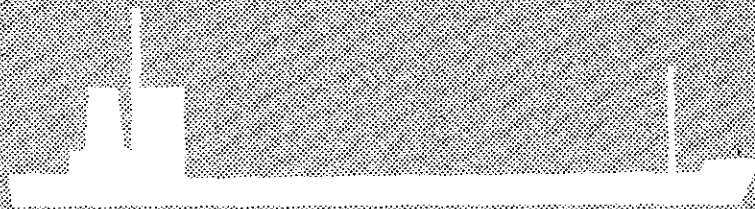


FINAL REPORT
OCTOBER 1984

**THE COMPREHENSIVE
DEVELOPMENT STUDY OF
COASTAL SHIPPING IN
THE KINGDOM OF THAILAND**

VOLUME 1 — REPORT



JAPAN INTERNATIONAL COOPERATION AGENCY

SDF

84-091(1/2)

JICA LIBRARY



1030885[6]

FINAL REPORT
OCTOBER 1984

**THE COMPREHENSIVE
DEVELOPMENT STUDY OF
COASTAL SHIPPING IN
THE KINGDOM OF THAILAND**

VOLUME 1 — REPORT

JAPAN INTERNATIONAL COOPERATION AGENCY

国際協力事業団	
受入 月日 '85. 1. 16	122
登録No. 11022	72
	SDF

PREFACE

In response to the request of the Government of the Kingdom of Thailand, the Japanese Government decided to conduct a Comprehensive Development Study of Thai Coastal Shipping and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Thailand a study team jointly organized by the Maritime International Cooperation Center of Japan (MICC) and the Overseas Coastal Area Development Institute of Japan (OCDI), headed by Mr. Takashi Miura, several times during the period from July 1983 to October 1984, under the guidance of the Supervisory Committee chaired by Mr. Koichi Yoshida, Director of the Coastal Shipping Div., Cargo Transport and Distribution Bureau, Ministry of Transport of the Japanese Government.

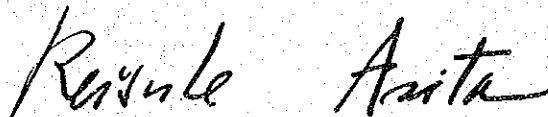
The study team exchanged views with the officials concerned of the Government of Thailand and conducted field surveys and collected reference materials.

After the team returned to Japan, further studies were made and the present report has been prepared.

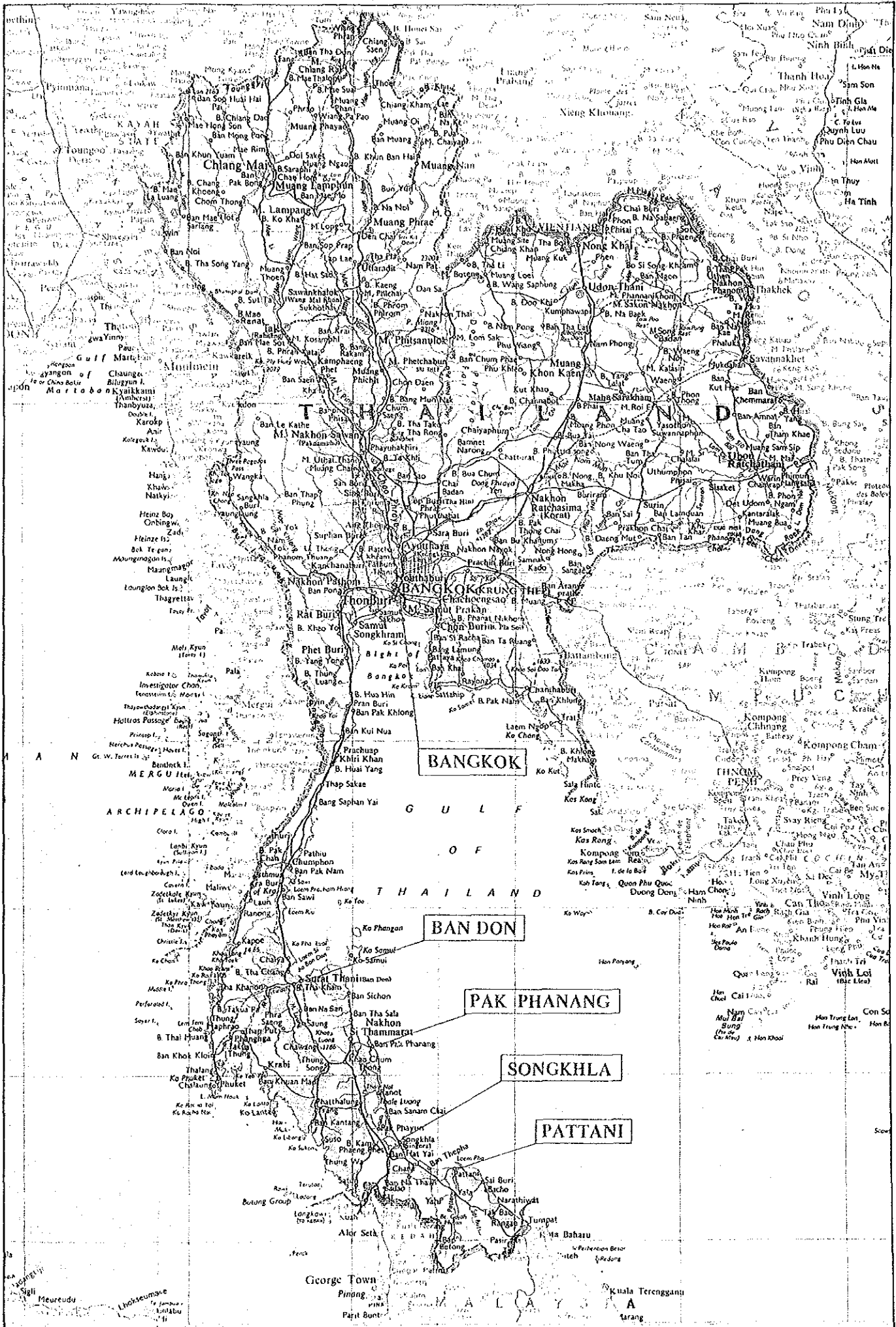
I hope that this report will serve for the development of domestic coastal shipping and local ports in Thailand and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to all the officials concerned of the Government of the Kingdom of Thailand for their cooperation extended to the team.

October 1984



Keisuke Arita
President
Japan International Cooperation Agency



BANGKOK

BAN DON

PAK PHANANG

SONGKHLA

PATTANI

GULF OF THAILAND

THAILAND

George Town

Malaysia

Kuala Terengganu

Tarung

KAYAH STATE

Chiang Mai

Muang Lamphun

Muang Phrae

Phitsanulok

Udon Thani

Nakhon Phanom

Ubon Ratchasima

Surin

Gulf Martaban

Andaman Sea

Thonburi

Nakhon Si Thammarat

Phuket

Nakhon Ratchasima (Korat)

Prachin Buri

Surat Thani

Phuket

ARCHIPELAGO

Mergu Islands

Andaman Islands

Pathu Chumphon

Ban Pak Nam

Ko Phanang

Ko Samui

Ban Na San

Ban Tha Sala

George Town

Pinang

Parit Buntar

Alor Setar

Ma Bsharu

Perlis

Perlis

Perlis

Perlis

CONTENTS

PREFACE

DEFINITIONS AND ABBREVIATION	I ~ VI
SUMMARY AND RECOMMENDATIONS	(1) ~ (37)
CHAPTER 1 INTRODUCTION	1
1.1 Background	1
1.2 Objective of the Study	2
1.3 Scope of the Study	2
1.4 Progress of the Study	3
1.5 General Observation	3
1.6 Members and Itinerary	5
1.6.1 Members	5
1.6.2 Itinerary	9
CHAPTER 2 GENERAL BACKGROUND	19
2.1 Natural Conditions	19
2.2 Socio-Economic Indicators	25
2.2.1 Population	25
2.2.2 Economic Development	29
2.2.3 Production Section	32
CHAPTER 3 REVIEW OF TRANSPORT SECTORS	51
3.1 Overall Review of Cargo Flow	51
3.2 Shipping	58
3.2.1 Domestic Coastal Shipping	58
3.2.2 Inland Waterways	81
3.2.3 Sub-Regional Coastal Shipping	88
3.2.4 Seafarers	93
3.3 Railways	101
3.3.1 Transport Activities	101
3.3.2 Cargo Flow	101

3.4	Road Transport	105
3.4.1	Trucking Company's Activities	105
3.4.2	Cargo Flow	109
3.4.3	Cost and Freight	112
CHAPTER 4 REVIEW OF PORTS AND HARBOURS		123
4.1	Outline of Ports and Harbours in Thailand	123
4.1.1	Classification of Ports in Thailand	123
4.1.2	Profiles of Coastal Ports	126
4.2	Administration of Ports and Harbours in Thailand	131
4.2.1	General Overview of Administration at Present	131
4.2.2	Role of Local Ports in Thailand	136
4.2.3	Necessity of Simplification of Port Authority's Organization	139
4.2.4	Diversification of the Revenue	142
4.3	Development and Planning of Local Ports	143
4.4	Cargo-handling Operation in Local Ports	144
4.4.1	Who Shoud Operate Cargo-handling Business?	144
4.4.2	Appropriate Port Cargo Handling Business at Local Ports	145
CHAPTER 5 REVIEW OF SHIPBUILDING AND REPAIRING		149
5.1	General	149
5.2	Shipbuilding and Ship Repair Yards	150
5.3	Shipbuilding and Ship Repair in Thailand - Prospects	155
5.4	Study Assumption on Prices	156
CHAPTER 6 MARITIME POLICY FOR COASTAL SHIPPING		159
6.1	Governmental Agencies	159
6.2	Statutes Relating to Domestic Coastal Shipping	162
6.3	Measures for the Development of Domestic Coastal Shipping	163
6.3.1	Status of Domestic Coastal Shipping	163
6.3.2	Owners and Operators - Domestic Coastal Shipping	163
6.3.3	Equal Footing with Other Modes of Transportation	164
6.4	Other Actions	165

CHAPTER 7	CARGO DEMAND FORECAST	169
7.1	Basic Approach - Methodology	169
7.2	Hinterland	171
7.3	Total Cargo Flow	171
7.3.1	Southbound Cargo	171
7.3.2	Northbound Cargo	179
7.3.3	Total Cargo Flow	184
7.4	The Cargo Split by Mode	190
7.4.1	The Concept	190
7.4.2	The Percentage of Cargo Commodity by Ship (by Hinterland)	191
7.5	The Shipping Cargo Volume by Port	193
CHAPTER 8	DEVELOPMENT PLAN OF DOMESTIC COASTAL COMMON CARRIER SERVICE	207
8.1	Roles of Domestic Shipping	207
8.2	Projected Trade Routes and Types of Vessels	209
8.2.1	Selection of Trade Routes	209
8.2.2	Selection of the Types of Vessels	210
8.2.3	Prices of Vessels	219
8.2.4	Scheme of Operation	221
8.2.5	Preconditions for Analysis	225
8.3	Financial Analysis	226
8.3.1	Profit/Loss Analysis	226
8.3.2	Investment Return Analysis	254
8.3.3	Sensitivity Analysis on Fuel and Crew Costs	255
8.3.4	Conclusions	256
CHAPTER 9	DEVELOPMENT PLAN OF COASTAL PORTS	273
9.1	Selection of Pivotal Ports	273
9.2	Development Plan of Pivotal Ports	274
9.3	Design and Cost Estimates	289

CHAPTER 10	ECONOMIC EVALUATION	293
10.1	Conceptual Background	293
10.2	Economic Evaluation	294
10.3	Financial Analysis for the Port Authorities	314
10.3.1	Outline of the Evaluation	314
10.3.2	Financial Evaluation	317

LIST OF TABLES

Table No.	Title	Page
2.1-1	Prevailing Wind and Wind Speed	20
2.1-2	Distances between Major Cities (Straight Line Distance)	22
2.2-1	Major Targets of the Fifth Plan	31
2.2-2	Scenarios for Economic Growth in the South	32
2.2-3	Forecast of Rubber Productions	36
2.2-4	Future Changes in Fish Landings	41
3.2-1	Number of Seafarers in Thailand, 1980	93
3.2-2	Forecast of Supply and Demand of Licensed Officers	95
3.4-1	Road Transport Flow, 1978	105
3.4-2	Expenses per One Round Trip	112
3.4-3	The Cost per One Round Trip between Bangkok/The South	113
3.4-4	Comparison of the Data	114
3.4-5	Cost Comparison of Present and Past	114
3.4-6	Distribution of Gross Vehicle Weight for 10 Wheels Trucks	116
3.4-7	Financial Costs of 10 Wheels Truck Costs	116
3.4-8	Average Actual Freight Rate (10 Wheels Truck) Bangkok/Southern Provinces	118
3.4-9	ETO's Freight Rate between Bangkok and the South (10 Wheels Truck)	118
7.1-1	Economic Growth in the South	170
7.2-1	Hinterlands of the Coastal Ports	171
7.3-1	Future General Cargo Flow by Hinterland (Southbound)	173
7.3-2	Future Fertilizer Flow by Hinterland (Southbound)	174
7.3-3	Future Construction Material Flow by Hinterland (Southbound)	175
7.3-4	Future Rice Flow by Hinterland (Southbound)	176
7.3-5	Future Maize Flow by Hinterland (Southbound)	177
7.3-6	Future Fuel Flow by Hinterland (Southbound)	178
7.3-7	Future General Cargo Flow by Hinterland (Northbound)	179
7.3-8	Future Forestry Products Flow by Hinterland (Northbound)	180

Table No.	Title	Page
7.3-9	Future Fish Products Flow (Northbound)	181
7.3-10	Future Vegetable/Fruits Flow (Northbound)	182
7.3-11	Future Rice Flow (Northbound)	183
7.3-12	Future Rubber Flow (Northbound)	184
7.5-1	Estimated Cargo Volume by Port, Chumphon	196
7.5-2	Estimated Cargo Volume by Port, Ban Don	197
7.5-3	Estimated Cargo Volume by Port, Pak Phanang	198
7.5-4	Estimated Cargo Volume by Port, Songkhla	199
7.5-5	Estimated Cargo Volume by Port, Pattani	200
7.5-6	Estimated Cargo Volume by Port, Narathiwat	201
7.5-7	Estimated Cargo Volume by Port, Bangkok	202
8.2-1	Particulars of Vessel	212
8.2-2	Prices of Vessels	220
8.2-3	Scheme of Operation for 15 Cases	224
8.3-1	Projected Freight Rates	229
8.3-2	Bases for the Computation of Profitability of 15 Cases	239
8.3-3	Crew Cost per Vessel	245
8.3-4	Profit and Loss of 15 Cases on Fleet Bases for 10 Years, Based on ETO Tariffs	247
8.3-5	Profit and Loss of 15 Cases on Fleet Bases for 10 Years, Based on Prevailing Market Rates	249
8.3-6	Projected Freight Rates and Break-even Points	252
8.3-7 (1)	Profit and Loss Analyses, Case 3 (Vessel)	258
8.3-7 (2)	Profit and Loss Analyses, Case 3 (Fleet)	259
8.3-8 (1)	Profit and Loss Analyses, Case 9 (Vessel)	260
8.3-8 (2)	Profit and Loss Analyses, Case 9 (Fleet)	261
8.3-9	Profit and Loss Analyses, Case 15 (Fleet)	263
8.3-10	Reversion Ratio of Investment of 15 Cases	267
9.2-1	Style of Packing by Commodities	275
9.2-2	Estimated Volume of Cargo at Individual Ports	277
9.2-3	Characteristics of Standard Berths	280
9.2-4	Cargo Flows in Port Areas	283

Table No.	Title	Page
9.2-5	Summary of Port Facilities & Examination of Additional Investment	285
10.2-1	Socio-Economic Indicators	295
10.2-2	Breakdown of Construction Cost	295
10.2-3	Actual and Proposed Construction Cost	296
10.2-4	Capital Dredging Cost by Port	297
10.2-5	Maintenance Dredging Cost (1983 prices)	297
10.2-6	Breakdown of Dredging Cost	298
10.2-7	Truck Transportation Cost by Hinterland, 1987	299
10.2-8	Shipping Freight Costs to and from Bangkok	300
10.2-9	Truck Operation Costs of Drayage	301
10.2-10	Cargo Handling Cost per Ton, 1987	302
10.2-11	Difference between Truck Cost and Shipping Cost (1987 prices)	303
10.2-12	Cargo Volume by Ship	304
10.2-13	Reduction of Transport Cost	305
10.2-14	Fuel Transport Cost (1987 prices)	306
10.2-15	Fuel Transport Volume by Shipping	307
10.2-16	Reduction of the Transport Costs by Using Large Size Vessels	308
10.2-17	Reduction of Road Maintenance Costs	309
10.2-18	Cost-Benefit Table	311
10.2-19	IRR Calculation (Residual Value Deleted)	312
10.2-20	IRR Calculation (Including Residual Value)	313
10.3-1	Revenue of the Local Authority per Tonnage	316
10.3-2	Port Authority of Ban Don (Surat Thani)	318
10.3-3	Port Authority of Pak Phanang (Nakhon Si Thammarat)	319
10.3-4	Port Authority of Songkhla	320
10.3-5	Port Authority of Pattani	321
10.3-6	Port Authority of Bangkok (Domestic)	322
10.3-7	Total Expenditure	323
10.3-8	Total Balance	324

LIST OF FIGURES

Fig. No.	Title	Page
2.1-1	Climate Map	24
2.2-1	Population of the Southern Provinces	26
2.2-2	Population Increase by Amphoe (1976 ~81)	28
2.2-3	Map of Rubber Growing Areas	35
2.2-4	Location of Rubber Processing/Smoking Factories	37
2.2-5	Rubber Flow	38
2.2-6	Loading Ports Trends	40
2.2-7	Countries Importing from Thailand	40
2.2-8	Annual Catch of Marine Fish	43
2.2-9	Percentage of Fishery Products Carried to Bangkok	44
2.2-10	Relation between Transport and Forestry Products	46
3.1-1	Cargo Flows by Road, Rail and Shipping (1975 ~ 1981) (All Cargoes - Bangkok to the South)	54
3.1.2	Cargo Flows by Road, Rail and Shipping (1975 ~ 1981) (All Cargoes - the South to Bangkok)	55
3.1-3	Cargo Flows by Road, Rail and Shipping (1975 ~ 1981) (Dry Cargoes only - Bangkok to the South)	56
3.1-4	Cargo Flows by Road, Rail and Shipping (1975 ~ 1981) (Dry Cargoes only - the South to Bangkok)	57
3.2-1	Coastal Shipping Cargo Flows (Bangkok to the South)	60
3.2-2	Coastal Shipping Cargo Flows (the South to Bangkok)	61
3.2-3	Coastal Shipping Cargo Flows - Major Commodity (Bangkok to the South)	63
3.2-4	Coastal Shipping Cargo Flows - Major Commodity (the South to Bangkok)	64
3.2-5	Coastal Shipping Cargo Flows - Main Ports - Dry Cargo Only (Bangkok to the South)	74
3.2-6	Coastal Shipping Cargo Flows - Main Ports - Dry Cargo Only (the South to Bangkok)	75
3.2-7	Sub-Regional Cargo Flows	89
3.3-1	Map of Railway of the South	102
3.3-2 (1)	Distribution of Railway Cargo Volume (Southbound) 1981	103
3.3-2 (2)	Distribution of Railway Cargo Volume (Northbound) 1981	103

Fig. No.	Title	Page
3.3-3	Relationship between Different Classes of the Present Carload	104
3.4-1	Highway Map of the South	106
3.4-2 (1)	Truck Cargo Volume between Bangkok and the South (Southbound)	107
3.4-2 (2)	Truck Cargo Volume between Bangkok and the South (Northbound)	108
3.4-3 (1)	Cargo Distribution Flow (Northbound) 1981	110
3.4-3 (2)	Cargo Distribution Flow (Southbound) 1981	111
4.1-1	Port of Bangkok	127
4.1-2	Private Wharves of Bangkok Port	128
4.1-3	Location Map of Coastal Ports	129
4.1-4	Location Map of Inland Waterways	130
4.2-1	Recommendable Organization of the Local Port Authority	141
7.1-1	Approach of Future Cargo Forecast	170
7.2-1	Hinterlands by Ports	172
7.3-1	Future Total Cargo Flow (Southbound)	185
7.3-2	Future Total Cargo Flow (Northbound)	186
7.3-3	Future Total Cargo Flow by Hinterland (Southbound)	188
7.3-4	Future Total Cargo Flow by Hinterland (Northbound)	189
7.4-1	Concept of Modal Split	190
7.4-2	Percentage of Cargo Carried by Ship and Distance	192
7.5-1	Total Sea Born Cargo - Low Estimate (Southbound)	194
7.5-2	Total Sea Born Cargo - Low Estimate (Northbound)	195
7.5-3	Cargo Forecasting of Total (Low Estimate)	203
7.5-4	Cargo Forecast of Dry Cargo from Bangkok (Low Estimate)	204
8.2-1	1,500 DWT General Cargo Vessel	213
8.2-2	1,000 DWT General Cargo Vessel	214
8.2-3	700 DWT General Cargo Vessel	215
8.2-4	2,600 DWT RoRo Vessel	216
8.2-5	1,000 DWT Pusher-Barge System	217

Fig. No.	Title	Page
8.3-1	Profit and Loss of 15 Cases on Fleet Bases for 10 Years (Profit after Income Tax)	257
8.3-2	Profitability of Case 3, 700 DWT Type General Cargo Vessel - 2 Port Call	262
8.3-3	Profitability of Case 9, 700 Tons Type General Cargo Vessel - 2 Port Call (Ships Price 50%)	265
8.3-4	Profitability of Case 15, Pusher-Barge System - 2 Port Call	268
9.2-1	Methodology of Development Plan	274
9.2-2	Cargo Movement in Port Areas	279

VOLUME 2 - APPENDICES

CONTENTS

A. 1	(1)	Members of Counter Part	1
A. 2	(2)	Data for Explanation of Socio-Economic Indicators	5
A. 3	(3)	Breakdown of Cargo Flows by Commodity and by Mode of Transport, 1981	19
A. 4	(3)	Review of Cargo Flows (All Modes)	25
A. 5	(3)	Review of Cargo Flows (Shipping)	33
A. 6	(4)	Budgets and Dredging Operations of HD	91
A. 7	(4)	Profiles of the Major Ports in the South	99
A. 8	(4)	Probable Cargo Handling Charge	125
A. 9	(6)	Governmental Agencies	131
A.10	(7)	Explanation of Cargo Demand Forecast	137
A.11	(8)	Energy Saving	225
A.12	(8)	Projected Trade Route	231
A.13	(8)	Financial Analysis of Projected Trade Route	235
A.14	(8)	IRR Calculation for Domestic Coastal Shipping	271
A.15	(9)	Explanation of the Proposed Cargo Handling System	281
A.16	(9)	Results of Analysis for Port Facilities	289
A.17	(9)	Port Facilities Plan and Construction Costs	299
A.18	(10)	Reduction of the Road Maintenance Cost	307
A.19		Outline of Coastal Ports in Southern Region	325

Note: Number in brackets shows chapter number in the Report.

DEFINITIONS AND ABBREVIATIONS

DEFINITIONS AND ABBREVIATION

I. DEFINITIONS

1. Bareboat Charter (Demise Charter)

As the name indicates, owners are letting the "bare ship" when fixing the vessel on bareboat charter terms. Charterers have the full right of control of the vessel upon manning which they are operating as if the vessel belonged to their own fleet. All costs and expenses incident to use and operation of the vessel are for charterer's account. Charterers will keep the vessel in good running order and conditions and in substantially the same conditions when delivered by the owners.

2. Berth Terms (Liner Terms)

This expression is used for shipments by the regular liner operations in a fixed trade and implies that loading and discharging expenses will be for shipowners' or operators' account.

3. Charter Base (C/B)

$$\frac{\text{Freight earnings} - \text{Operating costs}}{\text{Total days for a voyage}} \times 30 \times 1/\text{DWT}$$

Net earning of a voyage (Freight earnings - Operating costs) is divided by DWT of the vessel upon adjusting the net earning of the voyage to 30 days (one month), which is called Charter Base and used for proofing profitability of the voyage.

4. Common Carrier

Any ocean carrier who is available for a number of shipments received from different shippers consigned for delivery at various points of destination along the ship's route. Usually ship's schedule is fixed and announced in advance to the public for the convenience of customers.

5. Contract of Affreightment (COA)

In a contract of affreightment shipowners/operators undertake to carry goods by sea or to put a vessel - either wholly or partly - at the

disposal of shippers or charterers against payment of a certain rate of freight mutually agreed in advance. Such a contract of affreightment embodying the rights and obligations of both contracting parties, may take the form of charter party, bill of lading or booking note. However, recently, contract of affreightment is commonly used for a contract between owners/operators and shippers to perform of carriage of a rather larger amount of a commodity by sea in the fixed trade route for a certain period - one or more year - by a fixed type of vessels at the rate mutually agreed upon.

6. Domestic Coastal Shipping

Any coastal shipping service trading among ports within the territory of the Kingdom of Thailand.

7. Free In and Out (FIO)

As a rule, owners/operators have to pay the cost of loading and discharging the cargo, it being the duty of shippers to deliver the cargo free alongside at the port of loading and for consignees to take delivery from alongside at the port of destination. Sometimes shippers or consignees retain the right to nominate the stevedores at a fixed rate per ton at the loading and/or discharging ports.

The expression "free in and out" means it is the responsibility of shippers to load and consignees to discharge the cargo for their respective accounts.

Free in (FI) or free out (FO) can be used also depending on the trade practices or agreement between owners/operators and shippers/consignees.

8. Hire Base (H/B)

Fixed costs of a vessel for 30 days \times 1/DWT

All fixed costs of a vessel needed to maintain the vessel seaworthy for 30 days (one month) is divided by DWT of the vessel, which is called Hire Base and used for proofing the minimum cost of the vessel when the owners hold out the vessel to the market.

9. Industrial Carrier

Any carrier who is in a position to perfect vessels that are especially adapted to the specific trade for the shipper, oil company (tanker) and cement company (bulk carrier) being the best known industrial carrier in Thailand.

10. Sub-Regional Coastal Shipping or Home Trade

Any coastal shipping service trading between ports in the Kingdom of Thailand and ports in the Sub-Regional area such as Malaysia, Singapore and Indonesia (North of Sumatra).

11. Time Charter

A contract contains the terms and conditions mutually agreed upon between shipowners who have let and charterers who have hired a vessel for a stated period, e.g. one year, or the vessel may be let on time charter for one or more consecutive voyages between certain trades. As a rule owners shall provide and pay for all provisions, crew wages and other necessary expenses to maintain the vessel in a seaworthy condition. While the vessel is on hire, charterers shall provide and pay for all fuel and other operating expenses.

12. Ton

Unless otherwise indicated in the text, ton means metric ton.

13. Voyage Charter

Under a voyage charter shipowners undertake to put a vessel at charterers' disposal for the carriage of a full cargo or part cargo from one or more ports to named port(s) of destination or ports within a certain range at rates and conditions mutually agreed in advance. Shipowners have to defray all operating expenses, such as port charges, bunker, loading and discharging expenses and other charges out of the freight.

II ABBREVIATION

AIT	Asian Institute of Technology
ADB	Asian Development Bank
ADT	Average Daily Traffic
ASEAN	Association of Southeast Asian Nations
฿	Baht
BOI	Board of Investment
CD	Chart Datum
C & F	Cost and Freight
CIF	Cost, Insurance and Freight
CSO	Cold Storage Organization
DTEC	Department of Technical Economic Cooperation
DLT	Department of Land Transport
DOH	Department of Highway
DWT	Dead Weight Tonnage
EGAT	Electricity Generating Authority of Thailand
EIRR	Economic Internal Rate of Return
ETO	Express Transportation Organization of Thailand
FIRR	Financial Internal Rate of Return
FMO	Fish Marketing Organization
FOB	Free on Board
F/S	Feasibility Study
GCV	General Cargo Vessel
GDP	Gross Domestic Production
GPP	Gross Provincial Production
GT	Gross Tonnage

HD	Harbour Department
H _s	Significant Wave Height
HWS	High Water Springs
IBRD	International Bank for Re-construction and Development (World Bank)
IFCT	Industrial Finance Corporation of Thailand
IRR	Internal Rate of Return
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
LLW	Lowest Low Water
L _s	Significant Wave Length
LWS	Low Water Springs
MICC	The Maritime International Cooperation Center of Japan
MMPC	Mercantile Marine Promotion Commission
MMTC	Merchant Marine Training Center
MOC	Ministry of Communication
MOF	Ministry of Finance
MSL	Mean Sea Level
MOT	Ministry of Transport, Japan
NB	Northbound
NESDB	National Economic and Social Development Board
NRT	Net Registered Tonnage
NSO	National Statistic Office
OCDI	The Overseas Coastal Area Development Institute of Japan
O-D Data	Origine and Destination Data
OECD	Organization for Economic Cooperation and Development
PAT	Port Authority of Thailand
PB	Pusher Barge
PTT	Petroleum Authority of Thailand

RC	Reinforced Concrete
RORO	Roll-on Roll-off
RTG	Royal Thai Government
SB	Southbound
SRT	State Railway of Thailand
TMN	Thai Maritime Navigation Co., Ltd.
T _s	Significant Wave Period

SUMMARY AND RECOMMENDATIONS

SUMMARY AND RECOMMENDATIONS

I SUMMARY

1. Background

Domestic coastal shipping* together with the extensive use of inland waterways** has played an important role in the Thai domestic transportation system.

Among the various coastal shipping routes, those connecting the Southern Region to the Bangkok area are of prime importance and the others are routes in the Andaman Sea.

Though the coastal transport by industrial carriers, such as products tankers and log carriers, is still very active along the Bangkok - Southern routes, common carrier services have declined sharply since the completion of the region's modern highway network in the 1970's.

The development of highways in Thailand was carried out with remarkable speed during the 1960's and 1970's, and its impact on the domestic transport system has been significant and is still unfolding. This is particularly true for the transportation routes under discussion, due to the fact that the road distance between Bangkok & the South has been reduced by some 200 km. Consequently, the share of truck transport on this route has increased gradually.

* Though there is no clear-cut distinction between domestic and sub-regional coastal shipping in Thailand, the Study Team defines that domestic coastal shipping routes are limited within the nation's area. Hereafter this report calls it "The coastal shipping".

** Inland waterways - linkage with domestic coastal shipping
In Thailand, inland waterways are another key transportation method of domestic cargo next to road transportation. But from types of vessels in service at present and trade patterns, there, seemingly, is no direct linkage with domestic shipping. In other words, neither direct service can be feasible between river ports on the Chao Phraya River other than Bangkok and ports in the southern provinces nor indirect service via Bangkok between those areas.

Changes in the percentage of dry cargoes carried by each transport mode on the Bangkok - southern routes are summarized chronologically and shown in Table 1.

The most important fact we can read from the Table is that the share of shipping (southbound) was reduced to almost half in only three years (from 1975 to 1978). It is not difficult to understand that the above opening of the new highways was the deadly blow to the then existing coastal shipping services in the region.

Table 1 Percentage of Dry Cargo Carried by Each Transport Mode

Unit: %

	1975	1977	1978	1981
(Bangkok to the South)				
Road	46	54	58*	64
Shipping	17	11	9	11
Railways	37	35	33	25
(the South to Bangkok)				
Road	73	79	82*	80
Shipping	12	8	6	4
Railways	15	13	12	16

In fact some of the shipping companies** engaged in providing common carrier services in this region were forced to close down their business. The Study Team is of the opinion that if the government continues its "laissez-faire" policy in dealing with the coastal shipping during the coming decade, it may result in the complete disruption of common carrier services on Thailand's coastal shipping routes. Once the shipping services are closed down, and the people familiar with the business dispersed then the re-construction of the services would be extremely difficult.

* Estimation

** Thai Navigation Co. is an example.

It is commonly understood that the coastal shipping services are preferable to other freight transport modes over relatively longer routes* and the majority of the coastal shipping services between Bangkok and the South fit this case, provided that they have a substantial transport demand.

Low energy consumption (ton-km basis) is another merit of sea transport and the development of the coastal shipping will induce significant savings in highway maintenance cost. These points are fully discussed in Chapter 10.

The Royal Thai Government (RTG) upon fully recognizing the merits of sea transport and the critical situation for coastal shipping decided to launch an extensive study of Thai domestic coastal shipping. In relation to this RTG requested the Japanese Government to take part in a comprehensive study of Thai domestic coastal shipping. The Study Team started its surveys and analyses in August 1983 and the results are now compiled in this report.

2. Cargo Forecast

The methodology adopted in this study consists of the following four steps:

- (1) Set up the future economic framework for the region and break it down by hinterland for each port,
- (2) Estimate cargo flow between each hinterland and Bangkok by commodity (for all transport modes),
- (3) Decide the most appropriate modal split based on the origin - destination (O-D) analysis, and
- (4) Summarize each port's transport demand for the coastal shipping by commodity.

* In this study this threshold distance is estimated at around 600 km.

In step-1, based on the National Development Plan and other relevant socio-economic data, two scenarios are prepared (low estimate and high estimate) for the economic growth rate in the South.

Assumed Economic Growth Rate in the South (%)

	Low Estimate	High Estimate
1981 ~ 1987	6.6	7.1
1987 ~ 2000	5.0	7.5

In step-2, after examining the flow of major commodities, the road network and other socio-economic indicators by province, the hinterlands for the southern ports are defined as follows and shown in Fig. 1.

Port	Hinterland (provinces)
Chumpon	Chumpon, Ranong
Ban Don	Surat Thani, Phangnga, Phuket
Pak Phanang	Nakhon Si Thammarat, Krabi
Songkhla	Songkhla, Satun, Trang, Pattalung
Pattani	Pattani, Yala
Narathiwat	Narathiwat

In order to estimate cargo flow by commodity, cross checks for major commodities such as rubber, forestry products and fishery products were made by analyzing their production.

Total cargo flows for fuel, general cargo and dry others between Bangkok and the South are summarized in Table 2.

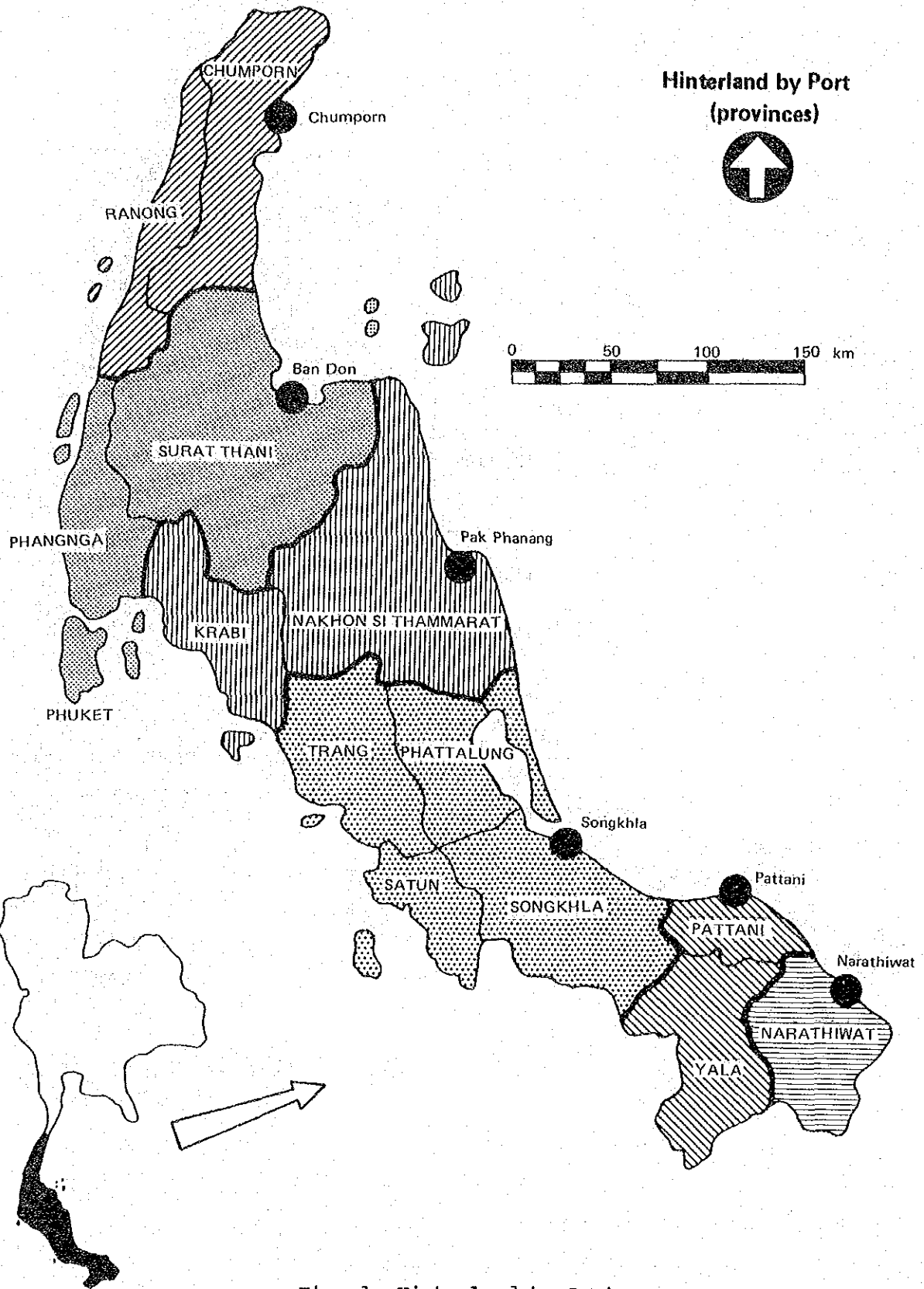


Fig. 1 Hinterland by Port

Table 2 Estimated Total Cargo Flow

Unit: Thousand tons

		1981	1987	1992	2000
(Southbound)					
General Cargo	High	(1,002)	1,533	2,284	4,203
	Low		1,473	1,939	2,892
Dry Others	High	(421)	776	1,188	2,101
	Low		753	1,077	1,711
Fuel	High	(917)	1,390	2,003	3,595
	Low		1,006	1,066	1,170
Total	High	(2,340)	3,699	5,475	9,899
	Low		3,232	4,082	5,773
(Northbound)					
Total (Dry)	High	(1,370)	2,580	3,032	3,899
	Low		1,590	1,839	2,364
Grand Total	High	(3,606)	6,096	8,199	13,062
	Low		4,646	5,672	7,689

In Step-3, based on the O-D analysis for major commodities, the modal split among road, rail and sea transport is estimated. Since the South has a long narrow topography, stretching along the Gulf of Thailand, the dominant factor in determining the modal split is the distance between origin and destination. From the estimated modal split, the transport demand for the coastal shipping in each port in the South by major commodity is calculated and shown in Table 3 and Fig. 2.

Table 3. Share of Domestic Coastal Shipping

Unit: %

	Chumphon	Ban Don	Pak Phanang	Songkhla	Pattani	Nara- thiwat
(Southbound)						
Fuel	67.7	95.0	95.0	95.0	95.0	95.0
Fertilizer, Rice, Maize	24.7	62.9	84.8	95.0	95.0	95.0
Construction Materials	9.9	25.3	34.1	45.9	50.3	59.2
General Cargo	2.6	21.1	31.7	45.8	51.1	61.7
(Northbound)						
Forestry Products	34.5	58.0	71.5	89.4	95.0	95.0
Rice	24.7	62.9	84.8	95.0	95.0	95.0
Fishery Products	0	1.6	9.1	19.0	22.7	30.2

In Step-4, by applying the estimated share of domestic coastal shipping for each port (Step-3) to the projected total transport demand (per commodity) for the corresponding port (Step-2) the transport demand (per commodity) for each port in target years was derived.

The results are summarized in Figs. 3 and 4. From these figures the following are inferred:

- (1) Judging from the transport demand, it is expected that Songkhla, Pak Phanang, Ban Don and Pattani will be the major local ports for common carrier services,
- (2) The Northbound services, however, are not promising due to the low transport demands,
- (3) Songkhla and Ban Don will continue their important roles in fuel transport and in this relation channel dredging planned for these ports will largely benefit petroleum transport, and
- (4) There is no immediate requirement for port development for Chumphon and Narathiwat except for the betterment of existing facilities.

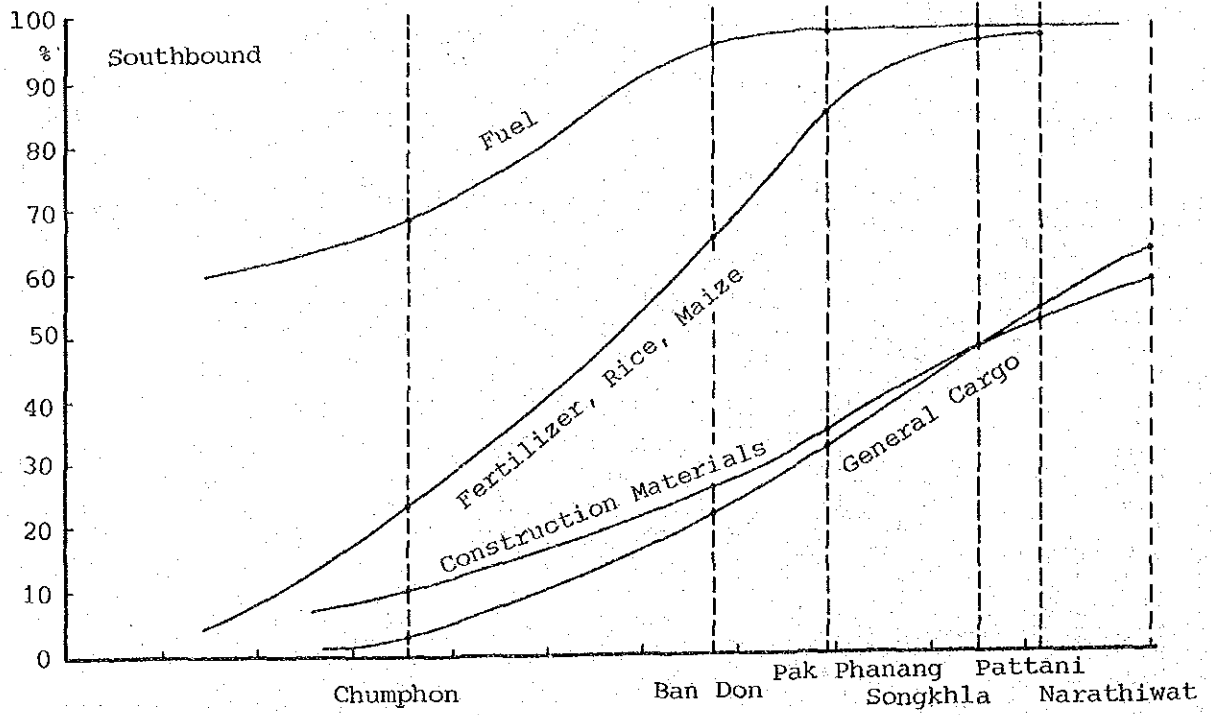


Fig. 2-1 Percentage of Cargo Carried by Ship and Distance

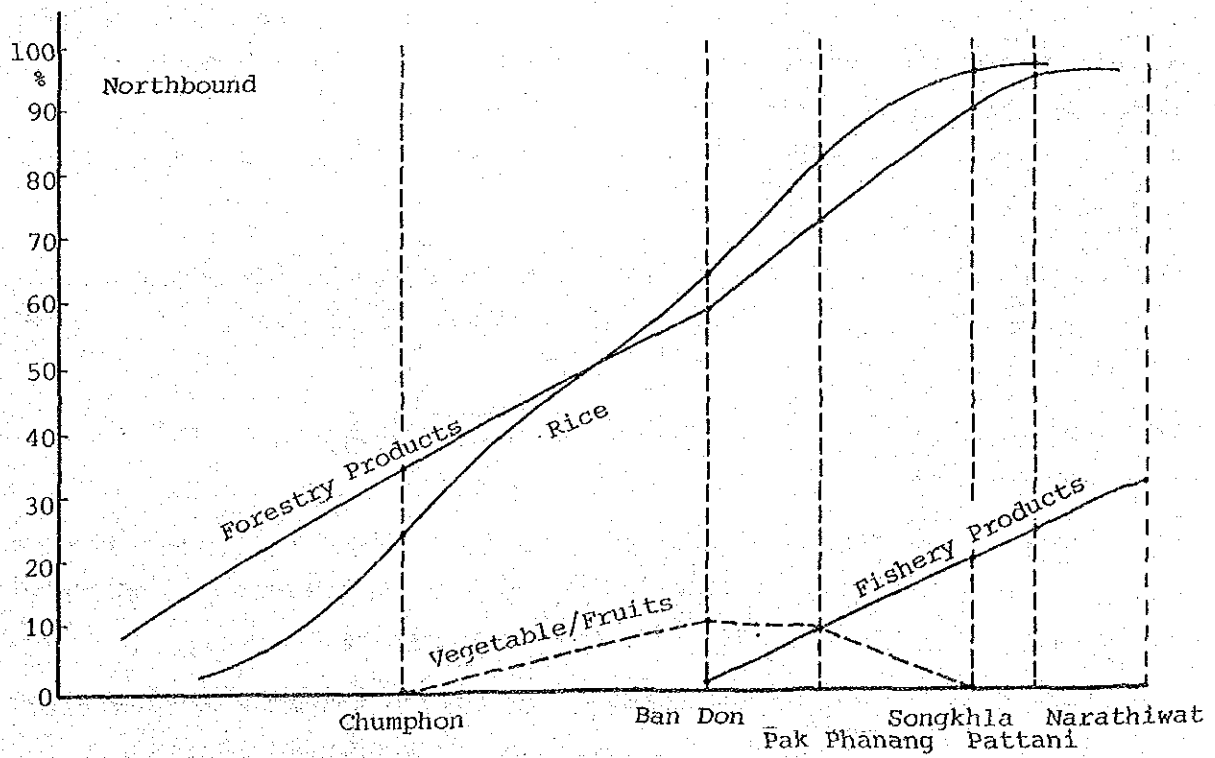


Fig. 2-2 Percentage of Cargo Carried by Ship and Distance

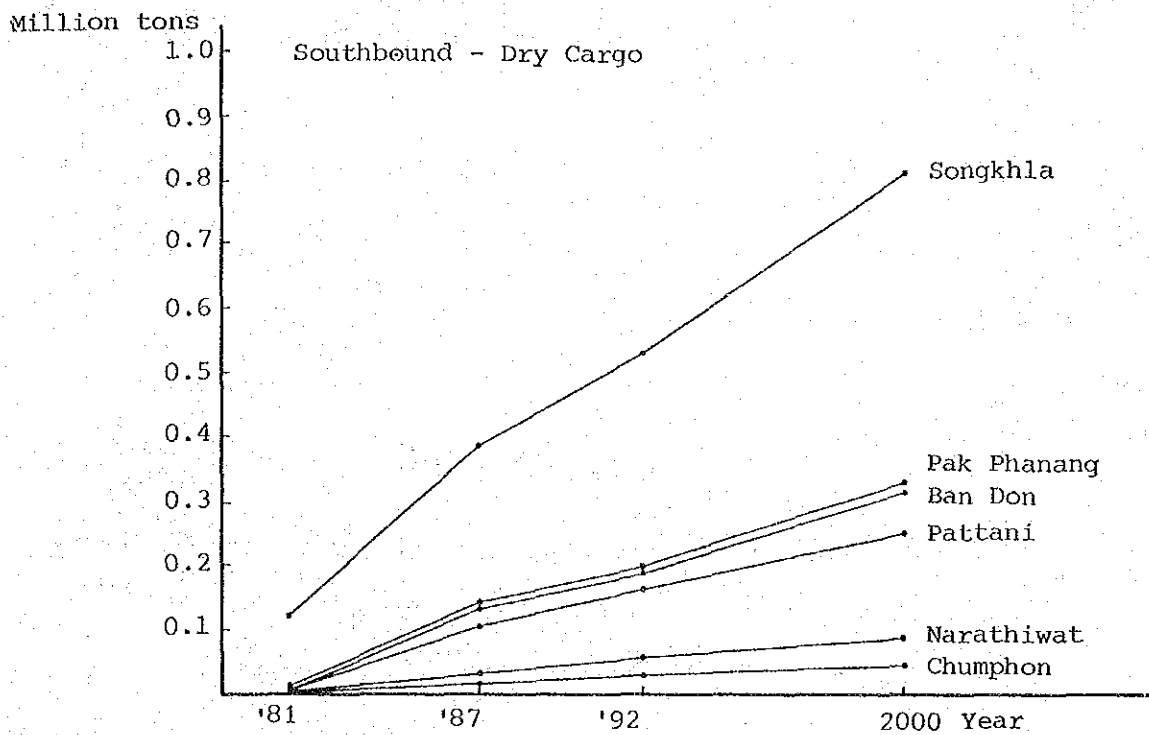


Fig. 3-1 Total Sea Born Cargo (Low Estimate)

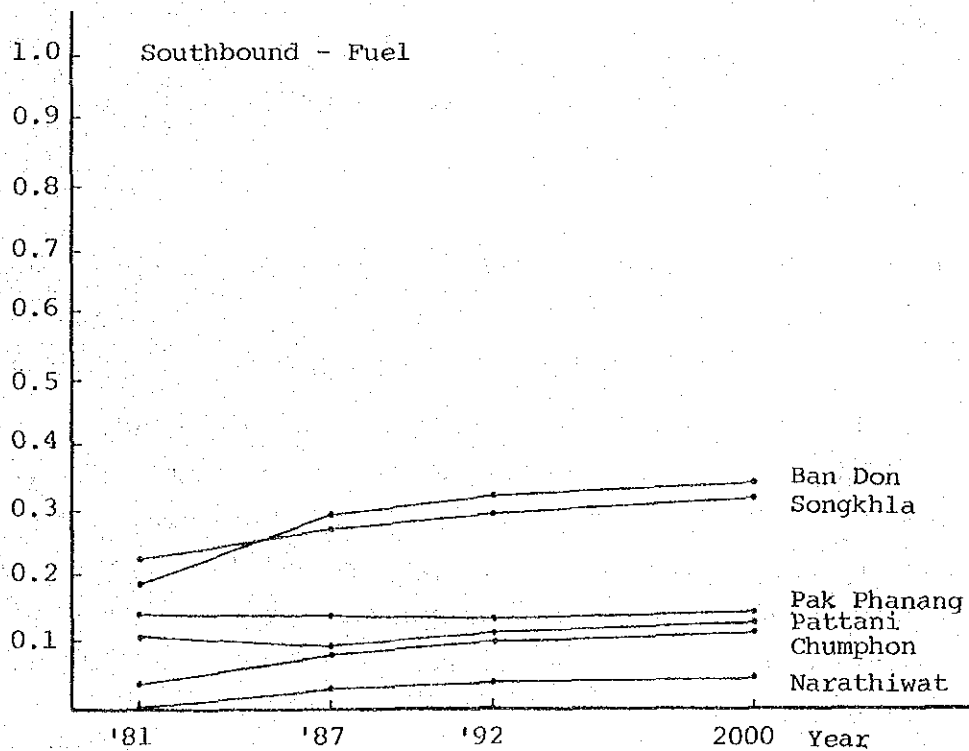


Fig. 3-2 Total Sea Born Cargo (Low Estimate)

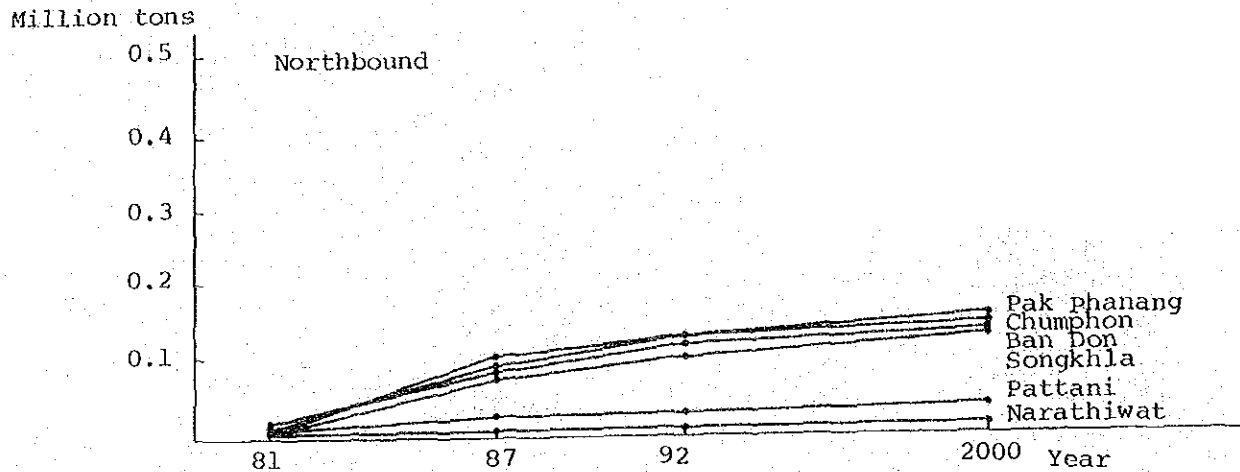


Fig. 4 Total Sea Born Cargo - Low Estimate

3. Development plan for a Common Carrier Service

This chapter is the core of the report and covers following items;

- (1) selection of the trade routes,
- (2) selection of suitable vessel types,
- (3) operation scheme, and
- (4) prices of vessels.

Preliminaries needed for analysis such as 1) berthing priority, 2) financing conditions, 3) BOI incentives, 4) simplification of documentation, and 5) trucking rates and regulations are also discussed.

The Study Team defines the feasible scope of the coastal shipping as a common carrier service, while services for industrial carriers and passenger boats are not included in the proposed project. The existing industrial carrier service is satisfactory and this system can be maintained for foreseeable future. Passenger service by sea would not be competitive with other transport modes and also not remunerative for operators and owners.

(1) The Trade Route

Based on the analysis and forecast of cargo volume in the target years (Chapter 7) routes were selected; the Bangkok - Songkhla, and Bangkok - Ban Don - Songkhla. The projected cargo volumes for the coastal common carrier service in 1987 (the proposed date for starting operation) are summarized and shown in Table 4.

Table 4 Projected Cargo Volume in 1987 for Selected Ports

Unit: Thousand tons

		South-bound	North-bound
Surat Thani (Ban Don)	Surat Thani (100%)	119	13
	Pak Phanang (20%)	21	8
	Total	140	21
Songkhla	Songkhla (100%)	346	48
	Pattani (40%)	37	4
	Narathiwat (10%)	2	-
	Total	385	52
Bangkok		525	73

In Table 4, 20 percent of the general cargo from Pak Phanang is added to Ban Don and 40 percent from Pattani and 10 percent from Narathiwat are assigned to Songkhla. The Study Team is of the opinion that the above figures could be fully assigned for newly proposed common carrier service without invading the market of existing shipping companies.

(2) Selection of Vessel Type

The types of vessel which can be used as common carriers are;

- 1) general cargo ships,
- 2) container ships,
- 3) Roll on Roll off (RoRo) ships,
- 4) car ferries, and
- 5) barges of various kinds.

From the above candidates, container ships and car ferry boats are eliminated because the introduction of these types of ships is considered premature under the existing conditions in this country. For the remaining three types of vessels their sizes are determined after careful examination. Major factors considered in the decision are, among others, projected cargo volume, frequency of service, and the condition of the sea and ports. Table 5 lists the vessel types selected for further examination.

Table 5 Particulars of Vessel

Item (Unit)	Type of Ship	General Cargo Ship (1,500 DWT Type)	General Cargo Ship (1,000 DWT Type)	General Cargo Ship (700 DWT Type)	RoRo Ship	Pusher Barge System	
						Barge	Pusher Boat
(1) Dimension (M)							
Length (l.o.a.)		69.7	64.5	54.0	103.0	54.5	19.1
Length (l.b.p.)		65.0	60.0	50.0	95.0	52.0	17.5
Breadth (mld.)		11.5	10.7	9.3	16.0	9.6	6.5
Depth (mld.)		6.4	6.0	5.2	10.2	4.5	2.6
Draft (mld.)		4.3	3.7	3.3	4.7	3.55	2.1
(2) Deadweight (Carrying capacity) (MT)		1,570 (1,450)	1,070 (950)	700 (600)	2,600 (70 units 10 wheeler)	1,000 (1,000)	-
(3) Gross Tonnage (GT)		1,190	970	610	3,000	590	80
(4) Net Tonnage (NT)		750	610	380	1,650	480	30
(5) Service Speed (Knots)		11.0	11.0	10.5	18.0	-	9.0

(3) Operation Scheme

Based on the proposed routes and vessel types, an operation scheme, as shown in Table 6, has been worked out. The assumed service speeds are; 11 knots for general cargo ships of 1,500 DWT and 1,000 DWT, 10.5 knots for general cargo ships of 700 DWT, 18.0 knots for RoRo ships, and 9.0 knots for the pusher barge system. Days in port are calculated on the following basis: cargo handling speed, 30 tons/hr/gang; number of gangs, two per ship; and working hours, 13.

Table 6 Operation Scheme

Type of Vessel	Route	Days (per Round Voy.)	Number of Vessel	Cargo Volume per Year (SB) (Ton)	Service (Voy./ Week)
1,500 DWT	BK-SK-BK	9.0	4	220,400	3.1
1,000 DWT	"	8.0	6	245,100	5.3
700 DWT	"	6.0	7	239,400	8.2
Pusher Barge	"	10.5	7	231,000	4.7
RoRo Ship	"	3.0	3	313,950	7
1,500 DWT	BK-SK-ST-BK	10.5	7	334,950	4.7
1,000 DWT	"	9.5	10	342,000	7.4
700 DWT	"	8.0	13	335,400	11.4

(4) Prices of Vessels

Though prices of newly built vessels fluctuate depending on the world market, the price of each vessel for 1986 has been assumed, in this study, based on the 1983 market price and an estimated annual increase of 3 percent as shown in Table 7. The prices include the cost for owners and interest during the construction period.

Table 7 Vessel Prices

Unit: Million Bahts

	General Cargo Vessel			RoRo Ship	Pusher	Barge System
	1,500 DWT	1,000 DWT	700 DWT			
(year 1983)	31.6	25.9	20.1	268.3	12.3	9.9
(year 1986)	34.6	28.3	22.0	293.2	13.4	10.8
Number of Vessel in Service	4	6	7	3	3	7
Total Investment	138.2	169.6	153.9	879.6	40.2	75.5

(5) Preliminaries for the Analysis

In the course of analysis for the development of a common carrier service in Thailand the Study Team faces many institutional problems which have to be cleared before the implementation of the project. The followings are the Study Team's assumptions on these issues and the Study Team is of the opinion that without appropriate improvements of these institutional issues, the proposed common carrier service will not be realized.

These issues include the financing arrangement, documentation simplification, berthing priority, BOI incentives, and control over trucking rates and over-loading.

1) The Financing Arrangement

It is considered critical to the overall feasibility of the proposed project that financing arrangements with a reasonable interest rate are secured for the construction of proposed fleet. In this report it is assumed that 80 percent of the vessel price will be financed on OECD conditions and the remaining 20 percent be financed on IFCT's (Industrial Finance Corporation of Thailand) preferential terms and conditions. These conditions are summarized as follows.

	IFCT (Domestic)	OECD (Foreign)
Minimum Rate of Down Payment	not fixed	20% or more
Interest Rates	14.50%	8.00%
Terms for Repayment	10 ~ 15 years	within 8.5 years
Grace Period	3 ~ 5 years	not fixed

2) Documentation

The study team fully recognizes that some measures need to be taken for the prevention of smuggling. However the present complicated documentation and deposit system should be improved for the shake of the sound development of Thai domestic coastal shipping. The Study Team believes that the Cargo Manifest should be the only document to be submitted to the customs office in the case of domestic coastal shipping.

3) Berthing Priority

In the nature of the proposed regular common carrier service, the Study Team considers that preferential berthing should be granted at fixed berth in each pivotal port of call, namely, Bangkok, Songkhla and Ban Don.

4) BOI Incentives

The maximum possible incentives are expected to be applied. Duty, business tax and municipal tax shall not be levied on the vessels and machineries purchased from abroad under the proposed project.

5) Control on Trucking Rates and Over-Loading

In view of the prevailing situation of Thailand's truck transport, bargaining and over-loading, the Study Team sets two different freight rates, namely 90 percent and 72 percent of ETO tariff. However, some measures are to be taken for implementing fair charge collection and control on over-loading, particularly in the case of 10-wheel trucks engaging in long distance truck transport.

6) Shipbuilding and Repairing and Seafarers

Regarding shipbuilding and repairing facilities and also supply of seafarers of Thai nationality, there is a good possibility that those can be managed to meet minimum requirements so far as the domestic coastal vessels under study are concerned, although not good enough for vessels of larger size and vessels engaged in international trade.

4. Financial Analysis of Proposed Common Carrier Services

In order to assess the financial viability of the proposed common carrier services, profit/loss analysis and investment return analysis are applied. The period for this analysis is set at 10 years starting from 1987 when the deep sea port at Songkhla is expected to become operational.

The profitability of each vessel and/or fleet is calculated by the following steps:

(A) Revenue

(B) Operating Expenses

- i) Port Charge, ii) Stevedorage, iii) Fuel Oil, iv) Agency Fee
- v) Other Expenses

(C) Operating Profit

(A) - (B)

(D) Vessel Expenses

- i) Crew Cost, ii) Maintenance, Repair & Supplies, iii) Insurance
- iv) Administrative Expenses, v) Other Expenses

(E) Interest

(F) Profit before Depreciation

(C) - (D + E)

(G) Depreciation

(H) Profit after Depreciation

(F) - (G)

(I) Income Tax

(J) Profit

(H) - (I)

In this calculation, foreign exchange rates are set at US\$ 1.00 = 23 Bahts and US\$ 1.00 = 240 yen. The inflation rate estimated and adopted is 6 percent per annum from 1987 onward based on the statistics with some fluctuations for each cost.

(A) Revenue

Revenue is calculated by multiplying the projected freight rate by the volume of cargo to be transported.

The size of the vessels were so determined as to utilize 100 percent of capacity for southbound trips and 10 percent for northbound. However, 100 percent utilization in both directions is assumed for RoRo ships.

In the case where a general cargo ship calls at 3 ports, it is assumed that in southbound, 70 percent of cargoes for Songkhla and 30 percent for Ban Don are loaded from Bangkok and northbound 5 percent of cargoes from each port, total 10 percent of loading capacity, for Bangkok are loaded.

For the freight rates, two cases are studied. Those are

- i) 90% of ETO legal tariff rates as of Jan. 1984 and
- ii) 90% of prevailing market rates (80% of ETO rates), namely 72% of ETO rates.

Annual increases of freight rates are assumed at 3 percent until 1992 and 5 percent after 1992. Freight rates for the pusher barge system are set at 10 percent less than these of general cargo ships because of the longer transit time.

Freight rates for RoRo ships are assumed to be equal to truck rates respectively and are calculated on a per-unit basis.

Based on the above, the projected freight rates are summarized in Table 8.

Table 8 Projected Freight Rates in 1987

Unit: Bahts/ton

	(A) Truck Rates	10% less than (A)	Dray- ages	Cargo Handling Charges	Net Rates	Pro- jected Rates	Rates for Barges	Rate for RoRo
	CASE 1) ETO Tariff							
Songkhla	631	568	112	15	441	440	395	4,800
Ban Don	446	401	112	15	274	270	-	-
	CASE 2) Prevailing Rates							
Songkhla	505	455	112	15	328	325	290	3,200
Ban Don	357	321	112	15	194	190	-	-

In calculating drayage, truck transport of 30 km distances at both ends is assumed and costs are calculated based on the ETO tariff for this distance, 62 Bahts/ton, but 80 percent is taken for Songkhla and Ban Don.

Cargo handling charges are estimated, in general, at around 2/3 of the stevedorage which is 25 Bahts per ton at both ends and cargoes subject to this charge, assuming double handling, are estimated to be about half of the total volume.

(B) Operating Expenses

Port charges: The present system of charges at Bangkok port is taken as the basis of calculation for Bangkok and Songkhla. For Ban Don, the newly authorized system for Tha Thong Port is used.

In calculation, the annual increase of port charges is estimated at 2 percent from 1987 onwards.

Stevedorage: For all three ports, it is estimated at 30 Bahts per ton (1987 price) with an annual increase of 5 percent.

RoRo ships do not pay stevedorage as the trucks can be driven on and off directly.

Fuel oil: The price of fuel oil (1,500 second) is estimated at US\$ 185 (or 4,255 Bahts) per metric ton (1987 price) and assumed to increase 5 percent per annum from 1987 onwards.

Agency fee and others: 3 percent of the revenue and 5 percent for other operating expenses.

(D) Vessel Expenses and Others

Crew costs: The annual crew costs (1983 prices) of each vessel are shown in Table 9. In this study, replacement crew are not taken into account because, from the field survey, it is found that most owners and operators will not maintain replacement crew.

The annual increase of crew costs is estimated at 5 percent from 1983 to 1987 and 7 percent from 1987 onwards.

Table 9 Crew Costs per Vessel

Unit: Million Bahts

Type of Vessel	Total Crew Costs per Year	
	1987	1989
General Cargo Vessel		
1,500 DWT	1.98	1.89
1,000 DWT	1.58	1.57
700 DWT	1.32	1.17
Pusher Barge	1.59	1.70
RoRo Ship	4.27	4.27

Maintenance: Repairs and supplies, and other vessel expenses related to them, the amount of 2 percent of the vessel price is assigned for these items with an assumed annual increase of 5 percent.

Insurance and others: 1 percent of the vessel price and 2 percent for other vessel expenses.

Administrative expenses: Costs of running offices, one head office in Bangkok and two husbanding agents in Songkhla and Ban Don are estimated at 3.49 million B with an annual increase of 5 percent.

Depreciation: 10 percent equal depreciation for 10 years with the residual value of 20 percent is applied in accordance with Section 65 bis of the Revenue Code of the RTG (No. 145) 1983.

Income tax: In accordance with Section 67 of the Revenue Code of the RTG, 40 percent of net income (Profit after depreciation) is assigned for income tax.

(J) Profit - Results of Calculation

Calculations were carried out for the following 15 cases, among which 8 cases are explained in previous Chapter and the remaining 7 are cases corresponding to the original 8 cases but with vessel prices reduced by 50 percent. The pusher barge system is not included in this second set of cases.

Table 10 Type of Vessels for Calculation

Case	Type of Vessel	Price of Vessel	Route
1	General Cargo Vessel 1,500 DWT Type	100%	BK-SK-BK
2	" 1,000 DWT Type	"	"
3	" 700 DWT Type	"	"
4	" 1,500 DWT Type	"	BK-SK-ST-BK
5	" 1,000 DWT Type	"	"
6	" 700 DWT Type	"	"
7	" 1,500 DWT Type	50%	BK-SK-BK
8	" 1,000 DWT Type	"	"
9	" 700 DWT Type	"	"
10	" 1,500 DWT Type	"	BK-SK-ST-BK
11	" 1,000 DWT Type	"	"
12	" 700 DWT Type	"	"
13	RoRo Ship 2,600 DWT Type	100%	BK-SK-BK
14	" 2,600 DWT Type	50%	"
15	Pusher Barge System 1,000 DWT Type	100%	"

Note: BK; Bangkok, SK; Songkhla, ST; Surat Thani (Ban Don)

For the above 15 cases, the profit and loss (profit after paying income tax) are calculated on a fleet basis for 10 years and summarized in Fig. 5.

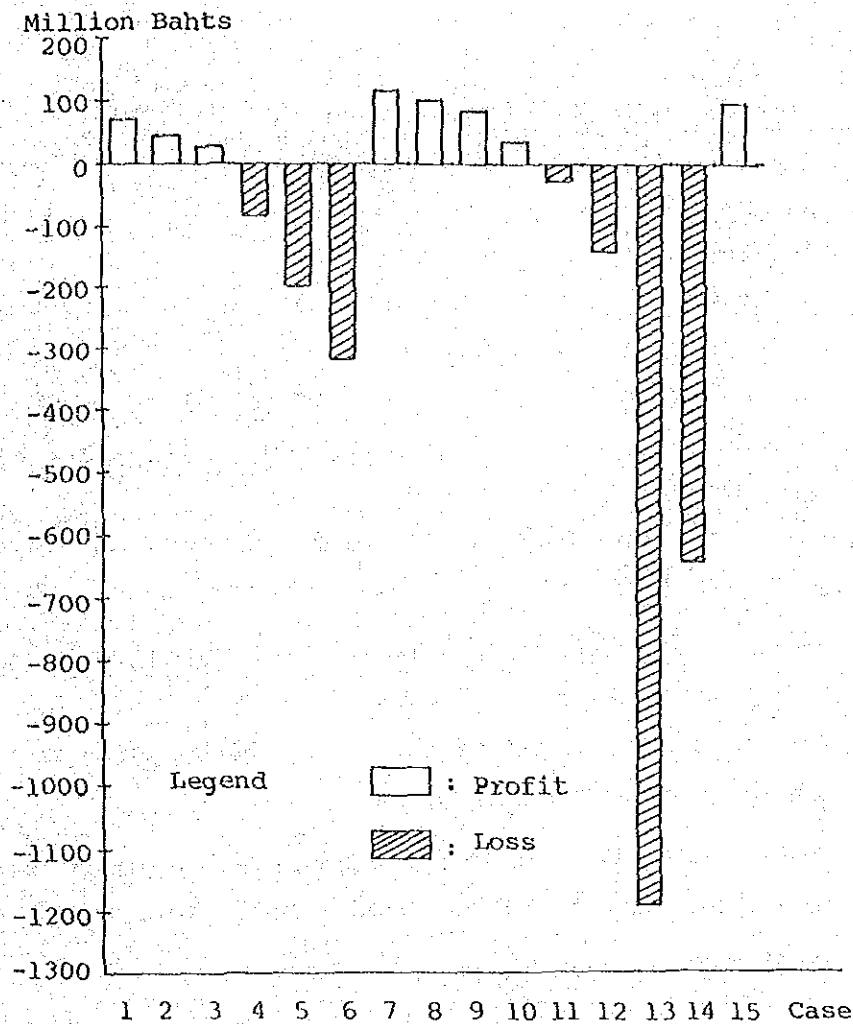


Fig. 5 Profit and Loss of 15 Cases (Fleet)

The Financial Internal Rate of Return (FIRR) is accordingly calculated for each of the 8 cases which recorded profits.

Case	1	2	3	7	8	9	10	15	
FIRR	16.6	11.8	10.6	38.2	30.3	28.1	13.6	21.2	(%)

5. Economic Evaluation

(1) General

In this report, the Study Team adopts the following approach to the economic evaluation; i) evaluation should be carried out for Bangkok and four major coastal ports as a single network, and ii) national economic viewpoint should be the evaluation criterion.

According to the cargo forecast and other basic socio-economic data, the South will experience rapid economic growth and the Study Team recommends the development of the following five ports as a single network; these are Bangkok (receiving terminal for coastal shipping), Songkhla, Ban Don (Tha Thong), Pattani and Pak Phanang.

Benefits attributable to the proposed and expected development of coastal shipping are estimated for the following items;

- 1) Reduction of transport cost, including the rerouting of cargoes from truck transport to coastal shipping,
- 2) Reduction of transport cost by the use of larger size vessels, and
- 3) Reduction of road maintenance costs.

Though the benefits difficult to measure in monetary term are not included in the report, the following item, among others, should be noted;

- 1) Positive effects on the regional development,
- 2) Increase of the income and job opportunities of local people, and
- 3) Promotion of international trade through these ports.

Construction and maintenance costs of ports are taken as the project cost for economic evaluation. These include construction of wharves (including private facilities), capital dredging of channel, and their maintenance costs. Details are summarized and shown in Table 14.

(2) Costs

Construction costs and costs for maintenance are discussed in Chapter 4. These figures are taken as the basis of calculating cost stream by applying estimated growth rates for labour, material and others. Yearly

allocation of construction and maintenance costs is worked out to meet the estimated traffic demands and necessary construction periods.

1) Port facilities: Main item is the construction of wharves and for the economic evaluation at the stage, construction costs per berth is taken as the basis for further calculation. It is estimated 32.6 million B at 1983 price and 38.5 million B at 1987 price.

The breakdown into material cost and labour cost is assumed 77 percent and 23 percent respectively.

We also make a rough estimate of the extra investment by petroleum companies for enlarging their facilities as 24 million B per port: (Ban Don, Pak Phanang and Pattani).

Yearly allocation of construction costs is estimated as follows:

Table 11 Timing of Construction

Year	Port	Construction Cost (M฿) at 1987 prices
1981	Tha Thong ^{/a} (Ban Don)	56.7 ^{/b}
1982	Pattani ^{/a}	71.7 ^{/b}
1983		
1984	<hr/>	
1985	Bangkok	154.0
1986		
1987	Bangkok	77.0
1988	Pak Phanang ^{/a}	
1989	Songkhla	77.0
1990		
1991	Bangkok	77.0
1992		
1993	Songkhla	115.5
1994		
1995	Bangkok	77.0
1996		
1997		
1998		
1999		
2000		

Note: /a Completed or On-going Project by HD, /b Actual Cost

- 2) Dredging cost (capital dredging): Capital dredging cost for each port is estimated and summarized in the table below.

Table 12 Dredging Cost

Port	Cost (M฿)	Remarks
Bangkok	-	PAT dredging covers this port
Songkhla	-	Deep water Ports dredging covers local port
Ban Don	95.0	IBRD loan's dredging (1982)
Pak Phanang	140.0	Estimation (1987)
Pattani	13.0	Estimation (1983)

- 3) Maintenance cost (dredging and facilities): The annual maintenance cost for each berth is assumed to be 1 percent of the construction cost. The maintenance dredging costs of Ban Don (Surat Thani), Pak Phanang, and Pattani are estimated but those costs for Bangkok and Songkhla are not included in because they would be attributed to ocean going vessels.

Table 13 Maintenance Dredging Cost (1983 prices)

	$10^3 \text{ m}^3/\text{year}$	Million ฿
Ban Don	350	3.1
Pak Phanang	200	1.5
Pattani	230	1.7

According to the estimation of the Study Team the breakdown into labour cost and material cost is assumed 25 percent and 75 percent respectively.

The results of these investment costs and maintenance costs are shown in Table 14.

Table 14 Construction and Maintenance Cost

Unit: Million Bahts

Year	Const. Wharf	Capital Dredging	Maintenance Wharf	Maintenance Dredging	Petro Investment	Total Cost
1981	56.7					56.7
1982		125.8	0.6	3.9		130.3
1983	71.7	16.3	0.6	3.9		92.5
1984			1.3	6.0		7.3
1985	154.0		1.3	6.0		161.3
1986			2.8	6.0		8.8
1987	77.0	175.2	2.8	6.0	72.0	333.0
1988			3.6	7.9		11.5
1989	77.0		3.6	7.9		88.5
1990			4.4	7.9		12.3
1991	77.0		4.4	7.9		89.3
1992			5.1	7.9		13.0
1993	115.5		5.1	7.9		128.5
1994			6.3	7.9		14.2
1995	77.0		6.3	7.9		91.2
1996			7.1	7.9		15.0
1997			7.1	7.9		15.0
1998			7.1	7.9		15.0
1999			7.1	7.9		15.0
2000			7.1	7.9		15.0
Residual Value	427.9	317.3				

(3) Benefits

1) Transport cost saving (for general cargo)

The reduction of transport cost is calculated under following items.

a) Truck Transportation Cost (T_{ic})

According to the estimation based on ETO's data, the truck transportation costs between Bangkok and Ban Don, Pak Phanang, Songkhla and Pattani are respectively 442, 507, 608 and 661 ฿/ton (1987).

b) Shipping Freight Cost (S_{ic})

After completion of the local ports, it is anticipated that many types of vessels will make port calls and that the size of these vessels will increase to take advantage of the enlargement of the ports' capacities.

The ports which are planned as the network would have the capacity of handling vessels up to 1,500 DWT alongside their wharves. However the average size of calling vessels depends on various factors such as the cargo volume on each route, seasonal cargo fluctuations, and the age of the fleets.

The Study Team assumed 700 DWT as the average vessel size in the rest of this analysis.

The shipping costs between Bangkok and Songkhla (Pattani), Surat Thani, Pak Phanang are 290 ฿/ton , 237 ฿/ton , 260 ฿/ton respectively.

c) Drayage Cost and Port handling Cost (D_c)

Checking ETO's table we find that the 30 km drayage cost is 93 ฿/ton and that the port handling cost, excluding stevedorage, is about 20 ฿/ton , which is for both the loading port and unloading port. These total amount to $D_c = 113 \text{ ฿/ton}$

The difference of truck transport cost and shipping cost for each port (to and from Bangkok) is summarized and shown in Table 15.

Table 15 The Difference between Truck Cost and Shipping Cost (1987 prices)

Unit: Bahts/ton

Items	Ports	Songkhla & Pattani	Surat Thani (Ban Don)	Pak Phanang
T _{ic} Truck Cost (1)		608 ~ 661	442	507
S _{ic} Shipping Cost (2)		} 290	} 237	} 260
D _c Drayage Cost (3) Cargo handling		} 113	} 113	} 113
Difference (1) - [(2) + (3)]		205 ~ 258	92	134

With the forecasted transport demand by shipping, cost savings in these items are summarized as follows.

Table 16 The Reduction of Transport Cost at 1987 Price (for general cargo)

Unit: Million Bahts

	Ban Don	Pak Phanang	Songkhla	Pattani	Total
1987	12.7	21.6	82.8	26.8	143.9
1988	13.4	22.6	87.1	28.6	151.5
1989	14.4	23.3	91.2	30.4	159.3
1990	15.5	24.5	95.7	33.0	168.7
1991	16.5	25.6	100.5	35.3	177.9
1992	17.6	26.8	105.8	37.7	187.9
1993	18.4	28.1	108.0	39.5	194.0
1994	19.4	29.3	114.4	41.3	204.4
1995	20.4	30.7	119.5	42.6	213.2
1996	21.3	32.3	124.2	44.4	222.2
1997	22.5	34.0	130.0	47.0	233.5
1998	23.7	35.8	135.9	49.3	244.7
1999	25.0	37.4	141.9	50.3	254.6
2000	26.5	39.5	148.0	53.4	267.4

2) The Reduction of Transport Costs from Using Large Size Vessels

After deepening the harbours at Tha Thong (Surat Thani), Pak Phanang and Pattani, the reduction of transport cost from using large size vessels for industrial cargo such as fuel, forestry products and fertilizer is considerable.

Though Songkhla and Bangkok are also carrying out dredging work, these costs should not be considered as included in this coastal shipping project but as part of the deep sea port project for international trade.

So the part of the benefits at these two ports should be deleted.

The Study Team analysed the expected benefit of this category only for fuel.

Today fuel is carried by small tankers going to Ban Don and Pak Phanang. Pattani has no large petroleum loading facilities so far. But after deepening the ports, petroleum companies are likely to use the new terminal instead of transshipping from Songkhla.

We assume the present vessel size as 500 DW and the future vessel size as 1,500 DW in accordance with the planned deepening of the channels.

According to the estimation of the Study Team, the actual transport cost saving by using larger size tanker for each port is summarized as follows:

Unit: Bahts/ton		
Ban Don	Pak Phanang	Pattani
110	130	140

Combined with traffic forecast and the above figures, total cost saving and breakdown for each port are calculated as Table 17.

Table 17 The Reduction of the Transport Costs
by Using Large Size Tanker

Unit: Million Bahts

	Ban Don	Pak Phanang	Pattani	Total
1987	32.6 (296)	16.8 (129)	18.9 (135)	68.3
1988	32.9 (299)	16.8 (129)	20.4 (146)	70.1
1989	33.2 (302)	16.6 (128)	22.0 (157)	71.8
1990	33.4 (304)	16.6 (128)	23.7 (169)	73.4
1991	33.8 (307)	16.5 (127)	25.6 (183)	75.9
1992	34.1 (310)	16.5 (127)	27.6 (197)	78.2
1993	34.4 (313)	16.8 (129)	29.7 (212)	80.9
1994	34.9 (317)	16.9 (130)	32.1 (229)	83.9
1995	35.3 (321)	17.2 (132)	34.6 (247)	87.1
1996	35.6 (324)	17.4 (134)	37.4 (267)	90.4
1997	36.1 (328)	17.7 (136)	40.3 (288)	94.1
1998	36.5 (332)	17.8 (137)	43.4 (310)	97.7
1999	36.9 (335)	18.1 (139)	46.9 (335)	101.9
2000	37.3 (339)	18.3 (141)	50.5 (361)	106.1

Note: Figures in brackets are the corresponding transport volume in thousand tons.

3) The reduction of road maintenance cost is estimated by the following procedure:

- a) Estimate reduction of traffic volume expected by the use of common carriers, which otherwise loaded on the highway transport.
- b) Estimate expected reduction of road maintenance cost for the above alleviation of truck transport. Details are explained in Appendix 18.

The results of benefits are shown in Table 18.

Table 18 Expected Road Maintenance Cost Reductions

Unit: Million Bahts

	Cost in 1983	Cost in 1987
1987	6.3	7.9
1988	6.7	8.4
1989	7.1	8.9
1990	7.4	9.2
1991	7.8	9.7
1992	8.2	10.2
1993	8.7	10.9
1994	9.1	11.4
1995	9.6	12.0
1996	10.0	12.5
1997	10.5	13.1
1998	10.9	13.6
1999	11.4	14.2
2000	11.8	14.7

(4) Results of the economic analysis

Based on the above estimations, costs and benefits in yearly basis have been calculated and shown in the following table.

To evaluate economic viability, economic internal rate of return (EIRR) is calculated. The value of EIRR thus calculated is 19.7~20.6, and proposed project is considered highly justifiable from the national economic viewpoint.

Table 19 Total Benefits

Unit: Million Bahts

Year	Reduction Cost Dry Cargo	Large Scale Tanker	Road Maintenance	Total Benefit	Benefit Cost
1981					-56.7
1982					-130.3
1983					-92.5
1984					-7.3
1985					-161.3
1986					-8.8
1987	143.9	68.3	7.9	220.1	-112.9
1988	151.5	70.1	8.4	230.0	218.5
1989	159.3	71.8	8.9	240.0	151.5
1990	168.7	73.4	9.2	251.3	239.0
1991	177.9	75.9	9.7	263.5	174.2
1992	187.9	78.2	10.2	276.3	263.3
1993	194.0	80.9	10.9	285.8	157.3
1994	204.4	83.9	11.4	299.7	285.5
1995	213.2	87.1	12.0	312.3	221.1
1996	222.2	90.4	12.5	325.1	310.1
1997	233.5	94.1	13.1	340.7	325.7
1998	244.7	97.7	13.6	356.0	341.0
1999	254.6	101.9	14.2	370.7	355.7
2000	267.4	106.1	14.7	388.2	373.2

II RECOMMENDATIONS

The Study Team would like to make following recommendations to RTG on Development Plan of Domestic Coastal Shipping, Governmental Policy for Domestic Shipping and Development Program and policy for Coastal Ports.

1. Development Plan of Domestic Coastal Shipping

Regarding common carrier service (general cargoes) the Study Team recommends followings.

Meanwhile, no positive plan is necessitated for industrial carrier (fuel, fertilizer and logs) because demand is well covered by private sectors and only fleet rejuvenation is a matter to be taken up in the near future.

(1) Trade route

A shuttle service between Bangkok and Songkhla is preferable, wherein 385 thousand tons of general cargo in southbound and 52 thousand tons in northbound can be expected to move in 1987.

(2) Type of vessel

Conventional type of cargo vessel of 700 DWT \times 7 (Cases 3 and 9 in the Study) or pusher barge system consisting of pusher \times 3 and 1,000 DWT barge \times 7 (Case 15) is suitable.

The amount of initial investment for vessels is 153.9 million Bahts in Case 3, 76.9 million Bahts in Case 9 (50% of Case 3) 115.8 Million Bahts in Case 15.

Note: Price of each vessel is as follows.

700 DWT cargo vessel	-	฿ 21,991 \times 10 ³
Pusher	-	฿ 13,407 \times 10 ³
1,000 DWT Barge	-	฿ 10,790 \times 10 ³

(3) Scheme of operation

In Case 3 and Case 9, six days are needed for a voyage, which enables daily service by 7 vessels. Cargoes to be loaded are 239 thousand tons in southbound (100% load factor) and 24 thousand tons in northbound.

In the meantime, in Case 15, 10.5 days are needed for one round of a barge, which enables 4 ~ 5 sailing per week as pusher barge system. Cargoes to be loaded are 231 thousand tons in southbound and 23 thousand tons in northbound.

As the second stage from 1992, another shuttle service between Bangkok and Ban Don and/or Pak Phanang is to be added because cargo volume is expected to increase and also service to and from Laem Chabang or Map Ta Phut is taken into consideration. In Bangkok/Songkhla trade, 700 DWT vessel is to be replaced by larger one.

To make the above plan feasible, some preconditions are set in the following ways.

- 1) "Preferential berthing" must be allowed instead of "first come, first served".
- 2) Financial resources are 80 percent of vessel price at 8 percent interest (international source) and 20 percent at 14.5 percent interest (domestic source).
- 3) Incentives by The Board of Investment are allowed (waiving of duty and business tax).
- 4) Simplification of documentation must be permitted by waiving customs regulations.
- 5) Projected freight rates

In 1987, B 325 per ton for cargo vessel, about 72 percent of ETO Tariff rate and B 290 per ton for pusher barge, 10 percent less than cargo vessel are assumed.

During the period of 10 years of business under the above plan, the accumulated revenue in Case 3 and Case 9 is 1,013 million Bahts and in Case 15 is 872 million Bahts with the accumulated profit after depreciation of 51 million Bahts in Case 3, 147 million Bahts in Case 9 and 146

million Bahts in Case 15 respectively. Eventually, profit after depreciation rate to revenue is 5.0 percent in Case 3, 14.5 percent in Case 9 and 16.7 percent in Case 15, meanwhile, internal rate of return (IRR) for each case is 10.6 percent in Case 3, 28.1 percent in Case 9 and 21.2 percent in Case 15.

From the financial analyses, seemingly, it is considered to be immediately unattractive for private sector to invest money for Case 3 but from the result of economic evaluation, roles of domestic coastal shipping are recognized and duly warranted and from the cargo volume expectable in 1987, the service frequency (daily sailing), and canvassing of general cargoes, the Study Team considers 700 DWT cargo vessels with shuttle service is more recommendable than 1000 DWT pusher barge system at the first stage. However, in order to make Case 3 feasible by reducing capital cost to some extent, the Study Team suggests either a long-term and low interest financing system or any other alternative measure should be introduced by the Thai Government.

2. Governmental Policy for Domestic Shipping

The Study Team appreciates that office of the Mercantile Marine Promotion Commission (MMPC) was appointed as the agency in charge of the domestic shipping. Under the supervision of MMPC, the followings are to be taken up.

- (1) Almost all of developed countries in shipping, domestic and international, maintain their own policy to protect national interest. The Study Team urges the Government of Thailand to promote some basic policies as soon as possible, which are given below.
 - 1) Thai Coastal Shipping Act or Thai Domestic Shipping Act is to be introduced.
 - 2) Domestic shipping and international shipping are separated in trade.
 - 3) Vessel registered with MMPC as "Domestic Trade" is only entitled to participate in domestic shipping.
 - 4) Prior to registration with MMPC, owner must obtain an approval beforehand from MMPC, which will be given pending outcome of adjustment of tonnage of fleet based on supply and demand of cargo transport every year.

- 5) In doing business, owner and/or operator must obtain a license from MMPC, and an annual report to be filed with MMPC with a financial statement. Regarding freight rates, only common carriers are required to file them with MMPC.
- (2) In order to develop recommended domestic coastal shipping successfully, following measures must be taken by the Government on top of the basic policy.
- 1) Reasonable incentives must be granted by the Investment Promotion Act.
 - 2) Special depreciation, income tax reduction for replacement of old vessel and other tax incentive if any are introduced.
 - 3) Simplification of shipping documents, namely waiver from customs law, becomes in reality.
 - 4) Government-sponsored financing system is established with a view to promoting softer loan for domestic vessels.

3. Development Program and Policy for Coastal Ports

(1) The Port Development Program

- 1) The following port development program should be carried out for the coastal common carriers.

Port Development Program (Number of berths to be required)

	Bangkok	Surat Thani	Pak Phanang	Songkhla	Pattani
1987	3 ~ 5	1	1	3	1
1992	6 ~ 8	1	1	3	1
2000	10	2	2	5	1

- 2) The dimensions of port facilities necessary to serve 1,500 DWT vessels are as follows.

Berth Length 90 m
 Channel & Basin -5.5 m
 (depth alongside)

- 3) Facilities at Ban Don (Tha Thong), Pattani and Pak Phanang are already being planned or constructed.

Thus the substance of above mentioned program is the construction of new terminals for the exclusive use of the coastal shipping at the Port of Bangkok and Port of Songkhla.

- 4) The economic evaluation of the investment for these five ports treated as the single network indicates that they are highly feasible. (EIRR 19.7 ~ 20.5%)
- 5) So it is likely that aid will be given by foreign countries or development banks as the cargo demand is high at Bangkok and Songkhla, therefore it is easy for them to promote it.

(2) Port Administration and Management

- 1) MOC, together with the local governments concerned, should establish an authority in each major local port, namely Ban Don (Tha Thong), Pak Phanang, Songkhla and Pattani.
- 2) An appropriate management scheme for Bangkok terminal should be worked out by HD and PAT.
- 3) Due to the weakness of the financial foundations, a small and simple organization must be planned for each authority. The main staff should be less than 10 persons.
- 4) MOC should not charge these new authorities with the construction and maintenance costs for the new port facilities.
- 5) The local port authorities except Bangkok and Songkhla should make an effort to obtain the necessary revenue by diversifying its sources; for instance import/export cargo dues, rent for land, and channel dues for industrial carriers.
- 6) MOC staff ought to be assigned to the local authorities to supervise routine engineering work and make sure that it is properly carried out.

(3) Port Planning

- 1) A port development plan should be prepared by each local authority and MOC should respect the plan.
- 2) This plan should include the following items.
 - a) Forecast of cargo demand
 - b) Layout and design of port facilities
 - c) Land use plan
 - d) Budget plan
- 3) A Council for Ports and Harbours has the responsibility to mediate and adjust the political interests of various Government sectors. MOC should obtain the council's opinion on all the important issues related to ports and harbours prior to the final decision.
- 4) The local governments concerned should promote plans to establish industrial and distribution centers behind the local ports.

(4) Port Activities of Private Sectors

- 1) The local port authorities should not interfere in the internal affairs of the private sector, but they have their responsibility to mediate conflicts among the various private sector's interests.
- 2) Cargo handling should be performed by private sectors and the authorities should not be engaged in it.
- 3) The rules and regulations for cargo handling operations should be prepared by MOC.

