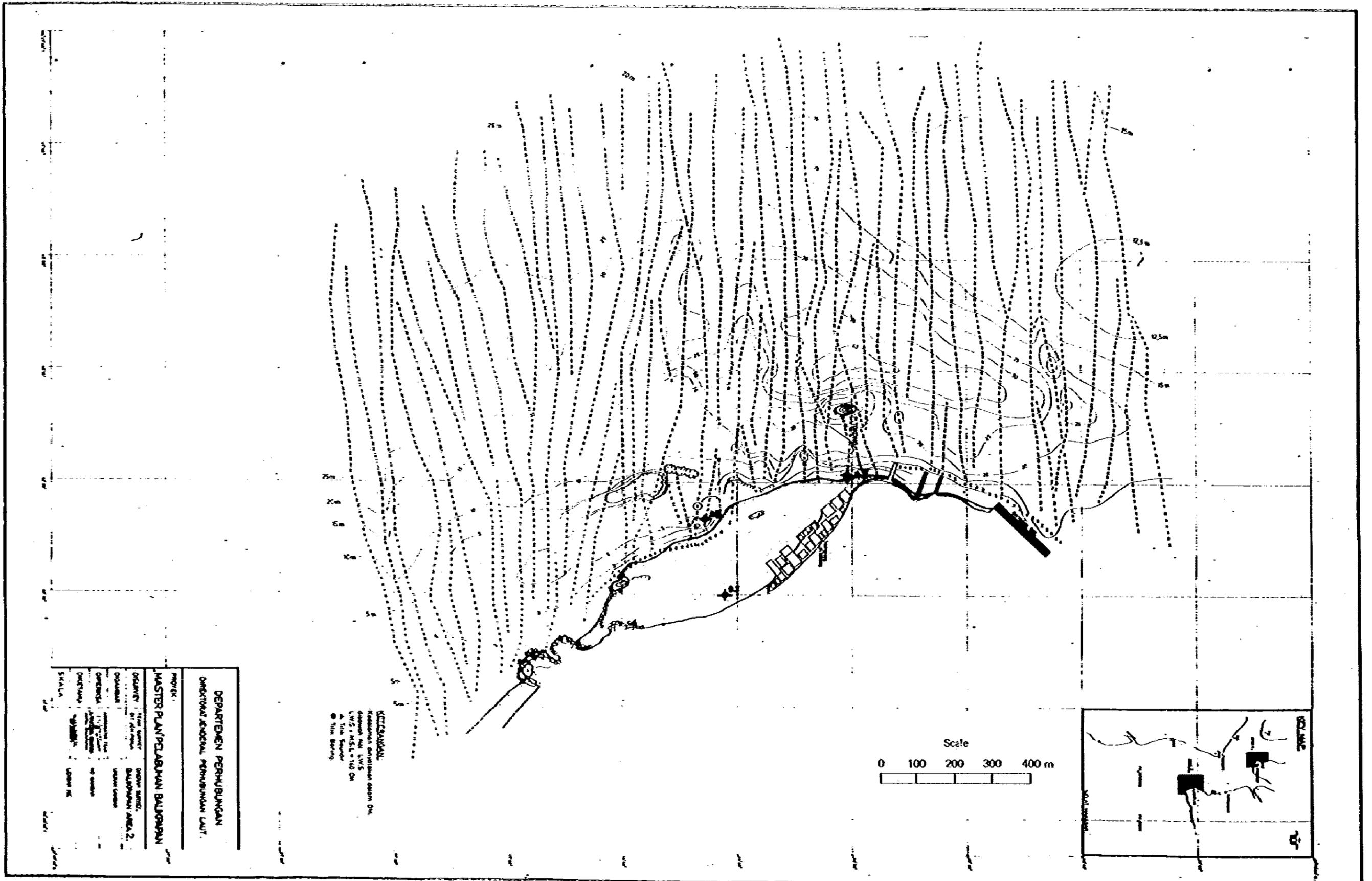


Fig. 3-2 (1) shows the results of detailed sounding surveys of the area in the south of the Tokong Cape (which will be referred to "Site 2" in the following). In order to get quay wall with the water depth of -10m required for navigation and mooring of 15,000 DWT vessels, without dredging, it would be better to construct quay wall along the -10m depth contour. Then, the total extension of 1,500m can be obtained, and the area enclosed by the -10m depth contour and the road along the seashore is about 40 ha.

Fig. 3-3 (1) Cross Section (Site 2) (C-C)

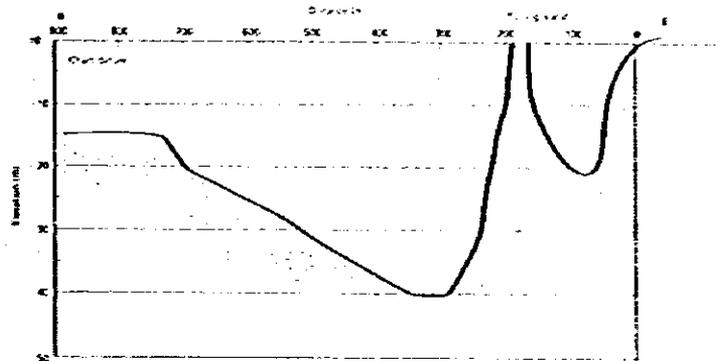
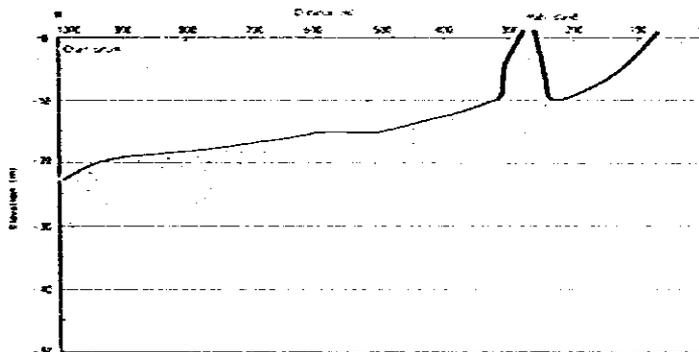


Fig. 3-3 (2) Cross Section (Site 2) (D-D)



Figs. 3-3 (1) and (2) show cross-sections C-C, D-D of Site 2. The location of cross-section C-C, D-D are shown in Fig. 3-14 (1). The area of a water depth of -10m or shallower of Site 2 includes reefs spotted here and there and forms a complex submarine topography locally. In the cross-section taken along C-C, the mean inclination of seabottom is sharp at 1/2.5, and in the cross-section D-D, it is not sharp at 1/15. In Site 2, about one-third of the area of a water depth shallower than -10m has a height above LWL.

Fig. 3-2 (2) shows the results of detailed sounding surveys of the area in the west of Makasar Cape (which will be referred to "Site 4" below). Site 4 has a reef zone of an area of 80 ha extending in the south and is of shallow water depth. In the east of the reef zone, the water depth is -5m or less because of the sediment discharges from the Wain and Sembur Rivers. In Site 4, the water depth is increasing sharply with increasing distance from the coastline. In Figs. 3-4 (1) and (2) are shown cross-sections A-A, B-B of Site 4. The location of cross-section A-A, B-B are shown in Fig. 3-14 (2). In the cross-section A-A, the mean bottom slope is 1/3, and in the cross-section B-B, it is 1/5.5. Further, at Makasar Cape in Site 4, there is a T-type cell quay wall which is not used at present.

As the topographic features of Sites 2 and 4, there may be cited (1) that the submarine gradient is great with a sharp slope, (2) that the sea depth as a navigation and a channel more than -10m can be obtained without dredging, (3) that deposition of sediment due to discharges from rivers or littoral drift is not much and (4) that a hilly land stretches in the back with little flat land left.

Fig. 3-4 (1) Cross Section (Site 4) (B--B)

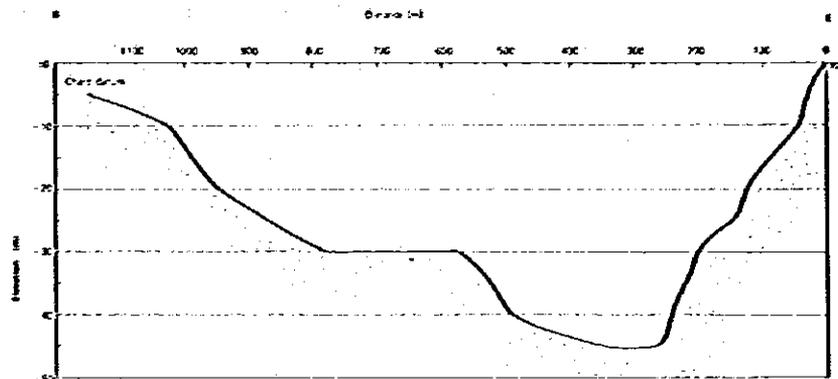
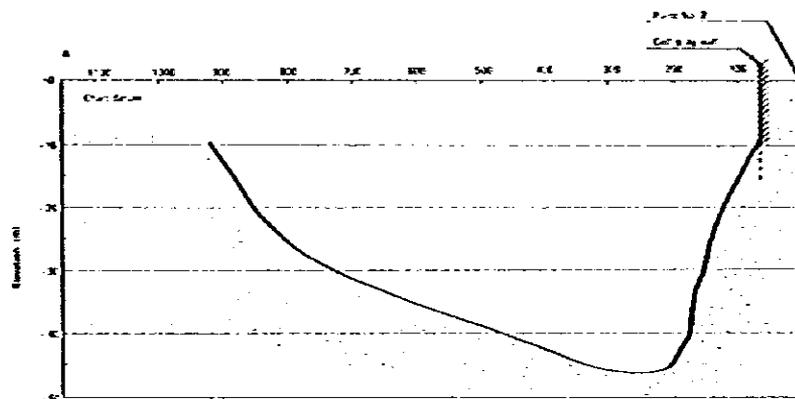


Fig. 3-4 (2) Cross Section (Site 4) (A -- A)



3-1-3 Geological Features of Balikpapan

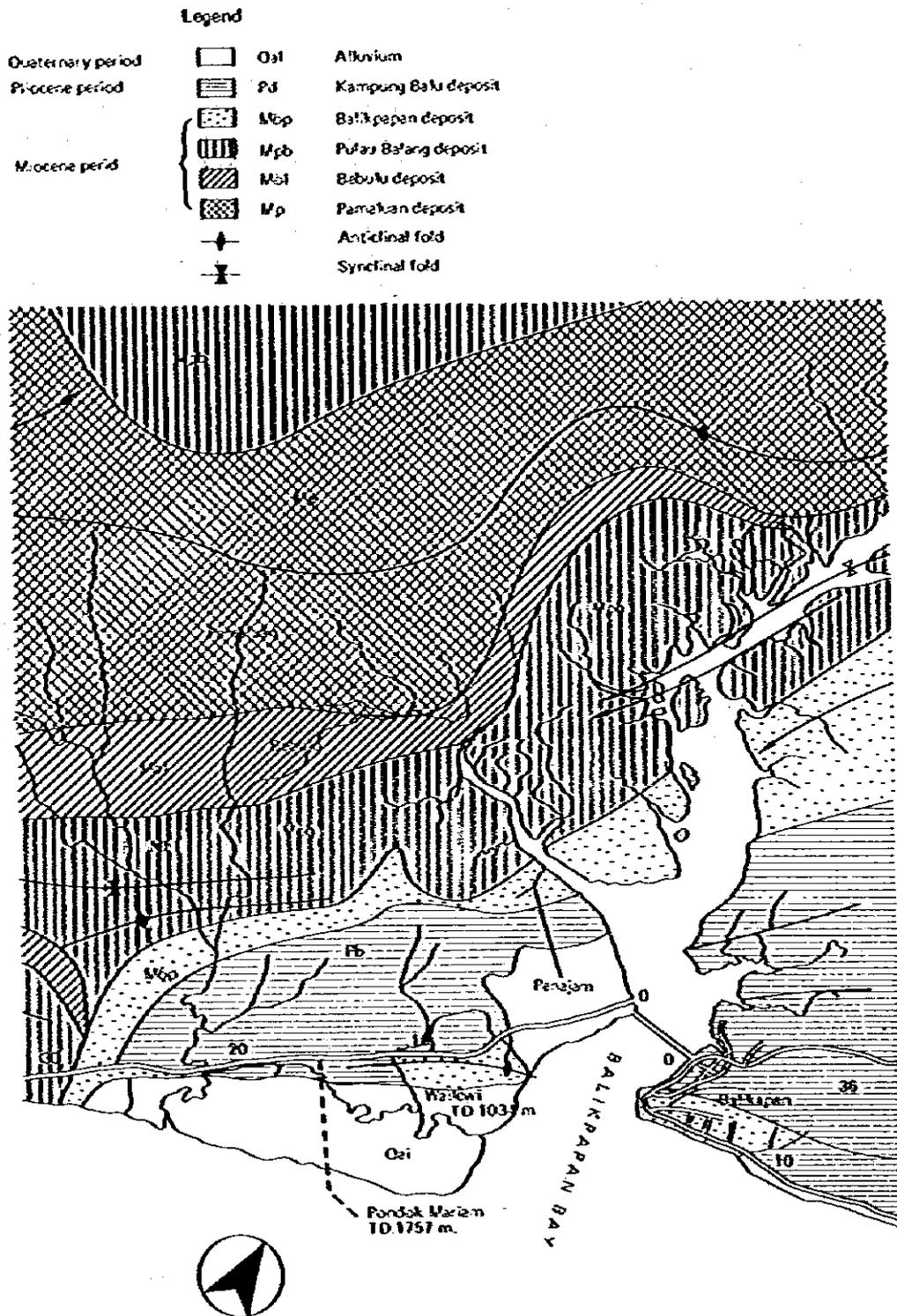
Geologic formations and rocks in the Balikpapan area are shown in Fig. 3-5 and Table 3-3. The stratum of the urban area of Balikpapan and the area of Makasar Cape is Kampung Baru layer comprising alternate layers of silt, brownish sandstone and mudstone formed in the Pliocene or a layer of seashore or river mouth formation. On the other hand, the stratum in the vicinity of Tokong Cape is a Balikpapan layer of regressive river mouth or delta formation comprising yellow reddish brown medium grain sand stone, brown ironstone silt, thin limestone and marlstone and formed in the middle to later stages of the Miocene. In the area of Penajam along the west coast of Balikpapan Bay, a stratum consisting of the Quarternary alluvial bed is spreading along the coast. In the northern part of the bay, a Pulau Balang layer of the middle stage of the Tertiary Miocene is present, succeeded in the north by Bebulu layer and Pamaluan layer.

Table 3-3 Geology of the Area of Balikpapan

Periods	Stratum Name	Rocks	
Quaternary	Alluvial layer		
Pliocene	Kampung Baru layer	Cyclic alternate layers of silt, brown sandstone and mudstone. Accompanying limonite (concretion) and brown coal. → Seashore or river mouth formation.	
Miocene	Later stage Balikpapan layer	Accompanying yellow reddish brown colored medium size sandstone (limonite material), limonite silt, thin limestone and marlstone, brown coal and coal. Including foraminiferal fossils at the lower part. → Regressive river mouth or delta formation.	
	Middle stage Pulau Balang layer	Alternate layers of mudstone, silt and sandstone. Thin limestone interposed. Coal layer interposed rarely at the upper part. → Shallow water formation of the lower part to coast, river mouth or delta formation of the upper part.	
	Early stage	Bebulu layer	Limestone, sandstone and silt. Sandstone of medium size largely, yellow reddish brown colored, including rotten wood. Limestone rich in fossils (coral, bivalve and foraminifera).
		Pamaluan layer	Limestone and sandstone, and limonite silt. Sandstone fine to medium size, dark gray dull yellow colored, having vegetable fossils, insect ducts and load casts. Containing gravel sometimes.

Source: 1978 Overseas Coal Development Survey Report (Kalimantan Coalmine, Indonesia).

Fig. 3-5 Geological Chart of Balikpapan and Its Vicinity



Source: Overseas Coal Development Survey Report (Kalimantan Coal mine, Indonesia, 1978)