

**APPENDIX 8 PROBABLE CARGO HANDLING CHARGE**



APPENDIX 8 PROBABLE CARGO HANDLING CHARGE

(1) Premises

1) Cargo: Annual Average Cargo Handling Volume per berth is 160 thousand tons

2) Gang

Stevedoring	2 gang	2 shift	Ship hold	Truck Yard Warehouse
	per	gang		
	Fore man	1		
	Winchman	1		
	Forklift	2		
	Labour	8		
		<hr/>		
		12		

Yard Operating	1 gang	2 shift	Yard Warehouse	Truck Warehouse
	per	gang		
	Foreman	1		
	Forklift	2		
	Labour	4		
		<hr/>		
		7		

3) Labourer's Salary/Year

Foreman	4,500	£/month	14	month
Winch/Fork	3,600	"	"	"
Labour	2,800	"	"	"

4) Labourer's Overtime/Year

Only one gang works overtime 25 percent up, 8 hr, 210 days

Foreman 9,450 ₪/year

Winch/Forkman 7,560 "

Labour 5,880 "

5) Depreciation for Crane/Forklift (10 years)

Crane  $3,000,000 \text{ ₪} + 10 = 3.0 \times 10^5 \text{ ₪/Year}$

Forklift  $400,000 \text{ ₪} + 10 = 4.0 \times 10^4 \text{ ₪/Year}$

6) Maintenance for Crane/Forklift

Crane 3% of Price per year

Forklift 10% "

7) Fuel

Crane/Fork (20 /day per one Crane/Fork 7.5 ₪/ , 210 days)  $3.2 \times 10^4 \text{ ₪}$  per one Crane/Fork/Year

8) Charge for Warehouse

ton per 1 ₪/day

25% of cargoes pass through the warehouses

average staying: 3 days 1 ₪ per ton

9) Pallet

per m 50 ₪

1.0 ton/m 25 trip (depreciation)

per one trip = 2 ₪ for 50% cargo

average per ton 1 ₪

(2) Conclusion

Cargo Handling Charges in 1983

		Bahts/ton
	Stevedoring	Yard Operation (Double Handling)
Labour Cost	13.2	4.0
Overtime	1.0	0.3
Depreciation	4.5	0.5
Maintenance	2.0	0.5
Fuel	1.7	0.4
Warehouse	-	0.8
Pallet	1.0	-
Sub total	23.4	6.5
Management 15%	3.5	1.0
Total	26.9	7.5

We assume that the stevedoring charge and yard operation charge in 1987 are 30  $\text{฿}$ /ton and 10  $\text{฿}$ /ton respectively.



**APPENDIX 9. GOVERNMENTAL AGENCIES**





APPENDIX 9 GOVERNMENTAL AGENCIES

Chart A.9-1 Organization Chart of Ministry of Communications  
(General)

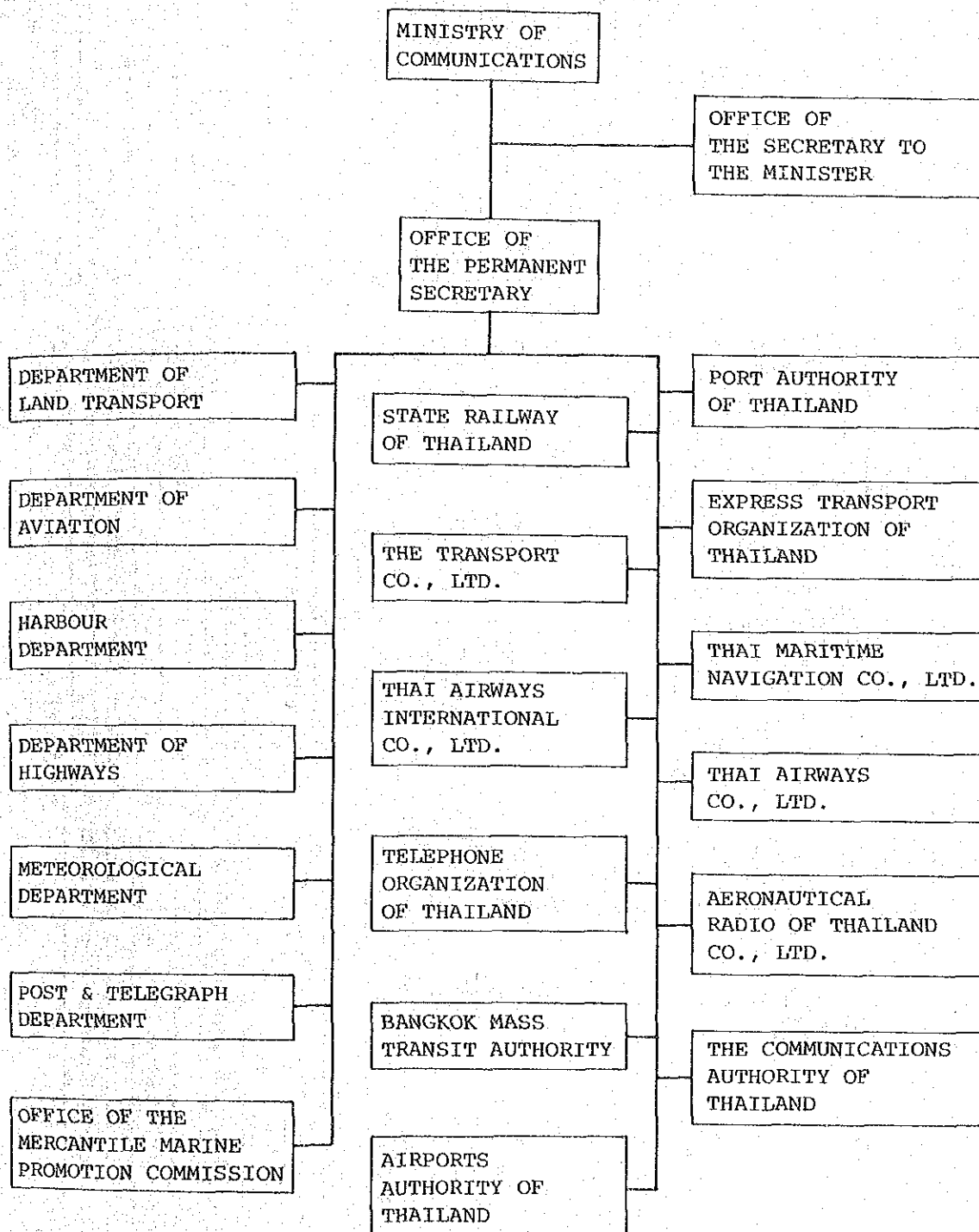


Chart A.9-2 Organization Chart of Ministry of Communications (Office of the Mercantile Marine Promotion Commission)

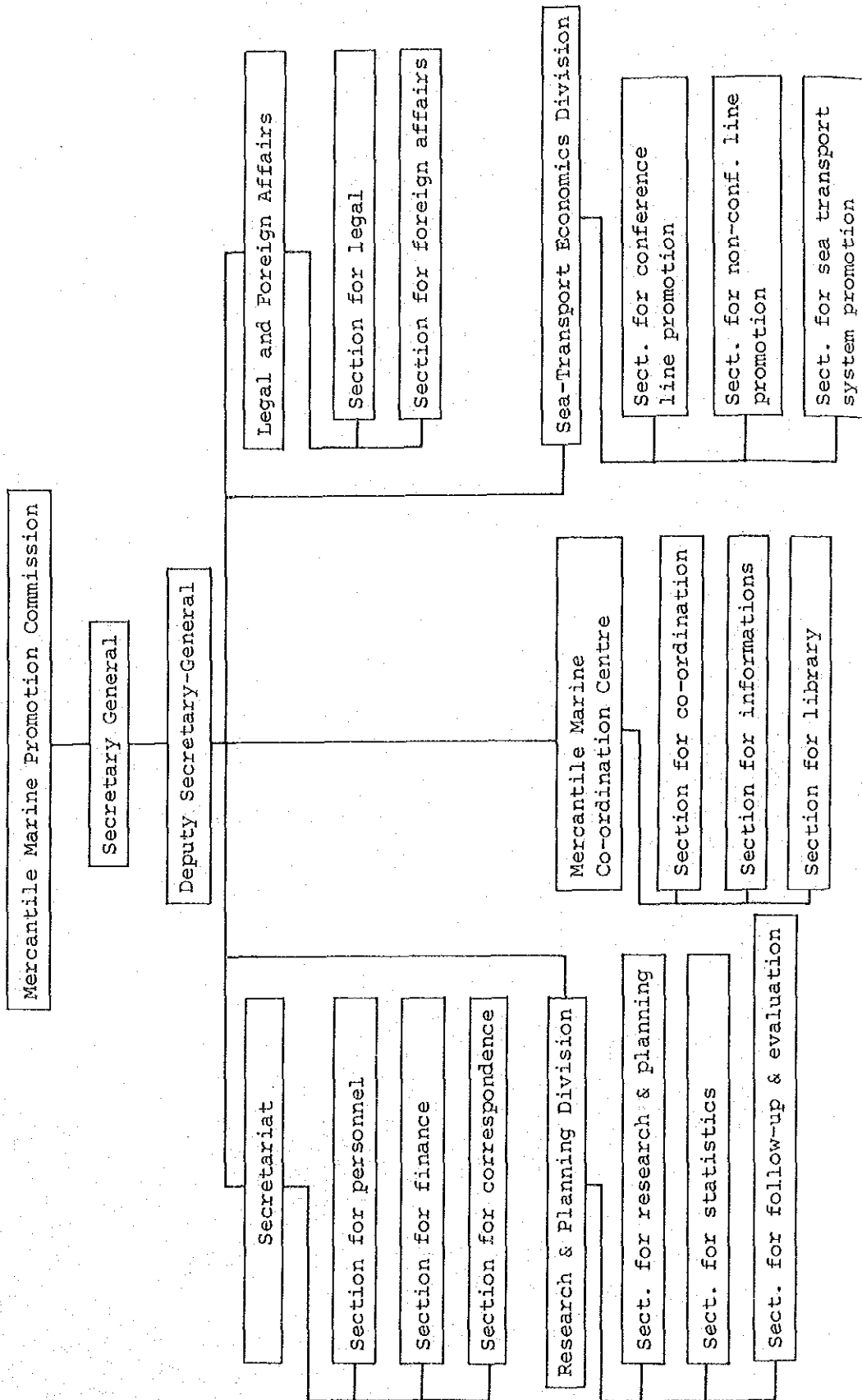
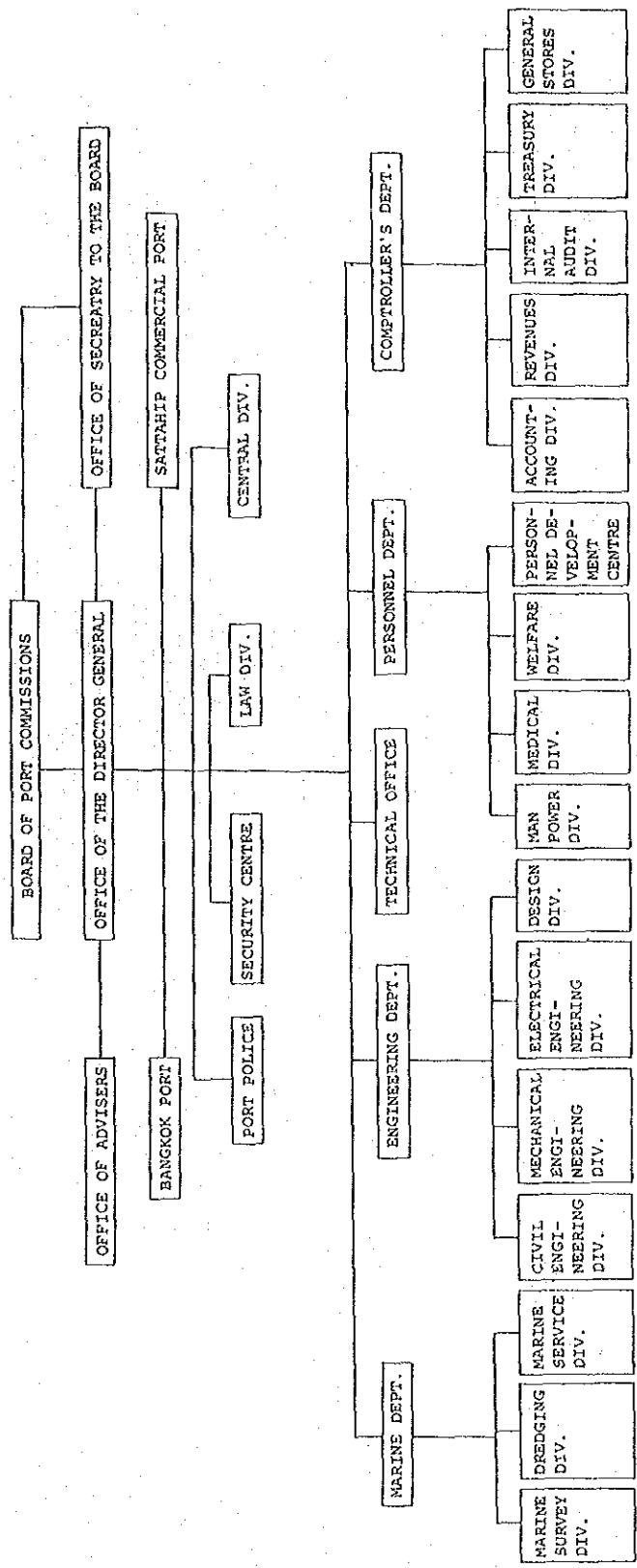
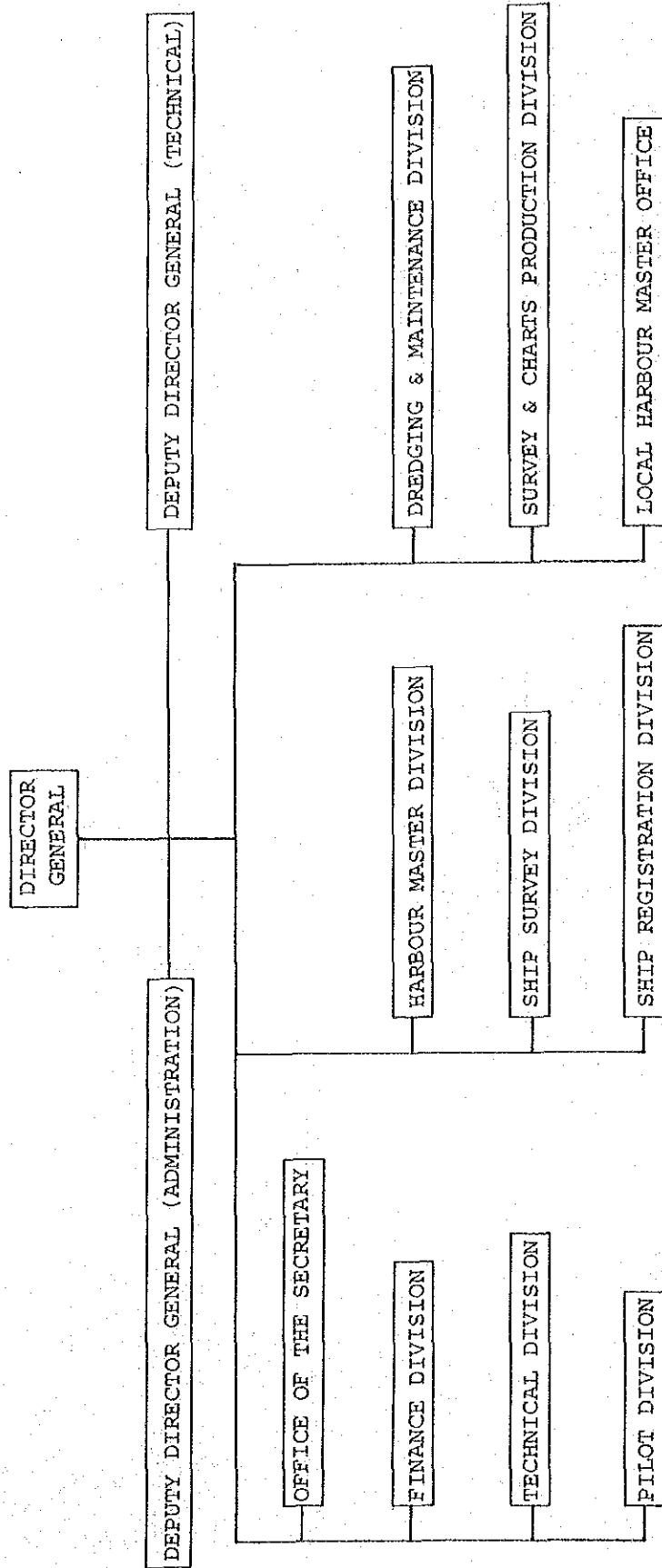


Chart A.9-3 Organization Chart of Ministry of Communications  
(Port Authority of Thailand)



Source: PAT

Chart A.9-4 Organization Chart of Ministry of Communications  
(Harbour Department)



Source: Harbour Department

**APPENDIX 10 EXPLANATION OF CARGO DEMAND FORECAST**



## APPENDIX 10 EXPLANATION OF CARGO DEMAND FORECAST

### 10A-1 The Present Cargo Flow

According to MOC's Statistics the cargo volume fluctuated considerably from year to year, so our consultants choose a standard year for each commodity all 1978 or 1979.

The Cargo Flow for the standard year are as follows.

Table A.10-1 Cargo Flow, 1978

Unit: Thousand tons

Province	Southbound						Northbound				
	General cargo	Fertilizer	Construction Material	Rice	Maize **	Fuel	Wood	Fish *	Vegetable /Fruits *	Rice *	Rubber *
Chumphon	77	6	20	12	2	95 (48)	86	105	25	2	-
Ranong	62	-	11	5	-	40	150	88	-	-	-
Surat Thani	66 (17)	4	22	3	1	265 (257)	67 (29)	41	38	-	2
Phangnga	16	-	7	2	-	3	25	2	1	-	-
Phuket	31	1	14	1	2	3	6	15	2	-	-
Krabi	11	2	5	1	-	-	30	9	-	-	-
Trang	66	4	8	1	-	2	11	38	1	-	4
Nakhon Si- Thammarat	141 (8)	6	19	12	1	156 (141)	18 (1)	43	12	25	13
Phattalung	19	4	6	-	-	-	1	-	-	10	-
Satun	9	1	8	-	-	-	4	4	-	-	-
Songkhla	202 (38)	13	44 (2)	6	24 (8)	341 (331)	7 (1)	62	5	8	9
Pattani	58 (28)	3	5	5	-	37 (36)	12 (4)	3	3	1	3
Yala	1	-	1	-	-	-	-	1	2	-	-
Narathiwat	20	-	4	6	-	1	6	10	2	-	2
Total	779 (91)	44	174 (2)	54	32 (8)	943 (813)	423 (35)	421	91	47	33

Note: \* 1979 Data  
 \*\* 1978, 1979 Data  
 ( ) Shipping

Source: Compiled MOC's Statistics



10A-2 Cargo Forecasting

(1) General cargo (southbound)

The demand for general cargo from Bangkok is proportional to the growth of GDP in the south.

Table A.10-2 General Cargo to the South

Unit: Thousand tons

	1977				1978			
	Road	Rail	Ship	Total	Road	Rail	Ship	Total
Chumphon	90	1		91	76	1		77
Ranong	66	-		66	62	-		62
Surat Thani	34	13	21	68	41	8	17	66
Phangnga	15			15	16			16
Phuket	30			30	31			31
Krabi	6			6	11			11
Trang	10	64		74	10	56		66
Nakhon Si Thammarat	77	66	9	152	79	54	8	141
Phattalung	2	17		19	1	18		19
Satun	6			6	9			9
Songkhla	38	137	52	227	50	114	38	202
Pattani	-	24	33	57	1	29	28	58
Yala	-	-		-	1	-	-	1
Narathiwat	3	11	0	14	5	15	0	20
Total	377	333	115	825	393	295	91	779

The relation between general cargo transported and GPP is as follows.

Table A.10-3 The Relation between GPP and General Cargo

Unit: Thousand Tons  
Million Bahts

	1977		1978		Group
	X (GPP)	Y (Cargo)	X (GPP)	Y (Cargo)	
Chumphon	1520	91	1890	77	A
Ranong	1968	66	1300	62	A
Surat Thani	2607	68	3114	66	A
Phangnga	1875	15	2318	16	B
Phuket	1200	30	1316	31	A
Krabi	892	6	1043	11	B
Trang	1723	74	1954	66	A
Nakhon Si Thammarat	3884	152	4150	141	A
Phattalung	1286	19	1219	19	B
Satun	819	6	860	9	B
Songkhla	925	227	4151	202	A
Pattani	1417	57	1429	58	A
Yala	979	-	1173	1	B
Narathiwat	2138	14	1709	20	B

The consumer areas in this relation can be put in two groups as follows:

Group A: Consumer use general cargo coming directly from Bangkok in great quantities.

Group B: Consumer areas that use little general cargo coming directly from Bangkok.

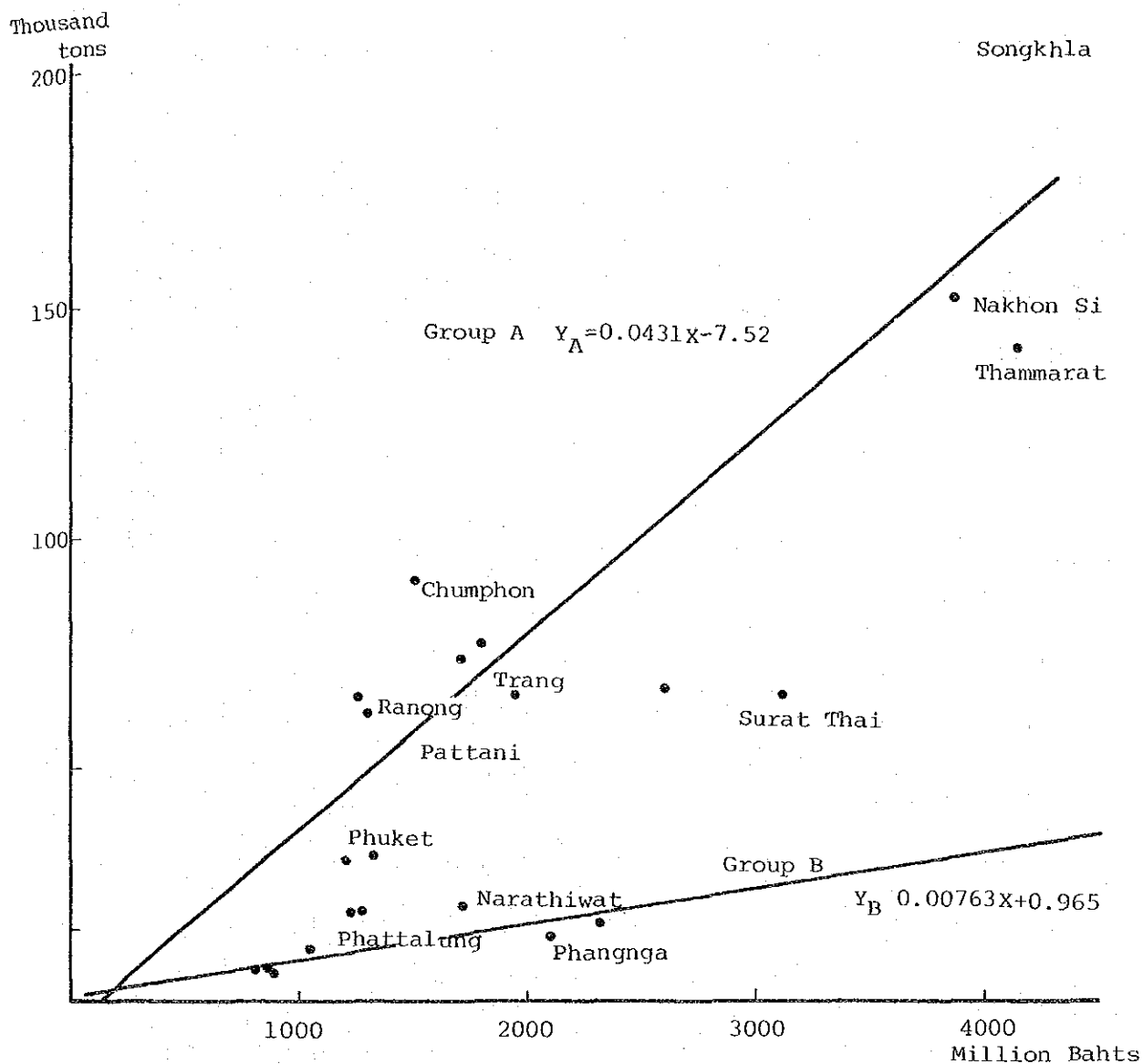


Fig. A.10-1 Relation between General Cargo and GPP

Group A (Songkhla, Nakhon Si Thammarat, Surat Thani, Chumphon, Trang, Ranong, Pattani and Phuket)

$$Y_A = 0.0431X - 7.52$$

$$r = 0.854$$

Group B (Phangnga, Krahi, Phattalung, Satun, Yala and Narathiwat)

$$Y_B = 0.00763X + 0.965$$

$$r = 0.570$$

From the economic frame of the southern province and the above-mentioned formula we can arrive at the following Table.

Table A.10-4 Estimation of General Cargo Flow to the South

Unit: Thousand tons

	Present		Low Estimate			High Estimate		
	1978	1981	1987	1992	2000	1987	1992	2000
Chumphon	77	95	158	226	337	164	252	467
Ranong	62	50	84	121	182	87	134	252
Surat Thani	66	147	202	249	371	210	357	659
Phangnga	16	26	52	60	88	55	67	96
Phuket	31	77	140	217	324	146	241	448
Krabi	11	8	10	12	17	11	15	26
Trang	66	85	96	114	173	100	145	271
Nakhon Si Thammarat	141	168	222	267	399	231	320	593
Phattalung	19	12	15	18	26	16	20	36
Satun	9	8	9	10	15	9	12	23
Songkhla	202	238	356	473	703	370	527	972
Pattani	58	58	90	122	183	94	136	256
Yala	1	14	21	29	43	22	32	58
Narathiwat	20	16	18	21	31	18	26	46
Total	779	1002	1473	1939	2892	1533	2284	4203

## (2) Fertilizer (southbound)

## 1) Consumption at present

In Thailand almost fertilizers are imported, and the trends of imported fertilizers with GDP (crops) are shown as follows.

Table A.10-5 Imported Fertilizer and GDP (Crops)

Unit: Thousand tons  
Million Bahts

	1975	1976	1977	1978	1979	Rate of Growth
Fertilizer Imported	425 (474)	621 (635)	871 (784)	757 (812)	861 (835)	19.3% (15.21)
GDP (Crops)	470 (475)	490 (480)	468 (490)	536 (515)	518 (523)	2.44% (5.33)

Source: Foreign Trade Statistics of Thailand

Note: ( ) Adjusted Value

$$Y = 0.119 + 412 X \quad \text{X Fertilizer Imported (1,000 ton)}$$

$$r = 0.848 \quad \text{Y GDP (million } \text{฿)}$$

This shows that there is a mutual relation between two data sets.

The Elasticity of Fertilizer with GDP

$$= \frac{\text{The Rate of Fertilizer Growth}}{\text{The Rate of GDP Growth (Crops)}}$$

$$= \frac{15.21}{2.44} = 6.23$$

The statistics for the fertilizer transported from Bangkok and for land use in the South in 1978 are shown as follows.

Table A.10-6 Fertilizer Transported and Land Use  
by Southern Province, 1978

	Fertilizer from Bangkok 1978 (1,000 ton)	Type of Crop Area (1,000 rai)					Rubber (1,000 rai)
		Rice	Tree crops	Field/Veg. Crops	Forest/ Pasture Others	Total	
Chumphon	6	164	526	22	106	818	66
Ranong	-	20	60	2	14	96	21
Surat Thani	4	414	757	21	162	1354	766
Phangnga	-	44	234	3	8	299	427
Phuket	1	9	100	3	3	115	92
Krabi	2	137	373	7	90	607	536
Trang	4	251	561	5	75	892	912
Nakhon Si Thammarat	6	1278	1002	45	171	2496	1212
Phattalung	4	591	248	8	57	904	443
Satun	1	122	129	7	41	299	144
Songkhla	13	602	765	15	92	1474	1400
Pattani	3	209	180	6	18	413	302
Yala	-	59	487	3	22	571	886
Narathiwat	-	177	466	6	30	679	827
Total	44	4077	5883	153	899	11017	8036

Source: MOC Statistic, 1978 Agricultural Census, Report Rubber  
Research Institute

Note: rai = 1600 m

According to the Agricultural Census 1978, the fertilizer consumption  
and treated area in the south are shown by crop as follows.

Table A.10-7 Consumption and the Treated, Area

	Consumption (ton)	Treated Area (1,000 rai)	kg/rai
Rice	28426	2239	12.70
Tree Crops	25898	(5888+8036) × 0.2*	9.30
Field Crops	2958	157	} 20.44
Vegetable Crops	1901	93	

Source: 1978 Agricultural Census Report Southern Region

Note \*: Treated Area of Tree Crops is estimaton by the field survey data. (Rate of Deffusion is about 20%.)

The rate of diffusion and non treated area are presented as follows.

Table A.10-8 Rate of Diffusion and Non Treated Area, 1978

	Rate of Diffusion	Non Treated Area (1,000 rai)
Rice	54.9%	1838
Tree Crops	20.0%	11139
Field Crops Vegetable Crops	100.0%	0

The growth rate of planting area is shown as follows.

Table A.10-9 Growth Rate of Planting, Area

	Rice	Tree Crops Rubber	Field Vegetable /Crops
Trend of Statistic	2.2% 1)	1.4% 2)	-
Five Year Plan Target (Product)	2.9%	12.3%	-
This Survey Target	2.2%	3%	5%

## 2) Future consumption

This forecast is carried out using agricultural statistics instead of economic figures.

### a) For rice

According to the FAO survey, the economically optimum application for tropical rice products is 40 kg/ha of nitrogen fertilizes or about 19.2 kg/rai of all fertilizers. The Thai Government is also encouraging the use of the fertilizer "Ammphos" at a rate of 95 kg/ha (15.2 kg/rai) for rice.

The consumption of fertilizer is in proportion to the planting area, diffusion and unit of treated area.

For this reason the Study Team set the target of 15.2 kg/rai in 1987 and 19.2 kg/rai, 100 percent diffusion in 2,000.

The future consumption is presented as follows.

N years' consumption (1,000 ton)	:	An
The rated diffusion at n year (%)	:	dn
The treated area (1,000 rai)	:	An
Unit of treated area (n year) (kg/rai)	:	fn
The planting area (1,000 rai)	:	Pn

n: 1980 = 0 1981 = 1 2000 = 20

$$Q_n = f_n \times A_n = f_n \times d_n \times P_n$$

$$d_n = \frac{[\text{Rate of Diffusion 1980}] + n \times \frac{\text{Rate of Non Treated Area 1980}}{2000 - 1980}}{1}$$

$$= 54.9 + n \frac{45.1}{20}$$

$$= 2.26n + 54.9 (\%)$$

$$P_n = 4453 \times (1,022)^n$$

$$A_n = d_n \times P_n = (2445 + 101n) \times 1,022^n$$

$$f_n = 12.7 + n \frac{(15.2 - 12.7)}{7} \quad (n \leq 7)$$

$$= 0.357n + 12.7 \quad (1981 \sim 1987)$$



$$f_n = 15.2 + n \frac{(19.2 - 15.2)}{20} \quad (n < 7)$$

$$= 0.190n + 15.2 \quad (1987 \sim 2000)$$

<1981 ~ 1992>

$$Q_n = f_n \times A_n = (0.357n + 12.7) \times (101n + 2445) \times 1.022^n$$

$$= (36.1n^2 + 2156n + 31051) \times 1.022^n$$

<1993 ~ 2000>

$$Q_n = f_n \times A_n = (0.17n + 15.2) (101n + 2445) \times 1.022^n$$

$$= (19.2n^2 + 2000n + 37164) \times 1.022^n$$

b) Tree crops

According to the field survey we set the target at 15.0 kg/rai and 100 percent diffusion in 2000.

$$\text{The Diffusion } d_n = 20 + 80 \times \frac{n}{20} = 4.0n + 20 \quad (\%)$$

$$\text{The Planting Area } P_n = (5888 + 8036) \times (1.03)^{n+1}$$

$$\text{The treated Area } A_n = d_n \times P_n = (557n + 2785) \times (1.03)^n$$

(1000 rai)

$$f_n = 9.3 + (15.0 - 9.3) \times \frac{n}{20}$$

$$= 0.285n + 9.3 \quad (\text{kg/rai})$$

$$Q_n = f_n \times A_n = (0.285n + 9.3) \times (557n + 2785) \times (1.03)^n$$

$$= (159n^2 + 5974n + 25900) \times (1.03)^n \quad (\text{ton})$$

c) Field crop/vegetable

5 percent growth is assumed, including the growth of planting area.

$$Q_n = (2958 + 1901) \times (1.05)^{n+3}$$

$$= 5625 \times (1.05)^n$$

From  $Q_n$ , we can get the future consumption of the south as follows.

Table A.10-10 Future Consumption of Fertilizer

Unit: Thousand tons

Province	1987			1992			2000					
	Rice	Tree	Field/Veg.	Total	Rice	Tree	Field/Veg.	Total	Rice	Tree	Field/Veg.	Total
Chumphon	2	4	1	7	3	7	1	11	5	16	2	23
Ranong	-	1	-	1	-	1	-	1	1	2	-	3
Surat Thani	6	10	1	17	8	19	1	28	13	41	2	56
Phangnga	1	4	-	5	1	8	-	9	1	18	-	19
Phuket	-	1	-	1	-	2	-	2	-	25	-	5
Krabi	2	6	1	9	3	11	1	15	4	25	1	30
Trang	3	10	-	13	5	18	-	23	8	40	1	49
Nakhon Si Thammarat	18	15	3	36	26	27	3	56	42	61	4	107
Phattalung	8	5	-	13	12	9	1	22	19	19	1	39
Satun	2	2	-	4	2	3	1	6	4	7	1	12
Songkhla	8	14	2	24	12	27	1	40	19	59	1	79
Pattani	3	3	-	6	4	6	-	10	7	13	1	21
Yala	1	9	-	10	1	17	-	18	2	37	-	39
Narathiwat	2	9	-	11	4	16	-	20	6	35	1	42
Total	56	93	8	157	81	171	9	261	131	378	15	524

(3) Construction Material (Southbound)

1) General

In Thailand almost construction materials such as cement and steel plate are produced within the country. The relation between construction material produced and the value of the construction sector of the GDP is shown as follows.

Table A.10-11 Relation between GDP and Construction Material

	1975	1976	1977	1978	1979	1980	Unit
Construction Sector of GDP	8319	10022	11996	13583	14547	16576	1 million Bahts
Construction Material Production							
Cement	3959	4422	5063	5044	5204	5337	1,000 t
Steel Plate	94	115	138	129	166	167*	"
Total	4053 (4174)	4537 (4582)	5201 (5028)	5173 (5229)	5370 (5364)	5544 (5500)	

Source: Bank of Thailand Statistical Bulletin

\* 1987 Estimation

X: Construction Material (1,000 ton), ( ) Adjusted Producted

Y: GDP (Construction) (million ฿)

$$Y = 5.819 X - 16470$$

$$r = 0.976$$

This shows that there is a good relation between two data.

The Elasticity of Construction Material =  $e_c$

$$= \frac{\text{The Rate of Construction Material Growth}}{\text{The Rate of GDP Growth (Construction)}}$$

$$= \frac{5.67}{14.78} = 0.384$$

Table A.10-12 Relation between GPP and Construction Material Transported

Unit: Million Bahts  
Thousand tons

	1977		1978		Group
	X (GPP)	Y (Cargo)	X (GPP)	Y (Cargo)	
Chumphon	124	18	90	20	A
Ranong	44	13	36	11	A
Surat Thani	212	14	257	22	B
Phangnga	86	4	109	7	B
Phuket	82	14	76	14	A
Krabi	43	4	9	5	B
Trang	50	20	39	8	A
Nakhon Si Thammarat	203	18	213	19	B
Phattalung	87	4	49	6	B
Satun	41	5	46	8	A
Songkhla	271	31	397	44	A
Pattani	85	5	88	5	B
Yala	59	1	69	1	B
Narathiwat	61	5	53	4	B

Group A Mainly dependent on Bangkok for construction materials (Chumphon, Ranong, Phuket, Trang, Satun and Songkhla)

Group B Less dependent on Bangkok for construction materials (Surat Thani, Phangnga, Krabi, Nakhon Si Thammarat, Phattalung, Yala and Narathiwat)

X: GPP (Construct Sector): million B

Y: Construct Materials transported: thousand tons

$$Y_A = 0.0921 X + 7.221$$

$$r = 0.9421$$

$$Y_B = 0.0829 X - 0.974$$

$$r = 0.9249$$

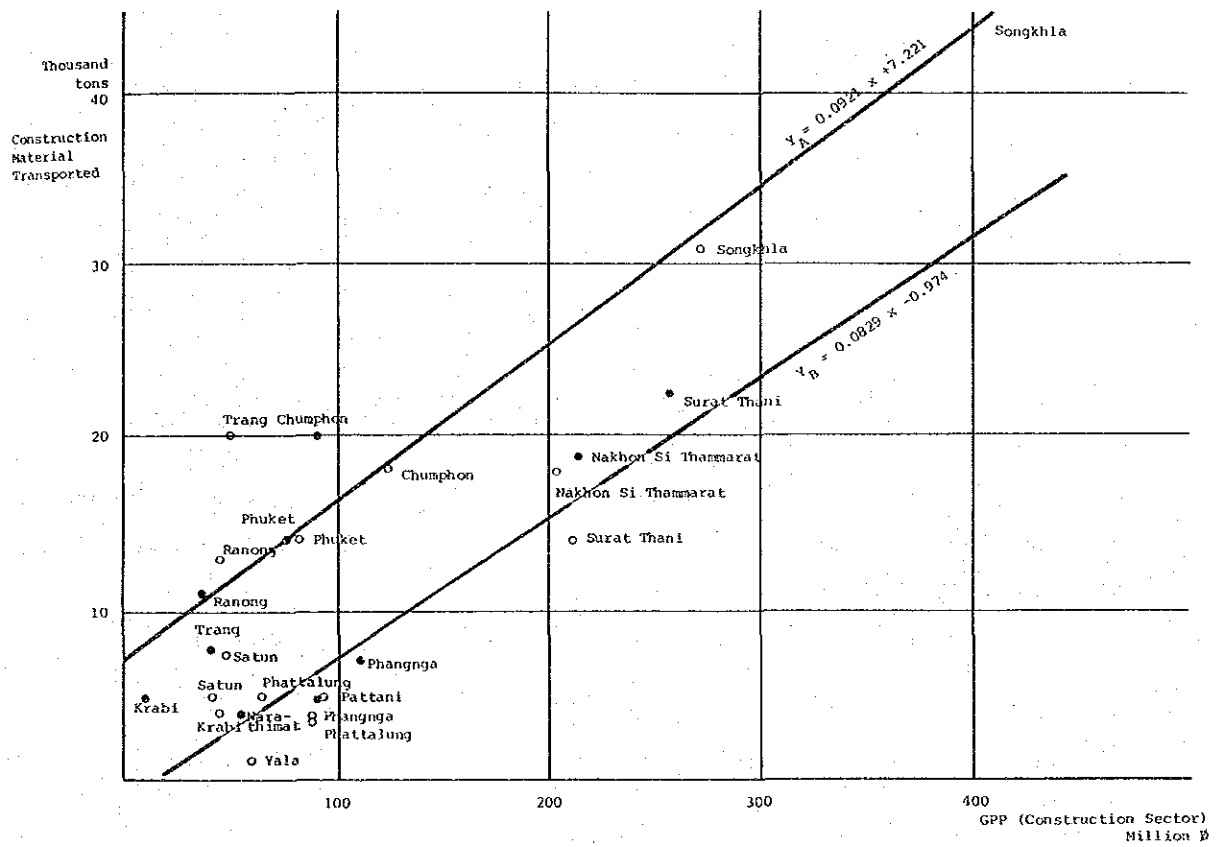


Fig. A.10-2 Relation between Construction Material and GPP

2) The future frame

The growth of the construction sector of the GPP has recently been very rapid. This tendency will continue for a while so we estimated construction sector the GPP considering the balance between it and the total GPP and the growth of each province respectively as mentioned below.

Table A.10-13 Target of Construct Sectors Rate of Growth

Unit: %

		1978~81	1981~87	87~2000
GPP	L	7.1	6.6	5.5
	H	7.1	7.1	7.5
GPP Construct Sector	L	15.3	14.2	10.8
	H	15.3	15.3	16.2

In this analysis the Study Team sets the upperlimit Construct Sector GPP which means the percentage of the total GPP, because of the high growth of this sector.

$$* \text{Upperlimit} \leq \frac{\text{GPP Const}}{\text{GPP Total}} = 10\%$$

	Whole Kingdom	Bangkok	South	Songkhla
Percentage of the Total GPP	5.3%	8.1%	5.2%	10.7%

In future at most 8 ~ 12%

We set the upperlimit at 10%

Table A.10-14 Construction Sector GPP (Future Frame)

Unit: Million Bahts

	Low Estimate				High Estimate		
	1981	1987	1992	2000	1987	1992	2000
Chumphon	133	260	404	750	276	539	1412
Ranong	55	156	193	358	126	264	692
Surat Thani	358	630	922	1437	668	1186	2119
Phiangnga	135	187	240	446	198	285	748
Phuket	133	365	686	1254	386	1017	1441
Krabi	16	46	90	166	49	95	250
Trang	51	81	114	211	86	138	362
Nakhon Si Thanmarat	280	438	601	1114	464	745	1908
Phattalung	100	371	472	545	393	479	629
Satun	47	50	55	102	53	66	173
Songkhla	679	1792	2333	2692	1898	2370	3112
Pattani	124	219	321	594	231	414	837
Yala	134	447	773	893	474	785	1030
Narathiwat	76	144	217	402	153	289	757
Total	2322	5150	7422	10964	5455	8674	15468

3) Future cargo forecasting

From Table and the formula mentioned above the future cargo forecasts are as follows.

Table A.10-15 Future Consumption of Construction Material

Unit: Thousand tons

	At present	Low Estimate			High Estimate		
	1981	1987	1992	2000	1987	1992	2000
Chumphon	19	31	44	76	33	57	137
Ranong	12	21	25	40	19	32	71
Surat Thani	29	51	75	118	54	97	175
Phangnga	10	15	19	36	15	23	61
Phuket	19	41	70	123	43	101	140
Krabi	-	3	6	13	3	7	20
Trang	12	15	18	28	15	20	41
Nakhon Si Thammarat	22	35	49	91	37	61	157
Phattalung	7	30	38	44	32	39	51
Satun	12	12	12	17	12	13	23
Songkhla	70	172	222	255	182	225	294
Pattani	9	17	26	48	18	33	68
Yala	10	36	63	73	38	64	84
Narathiwat	5	11	17	32	12	23	62
Total	236	490	684	994	513	795	1384



(4) Rice (southbound)

The real figure for rice transport to the south and the growth of population by province are as follows.

Table A.10-16 Rice Transported and the Growth of Population

Unit: Thousand tons

	Transported Rice 1981	Growth of population at present	Growth of population for forecasting
Chumphon	12	2.1	1.2
Ranong	5	3.2	1.7
Surat Thani	3	1.9	1.4
Phangnga	2	2.7	1.4
Phuket	1	2.5	1.5
Krabi	1	3.4	1.4
Trang	1	2.2	1.5
Nakhon Si Thammarat	12	1.9	1.4
Phattalung	-	1.7	1.4
Satun	-	2.8	1.4
Songkhla	6	2.2	1.4
Pattani	5	2.3	1.5
Yala	-	2.8	1.9
Narathiwat	6	2.1	1.4
Total	54	2.2	1.4

Source: Statistic of MOC

N.S.O.

The volume of rice transported is supposed to grow in proportion to the growth of population. Southbound rice is presented as follows.

$$\boxed{\text{The rice in year } n} = \boxed{\text{The rice in 1981}} \times (1 + \boxed{\text{Growth of Population}})^n$$

Table A.10-17 Future Forecast of Rice (Southbound)

Unit: Thousand tons

	1987	1992	2000
Chumphon	14	14	16
Ranong	6	7	8
Surat Thani	3	4	4
Phangnga	2	3	3
Phuket	1	1	1
Krabi	1	1	1
Trang	1	1	1
Nakhon Si Thammarat	13	14	16
Phattalung	-	-	-
Satun	-	-	-
Songkhla	7	7	8
Pattani	6	6	7
Yala	-	-	-
Narathiwat	7	7	8
Total	61	65	73

(5) Maize (southbound)

Southbound maize is distributed to all southern provinces.

Table A.10-18 Relation between Maize and Livestock

Unit: Thousand heads

	Transported 1981 (Thousand tons)	Number of Live Stock Slaughtered 1979*	Growth Rates of Slaughtered (%)	Estimated Consumption 1981 (Thousand tons)
Chumphon	2	30.3	10.6	2.0
Ranong	-	10.1	3.2	0.7
Surat Thani	1	48.4	3.7	3.1
Phangnga	-	27.0	8.8	1.8
Phuket	1	27.5	5.4	1.8
Krabi	-	10.3	4.0	0.7
Trang	-	50.4	9.7	3.3
Nakhon Si Thammarat	1	70.7	9.0	4.6
Phattalung	-	17.1	5.9	1.1
Satun	-	5.1	6.3	0.3
Songkhla	24	95.4	7.2	6.2
Pattani	-	11.8	8.5	0.8
Yala	-	36.3	6.3	2.4
Narathiwat	-	15.3	4.0	1.0
Total	29	466.1	7.8	29.0

Source: \*Annual Report of Livestock Department of Livestock  
Development

The future forecast for maize transported to the south is done as follows:

$$\boxed{\text{The Maize in Year } n} = \boxed{\text{The Maize Estimated in 1981}} \times \left(1 + \boxed{\text{Growth Rate of Slaughtered}}\right)^n$$

1981: n = 0      1982: n = 1

Table A.10-19 Future Forecast for Maize

Unit: Thousand tons

	1987	1992	2000
Chumphon	4	6	14
Ranong	1	1	1
Surat Thani	4	5	6
Phangnga	3	5	9
Phuket	2	3	5
Krabi	1	1	1
Trang	6	9	19
Nakhon Si Thammarat	8	12	24
Phattalung	2	2	3
Satun	-	1	1
Songkhla	9	13	23
Pattani	1	2	4
Yala	3	5	8
Narathiwat	1	2	2
Total	45	67	120

(6) Fuel (southbound)

1) Economic growth and fuel consumption

Fuel consumption is proportional to the growth of GDP as follows:

Table A.10-20 Fuel Consumption/GDP

GDP	75 20.3	76 22.0	77 23.7	78 26.1	79 27.7	80 29.3	10 Billion ₪
Fuel consumption	8.51	9.62	10.73	12.24	12.24	12.29	Million Kℓ

Source: National Energy Administration

GDP : X (10 Billion ₪)

Fuel C: Y (Million Kℓ)

$$Y = 0.440 X - 0.0028$$

$$r = 0.943$$

This shows that there is a good relation these data.

The Elasticity of Fuel with GDP.

$$= \frac{\text{The Rate of Fuel Consumption Growth}}{\text{The Rate of GDP Growth}}$$

$$= \frac{7.63}{7.55} = 1.011$$

The relation between Economic Growth and Fuel Consumption in the South is as follows.

Table A.10-21 Fuel Consumption/GPP, 1980  
 Unit: Million Bahts  
 Thousand Kilo liters

	GPP Fish A	GPP Transport B	GPP Fish & Transport A + B = C	GPP Total D	Fuel Con- sumption 1980
Chumphon	222	51	273	1980	86.0
Ranong	134	70	204	1693	40.0
Surat Thani	264	89	353	3196	121.0
Phangnga	43	70	113	2956	56.2
Phuket	110	119	229	1707	77.6
Krabi	29	42	71	896	14.8
Trang	277	136	413	2186	59.7
Nakhon Si Thammarat	138	140	278	3879	101.7
Phattalung	12	71	83	1319	14.4
Satun	182	30	212	788	5.3
Songkhla	480	383	863	4883	195.9
Pattani	252	115	367	1388	41.1
Yala	-	83	83	1412	22.3
Narathiwat	8	56	64	1954	19.3
Total	2150	1460	3610	30236	855.3

2) The percentage of the total GPP

Y: Fuel (1000 k)

X: GPP (Total Million  $\text{M}$ )

$$Y = 0.0402 \times X - 25.73$$

$$r = 0.899$$

3) The percentage of the GPP (fish and transport)

$$Y = 0.213 \times X + 6.323$$

$$r = 0.849$$

$$r (\text{total}) > r (\text{fish and transport})$$

we use total GPP in this analysis.

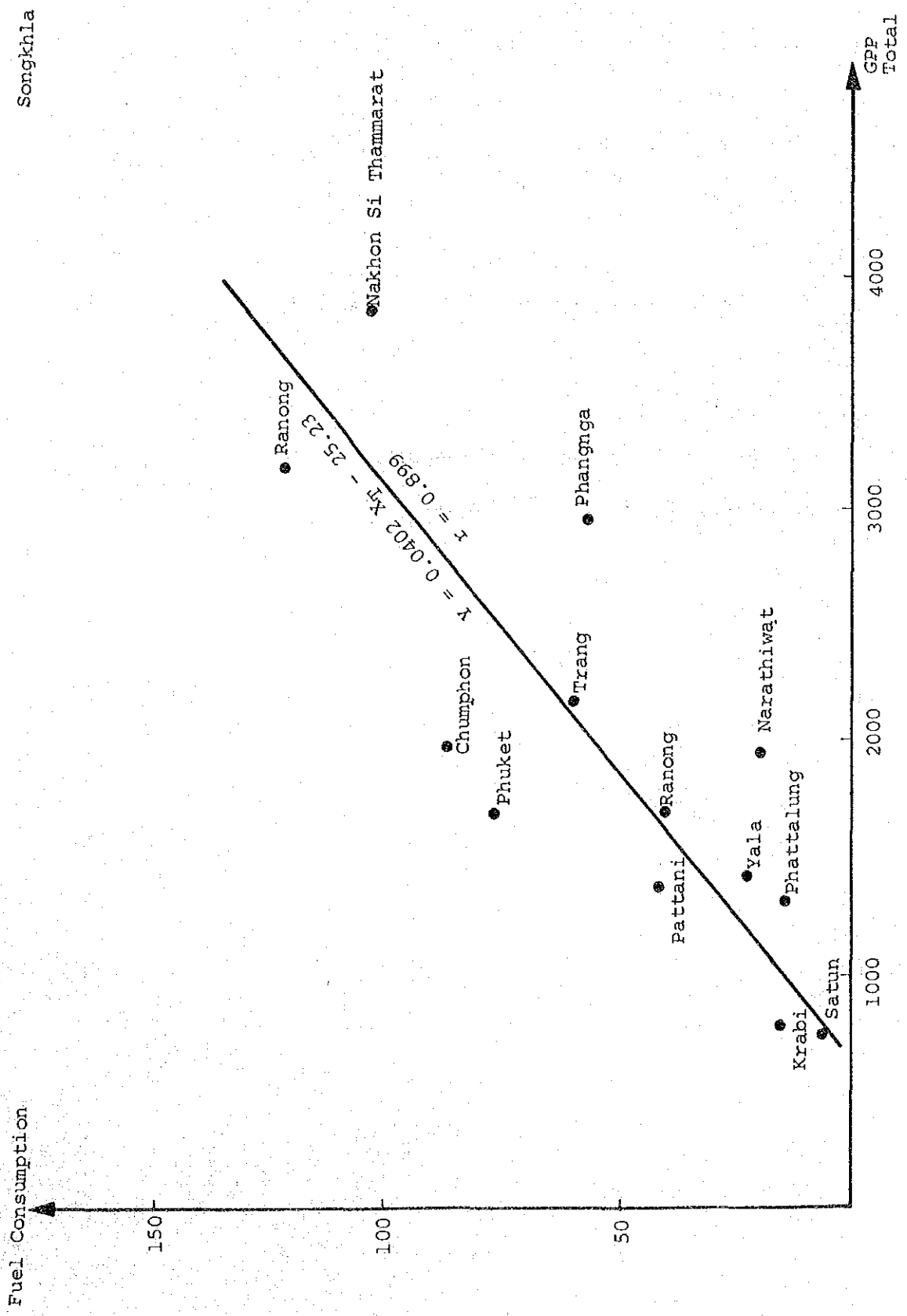


Fig. A.10-3 Relation between GPP and Fuel Consumption in the South



4) Future consumption

a) Basic unit for economy

According to the forecast of the National Energy Administration, it was supposed that fuel consumption between 1982 and 1990 would mark a low level of growth averaging 1.36 percent per year.

This data is shown as follows.

Table A.10-22 Future Fuel Consumption

Unit: Thousand kilo liters

1982	1983	1984	1985	1986	1987	1988	1989	1990
10,270	10,668	9,349	10,191	11,230	10,133	10,690	10,831	11,440

Source: National Energy Administration

As the Fifth Development Plan shows the future forecast of the fuel consumption is at very low level.

The Fifth Plans' The Elasticity of Fuel Consumption

$$= \frac{\text{Growth Rate of Fuel Consumption (1982 ~ 86)}}{\text{GDP Rate of Growth (The Fifth Plan)}}$$

$$= \frac{1.803\%}{6.60\%} = 0.273$$

This forecast is far from real consumption, so we have decided to make two scenarios in the South to cope with the two economic growth patterns that were mentioned before.

The first, we present a zero energy growth scenario to cope with the Fifth Plan.

The Secondly we present an optimistic scenario to cope with the recent statistics loading of a high estimate.

b) The future Prospect

From growth of GPP, elasticity and fuel consumption by hinterland, the fuel consumed in the future is presented as follows.

N years' Growth of GPP                      Pn :     %  
 Elasticity                                              ep :  
 N years' Future Consumption                  Qn :     1000 k  
 The Consumption 1980                              Qo :     1000 k

Table A.10-23 N Years' Growth of GPP and Elasticity

	1981-1987	1987-1992	1992-2000	Elasticity
Low Estimate	6.6%	5.0%	5.0%	0.237
High Estimate	7.1%	7.5%	7.5%	1.011

$$Q_n = Q_o \times [1 + P_n \times e_p]^n$$

$$= Q_o \times e_{n \log [1 + P_n \times e_p]}$$

1981, n=1 ..... 1990 n=10

Table A.10-24 Future Forecast of Fuel Consumption in the South

Unit: Thousand kilo liters

Present Consumption	Low Estimate			High Estimate		
	1987	1992	2000	1987	1992	2000
917	1006	1066	1170	1390	2003	3595

Table A.10-25 Fuel Distribution by Province

Unit: Thousand kilo liters

	Present	Low Estimate			High Estimate		
	1981	1987	1992	2000	1987	1992	2000
Chumphon	66	80	93	102	110	167	307
Ranong	37	44	51	56	61	91	168
Surat Thani	100	101	103	113	139	234	431
Phangnga	91	140	133	146	194	239	348
Phuket	55	71	90	98	98	160	295
Krabi	26	25	24	27	35	50	91
Trang	60	50	49	54	69	98	180
Nakhon Si Thanmarat	113	111	110	121	153	211	389
Phattalung	40	39	39	43	54	70	128
Satun	26	22	22	24	30	43	79
Songkhla	158	175	191	210	242	343	634
Pattani	42	47	52	57	65	93	170
Yala	48	55	64	70	77	114	210
Narathiwat	55	46	45	49	63	90	165
Total	917	1006	1066	1170	1390	2003	3595

(7) General Cargo (Northbound)

The cargo flow from the south to Bangkok by province and transportation mode is as follows.

Table A.10-26 General Cargo for the Bangkok, 1981

Unit: Thousand tons

	Road	Rail	Ship	Total
Chumphon	10	0	0	10
Ranong	4	-	-	4
Surat Thani	7	0	3	10
Phangnga	0	-	-	0
Phuket	9	-	-	9
Krabi	1	-	-	1
Trang	2	15	-	17
Nakhon Si Thammarat	4	2	8	14
Phattalung	1	-	-	1
Satun	0	-	-	0
Songkhla	10	14	5	29
Pattani	2	2	1	5
Yala	1	-	-	1
Narathiwat	1	2	0	3
Total	52	35	17	104

The demand for future transportation is proportional to the growth of GPP (manufacture) in the south. Northbound general cargo is presented as follows.

$$\boxed{\text{General Cargo in Year}} = \boxed{\text{General Cargo in 1981}} \times \left( 1 + \boxed{\text{Growth of GPP (Manufacture)}} \right)^n$$

Table A.10-27 Growth of GPP (Manufacture) by Province

Unit: Percentage/Year

	Low Estimate		High Estimate	
	1981~1987	1988~2000	1981~1987	1988~2000
G R P (South)	6.6	5.0	7.1	7.5
Chumphon	10.83	8.20	11.65	12.31
Ranong	7.80	5.91	8.39	8.86
Surat Thani	8.41	6.37	9.05	9.56
Phangnga	5.30	4.01	5.70	6.02
Phuket	14.04	10.63	15.10	15.95
Krabi	4.86	3.68	5.23	5.52
Trang	3.29	2.49	3.54	3.74
Nakhon Si Thammarat	8.94	6.77	9.62	10.16
Phattalung	4.98	3.77	5.36	5.66
Satun	6.31	4.78	6.79	7.17
Songkhla	11.04	8.37	11.88	12.55
Pattani	6.78	5.13	7.29	7.70
Yala	5.07	3.84	5.45	5.76
Narathiwat	8.94	6.77	9.62	10.16

Table A.10-28 Future Forecast of General Cargo (Northbound)

Unit: Thousand tons

	Low Estimate			High Estimate		
	1987	1992	2000	1987	1992	2000
Chumphon	19	28	53	19	34	86
Ranong	6	8	13	6	9	18
Surat Thani	16	22	36	17	27	56
Phangnga	1	1	2	1	2	2
Phuket	20	33	74	21	44	144
Krabi	1	1	2	1	1	2
Trang	21	24	29	21	25	34
Nakhon Si Thammarat	23	33	54	24	40	86
Phattalung	1	1	2	1	1	2
Satun	1	1	2	1	2	2
Songkhla	54	81	156	57	103	268
Pattani	7	9	13	8	12	21
Yala	1	1	2	1	1	2
Narathiwat	5	7	12	5	8	18
Total	176	250	450	183	309	741

(8) Forestry Products

According Chapter 2, the rate of growth is defined as follows, because of restriction of wood resources.

1) High estimate

In this case, the demand for fuel wood is diminished by diffusion of petroleum.

The growth rate in future is fixed at 0.

2) Low estimate

This case the conservation of petroleum will go on, so the demand for fuel wood will be increasing in stead of that for petroleum.

The growth rate is fixed at 2 percent.

(It comes from the 2.00 percent growth rate of wood use during the energy crisis (1974 ~ 77))

Table A.10-29 Future Transport of Forestry Products

Unit: Thousand tons

	Low Estimate			High Estimate
	1987	1992	2000	1981 ~ 2000
Chumphon	107	118	138	95
Ranong	186	206	242	166
Surat Thani	83	92	108	74
Phangnga	31	35	41	28
Phuket	8	9	10	7
Krabi	37	41	48	33
Trang	14	15	17	12
Nakhon Si Thammarat	23	25	29	20
Phattalung	1	1	1	1
Satun	5	5	6	4
Songkhla	9	10	12	8
Pattani	15	16	19	13
Yala	-	-	-	-
Narathiwat	8	9	10	7
Total	527	582	681	468



(9) Fish product/transport (northbound)

1) Economic growth and fish product in the south

The annual catches of marine fish by province are as follows.

Table A.10-30 Annual Catches of Marine Fish by Province

Unit: Thousand tons

	1974	1975	1976	1977	1978	1979	Rate of Growth
Chumphon	47.8	43.2	69.1	90.8	68.8	90.3	13.6%
Ranong	96.3	89.4	104.5	109.6	64.6	56.1	0
Surat Thani	34.2	32.5	38.2	50.2	100.1	97.0	23.2
Phangnga	3.1	2.1	9.5	11.1	17.2	16.0	38.9
Phuket	26.2	23.3	31.3	41.8	32.2	46.0	11.9
Krabi	3.3	3.4	4.5	11.8	12.7	11.6	28.6
Trang	94.6	81.7	79.0	107.7	119.5	114.8	3.9
Nakhon Si Thammarat	59.0	37.0	59.3	78.0	89.4	55.5	0
Phattalung	-	-	-	-	-	-	-
Satun	21.0	22.5	27.2	60.9	78.5	74.7	28.9
Songkhla	90.6	123.8	168.3	224.3	188.0	188.1	15.7
Pattani	19.6	29.5	50.5	85.4	87.7	104.4	39.7
Yala	-	-	-	-	-	-	-
Narathiwat	-	-	-	-	-	-	-
Total	495.7	488.3	641.4	871.6	858.7	854.5	11.5

Source: Department of Fisheries Ministry of Agriculture and Cooperations

The relation between economic growth and fish catches is as follows.

Table A.10-31 GPP and Fish Products of the South

	1974	1975	1976	1977	1978	1979	
Catch of fish	495.7	488.3	641.4	871.6	858.7	854.5	Thousand tons
GDP (Fishery)	1431	2176	1911	2523	2487	2620	Million ø

Source: Department Fisheries and MOC Statistics

GDP X (Million ø)

Catch of fish Y (Thousand tons)

$$Y = 0.332 X - 26.72$$

$$r = 0.825$$

2) Future forecast of transport

The relation between fishery products and carried to Bangkok are as follows.

Table A.10-32 Relation between Fish Catches and Transport

Unit: Thousand tons

	1977			1978			Distance km
	Catch of Fish	Trans- port	Transport /Catch	Catch of Fish	Trans- port	Transport /Catch	
Chumphon	91	92	100%	69	105	100%	460
Ranong	110	114	100	65	88	100	500
Surat Thani	50	45	90	100	41	41	670
Phangnga	11	-	0	17	2	12	730
Phuket	42	15	36	32	15	47	830
Krabi	12	6	50	13	9	69	830
Trang	108	40	37	120	38	32	900
Nakhon Si Thammarat	78	47	60	89	43	48	790
Satun	61	2	3	79	4	5	1000
Songkhla	224	61	27	188	62	33	950
Pattani	85	9	11	89	3	3	1010
Yala Narathiwat	-	6	-	-	7	-	1060~ 1130
Total	872	437	50	859	429	49	

Source: Department Fisheries  
and MOC Statistics

Y Rate of carried to Bangkok %

X Distance km

$$Y = -0.001737 X + 1.8777$$

$$r = 0.973$$

According to Chapter 2, the targets are presented as follows due to the high fuel price and the restriction of resources.

Table A.10-33 Target of Fish Catches/Transportation

		Low Estimate	High Estimate
1981	1987	2.0%	Catching Growth by Province
1987	2000	2.0%	2.0%

Table A.10-34 Future Forecast of Fishery Products Transport

	1979 Product	Carried/ Product	1981 <sup>*</sup>	Low Estimate			High Estimate		
				1987	1992	2000	1987	1992	2000
Chumphon	90	1.00	132	149	164	192	284	314	367
Ranong	56	1.00	56	63	70	82	63	70	82
Surat Thani	97	0.71	129	145	160	188	451	498	583
Phangnga	16	0.61	26	29	32	38	187	206	242
Phuket	46	0.44	28	32	35	41	55	61	71
Krabi	12	0.44	11	14	15	17	54	60	70
Trang	115	0.31	40	45	50	58	50	55	65
Nakhon Si Thammarat	56	0.51	29	33	36	42	33	36	42
Phattalung	-	0.31	-	-	-	-	-	-	-
Satun	75	0.14	22	25	27	32	101	112	131
Songkhla	188	0.23	66	74	82	96	158	174	204
Pattani	104	0.12	34	38	42	50	253	375	439
Yala	-	0.04	-	-	-	-	-	-	-
Narathiwat	-	0	11	12	14	16	12	14	16
Total	855	-	584	659	727	852	1701	1975	2312

Note: \* Estimation

(10) Vegetables/Fruits (Northbound)

The forecast for vegetables and fruit is presented as follows:

The rate of growth is 4.5 percent, which is the same as the target for agricultural products in the Fifth Development Plan.

Table A.10-35 Future Forecast for Vegetables and Fruit

	1981	1987	1992	2000
Chumphon	25	33	41	58
Ranong	-	1	1	1
Surat Thani	38	49	62	88
Phangnga	1	1	2	2
Phuket	2	3	3	5
Krabi	-	1	1	1
Trang	1	1	2	2
Nakhon Si Thammarat	12	16	19	28
Phattalung	-	1	1	1
Satun	-	1	1	1
Songkhla	5	6	8	12
Pattani	3	4	5	7
Yala	2	3	3	5
Narathiwat	2	3	3	5
Total	91	123	152	216

(11) Rice (Northbound)

The rate of growth is assumed to be the same as in the Fifth Development Plan 2.8 percent.

Table A.10-36 Future Forecast of Rice (Northbound)

	1981	1987	1992	2000
Nakhon Si Thammarat	25	30	34	42
Phattalung	10	12	14	17
Songkhla	8	10	11	13
Total	43	52	59	72

(12) Rubber to Bangkok

According to Chapter 2, Future Production in the South is as follows.

Table A.10-37 Future Production in the South

Unit: Thousand tons

	1981	1987	1992	2000
Whole Kingdom	530	1000	1400	1900
Share of the South	90%	85%	80%	80%
Production in the South	465	850	1120	1520

After completion of the Songkhla deepsea port, the rubber cargo flow to Bangkok will decline.

It is assumed that only a few rubber processing factories located in the upper south district will send their goods to Bangkok, and from view-point of distances port and the factories locations, only Surat Thani and Pak Panang will be able to send rubber by coastal shipping.

No. of Smoking/Processing Factories 88

Surat Thani 2 9  
Nakhon Si Thammarat 7

(These 7 factories in Nakhon Si Thammarat  
are on Highway 41, (Chawang, Thung Song))

Cargo Volume (Possible) to the North

Unit: Thousand tons

$$1987 \quad 850 \times \left( \frac{2}{88} + \frac{7}{88} \times 0.5 \right) = 53$$

$$1992 \quad 1120 \times \left( \frac{2}{88} + \frac{7}{88} \times 0.5 \right) = 70$$

$$2000 \quad 1520 \times \left( \frac{2}{88} + \frac{7}{88} \times 0.5 \right) = 95$$

\* Nakhon Si Thammarat Share 50%

Table A.10-38 Future Forecast of Rubber

	1987	1992	2000
Surat Thani	19	25	35
Nakhon Si Thammarat	34	45	60
Total	53	70	95



(13) Total Future Cargo Flow

The total cargo flow between Bangkok and the South is presented as follows.

Table A.10-39 Total Future Cargo Flow

Unit: Thousand tons

	Present	Low Estimate			High Estimate		
	1981	1987	1992	2000	1987	1992	2000
General Cargo	1002	1473	1939	2892	1533	2284	4203
Fertilizer	99	157	261	524	157	261	524
Construction Material	236	490	684	994	513	795	1384
Rice	57	61	65	73	61	65	73
Maize	29	45	67	120	45	67	120
Dry Total	1423	2226	3016	4603	2309	3472	6304
Fuel	917	1006	1066	1170	1390	2003	3595
Southbound Total	2340	3232	4082	5773	3699	5475	9899
General Cargo	104	176	249	448	183	308	736
Wood Products	468	527	582	681	468	468	468
Fish Products	584	659	727	852	1701	1975	2312
Vegetables/Fruit	91	123	152	216	123	152	216
Rice	43	52	59	72	52	59	72
Rubber	80	53	70	95	53	70	95
Northbound Total	1370	1590	1839	2364	2580	3032	3899
Total	3606	4646	5672	7689	6096	8199	13062

Table A.10-40 (1) Total Future Cargo Flow by Hinterland (Southbound)

Unit: Thousand tons

	Hinterland	Present	Future		
		1981	1987	1992	2000
Low Estimate	Chumphon	305	451	600	858
	Ban Don	573	851	1,076	1,525
	Pak Phanang	359	474	567	847
	Songkhla	829	1,070	1,330	1,826
	Pattani	188	292	397	553
	Narathiwat	83	94	112	164
	Total	2,337	3,232	4,082	5,773
High Estimate	Chumphon	305	507	773	1,467
	Ban Don	573	992	1,579	2,761
	Pak Phanang	359	538	763	1,455
	Songkhla	829	1,210	1,679	2,966
	Pattani	188	340	513	925
	Narathiwat	83	112	168	325
	Total	2,337	3,699	5,475	9,899

Table A.10-40 (2) Total Future Cargo Flow by Hinterland (Northbound)

Unit: Thousand tons

	Hinterland	Present	Future		
		1981	1987	1992	2000
Low Estimate	Chumphon	488	564	636	779
	Ban Don	382	437	511	668
	Pak Phanang	195	212	250	323
	Songkhla	224	281	334	451
	Pattani	58	68	76	96
	Narathiwat	23	28	33	43
	Total	1,370	1,590	1,839	2,366
High Estimate	Chumphon	488	667	730	873
	Ban Don	382	913	1,039	1,337
	Pak Phanang	195	246	289	384
	Songkhla	224	445	534	772
	Pattani	58	282	409	487
	Narathiwat	23	27	32	46
	Total	1,370	2,580	3,032	3,899

10A-3 Modal Split of Shipping by commodity

1) General cargo

According to MOC's statistics general cargo flow from Bangkok by hinterland and by transportation mode is as follows.

Table A.10-41 Cargo Flow by Hinterland, General Cargo, 1978

Unit: Thousand tons

Hinterland	Transportation Mode			
	Shipping	Rail	Road	Total
Chumphon	0 (0)	1 (1)	138 (99)	139 (100)
Ban Don	17 (15)	8 (7)	88 (78)	113 (100)
Pak Panang	8 (5)	54 (36)	90 (59)	152 (100)
Songkhla	38 (13)	188 (63)	70 (24)	296 (100)
Pattani	28 (48)	29 (49)	2 (3)	59 (100)
Narathiwat	0 (0)	15 (75)	5 (25)	20 (100)
Total	91 (12)	295 (38)	393 (50)	779 (100)

( ) percentage

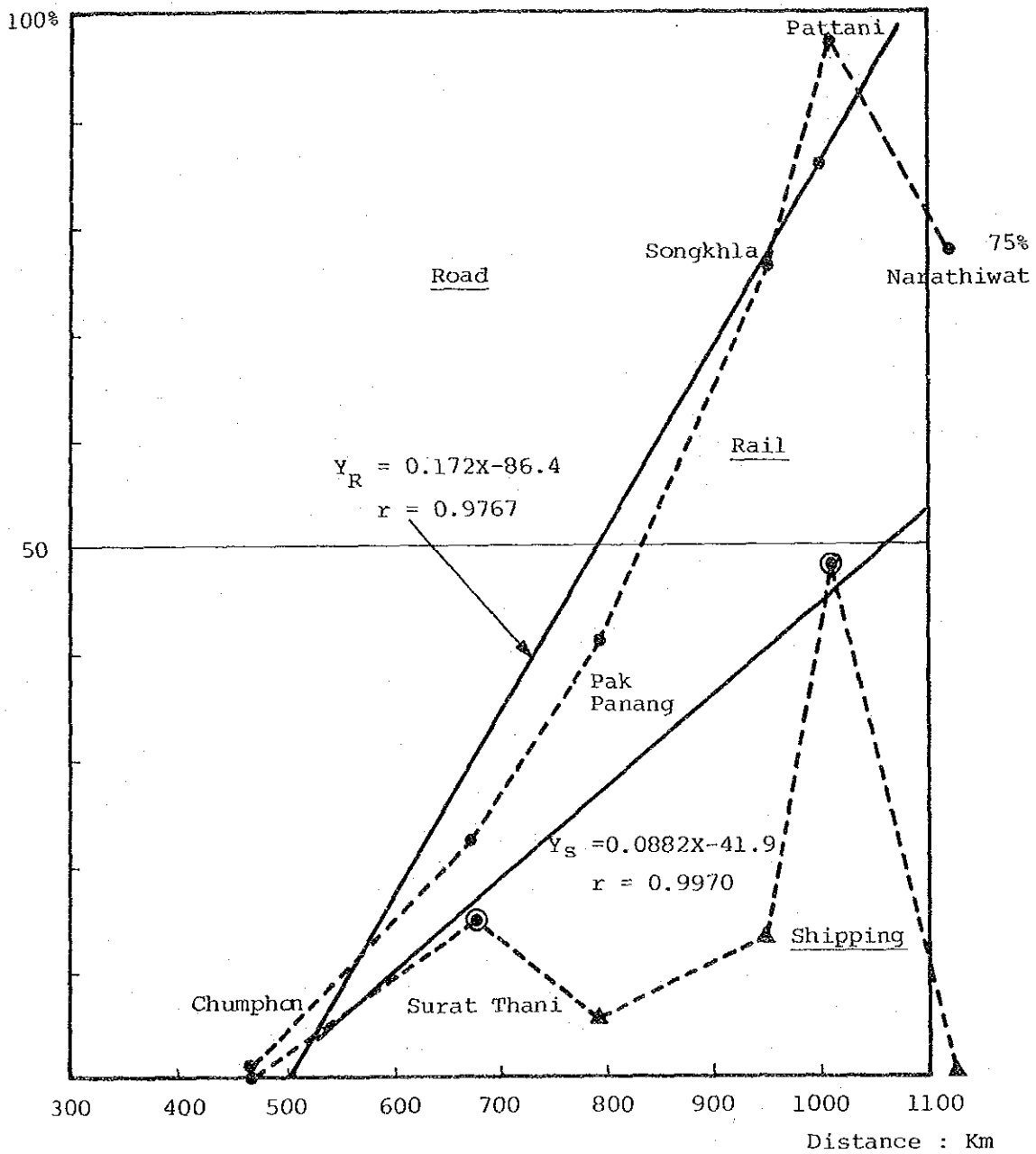
Average Carried Distance of General Cargo by Mode

Unit: Km  
( ) Million ton·Km

Shipping	Rail	Road	Average
(82.1)	(269.6)	(276.5)	(628.2)
902	914	704	806

General Cargo

Rate of Distribution



Note: ● Port Facilities are well equipped.  
 ▲ " " are not enough.

Fig. A.10-4 Distribution of Transportation Mode by Distance

$$Y = aX + b$$

Y: %

X: Distance km

1) Road/Rail

$$Y_R = 0.172X - 86.4 \text{ (excluding Narathiwat)}$$

$$r = 0.977$$

2) Rail/Shipping

$$Y_S = 0.0882X - 41.9 \text{ (excluding Narathiwat, Songkhla, Ban Don because the facilities there are scarce)}$$

$$r = 0.997$$

2) Fertilizer

According to MOC's Statistics fertilizer flow from Bangkok by hinterland is as follows.

Table A.10-42 Cargo Flow by Hinterland, Fertilizer, 1978/79

Unit: Thousand tons

Hinterland	Transportation Mode			
	Shipping	Rail	Road	Total
Chumphon	0	0	13 (100)	13 (100)
Ban Don	1 (13)	2 (25)	5 (62)	8 (100)
Pak Phanang	1 (8)	7 (54)	5 (38)	13 (100)
Songkhla	17 (45)	19 (50)	2 (5)	38 (100)
Pattani	3 (75)	1 (25)	0	4 (100)
Narathiwat	0	0	0	0
Total	22 (29)	29 (38)	25 (33)	76 (100)

( ) percentage

Average Shipping Distance of Fertilizer by Mode

Unit: km

( ) Million ton·km

Shipping	Rail	Road	Total
(20.6)	(23.7)	(15.5)	(59.8)
938	817	535	787

Fertilizer

Rate of Distribution

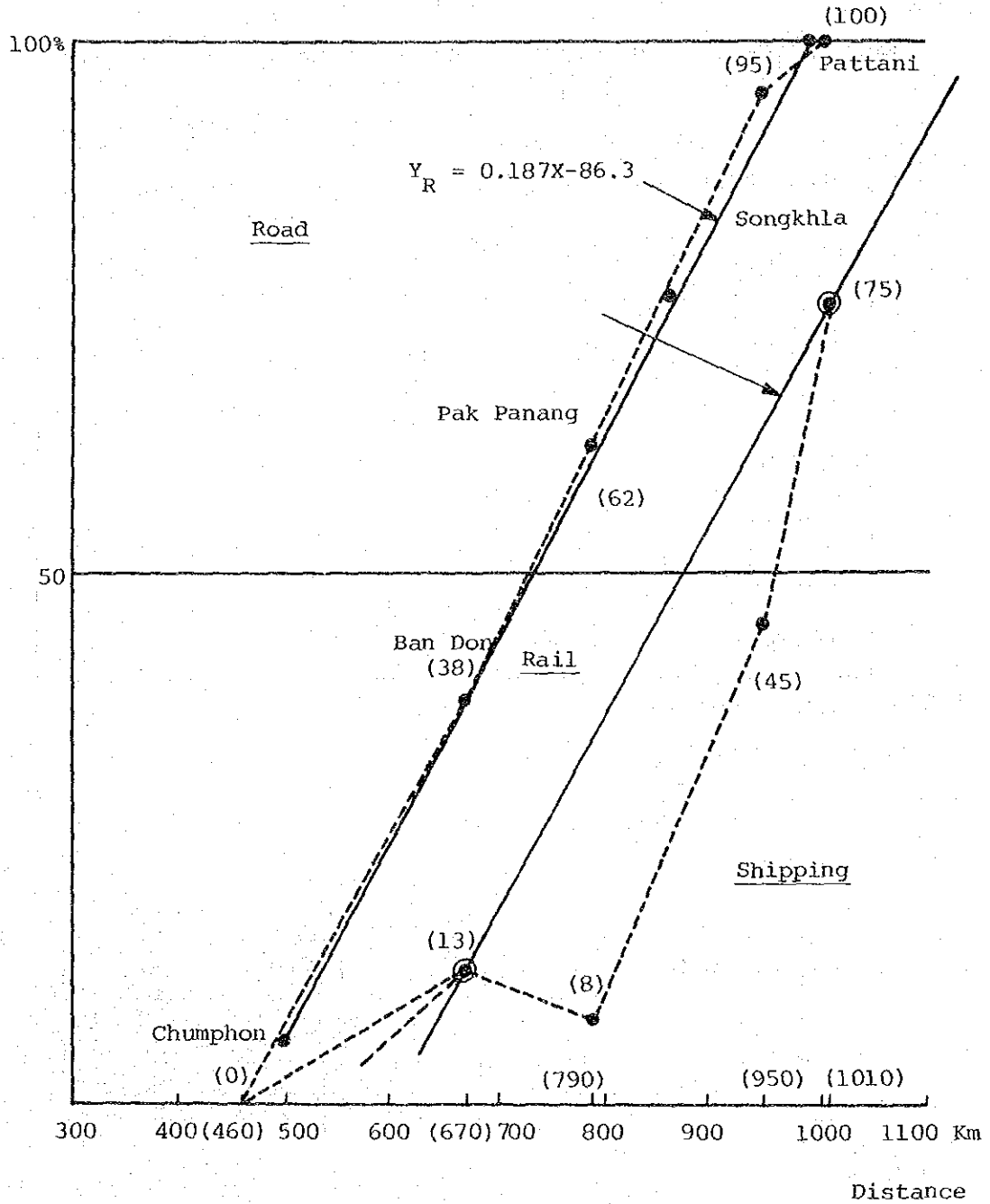


Fig. A.10-5 Distribution of Transportation by Distance (Fertilizer)



$$Y = aX + b$$

Y: ¢

X: Distance km

1) Road/Rail

$$Y_R = 0.187X - 86.3 \text{ (excluding Narathiwat)}$$

$$r = 0.998$$

2) Rail/Shipping

$$Y_S = 0.182X - 109.2 \text{ (excluding Narathiwat, Songkhla, Pak Panang and Chumphon because the facilities there are scarce)}$$

$$r = 1.000$$

### 3) Construction Material

The flow of construction materials from Bangkok, by Hinterland, is as follows.

Table A.10-43 Cargo Flow by Hinterland, Construction Material, 1977/78

Unit: Thousand tons

Hinterland	Transportation Mode			
	Shipping	Rail	Road	Total
Chumphon	0	0	62 (100)	62 (100)
Ban Don	0	4 (5)	71 (95)	75 (100)
Pak Phanang	0	11 (24)	35 (76)	46 (100)
Songkhla	3 (2)	33 (26)	90 (72)	126 (100)
Pattani	1 (8)	5 (42)	6 (50)	12 (100)
Narathiwat	0	4 (44)	5 (56)	9 (100)
<b>Total</b>	<b>4 (1)</b>	<b>57 (17)</b>	<b>269 (82)</b>	<b>330 (100)</b>

( ) percentage

### Average Shipping Distance for Fertilizer

Unit: km

( ) Million ton·km

Shipping	Rail	Road	Average
(3.9)	(51.3)	(220.3)	(275.5)
965	901	819	835

Construction Material

Rate of Distribution

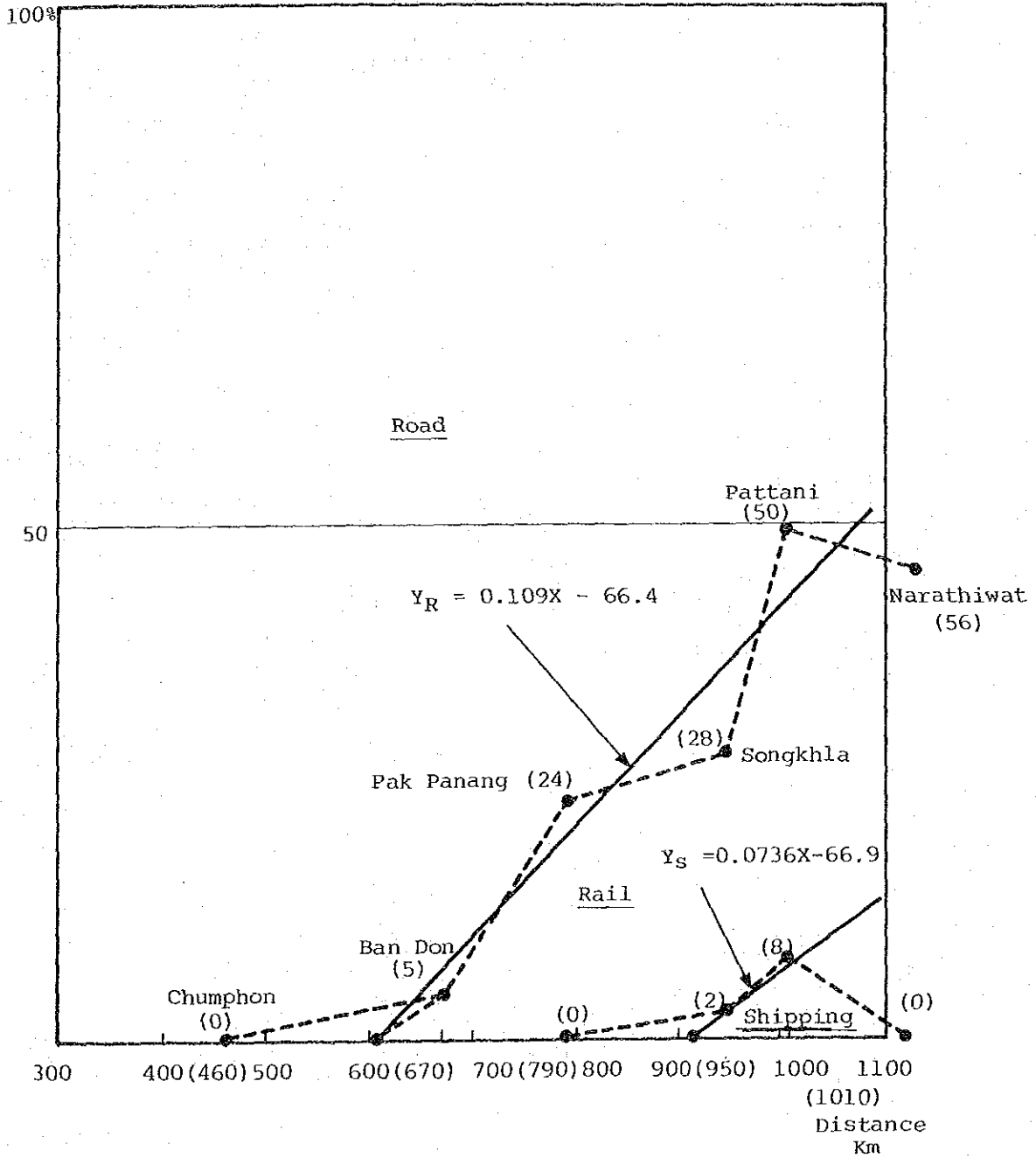


Fig. A.10-6 Distribution of Transportation by Distance (Construction Material)

$$Y = aX + b$$

Y: %

X: Distance km

1) Road/Rail

$$Y_R = 0.109X - 66.4 \text{ (excluding Narathiwat)}$$

$$r = 0.957$$

2) Rail/Shipping

$$Y_S = 0.0736X - 66.9$$

$$r = 0.973$$

4) Rice (Southbound)

Rice from Bangkok by hinterland is as follows.

Table A.10-44 Cargo Flow by Hinterland, Rice, 1977/78

Rice

Unit: Thousand tons

Hinterland	Transportation Mode			
	Shipping	Rail	Road	Total
Chumphon	0	0	37 (100)	37 (100)
Ban Don	0	4 (29)	10 (71)	14 (100)
Pak Phanang	0	4 (15)	23 (85)	27 (100)
Songkhla	0	11 (91)	1 (9)	12 (100)
Pattani	0	12 (100)	0	12 (100)
Narathiwat	0	16 (100)	0	16 (100)
Total	0	47 (40)	71 (60)	118 (100)

( ) percentage

Average Shipping Distance for General Cargo

Unit: km

( ) Million ton·km

Shipping	Rail	Road	Average
(-)	(46.4)	(43.8)	(90.2)
-	987	617	764

Rice

Rate of Distribution

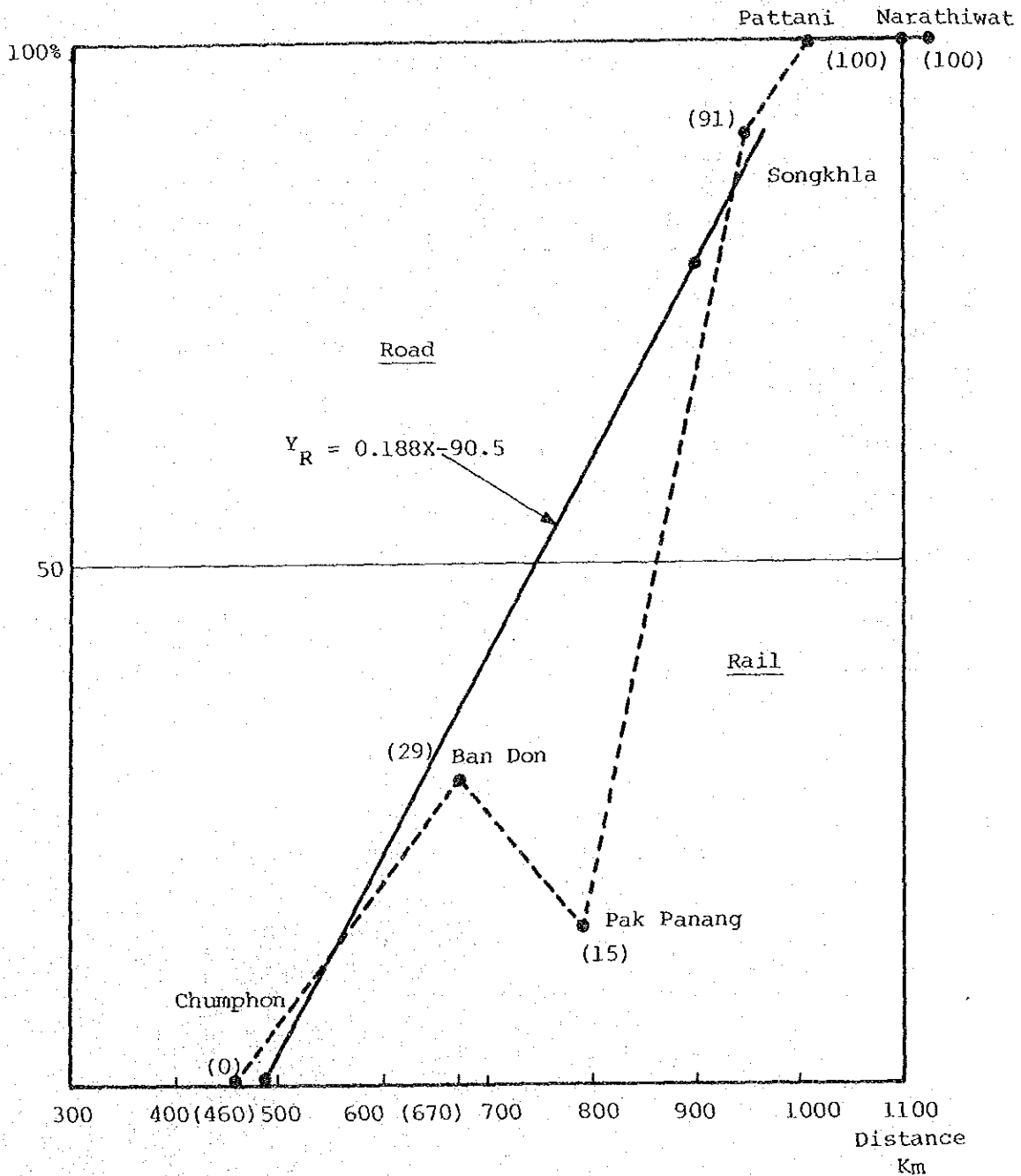


Fig. A.10-7 Distribution of Transportation by Distance (Rice)

$$Y = aX + b$$

Y: %

X: Distance km

1) Road/Rail

$$Y_R = 0.188X - 90.5 \text{ (excluding Pak Panang, Narathiwat)}$$

$$r = 0.995$$

5) Maize

Maize by hinterland is as follows.

Table A.10-45 Cargo Flow by Hinterland, Maize, 1977/78

Maize

Unit: Thousand tons

Port	Transportation Mode			
	Shipping	Rail	Road	Total
Chumphon	0	0	0	0 (100)
Ban Don	0	0	3 (100)	3 (100)
Pak Phanang	0	0	2	2 (100)
Songkhla	(0)	7	5	12 (100)
Pattani	(0)	(0)	(0)	(0)
Narathiwat	(0)	(0)	(0)	(0)
Total	0	7 (41)	10 (59)	17 (100)

( ) Percentage

According to MOC's Statistics, the maize cargo volume is low so maize is regarded as having the same trend as fertilizer.

Average Shipping Distance

Unit: km  
( ) Million ton-km

Shipping	Rail	Road	Average
(-)	(6.7)	(8.7)	(15.4)
-	950	866	906



6) Fuel

Fuel by hinterland is as follows.

Table A.10-46 Cargo Flow by Hinterland, Fuel, 1978

Unit: Thousand tons

Port	Transportation Mode			
	Shipping	Rail	Road	Total
Chumphon	48 (36)	13 (10)	74 (55)	135 (100)
Ban Don	257 (95)	2 (1)	12 (4)	271 (100)
Pak Phanang	141 (90)	7 (4)	8 (6)	156 (100)
Songkhla	331 (97)	9 (2)	3 (1)	343 (100)
Pattani	36 (97)	1 (3)	0 (0)	37 (100)
Narathiwat	0 (0)	1 (100)	0 (0)	1 (100)
Total	813 (86)	33 (3)	97 (10)	943 (100)

( ) Percentage

Average Shipping Distance for Fuel

Unit: km

( ) Million ton·km

Shipping	Rail	Road	Average
(656.5)	(23.5)	(53.5)	(733.5)
807	712	551	778

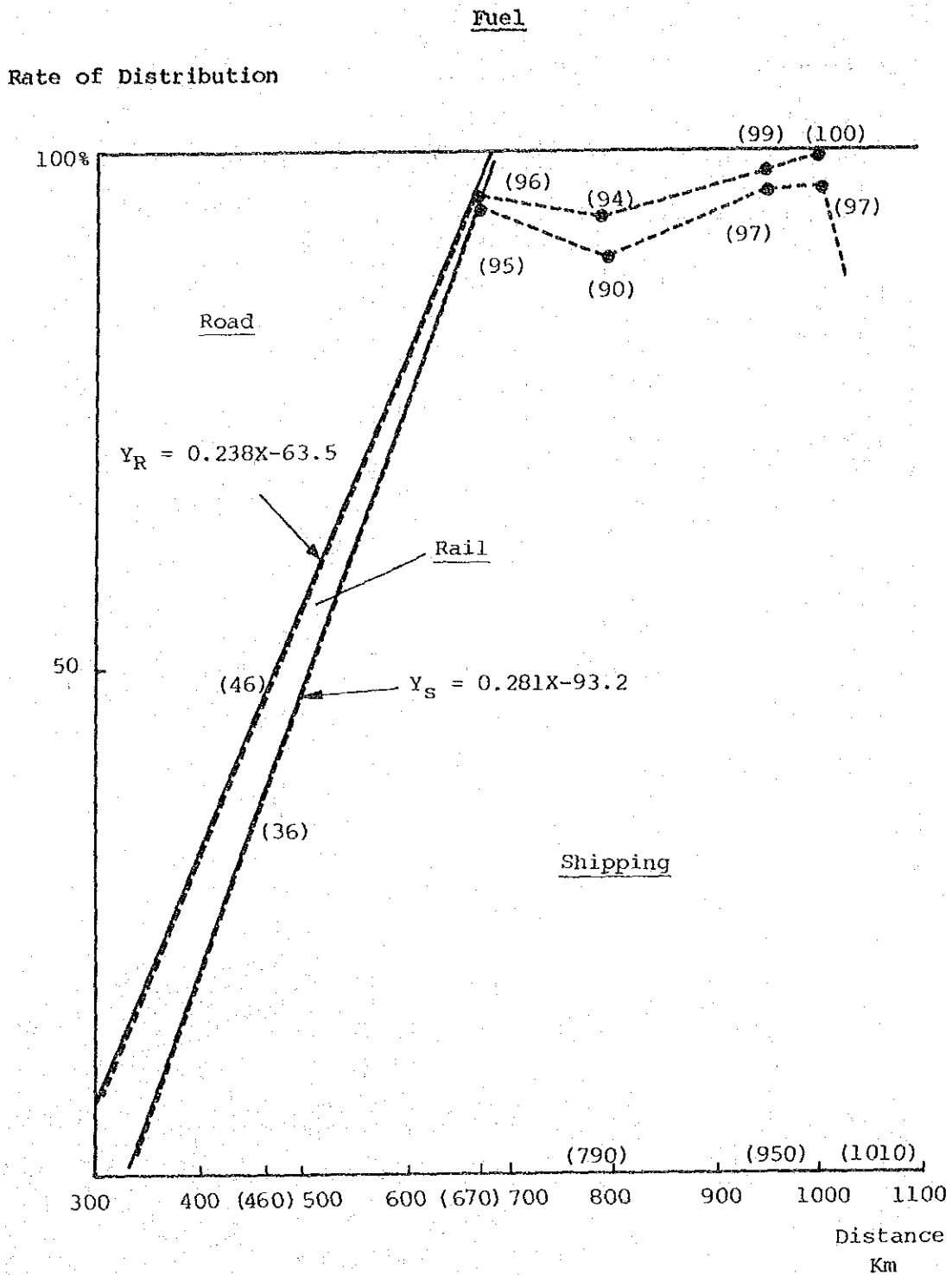


Fig. A.10-8 Distribution of Transportaion by Distance (Fuel)

$$Y = aX + b$$

Y: Rate of Distribution %

X: Distance km

1) Road/Rail

$$Y_R = 0.238X - 63.5 \text{ (only Chumphon, Surat Thani)}$$

$$r = 1.00$$

2) Rail/Shipping

$$Y_S = 0.281X - 93.2$$

$$r = 1.00$$

7) General cargo (Northbound)

In case of the outbound general cargo from local port the hinterland is very small. Only the cargo originated from around the Port is considered. So in this case we set the hinterland and rate of distribution as follows:

Table A.10-47 Cargo Flow by Hinterland, General Cargo (Northbound)

Port	Hinterland	Rate of distribution (%)
Chumphon	Chumphon	0
Ban Don	Surat Thani	30
Pak Phanang	Nakhon Si Thammarat	57
Songkhla	Songkhla	17
Pattani	Pattani	20
Narathiwat	Narathiwat	0

8) Forestry products

The forestry products flow from the South by hinterland is shown as follows.

Table A.10-48 Cargo Flow by Hinterland, Forestry Products, 1977/78

Unit: Thousand tons

Hinterland	Transportation Mode			
	Shipping	Rail	Road	Total
Chumphon	0 (0)	20 (4)	531 (96)	551 (100)
Ban Don	70 (39)	7 (4)	101 (57)	178 (100)
Pak Phanang	1 (1)	13 (15)	75 (84)	89 (100)
Songkhla	2 (5)	24 (60)	14 (35)	40 (100)
Pattani	23 (64)	11 (31)	2 (5)	36 (100)
Narathiwat	0 (0)	10 (91)	1 (9)	11 (100)
Total	96 (11)	85 (10)	724 (80)	905 (100)

( ) Percentage

Average Shipping Distance for Wood Products

Unit: km  
( ) Million ton-km

Shipping	Rail	Road	Average
(72.8)	(68.5)	(408.6)	(549.9)
759	806	564	608

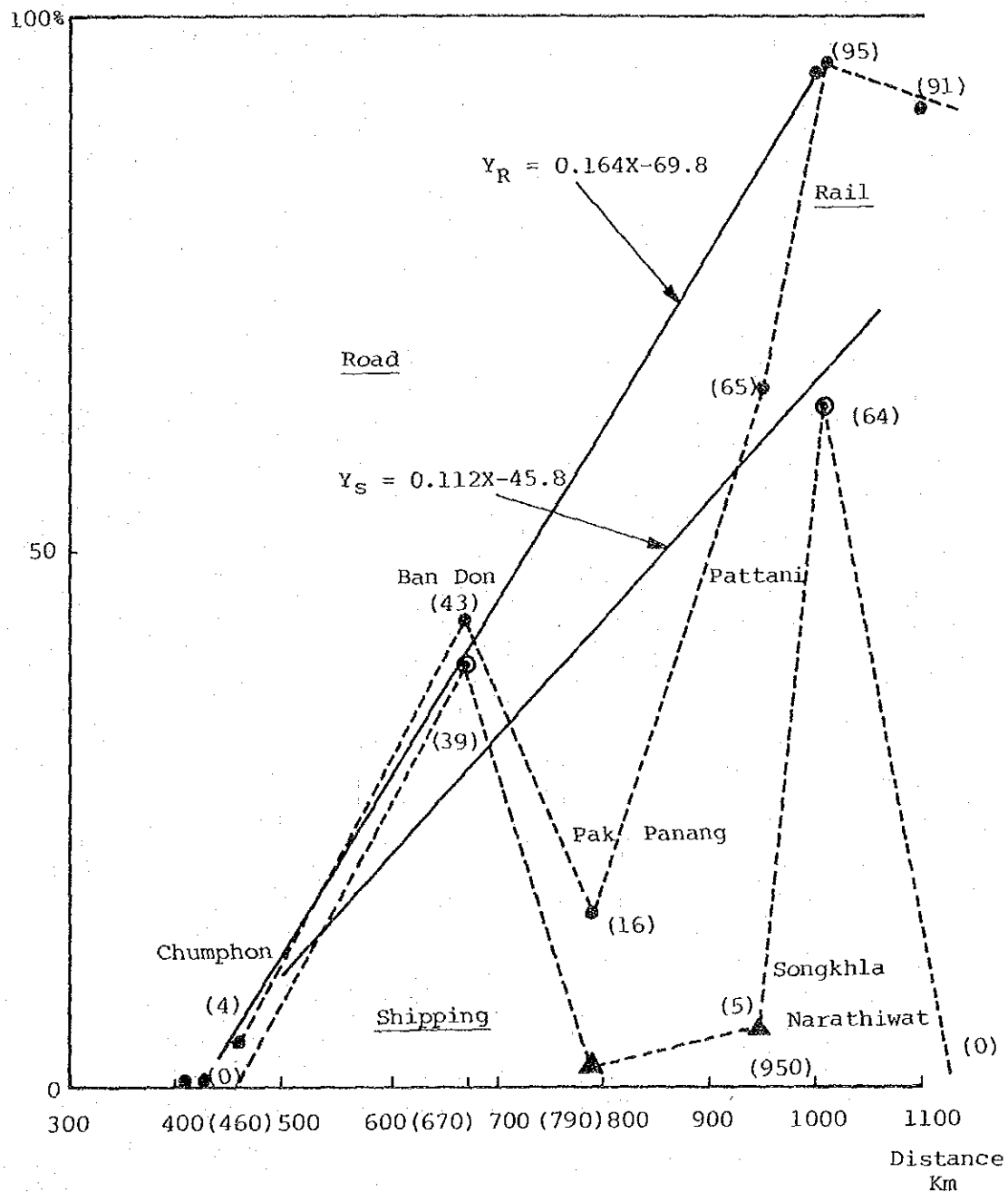


Fig. A.10-9 Distribution of Transportation by Distance (Forestry Products)

$Y = aX + b$  (excluding Pak Phanang, Songkhla and Narathiwat)

1) Road/Rail

$$Y_R = 0.164X - 69.8$$

$$r = 0.999$$

2) Rail/Shipping

$$Y_S = 0.112X - 45.8$$

$$r = 0.966$$

9) Fishery products

The Fishery Products flow from the South by Hinterland is as follows.

Table A.10-49 Cargo Flow by Hinterland, Fish Products, 1977/78

	Transportation Mode			
	Shipping	Rail	Road	Total
Chumphon	0 (0)	0 (0)	399 (100)	399 (100)
Ban Don	0 (0)	3 (2)	121 (98)	124 (100)
Pak Phanang	0 (0)	10 (10)	95 (90)	105 (100)
Songkhla	0 (0)	20 (10)	174 (90)	194 (100)
Pattani	0 (0)	4 (31)	9 (69)	13 (100)
Narathiwat	0 (0)	5 (31)	11 (69)	16 (100)
Total	0	42 (5)	809 (95)	851 (100)

Average Shipping Distance

Unit: km  
( ) Million ton·km

Shipping	Rail	Road	Total
(-)	(38.0)	(533.8)	(571.8)
	905	660	672

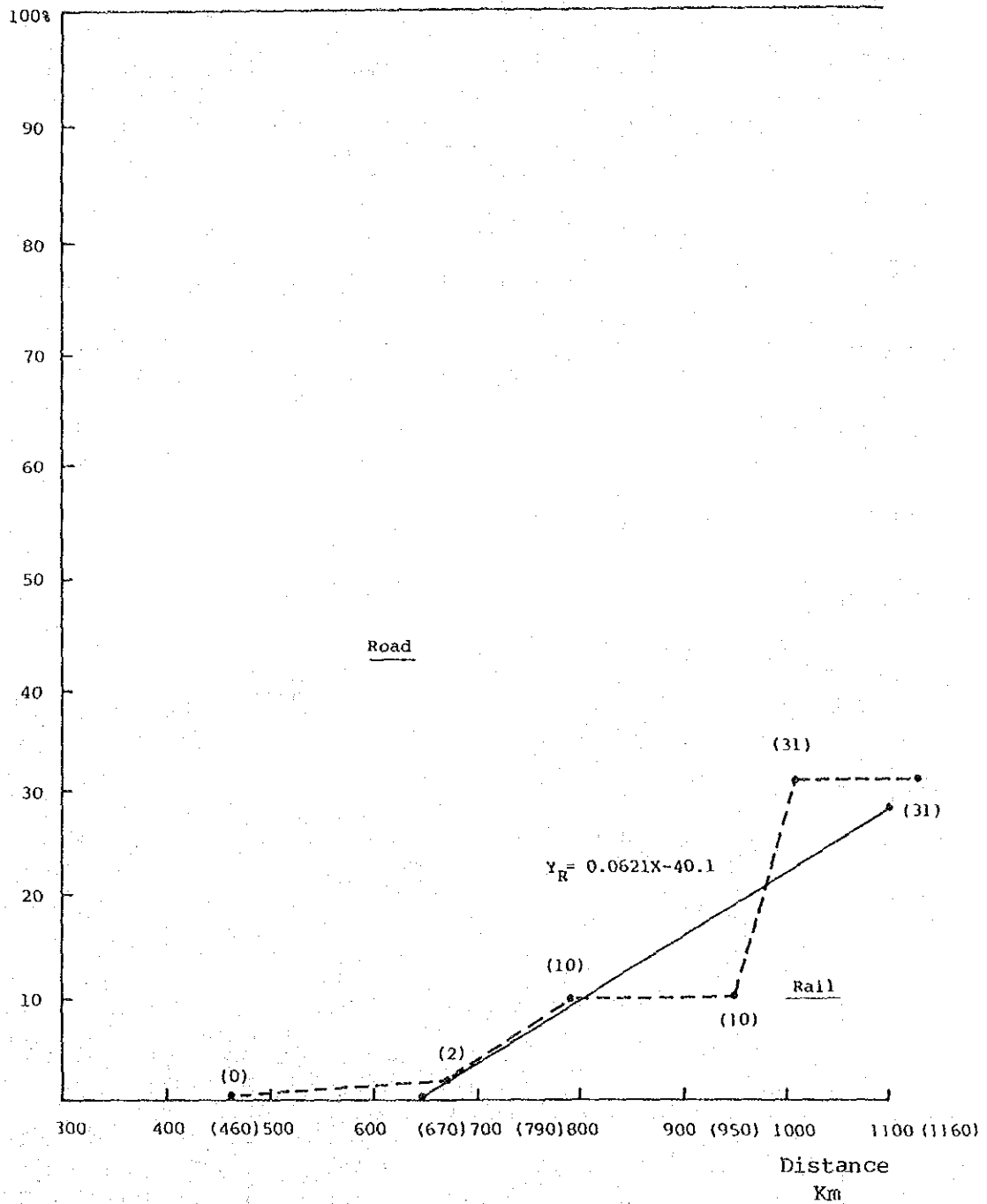


Fig. A.10-10 Distribution of Transport by Distance (Fish Products)



$$Y = aX + b$$

Road/Rail

$$Y_R = 0.0621X - 0.40.1$$

$$r = 0.888$$

10) Vegetables and Fruit

Most Vegetables/Fruit are transported by truck. This is hardly likely to shift to coastal shipping.

11) Rubber/Rice (Northbound)

Most cargo today is transported by rail at the shipper's request.

But in the future, feeder service will be available from the South to Bangkok depending on the transportation cost.

The cargo distribution among different transport modes depends on many factors such as cost, service, cargo lots, distance, etc.

In general in advanced shipping countries, the rate of coastal shipping is over 50 percent at distances greater than 500 km.

As there will be fully equipped port facilities and increased cargo volume in the near future, it will be easy to attained to this level.

But today in the South only fuel reaches this level.

In this report the Study Team decided the forget distribution formula by commodity as follows.

Table A.10-50 Target of Cargo Distribution

		Present		Future Target		
		Formula	50% Line	Formula	50% Line	Remarks
Southbound	General Cargo	$Y=0.0882X-42$	1042	$Y=0.0882X-38$	1000	Same as at present
	Fertilizer	$Y=0.182X-109$	874	$Y=0.182X-59$	600	
	Construction Material	$Y=0.0736X-67$	1588	$Y=0.0736X-24$	1000	
	Rice	-	-	$Y=0.182X-59$		Same Formula of Fertilizer
	Maize	-	-	$Y=0.182X-59$	600	"
	Fuel	$Y=0.281X-93$	509	$Y=0.282X-62$	400	
Northbound	General cargo	-	-	-	-	See page 199
	Wood product	$Y=0.112X-46$	855	$Y=0.112X-17$	600	
	Fish product	-	-	$Y=0.0621X-40$	1500	Same of Road
	Vegetables/ Fruit	-	-	10% of Hinterland of Pak Panang, Ban Don		
	Rice	-	-	$Y=0.182X-59$	600	Same Formula of Fertilizer
	Rubber	-	-	30% of Hinterland Ban Don, Pak Panang		

Table A.10-51 Rate of Distribution by Port

		Champhon	Ban Don	Pak Panang	Songkhla	Pattani	Narathiwat
Distance from Bangkok		km 460	km 670	km 790	km 950	km 1010	km 1130
Southbound	General Cargo	2.6	21.1	31.7	45.8	51.1	61.7
	Fertilizer	24.7	62.9	84.8	95.0	95.0	95.0
	Construction Material	9.9	25.3	34.1	45.9	50.3	59.2
	Rice	24.7	62.9	84.8	95.0	95.0	95.0
	Maize	24.7	62.9	84.8	95.0	95.0	95.0
	Fuel	67.7	95.0	95.0	95.0	95.0	95.0
Northbound	Wood Product	34.5	58.0	71.5	89.4	95.0	95.0
	Fish Product	0	1.6	9.1	19.0	22.7	30.2
	Vegetables Fruit	0	10.0	10.0	0	0	0
	Rice	24.7	62.9	84.8	95.0	95.0	95.0

Note: Upperlimit 95%

10A-3 The Estimated Value by Port and Commodity

From the future cargo flow by hinterland and the rate of distribution above mentioned, the cargo forecast of the six ports are as follows.

This forecast is based on the economic activities of the hinterlands and the cargo distribution depending on the characteristic of the transportation mode, and so this figure means the potential demand in future.

As a matter of course, there is a presupposition that fully equipped port facilities and modern and sound coastal shipping companies were served.

Table A.10-52 (1) Cargo Forecast by Ports

Ban Don (Low Estimate)

	Southbound								Northbound						Total	
	G. C.	Ferti- lizer	Const. M	Rice	Maize	Dry Total	Fuel	Sub Total	Wood Pro.	Fish Pro.	Veg. F.	Rice	Rubber	G. C. Others		Sub Total
1974	22	0	0	0	0	22	77	99	42	0	4	0	0	4	50	149
1975	22	0	0	0	0	22	90	112	43	4	3	0	0	4	54	166
1976	23	0	0	0	0	23	123	146	37	1	2	0	0	10	50	196
1977	23	1	0	0	0	24	165	189	41	0	5	0	0	4	50	239
1978	17	0	0	0	0	17	239	256	29	0	0	0	0	12	41	297
1979	11	1	0	0	0	12	263	275	26	0	0	0	0	2	28	303
1980	9	0	0	0	0	9	288	297	18	0	0	0	0	2	20	317
1981	4	0	0	0	0	4	193	197	10	0	0	0	0	3	13	210
1982	7	2	2	1	1	13	207	220	14	1	1	0	1	3	20	240
1983	11	2	3	2	2	20	223	243	19	1	2	0	2	4	28	271
1984	18	4	5	2	2	31	239	270	27	2	2	0	2	4	37	307
1985	30	6	9	3	3	51	257	308	37	2	3	0	3	4	49	357
1986	50	9	16	3	4	82	276	358	51	3	3	0	4	4	65	423
1987	83	14	27	4	6	134	296	430	71	3	4	0	6	5	89	519
1988	87	16	29	4	6	142	299	441	73	3	4	0	6	5	91	532
1989	92	17	32	4	7	152	302	454	74	3	5	0	7	6	95	549
1990	98	19	35	5	7	164	304	468	76	4	6	0	7	6	99	567
1991	104	22	38	5	8	177	307	484	77	4	6	0	8	6	101	585
1992	111	25	41	5	8	190	310	500	79	4	7	0	8	7	105	605
1993	116	26	44	5	9	200	313	513	81	4	7	0	8	7	107	620
1994	122	29	47	5	9	212	317	529	82	4	7	0	9	8	110	639
1995	128	32	50	5	10	225	321	546	84	4	8	0	9	8	113	659
1996	134	35	54	5	10	238	324	562	85	4	8	0	9	8	114	676
1997	141	38	57	5	11	252	328	580	87	4	8	0	10	9	118	698
1998	148	42	61	5	12	268	332	600	89	4	8	0	10	10	121	721
1999	156	46	65	5	12	284	335	619	90	4	9	0	11	10	124	743
2000	165	50	70	5	13	303	339	642	92	4	9	0	11	11	127	769

Table A.10-52 (2)

Ban Don (High Estimate)

	Southbound								Northbound						Total	
	G. C.	Ferti- lizer	Const. M	Rice	Maize	Dry Total	Fuel	Sub Total	Wood Pro.	Fish Pro.	Veg. F.	Rice	Rubber	G. C. Others		Sub Total
1974	22	0	0	0	0	22	77	99	42	0	4	0	0	4	50	149
1975	22	0	0	0	0	22	90	112	43	4	3	0	0	4	54	166
1976	23	0	0	0	0	23	123	146	37	1	2	0	0	10	50	196
1977	23	1	0	0	0	24	165	189	41	0	5	0	0	4	50	239
1978	17	0	0	0	0	17	239	256	29	0	0	0	0	12	41	297
1979	11	1	0	0	0	12	263	275	26	0	0	0	0	2	28	303
1980	9	0	0	0	0	9	288	297	18	0	0	0	0	2	20	317
1981	4	0	0	0	0	4	193	197	10	0	0	0	0	3	13	210
1982	7	2	2	1	1	13	219	232	14	1	1	0	1	3	20	252
1983	11	2	3	2	2	20	248	268	18	2	2	0	2	4	28	296
1984	19	4	5	2	2	32	281	313	25	3	2	0	2	4	36	349
1985	31	6	9	3	3	52	318	370	34	5	3	0	3	4	49	419
1986	52	9	16	3	4	84	361	445	46	7	3	0	4	5	65	510
1987	87	14	28	4	6	139	409	548	63	11	4	0	6	5	89	637
1988	95	16	32	4	6	153	442	595	63	11	4	0	6	6	90	685
1989	105	17	37	4	7	170	477	647	63	11	5	0	7	6	92	739
1990	115	19	42	5	7	188	515	703	63	12	6	0	7	7	95	798
1991	127	22	48	5	8	210	556	766	63	12	6	0	8	7	96	862
1992	140	25	56	5	8	234	601	835	63	12	7	0	8	8	98	933
1993	151	26	59	5	9	250	642	892	63	12	7	0	8	9	99	991
1994	162	29	63	5	9	268	686	954	63	12	7	0	9	10	101	1055
1995	175	32	68	5	10	290	733	1023	63	13	8	0	9	10	103	1126
1996	188	35	72	5	10	310	783	1093	63	13	8	0	9	11	104	1197
1997	203	38	77	5	11	334	836	1170	63	13	8	0	10	13	107	1277
1998	218	42	83	5	12	360	894	1254	63	13	8	0	10	14	108	1362
1999	235	46	89	5	12	387	955	1342	63	14	9	0	11	15	112	1454
2000	254	50	95	5	13	417	1020	1437	63	14	9	0	11	17	114	1551

Table A.10-53 (1)

## Pak Phanang (Low Estimate)

	Southbound								Northbound						Total	
	G. C.	Ferti- lizer	Const. M	Rice	Maize	Dry Total	Fuel	Sub Total	Wood Pro.	Fish Pro.	Veg. F.	Rice	Rubber	G. C. Others		Sub Total
1974	13	0	0	0	0	13	91	104	1	3	2	0	0	8	14	118
1975	10	1	0	0	0	11	112	123	0	5	2	0	0	2	9	132
1976	11	0	0	0	0	11	109	120	0	6	1	0	0	1	8	128
1977	12	1	0	0	0	13	120	133	1	7	0	0	0	3	11	144
1978	10	1	0	0	0	11	131	142	1	8	1	0	0	1	11	153
1979	8	1	0	0	0	9	122	131	1	7	2	0	0	2	12	143
1980	6	0	0	0	0	6	144	150	0	0	0	0	0	10	10	160
1981	7	0	0	0	0	7	135	142	0	3	0	0	0	8	11	153
1982	10	2	2	2	1	17	134	151	7	3	1	2	1	9	23	174
1983	15	3	2	2	2	24	133	157	14	3	1	3	2	9	32	189
1984	23	6	4	3	3	39	132	171	22	3	1	5	3	10	44	215
1985	34	11	6	5	4	60	131	191	29	4	2	9	5	11	60	251
1986	50	21	8	8	6	93	130	223	36	4	2	15	7	12	76	299
1987	74	38	13	12	8	145	129	274	43	4	2	25	10	13	97	371
1988	77	42	14	12	9	154	129	283	44	4	2	26	11	14	101	384
1989	79	46	15	12	9	161	128	289	45	4	2	27	11	15	104	393
1990	82	50	16	13	10	171	128	299	45	5	2	27	12	16	107	406
1991	85	55	18	13	10	181	127	308	46	5	2	28	13	17	111	419
1992	88	60	19	13	11	191	127	318	47	5	2	29	14	19	116	434
1993	93	65	21	13	12	204	129	333	48	5	2	30	14	20	119	452
1994	97	71	22	13	13	216	130	346	49	5	2	31	15	21	123	469
1995	102	77	24	13	14	230	132	362	50	5	2	31	15	23	126	488
1996	108	83	26	13	15	245	134	379	51	5	2	32	16	24	130	509
1997	113	91	28	14	16	262	136	398	52	5	3	33	16	26	135	533
1998	119	98	30	14	18	279	137	416	53	5	3	34	17	27	139	555
1999	125	107	32	14	19	297	139	436	54	5	3	35	17	29	143	579
2000	132	116	35	14	21	318	141	459	55	5	3	36	18	31	148	607

Table A.10-53 (2)

## Pak Phanang (High Estimate)

	Southbound								Northbound						Total	
	G. C.	Ferti- lizer	Const. M	Rice	Maize	Dry Total	Fuel	Sub Total	Wood Pro.	Fish Pro.	Veg. F.	Rice	Rubber	G. C. Others		Sub Total
1974	13	0	0	0	0	13	91	104	1	3	2	0	0	8	14	118
1975	10	1	0	0	0	11	112	123	0	5	2	0	0	2	9	132
1976	11	0	0	0	0	11	109	120	0	6	1	0	0	1	8	128
1977	12	1	0	0	0	13	120	133	1	7	0	0	0	3	11	144
1978	10	1	0	0	0	11	131	142	1	8	1	0	0	1	11	153
1979	8	1	0	0	0	9	122	131	1	7	2	0	0	2	12	143
1980	6	0	0	0	0	6	144	150	0	0	0	0	0	10	10	160
1981	7	0	0	0	0	7	135	142	0	3	0	0	0	8	11	153
1982	10	2	2	2	1	17	141	158	2	4	1	2	1	9	19	177
1983	16	3	2	4	2	27	148	175	3	4	1	3	2	10	23	198
1984	23	6	4	6	3	42	155	197	6	5	1	5	3	11	31	228
1985	35	11	6	8	4	64	163	227	11	6	1	9	5	12	44	271
1986	52	21	9	10	6	98	171	269	21	7	2	15	7	13	65	334
1987	77	38	14	12	8	149	179	328	38	8	2	25	10	14	97	425
1988	82	42	15	12	9	160	191	351	38	8	2	26	11	15	100	451
1989	88	46	17	12	9	172	204	376	38	8	2	27	11	17	103	479
1990	93	50	19	13	10	185	218	403	38	9	2	27	12	19	107	510
1991	99	55	21	13	10	198	232	430	38	9	2	28	13	20	110	540
1992	106	60	23	13	11	213	248	461	38	9	2	29	14	23	115	576
1993	114	65	26	13	12	230	268	498	38	9	2	30	14	25	118	616
1994	124	71	29	13	13	250	289	539	38	9	2	31	15	27	122	661
1995	133	77	33	13	14	270	312	582	38	9	2	31	15	30	125	707
1996	144	83	37	13	15	292	336	628	38	9	2	32	16	33	130	758
1997	156	91	42	14	16	319	363	682	38	10	3	33	16	37	137	819
1998	168	98	47	14	18	345	392	737	38	10	3	34	17	40	142	879
1999	182	107	53	14	19	375	423	798	38	10	3	35	17	44	147	945
2000	196	116	60	14	21	407	456	863	38	10	3	36	18	49	154	1017

Table A.10-54 (1)

## Songkhla (Low Estimate)

	Southbound								Northbound						Total	
	G. C.	Ferti- lizer	Const. M	Rice	Maize	Dry Total	Fuel	Sub Total	Wood Pro.	Fish Pro.	Veg. F.	Rice	Rubber	G. C. Others		Sub Total
1974	79	0	0	0	0	79	211	290	4	0	0	0	4	57	65	355
1975	65	0	1	1	8	75	199	274	2	1	2	0	1	18	24	298
1976	71	0	0	0	0	71	225	296	0	0	0	0	2	1	3	299
1977	59	9	1	0	0	69	247	316	1	0	1	0	3	9	14	330
1978	38	8	2	0	4	52	279	331	0	0	0	0	2	11	13	344
1979	52	76	0	0	0	128	254	382	0	0	0	0	1	9	10	392
1980	52	31	0	0	2	85	237	322	0	0	0	0	0	5	5	327
1981	59	55	0	0	8	122	222	344	1	0	0	0	0	5	6	350
1982	73	54	2	1	9	139	230	369	2	2	0	4	0	6	14	383
1983	91	54	5	2	10	162	238	400	3	3	0	7	0	6	19	419
1984	113	53	10	3	11	190	246	436	5	5	0	11	0	7	28	464
1985	141	52	22	4	13	232	254	486	9	9	0	14	0	8	40	526
1986	175	52	48	6	14	295	263	558	15	16	0	18	0	8	57	615
1987	218	51	105	8	16	398	272	670	26	27	0	21	0	9	83	753
1988	230	57	110	8	17	422	275	697	26	28	0	22	0	10	86	783
1989	242	63	115	8	19	447	278	725	27	28	0	22	0	11	88	813
1990	254	70	121	8	20	473	280	753	27	29	0	23	0	12	91	844
1991	268	77	127	8	22	502	283	785	28	29	0	23	0	13	93	878
1992	282	86	133	8	24	533	286	819	28	30	0	24	0	14	96	915
1993	296	94	136	8	26	560	289	849	28	31	0	25	0	15	99	948
1994	311	102	139	8	28	588	293	881	29	31	0	25	0	16	101	982
1995	327	111	142	8	30	618	296	914	29	32	0	26	0	18	105	1019
1996	344	121	145	8	32	650	300	948	30	32	0	26	0	19	107	1055
1997	361	132	148	9	35	685	303	988	30	33	0	27	0	21	111	1099
1998	380	143	151	9	38	721	307	1028	31	34	0	28	0	23	116	1144
1999	400	156	155	9	41	761	310	1071	31	34	0	28	0	25	118	1189
2000	420	170	158	9	44	801	314	1115	32	35	0	29	0	27	123	1238



Table A.10-54 (2)

## Songkhla (High Estimate)

	Southbound								Northbound						Total	
	G. C.	Ferti- lizer	Const. M	Rice	Maize	Dry Total	Fuel	Sub Total	Wood Pro.	Fish Pro.	Veg. F.	Rice	Rubber	G. C. Others		Sub Total
1974	79	0	0	0	0	79	211	290	4	0	0	0	4	57	65	355
1975	65	0	1	1	8	75	199	274	2	1	2	0	1	18	24	298
1976	71	0	0	0	0	71	225	296	0	0	0	0	2	1	3	299
1977	59	9	1	0	0	69	247	316	1	0	1	0	3	9	14	330
1978	38	8	2	0	4	52	279	331	0	0	0	0	2	11	13	344
1979	52	76	0	0	0	128	254	382	0	0	0	0	1	9	10	392
1980	52	31	0	0	2	85	237	322	0	0	0	0	0	5	5	327
1981	59	55	0	0	8	122	222	344	1	0	0	0	0	5	6	350
1982	74	54	19	1	9	157	242	399	2	2	0	2	0	6	12	411
1983	92	54	37	2	10	195	264	459	3	4	0	3	0	6	16	475
1984	115	53	56	4	11	239	289	528	5	8	0	5	0	7	25	553
1985	144	52	74	5	13	288	315	603	8	15	0	8	0	8	39	642
1986	181	52	93	6	14	346	344	690	13	30	0	13	0	9	65	755
1987	227	51	111	8	16	413	375	788	22	59	0	21	0	10	112	900
1988	243	57	116	8	17	441	401	842	22	60	0	22	0	11	115	957
1989	261	63	120	8	19	471	429	900	22	61	0	22	0	12	117	1017
1990	280	70	125	8	20	503	459	962	22	63	0	23	0	14	122	1084
1991	300	77	131	8	22	538	492	1030	22	64	0	23	0	16	125	1155
1992	322	86	136	8	24	576	526	1102	22	65	0	24	0	18	129	1231
1993	348	94	142	8	26	618	568	1186	22	66	0	25	0	20	133	1319
1994	376	102	147	8	28	661	614	1275	22	68	0	25	0	22	137	1412
1995	406	111	154	8	30	709	663	1372	22	69	0	26	0	25	142	1514
1996	438	121	160	8	32	759	717	1476	22	70	0	26	0	28	146	1622
1997	473	132	167	9	35	816	774	1590	22	72	0	27	0	32	153	1743
1998	511	143	173	9	38	874	836	1710	22	73	0	28	0	36	159	1869
1999	552	156	181	9	41	939	903	1842	22	75	0	28	0	41	166	2008
2000	596	170	188	9	44	1007	976	1983	22	76	0	29	0	46	173	2156

Table A.10-55 (1)

## Pattani (Low Estimate)

	Southbound								Northbound						Total	
	G. C.	Ferti- lizer	Const. M	Rice	Maize	Dry Total	Fuel	Sub Total	Wood Pro.	Fish Pro.	Veg. F.	Rice	Rubber	G. C. Others		Sub Total
1974	48	0	0	0	0	48	0	48	27	0	1	0	0	6	34	82
1975	35	0	0	2	0	37	0	37	20	0	6	0	1	2	29	66
1976	33	1	0	0	0	34	1	35	16	0	7	0	1	3	27	62
1977	34	1	1	0	0	36	0	36	19	0	3	0	0	2	24	60
1978	28	2	0	0	5	35	0	35	4	0	1	0	0	2	7	42
1979	25	1	0	0	0	26	0	26	6	0	0	0	1	0	7	33
1980	9	0	1	0	0	10	0	10	11	0	0	0	0	0	11	21
1981	0	0	0	0	0	0	114	114	2	0	0	0	0	1	3	117
1982	2	2	2	1	1	8	111	119	3	1	0	0	0	1	5	124
1983	4	2	3	2	2	13	108	121	4	2	0	0	0	1	7	128
1984	8	4	5	2	2	21	105	126	5	3	0	0	0	1	9	135
1985	15	6	9	3	3	36	102	138	7	4	0	0	0	1	12	150
1986	29	10	16	4	3	62	100	162	10	6	0	0	0	1	17	179
1987	57	15	27	6	4	109	97	206	14	9	0	0	0	1	24	230
1988	61	17	30	6	4	118	99	217	14	9	0	0	0	1	24	241
1989	64	19	33	6	5	127	102	229	14	9	0	0	0	1	24	253
1990	68	21	37	6	6	138	105	243	15	10	0	0	0	1	26	269
1991	73	24	41	6	6	150	107	257	15	10	0	0	0	1	26	283
1992	77	27	45	6	7	162	110	272	15	10	0	0	0	2	27	299
1993	81	30	47	6	7	171	111	282	15	10	0	0	0	2	27	309
1994	85	33	49	6	8	181	113	294	16	10	0	0	0	2	28	322
1995	89	36	50	6	8	189	114	303	16	10	0	0	0	2	28	331
1996	94	39	52	6	8	199	115	314	16	10	0	0	0	2	28	342
1997	99	43	54	7	9	212	117	329	17	11	0	0	0	2	30	359
1998	104	47	57	7	9	224	118	342	17	11	0	0	0	3	31	373
1999	105	52	59	7	10	233	120	353	18	11	0	0	0	3	32	385
2000	115	57	61	7	10	250	121	371	18	11	0	0	0	3	32	403

Table A.10-55 (2)

## Pattani (High Estimate)

	Southbound								Northbound						Total	
	G. C.	Ferti- lizer	Const. M	Rice	Maize	Dry Total	Fuel	Sub Total	Wood Pro.	Fish Pro.	Veg. F.	Rice	Rubber	G. C. Others		Sub Total
1974	48	0	0	0	0	48	0	48	27	0	1	0	0	6	34	82
1975	35	0	0	2	0	37	0	37	20	0	6	0	1	2	29	66
1976	33	1	0	0	0	34	1	35	16	0	7	0	1	3	27	62
1977	34	1	1	0	0	36	0	36	19	0	3	0	0	2	24	60
1978	28	2	0	0	5	35	0	35	4	0	1	0	0	2	7	42
1979	25	1	0	0	0	26	0	26	6	0	0	0	1	0	7	33
1980	9	0	1	0	0	10	0	10	11	0	0	0	0	0	11	21
1981	0	0	0	0	0	0	114	114	2	0	0	0	0	1	3	117
1982	2	2	2	1	1	8	117	125	3	2	0	0	0	1	6	131
1983	4	2	3	2	2	13	121	134	4	4	0	0	0	1	9	143
1984	8	4	5	2	2	21	124	145	5	8	0	0	0	1	14	159
1985	15	6	9	3	3	36	128	164	7	15	0	0	0	1	23	187
1986	30	10	16	4	3	63	131	194	10	29	0	0	0	2	41	235
1987	59	15	28	6	4	112	135	247	12	57	0	0	0	2	71	318
1988	64	17	31	6	4	122	146	268	12	62	0	0	0	2	76	344
1989	69	19	35	6	5	134	157	291	12	67	0	0	0	2	81	372
1990	74	21	39	6	6	146	169	315	12	72	0	0	0	2	86	401
1991	80	24	44	6	6	160	183	343	12	78	0	0	0	2	92	435
1992	86	27	49	6	7	175	197	372	12	85	0	0	0	2	99	471
1993	93	30	52	6	7	188	212	400	12	87	0	0	0	2	101	501
1994	100	33	55	6	8	202	229	431	12	89	0	0	0	3	104	535
1995	109	36	58	6	8	217	247	464	12	90	0	0	0	3	105	569
1996	117	39	61	6	8	231	267	498	12	92	0	0	0	3	107	605
1997	127	43	64	7	9	250	288	538	12	94	0	0	0	3	109	647
1998	137	47	68	7	9	268	310	578	12	96	0	0	0	3	111	689
1999	148	52	72	7	10	289	335	624	12	98	0	0	0	4	114	738
2000	160	57	76	7	10	310	361	671	12	100	0	0	0	4	116	787