

**APPENDIX 16 RESULTS OF ANALYSIS FOR PORT FACILITIES**



APPENDIX 16 RESULTS OF ANALYSIS OF PORT FACILITIES

Table A.16-1 (1) Result of Analysis for Berth

BANGKOK

Year	Annual Cargo Volume (A) (1,000 t)	(B) (t/day)	(C) (day)	(D) (t)	(E) = (A) (D) (Nos)	(D) + (C) (day)	(F) (day)	(G)	(H)	(I) = (F) (G)(H)	
1987	Case 1 854	900	0.5	600	1,423	1	1,423			7	
				950	899	1.5	1,349	0.7	310	6	
				1,450	589	2	1,178		5		
	Case 2 984	900	0.5	600	1,640	1	1,640				8
				950	1,036	1.5	1,554	0.7	310	7	
				1,450	679	2	1,358		6		
1992	Case 1 1,112	900	0.5	600	1,853	1	1,853			9	
				950	1,171	1.5	1,757	0.7	310	8	
				1,450	767	2	1,534		7		
	Case 2 1,332	900	0.5	600	2,220	1	2,220				10
				950	1,402	1.5	2,103	0.7	310	10	
				1,450	919	2	1,838		8		
2000	Case 1 1,599	900	0.5	600	2,598	1	2,598			12	
				950	1,641	1.5	2,462	0.7	310	11	
				1,450	1,075	2	2,150		10		
	Case 2 2,038	900	0.5	600	3,397	1	3,397				16
				950	2,145	1.5	3,218	0.7	310	15	
				1,450	1,406	2	2,812		13		

Table A.16-1 (2) Result of Analysis for Berth

SURAT THANI

Year	Annual Cargo Volume (1,000 t) (A)	(B) (t/day)	(C) (day)	(D) (t)	(E) = (A) / (D) (Nos)	(D) + (C) (day)	(F) (day)	(G)	(H)	(I) = (F) / (G) / (H)	
1987	Case 1 138	900	0.5	600	230	1	230			1	
				950	145	1.5	218	0.7	310	1	
				1,450	95	2	190			1	
	Case 2 152	900	0.5	600	253	1	253				1
				950	160	1.5	240	0.7	310	1	
				1,450	105	2	210			1	
1992	Case 1 191	900	0.5	600	318	1	318			1	
				950	201	1.5	302	0.7	310	1	
				1,450	132	2	264			1	
	Case 2 216	900	0.5	600	360	1	360				2
				950	227	1.5	341	0.7	310	2	
				1,450	149	2	298			1	
2000	Case 1 288	900	0.5	600	480	1	480			2	
				950	303	1.5	455	0.7	310	2	
				1,450	199	2	398			2	
	Case 2 338	900	0.5	600	563	1	563				3
				950	356	1.5	534	0.7	310	2	
				1,450	233	2	466			2	

Table A.16-1 (3) Result of Analysis for Berth

PAK PHANANG

Year	Annual Cargo Volume (A) (1,000 t)	(B) (t/day)	(C) (day)	(D) (t)	(E) = (A) (Nos)	(D) (t)	(E) = (A) (Nos)	(D) (t)	(E) = (A) (Nos)	(D) + (C) (day)	(F) (day)	(G)	(H)	(I) = (E) (G)(H)
1987	Case 1 161	900	0.5	600	268	600	268	600	268	1	268			1
				950	169	950	169	950	169	1.5	254	0.7	310	1
				1,450	111	1,450	111	1,450	111	2	222			1
	Case 2 199	900	0.5	600	332	600	332	600	332	1	332			2
				950	209	950	209	950	209	1.5	314	0.7	310	1
				1,450	137	1,450	137	1,450	137	2	274			1
1992	Case 1 200	900	0.5	600	333	600	333	600	333	1	333			2
				950	211	950	211	950	211	1.5	317	0.7	310	1
				1,450	138	1,450	138	1,450	138	2	276			1
	Case 2 260	900	0.5	600	433	600	433	600	433	1	433			2
				950	274	950	274	950	274	1.5	411	0.7	310	2
				1,450	179	1,450	179	1,450	179	2	358			2
2000	Case 1 295	900	0.5	600	492	600	492	600	492	1	492			2
				950	311	950	311	950	311	1.5	467	0.7	310	2
				1,450	203	1,450	203	1,450	203	2	406			2
	Case 2 411	900	0.5	600	685	600	685	600	685	1	685			3
				950	433	950	433	950	433	1.5	650	0.7	310	3
				1,450	283	1,450	283	1,450	283	2	566			3

Table A.16-1 (4) Result of Analysis for Berth

SONGKHLA

Year	Annual Cargo Volume (A) (1,000 t)	(B) (t/day)	(C) (day)	(D) (t)	(E) = (A) / (D) (Nos)	(D) + (C) (day)	(F) (day)	(G)	(H)	(I) = (F) / (G) = (C) / (H)
1987	Case 1 404	900	0.5	600	673	1	673	0.7	310	3
				950	425	1.5	638			3
				1,450	279	2	558			3
	Case 2 455	900	0.5	600	758	1	758	0.7	310	4
				950	479	1.5	719			3
				1,450	314	2	628			3
600				858	1	858	4			
950				542	1.5	813	4			
1,450				355	2	710	3			
1992	Case 1 515	900	0.5	600	1,002	1	1,002	0.7	310	5
				950	633	1.5	950			4
				1,450	414	2	838			4
	Case 2 601	900	0.5	600	1,203	1	1,203	0.7	310	6
				950	760	1.5	1,140			5
				1,450	498	2	996			5
2000	Case 1 722	900	0.5	600	1,487	1	1,487	0.7	310	7
				950	939	1.5	1,409			7
				1,450	615	2	1,230			6
	Case 2 892	900	0.5	600	1,487	1	1,487	0.7	310	7
				950	939	1.5	1,409			7
				1,450	615	2	1,230			6

Table A.16-1 (5) Result of Analysis for Berth

PATTANI

Year	Annual Cargo Volume (1,000 t) (A)	(B) (t/day)	(C) (day)	(D) (t)	(E) = (A) / (B) (Nos)	(D) + (C) (day)	(F) (day)	(G)	(H)	(I) = (F) / (G)	
1987	Case 1 104	900	0.5	600	173	1	173			1	
				950	109	1.5	164	0.7	310	1	
				1,450	72	2	144			1	
	Case 2 119	900	0.5	600	198	1	198				1
				950	125	1.5	188	0.7	310	1	
				1,450	82	2	164			1	
1992	Case 1 147	900	0.5	600	245	1	245			1	
				950	155	1.5	233	0.7	310	1	
				1,450	101	2	202			1	
	Case 2 174	900	0.5	600	290	1	290				1
				950	183	1.5	275	0.7	310	1	
				1,450	120	2	240			1	
2000	Case 1 207	900	0.5	600	345	1	345			2	
				950	218	1.5	327	0.7	310	2	
				1,450	143	2	286			1	
	Case 2 264	900	0.5	600	440	1	440				2
				950	278	1.5	417	0.7	310	2	
				1,450	182	2	364			2	

Table A.16-2 (1) Result of Analysis  
Open Storage Area

Port	Year	Cargo Volume × 25%	N (1,000 t)	R × W	A <sub>s</sub> (m <sup>2</sup> )
Bangkok	1992	Case 1 × 25%	278	20×0.5×2.5 25	11,100
	2000	Case 1 × 25%	400	"	16,000
Surat Thani (Ban Don)	1992	Case 1 × 25%	48	"	1,900
	2000	Case 1 × 25%	72	"	2,900
Pek Phanang	1992	Case 1 × 25%	50	"	2,000
	2000	Case 1 × 25%	74	"	3,000
Songkhla	1992	Case 1 × 25%	129	"	5,200
	2000	Case 1 × 25%	181	"	7,200
Pattani	1992	Case 1 × 25%	37	"	1,500
	2000	Case 1 × 25%	52	"	2,100

Case 1 only



Table A.16-2 (2) Result of Analysis  
Transit Shed

Port	Year	Cargo Volume	N (1,000 t)	$R \propto \omega$	A (m <sup>2</sup> )	n
Bangkok	1992	Case 1 × 25%	278	$35 \times 0.5 \times 2.5$ = 43.75	6,400	7
	2000	Case 1 × 25%	400	"	9,100	9
Surat Thani (Ban Don)	1992	Case 1 × 25%	48	"	1,100	1
	2000	Case 1 × 25%	72	"	1,700	2
Pak Phanang	1992	Case 1 × 25%	50	"	1,100	1
	2000	Case 1 × 25%	74	"	1,700	2
Songkhla	1992	Case 1 × 25%	129	"	3,000	3
	2000	Case 1 × 25%	181	"	4,100	4
Pattani	1992	Case 1 × 25%	37	"	800	1
	2000	Case 1 × 25%	52	"	1,200	1

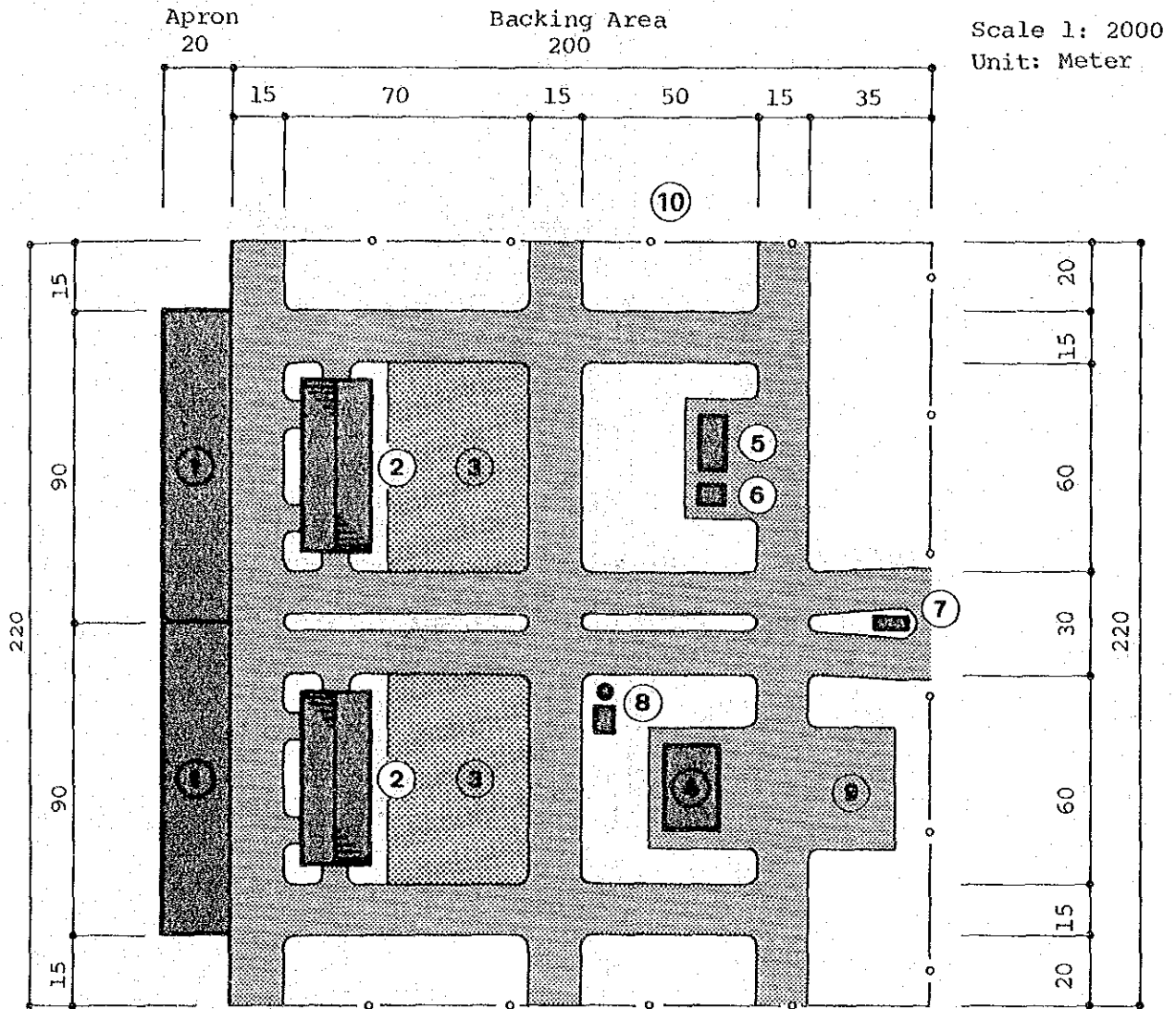
Case 1 only



**APPENDIX 17 PORT FACILITIES PLAN AND CONSTRUCTION COSTS**



APPENDIX 17 PORT FACILITIES PLAN AND CONSTRUCTION COSTS



①	RC Wharf & Bulkhead	2 Nos × 90M × 20M = 3,600 M <sup>2</sup>
②	Transit Shed	2 Nos × 50M × 20M = 2,000 M <sup>2</sup>
③	Open Storage	2 Nos × 60M × 40M = 4,800 M <sup>2</sup>
④	Port Office	400 M <sup>2</sup>
⑤	Work Shop	150 M <sup>2</sup>
⑥	Custom House	50 M <sup>2</sup>
⑦	Gate House	30 M <sup>2</sup>
⑧	Pump House & Water Tower	1 Unit including 80 M <sup>3</sup> Tank
⑨	Paved Road & Parking Area	18,000 M <sup>2</sup>
⑩	Fence & Gate	590 M

Fig. A.17-1 Typical Coastal Port (1500 DWTx2) General Plan

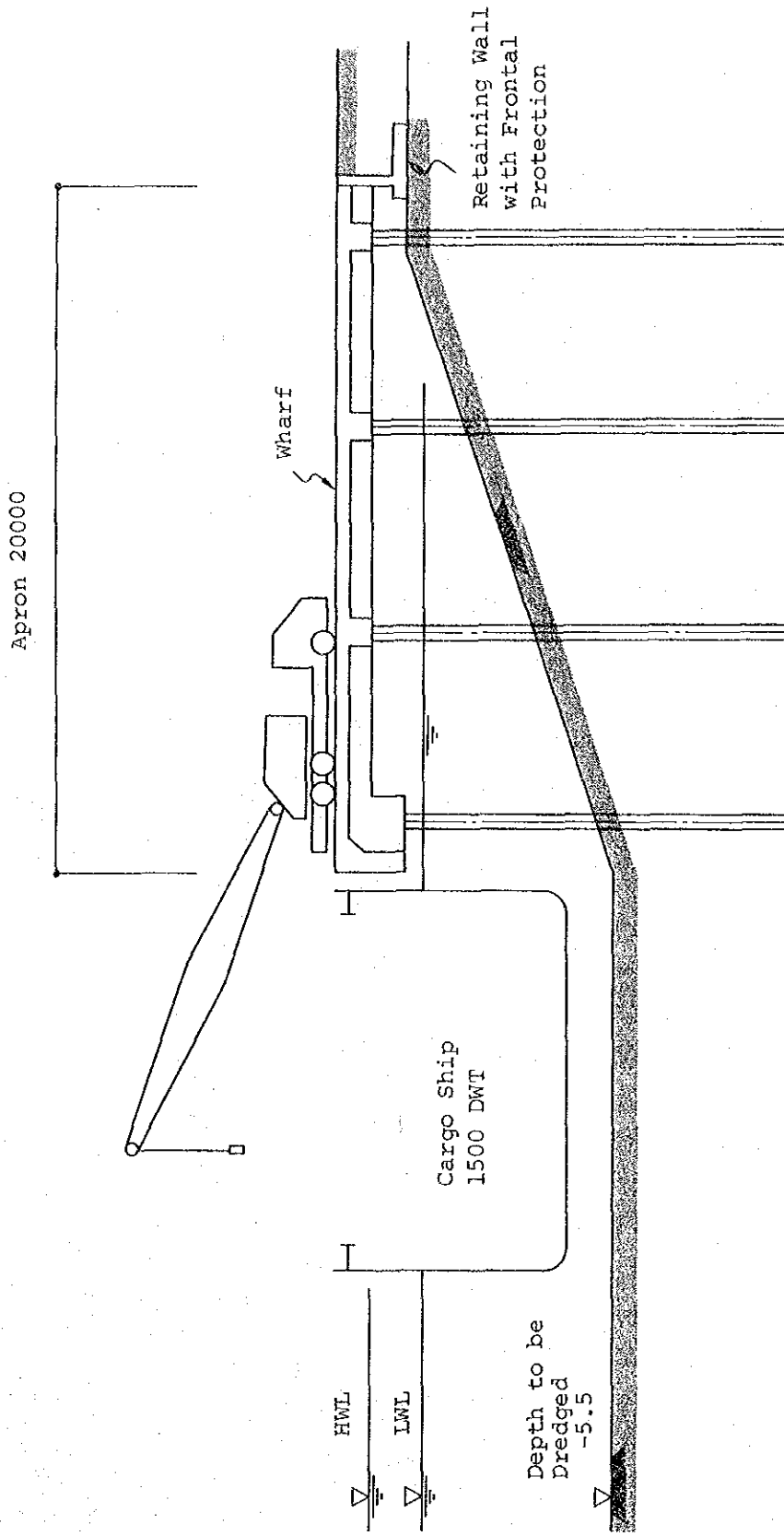


Fig. A.17-2 Typical Section of Wharf

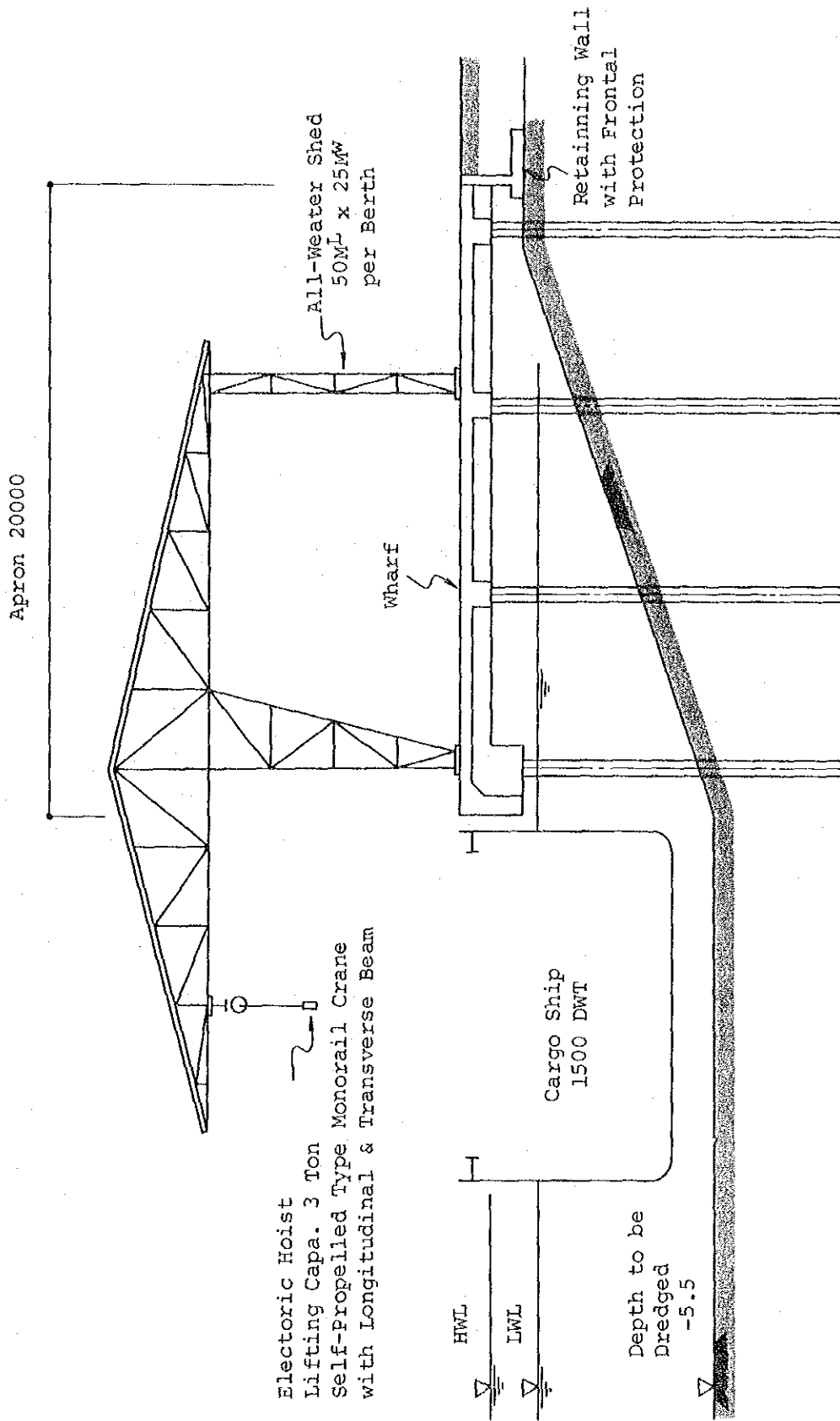


Fig. A.17-3 Typical Section of Wharf with All-Weather Shed

Table A.17-1 Construction Costs

					Per 2 Berths
Item	Unit	Q'ty	Rate (₪)	Amount (₪)	
1. Clearing & Site Preparation	m <sup>2</sup>	44,000	3.5	154,000	
2. Excavation	m <sup>3</sup>	-	-	-	
3. Filling 20 cm Thick	m <sup>3</sup>	8,800	180	1,584,000	
4. Road including Sub Base	m <sup>2</sup>	18,000	400	7,200,000	
5. Bank Protection					
Bulkhead (Rc) 2.4 m <sup>3</sup> /m	m <sup>3</sup>	530	2,500	1,325,000	
Rock Protection 3 m <sup>3</sup> /m	m <sup>3</sup>	660	400	264,000	
6. Rc Wharf	m <sup>2</sup>	3,600	4,500	16,200,000	
7. paved Open Storage	m <sup>2</sup>	4,800	400	1,920,000	
8. Transit Shed	m <sup>2</sup>	2,000	3,000	6,000,000	
9. Ancillary Buildings					
Port Office (Rc)	m <sup>2</sup>	400	4,500	1,800,000	
Work Shop (Rc)	m <sup>2</sup>	150	5,500	825,000	
Custom House (Rc)	m <sup>2</sup>	50	6,000	300,000	
Gate House (Rc)	m <sup>2</sup>	30	6,000	180,000	
10. Water Supply System	LS			2,500,000	
11. Drainage System	LS			1,000,000	
12. Electricity & Lighting	LS			1,800,000	
13. Fence & Gate	m	590	1,000	590,000	
Sub Total				43,642,000	
14. Overhead & Profit	15%			6,546,300	
Total				50,188,300	
15. Engineering	10%			5,018,830	
16. Contingency	20%			10,037,660	
Grand Total				65,244,790	



Table A.17-2 Alternative Construction Cost

					Per 2 Berths
	Item	Unit	Q'ty	Rate (₹)	Amount (₹)
1. 13.	Sub Total	-	-	-	43,642,000
14.	All-weather Shed	m <sup>2</sup>	2,500 <sup>1/</sup>	4,500	11,250,000
15.	Electric Hoist	No	5 <sup>2/</sup>	250,000	1,250,000
	Sub Total				56,142,000
16.	Overhead & Profit	15%			8,421,300
	Total				64,563,300
17.	Engineering	10%			6,456,330
18.	Contingency	20%			12,912,660
	Grand Total				83,932,290

Note: <sup>1/</sup> 50 m × 25 m × 2 nos = 2,500 m<sup>2</sup>

<sup>2/</sup> Required number of Hoist per berth shall be; -

2 nos + 0.5 no for spare = 2.5 nos/berth

Monorail beam shall be included in steel structures of the shed.

## Maintenance Dredging Cost

### (1) Unit Cost for Maintenance Dredging

As stated in Chapter 4, the operation cost for maintenance dredging is as follows.

7.5  $\text{฿}/\text{m}^3$  for Cutter  
10.0  $\text{฿}/\text{m}^3$  for Hopper

These cost shows the direct cost excluding administration and overheads.

### (2) Annual Required Volume

Annual required volume to be dredged of the following ports are assumed with regard to the depth for 1500 DWT vessels.

Surat Thani                     $V = 350,000 \text{ m}^3 \text{ p.a.}$   
Pak Phanang                    $V = 200,000 \text{ m}^3 \text{ p.a.}$     1/  
Pattani                          $V = 230,000 \text{ m}^3 \text{ p.a.}$

Note: 1/ Alternative port at Ban Pak Nakhon

These volume are assumed on the basis of silt rate estimated by AIT and past record of dredging.

### (3) Maintenance Dredging Cost

Surat Thani	350,000 $\text{m}^3$	8.75 $\text{฿}/\text{m}^3$	= 3.1 M฿	<u>2/</u>
Pak Phanang	200,000 $\text{m}^3$	7.5 $\text{฿}/\text{m}^3$	= 1.5 M฿	<u>3/</u>
Pattani	230,000 $\text{m}^3$	7.5 $\text{฿}/\text{m}^3$	= 1.7 M฿	<u>3/</u>
<hr/>				
Total				6.2 M฿

Note: 2/ by Hopper & Cutter,  
3/ by Cutter

**APPENDIX 18 REDUCTION OF THE ROAD MAINTENANCE COST**



APPENDIX 18 REDUCTION OF THE ROAD MAINTENANCE COST

The expected diversion of cargo from roads to ports due to the development of coastal shipping and the port improvement will bring various benefits to the country.

Particularly, considering that increases of heavy vehicle traffic and rampant overloading of trucks affects the pavement structure directly, the cargo diversion will, without doubt, help to prolong the pavement life. In this study, only the reduction of road maintenance cost is adopted as a countable benefit and indirect benefits such as the reduction of noise, vibration and air pollution are not taken into account.

It is needless to say that the cost reduction estimated in this section is not connected with DOH's budget reduction arising from the fact that the budget for road maintenance falls short of the required cost. Nevertheless, it is clear that the cargo diversion will contribute to restrain the prohibitive cost increases anticipated in the future.

(1) Affected roads

According to Thailand's Highway classification system, National Highways and Provincial Highways are under the responsibility of DOH.

Therefore, the above-mentioned Highways which are the main arterial roads are selected for consideration, and other roads (i.e. Rural Roads, Municipal Roads, Concession Roads, etc.) are excluded.

In the Southern Region, the roads are numbered as follows.

National Highways .....	Primary	No. 4, 41 & 42
	Secondary	No. 401 ~ 410
Provincial Highways .....	N.	4000s

However, since the National Highways play the leading role in long-distance truck transport, it is reasonable to confine our examination of the effect of cargo diversion to the National Highways between Bangkok and the South. The Provincial Highways are excluded for following two reasons.

- 1) Even though the feeder cargo using Provincial Highways will decrease as well, it may be counterbalanced by new traffic originating at the major ports, as they are part of the road network between the ports and their hinterlands.
- 2) Provincial Roads are generally short in comparison with National Highways.

(2) Trip Length

Judging from the long-distance traffic using the foregoing routes, the trip length is simplified as follows.

Bangkok - Songkhla 950 km via Route 4 & 41

(3) Road Maintenance Unit Cost

DOH's budget and its allocation are shown in Tables A.14-1 & A.14-2. As per the above-mentioned record, the budget allocation for recent years has been roughly: -

Administration	20%
Construction	60%
Maintenance	20%

For example, the budget for road maintenance for FY 1982 is 1,863 M\$, and this comprises only material and operation (labour) cost with associated overheads, that is, the direct cost excluding administration and equipment service cost (fuel).

Apart from DOH's budget, there are a few methods to compute the unit cost for road maintenance, but calculation based on only the budget is not suitable in the present circumstances, as was stated before.

Essentially, the road pavement maintenance cost will increase with time once it has begun to be used, in other words, the condition of paved roads will grow worse year by year independent of the traffic volume. Although the damage to pavement on aged roads will be accelerated by the traffic increases, this effect on deterioration is not considered in this study.

Therefore, the road maintenance unit cost is estimated by the following formula determined from the chart of annual maintenance costs.

$$M = 75,000 + 3.3 \text{ ADT} \underline{L}/$$

where, M: Road Maintenance Cost (ø/km/annum) for Asphalt Concrete Pavement in March 1981 prices

ADT: Average Daily Traffic

(4) Traffic Decrease due to Cargo Diversion

1) Cargo Diversion from Roads to Ports

A. Forecast of Road Cargo (Fig. A.14-1)

The results of the road cargo forecast are shown in Tables A.14-3 & A.14-4.

B. Forecast of Port Cargo (Fig. A.14-2)

The results of the port cargo forecast are described in Chapter 9, Development Plan for Coastal Ports.

C. Decrease in Road Cargo Volume

The decrease in road cargo volume is summarized in Fig. A.14-3. The cargo diversion is subject to the improvement of port facilities corresponding to the estimated port cargo volume.

2) Decrease in Highway Traffic

Firstly, the decrease in the daily volume of one-way trucks can be calculated from the decrease in road cargo volume due to cargo diversion.

Year	Decrease in truck numbers
1987	854,000 Ton ÷ 13 Ton ÷ 365 Days = 180 trucks
1992	1,112,000 Ton ÷ 13 Ton ÷ 365 Days = 234 trucks
2000	1,599,000 Ton ÷ 13 Ton ÷ 365 Days = 337 trucks

where, the number of trucks is for 10 wheel trucks.

Even though overload is a main factor affecting the pavement life, the calculation is carried out using the legal load because DOH's loading survey does not show a remarkable frequency.

3) ADT decrease

Finally, the decrease of daily traffic volume of one-way trucks is converted to the standard ADT for the following reasons.

- A. The formula estimating road maintenance costs is lead as a function of ADT based upon the standard composition of vehicles.
- B. Although heavy vehicles affect the pavement life directly, the cumulative stress from light vehicles such as passenger cars and light trucks cannot be ignored.

According to the data of the Traffic Volume & Flow Map prepared by DOH, the traffic constitution on Routes 4 and 41 is generally as follows.

The ratio of heavy vehicles: 30% of ADT  
(including Heavy Bus, Medium Truck and Heavy Truck)  
The ratio of heavy trucks: 10% of ADT

Therefore, the following standard ADT is obtained.

Year	Decrease in ADT
1987	1,800
1992	2,340
2000	3,370

(5) Reduction of Road Maintenance Cost

The individual cost reductions are calculated as follows.

$$M_{1987} = 3.3 \times 1,800 \times 960 \text{ km} \times (1.05)^2 = 6,286,896 \text{ ¥}$$

$$M_{1992} = 3.3 \times 2,340 \times 960 \text{ km} \times (1.05)^2 = 8,172,965 \text{ ¥}$$

$$M_{2000} = 3.3 \times 3,370 \times 960 \text{ km} \times (1.05)^2 = 11,770,466 \text{ ¥}$$

where, M is in March 1983 Price including cost escalation (i.e. price index 1.05)



Therefore,

Year	Cost Decrease (M\$ / year)
1987	6.3
1988	6.7
1989	7.1
1990	7.4
1991	7.8
1992	8.2
1993	8.7
1994	9.1
1995	9.6
1996	10.0
1997	10.5
1998	10.9
1999	11.4
2000	11.8

(6) Verification of Cost Reduction

As stated before, the reduction of road maintenance cost is calculated by an equation based on the relationship between ADT and the annual maintenance cost.

The cost reduction should be checked by different methods to ensure the reliability of this value.

This is done by using the Standard DOH Method for Maintenance Budgeting (the "Ka-factor" method), and this method is used for estimating the routine maintenance cost. 2/

$$M = (Na \cdot Ka \cdot Km + FE) \cdot L$$

where, M: Maintenance cost for the project road

Na: Maintenance cost/km for a standard road

Ka: Road characteristics factor

Km: Factor for material prices and delivery charges

FE: Equipment and fuel cost/km for the project road

L: Length of the road

And  $N_a = 8,800 \text{ B/km}$  for bitumen surfaced roads in 1982 prices

$K_m = 1.0$  for the southern region (Average)

$$K_a = 1 + 0.5 \left( \sum_{i=1}^6 X_i + \sum Y_i \right)$$

When this method is applied, there are many factors to be taken into account as mentioned above, but the only factor relating to ADT is  $X_3$ .

Therefore, the annual cost decreases in 1983 price are:-

$$M_{1987} = 8,800 \text{ B/km} \times 0.5 \times 0.53 \times 960 \text{ km} \times 1.05 = 2,350,656 \text{ B}$$

$$M_{1992} = 8,800 \text{ B/km} \times 0.5 \times 0.78 \times 960 \text{ km} \times 1.05 = 3,459,456 \text{ B}$$

$$M_{2000} = 8,800 \text{ B/km} \times 0.5 \times 1.27 \times 960 \text{ km} \times 1.05 = 5,632,704 \text{ B}$$

where,  $X_3$  (0.53 - 1.27) are obtained from decreases in ADT. 1.05 is the price index.

Meanwhile, the budget for all maintenance expenditures excluding administration, overhead expenditures and equipment service costs (fuel) is broken down into the following items.

Routine Maintenance	ex. 674 MB (FY1982)
Periodic Maintenance	484
Special Maintenance	169
Betterments	82
Emergency	54
Equipment Revolving Funds	<u>400</u>

ex. 1,863 MB (FY1982)

Therefore, the routine maintenance cost is a half of all maintenance expenditures excluding equipment revolving funds.

Consequently, the reduction of road maintenance cost due to cargo diversion is obtained by multiplying the above value by a factor 2 as follows.

$$M_{1987} \div 4.7 \text{ MB}$$

$$M_{1992} \div 6.9 \text{ MB}$$

$$M_{2000} \div 11.3 \text{ MB}$$

These results are similar to the previously calculated cost decrease.

Moreover, to compare these values with the DOH budget, the following percentages are roughly estimated.

The maintenance expenditure (FY1982) is

$$1863 \text{ M}\$ \div 44,000 \text{ km} \times 960 \text{ km} \doteq 40.6 \text{ M}\$$$

Therefore,

M 1987	6.3 M\$ by method 1	16%
	4.7 M\$ by method 2	12%
M 1992	8.2 M\$ by method 1	20%
	6.9 M\$ by method 2	17%
M 2000	11.8 M\$ by method 1	29%
	11.3 M\$ by method 2	28%

In short, the cost decrease for the year 2000 (ie; after the completion of the port improvements) will reach approx. 30 percent of the present maintenance cost.

Considering the fact that the traffic decrease due to cargo diversion is all heavy trucks, this estimated cost decrease is considered to be reasonable.

- 1/ Feasibility Study and Detailed Engineering Design for Provincial Road Improvement  
Phase I Technical Report      Oct. 1982
- 2/ Road Feasibility Study Project Vol. I      Oct. 1982

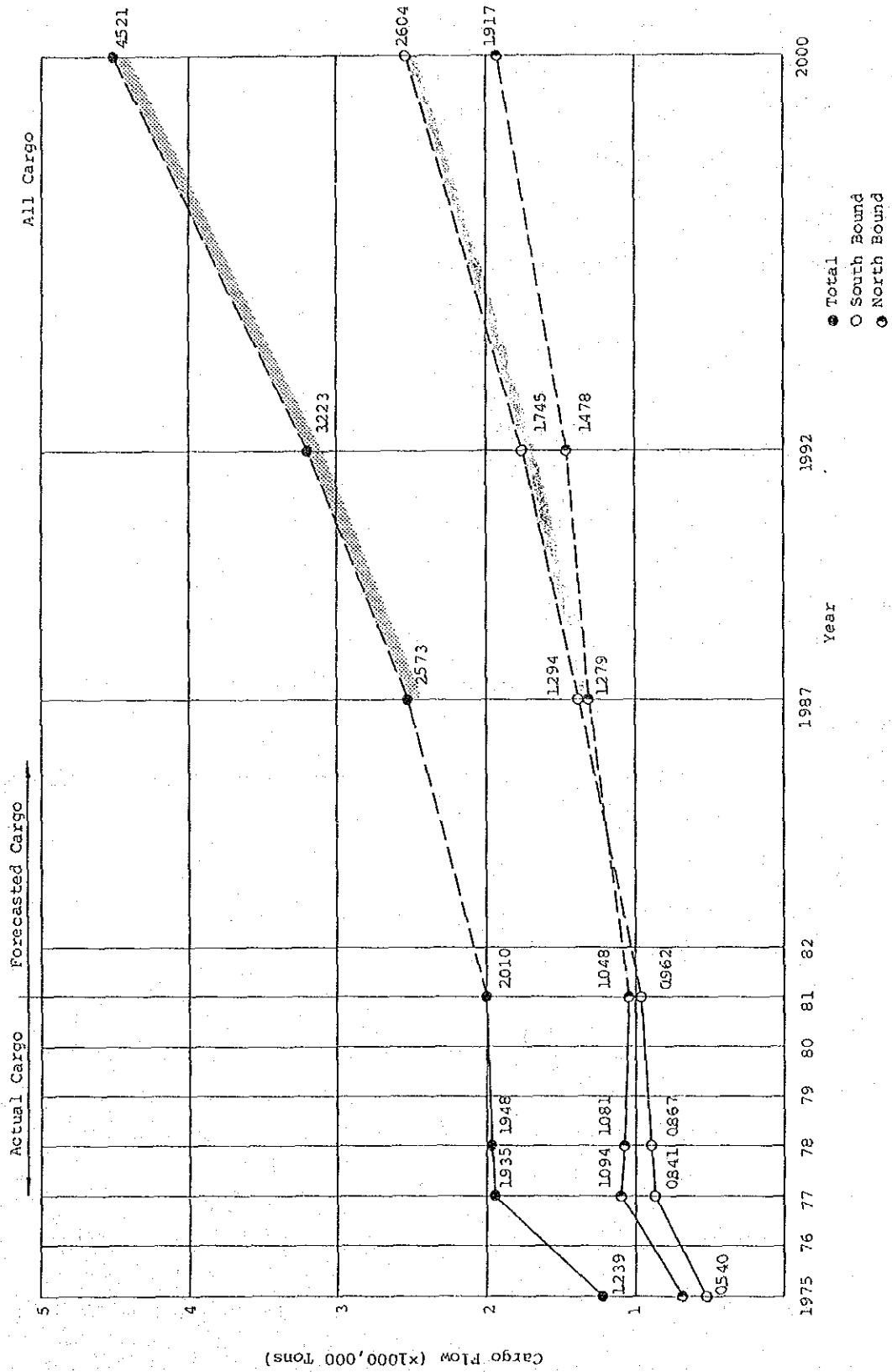


Fig. A.18-1 Cargo Flows by Road

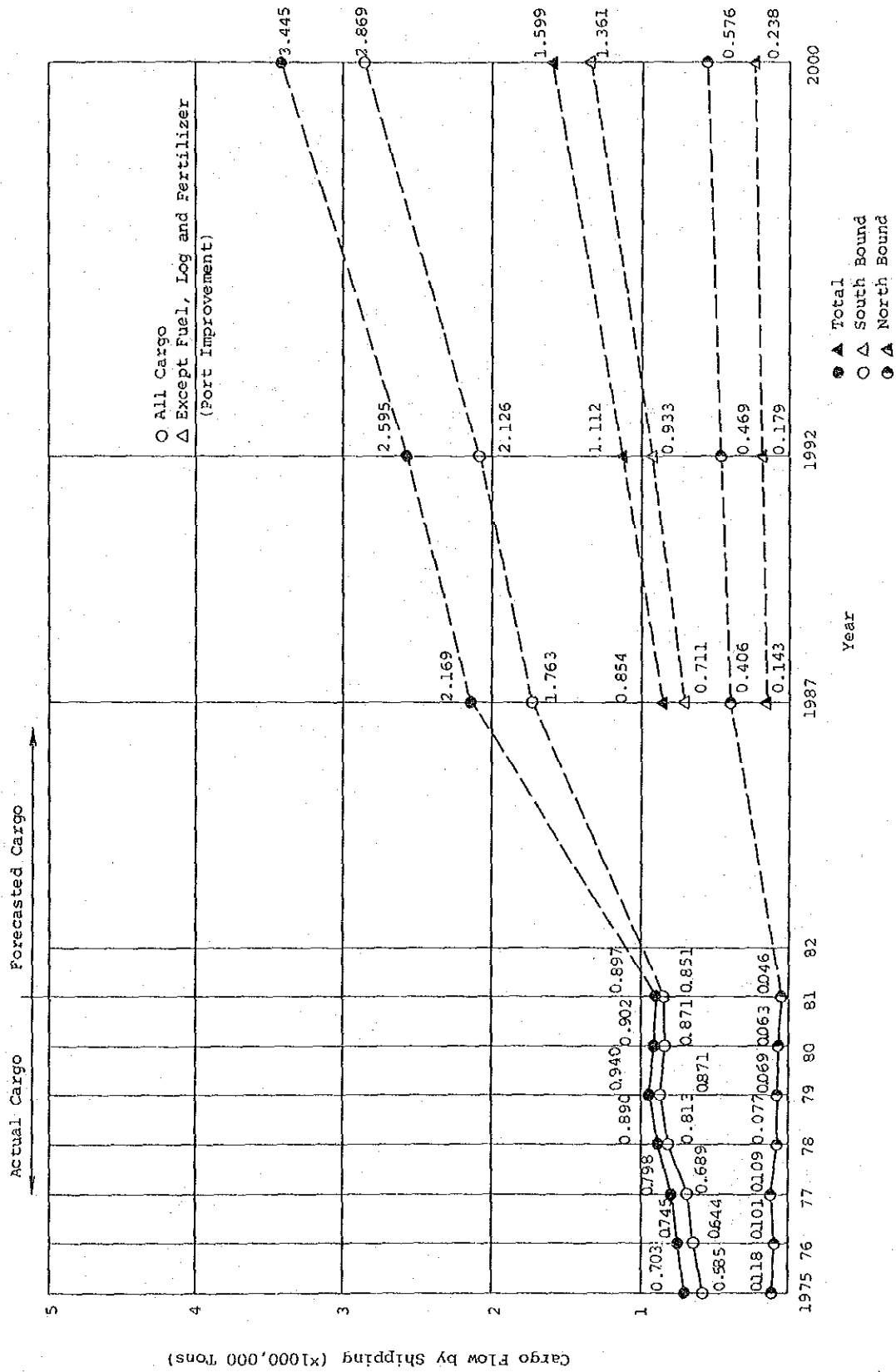


Fig. A.18-2 Cargo Flow by Shipping

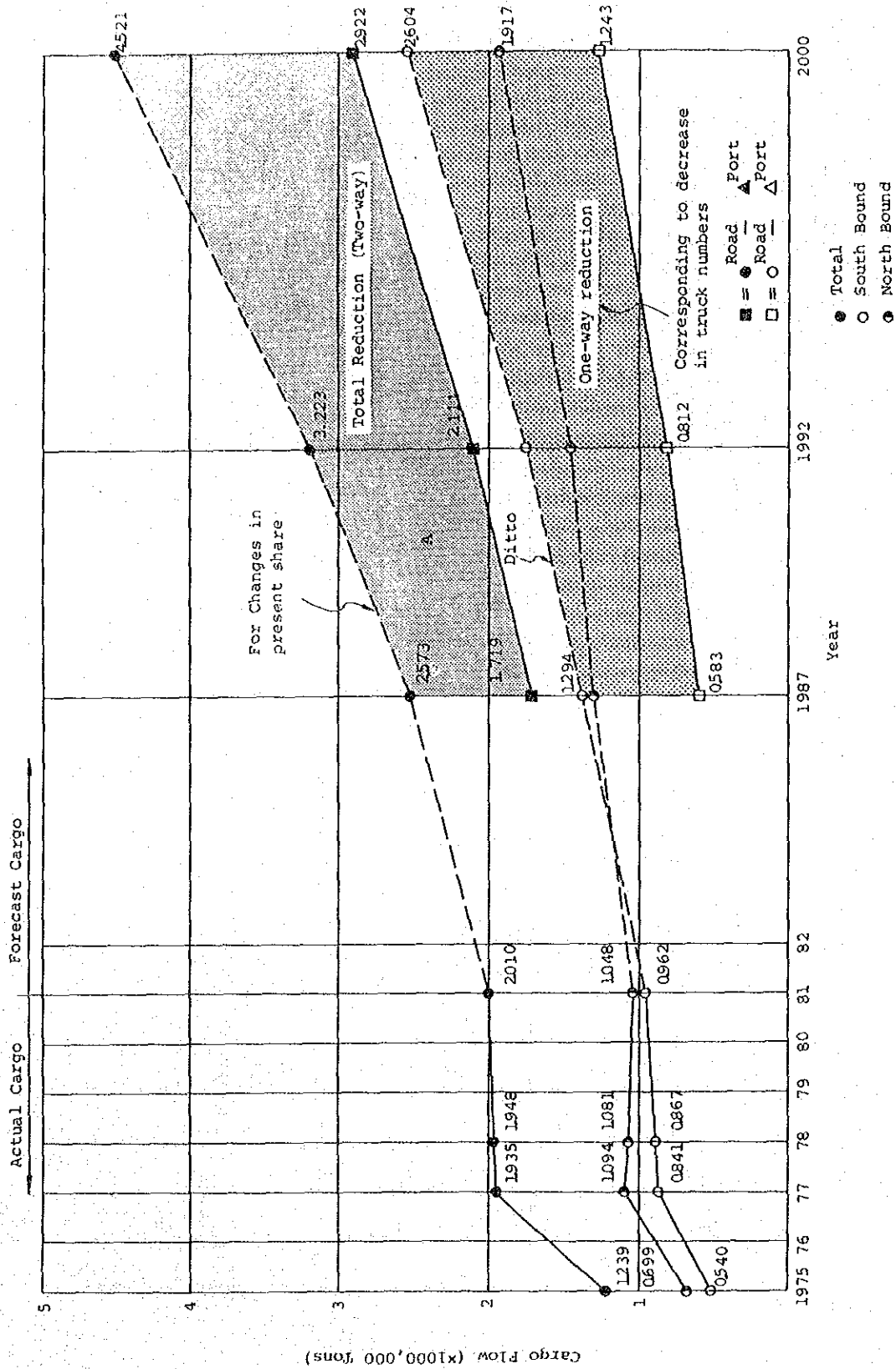


Fig. A.18-3 Cargo Flows by Road after Diversion

Target of Cargo Distribution (Road/Rail)

General Cargo : Y = 0.172 -86.4  
 Fertilizer : Y = 0.187 -86.3  
 Construction Material : Y = 0.109 -66.4  
 Rice : Y = 0.188 -90.5  
 Maize : Same as Fertilizer  
 Fuel : Y = 0.238 -63.5

Table A.18-1 (1) The Rate of Distribution by Road (Southbound)

Unit: %

Distance Commodity	Chumphon 460 km	Ban Don 670 km	Pak Phanang 790 km	Songkhla 950 km	Pattani 1,010 km	Narathiwat 1,130 km
General Cargo	100	71.2	50.5	23.0	12.7	0
Fertilizer	100	61.0	38.6	8.7	0	0
Const. M.	100	93.4	80.3	62.9	56.3	43.2
Rice	100	64.5	42.0	11.9	0.6	0
Maize	100	61.0	38.6	8.7	0	0
Fuel	54.0	4.0	0	0	0	0

100-Y

Target of Cargo Distribution (Road/Rail)

General Cargo : (Assumed) similar to Fish Products  
 Wood Products :  $Y = 0.164 - 69.8$   
 Fish Products :  $Y = 0.0621 - 40.1$   
 Vegetable & Fruit : (Assumed) similar to Fish Products  
 Rice : Same as Rice (Southbound)  
 Rubber : (Assumed) by rail

Table A.18-1 (2) The Rate of Distribution by Road (Northbound)

Unit: %

Distance Commodity	Chumphon 460 km	Ban Don 670 km	Pak Phanang 790 km	Songkhla 950 km	Pattani 1,010 km	Narathiwat 1,130 km
General Cargo	100	100	90 (100)	80 (100)	80 (100)	70 (100)
Wood Products	94.4	59.9	40.2	14.0	0.4	0
Fish Products	100	98.5	91.0	81.1	77.4	69.9
Veg. & Fruits	100	100	90 (100)	80 (100)	80 (100)	70 (100)
Rice	100	64.5	42.0	11.9	0.6	0
Rubber	0	0	0	0	0	0

100-Y



Table A.18-2 (1) Estimated Cargo Volume by Roads, 1987

Unit: Thousand Tons

	Commodity	Chumphon	Ban Don	Pak Phanang	Songkhla	Pattani	Narathiwat	Total	
South-bound	General Cargo	242	281	117	109	14	0	763	
	Fertilizer	8	14	17	5	0	0	44	
	Construction Material	52	100	31	144	30	5	362	
	Rice	20	4	6	1	0	0	31	
	Maize	5	5	4	1	0	0	15	
	Dry Total	327	404	175	260	44	5	1,215	
	Fuel	67	12	0	0	0	0	79	
	Southbound Total	394	416	175	260	44	5	1,294	
	North-bound	General Cargo	25	37	22	62	6	4	156
		Wood Products	277	73	24	4	0	0	378
Fish Products		212	203	43	117	29	8	612	
Vegetable & Fruits		34	53	15	7	6	2	117	
Rice		0	0	13	3	0	0	16	
Rubber		0	0	0	0	0	0	0	
Northbound Total		548	366	117	193	41	14	1,279	
Total	942	782	292	453	85	19	2,573		

Table A.18-2 (2) Estimated Cargo Volume by Roads, 1992

Unit: Thousand Tons

	Commodity	Chumphon	Ban Don	Pak Phanang	Songkhla	Pattani	Narathiwat	Total
South-bound	General Cargo	347	375	141	141	19	0	1,023
	Fertilizer	12	24	27	8	0	0	71
	Construction Material	69	153	44	182	50	7	505
	Rice	21	5	6	1	0	0	33
	Maize	7	8	5	2	0	0	22
	Dry Total	456	565	223	334	69	7	1,654
	Fuel	78	13	0	0	0	0	91
	Southbound Total	534	578	223	334	69	7	1,745
North-bound	General Cargo	36	56	31	86	8	5	222
	Wood Products	306	81	27	4	0	0	418
	Fish Products	234	224	46	129	33	10	676
	Vegetable & Fruits	42	67	18	10	6	2	145
	Rice	0	0	14	3	0	0	17
	Rubber	0	0	0	0	0	0	0
	Northbound Total	618	428	136	232	47	17	1,478
Total	Total	1,152	1,006	359	566	116	24	3,223

Table A.18-2 (3) Estimated Cargo Volume by Roads, 2000

Unit: Thousand Tons

	Commodity	Chumphon	Ban Don	Pak Phanang	Songkhla	Pattani	Narathiwat	Total	
South-bound	General Cargo	519	557	210	211	29	0	1,526	
	Fertilizer	26	49	53	16	0	0	144	
	Construction Material	116	259	84	216	68	14	757	
	Rice	24	5	7	1	0	0	37	
	Maize	15	12	10	4	0	0	41	
	Dry Total	700	882	364	448	97	14	2,505	
	Fuel	85	14	0	0	0	0	79	
	Southbound Total	785	896	364	448	97	14	2,604	
	North-bound	General Cargo	66	112	50	151	12	8	399
		Wood Products	359	95	31	5	0	0	490
Fish Products		274	270	54	151	39	11	799	
Vegetable & Fruits		59	95	26	13	10	4	207	
Rice		0	0	18	4	0	0	22	
Rubber		0	0	0	0	0	0	0	
	Northbound Total	758	572	179	324	61	23	1,917	
Total	Total	1,543	1,468	543	772	158	37	4,521	



**APPENDIX 19 OUT-LINE OF COASTAL PORTS IN SOUTHERN REGION**



APPENDIX 19 OUTLINE OF COASTAL PORTS IN SOUTHERN REGION

The Outline of coastal ports in Southern region consists of I. Port Activity and II. Dredging, individually.

No.	Port Name
1	Ban Don including Tha Thong Port
2	Khanom
3	Pak Phanang
4	Songkhla
5	Pattani
6	Narathiwat
7	Phuket (for reference)
8	Tha-Sala (for reference)
9	Sichon (for reference)

Source: Technical Division, HD  
Dredging & Maintenance Division, HD  
Planning Division, DOH  
Coastal Ports Study, Final Report by  
Maunsell Consultants Limited. April 1980

Table A.19-1 (1) Out-line of Coastal Ports, Ban Don.

I. Port Activity

Item	Existing Operations (including On-going Project)	Future Plan (Existing Development Proposal)
(1) Approach Channel		
Width (m)	Inner 40      Outer 60	IBRD Loan Dredging: Approach Channel to -4.5 m depth for 1,000 GRT (By Contract Dredging in 1984)
Length (m)	Do 10,000    Do 25,500	
Depth (m)	Do -2.0      Do -4.0	
(2) Tidal Conditions		
HWS (m)	+2.50	
MSL (m)	+1.40	
LWS (m)	+0.30	
(3) Facilities	Dimensions (L x W x Depth)	Dimensions (L x W x Depth)
Government Wharf	Tha Thong Port 1,000 GRT (193.6 + 93.6)m x 14.18m x -6	ADB loan fisheries wharf 100 or 150 <sup>m</sup> long
Municipal Jetty	Small passenger landing facility	
FMO Wharf	99.5 <sup>m</sup> x 20 <sup>m</sup>	
CSO Plant	Nil	
Private Fish	Numerous Small wharves	
Oil	Oil wharves and depots	
Cargo	25 <sup>m</sup> x 8 <sup>m</sup> & 30 <sup>m</sup> x 20 <sup>m</sup>	
Others	Repair shipyard for fishing vessel	
(4) Seasonal Influence	The port is usable all the year round	
(5) Shipping Company	Cho Vanakit Co., Ltd.	



Table A.19-1 (2) Out-line of Coastal Ports, Ban Don

II. Dredging

Item	Record or Programme			
(1) Capital Dredging	Year	Budget M\$	Volume M <sup>3</sup>	Dredger
	1971*	3.1	1,070,500	K 2&3
(2) Maintenance Dredging	Year	Budget M\$	Volume M <sup>3</sup>	Dredger
Record of Maintenance	1978	-	73,400+	K 3
Dredging including	1979	-	155,700	K 1
Annual Budget, Volume	1980	1.2	148,199	K 4
& Dredger's Name for	1981	0.8	174,000	K 2
recent 5 years	1982	1.5	190,600	K 1
(3) Dredging Programme	Year	Budget M\$	Volume M <sup>3</sup>	Dredger
Capital/Maintenance	1983			K 6
Dredging Programme	1984	As Contract Dredging		(K 1 & 3)
up to 1986	1985			K 1, 3 & 8
	1986			K 1, 3 & 8
(4) Dredging Method including Disposal Area				
(5) Siltation/Sedimentation ie. Littoral Drift affecting Navigation Channel	i) Estimated Maintenance Volume 174,000 M <sup>3</sup> p.a. ii) Silt Rate 0.1 M p.a.			
(6) Remarks	* Capital dredging had been continued up to 1976 Total Budget 24.3 M\$ Total Volume 8,500,000 M <sup>3</sup> + indicates Klong Tha Thong			

Table A.19-2 (1) Out-line of Coastal Ports, Khanom

I. Port Activity

Item	Existing Operations (including On-going Project)	Future Plan (Existing Development Proposal)
(1) Approach Channel Width (m) Length (m) Depth (m)	40 530 -3.0 (Inside)	
(2) Tidal Conditions HWS (m) MSL (m) LWS (m)	Unknown	
(3) Facilities Government Wharf Municipal Jetty FMO Wharf CSO Plant Private Fish Oil Cargo Others	Dimensions (L x W x Depth) Nil Ferry Jetty (790 CRT) Nil Nil Many small berths Seaberth (L/P, Dolphins) for 1,000 DWT Tanker Nil Gypsum loading jetty - Private Approx. 5 km from the Port	Dimensions (L x W x Depth)      As the oil berth of Power Plant.  Another loading jetty (Gypsum) 20,000 - 30,000 DWT
(4) Seasonal Influence		
(5) Shipping Company		

Table A.19-2 (2) Out-line of Coastal Ports, Khanom

II. Dredging

Item	Record or Programme			
(1) Capital Dredging	Year	Budget M฿	Volume M <sup>3</sup>	Dredger
	1978	0.4	114,700	K 3
(2) Maintenance Dredging  Record of Maintenance Dredging including Annual Budget, Volume & Dredger's Name for recent 5 years	Year	Budget M฿	Volume M <sup>3</sup>	Dredger
	1978	a/m	a/m	a/m
	1979	Nil	Nil	Nil
	1980	Nil	Nil	Nil
	1981	Nil	Nil	Nil
	1982	1.3	97,000	K 4
(3) Dredging Programme  Capital/Maintenance Dredging Programme up to 1986	Year	Budget M฿	Volume M <sup>3</sup>	Dredger
	1983	} Nil		
	1984			
	1985			
	1986			
(4) Dredging Method including Disposal Area	Vessel engaged in M/Dredging is hopper dredger.			
(5) Siltation/Sedimentation ie. Littoral Drift affecting Navigation Channel	i) Estimated Maintenance Volume M <sup>3</sup> p.a. ii) Silt Rate M p.a.			
(6) Remarks	No dredging in fiscal year 1979-1981 * River training wall (at River Mouth)			

Table A.19-3 (1) Out-line of Coastal Ports, Pak Phanang

I. Port Activity

Item	Existing Operations (including On-going Project)	Future Plan (Existing Development Proposal)
(1) Approach Channel Width (m) Length (m) Depth (m)	60 24,000 -3.0	SEATEC's Proposal: Alternative Navigation Channel -3.0m × 11 km
(2) Tidal Conditions HWS (m) MSL (m) LWS (m)	+1.4 +0.8 +0.2	
(3) Facilities Government Wharf Municipal Jetty FMO Wharf CSO Plant Private Fish Oil Cargo Others	Dimensions (L × W × Depth) Nil 10 <sup>m</sup> × 6 <sup>m</sup> Nil Nil 24 Fishing Wharves 280 <sup>m</sup> × 240 <sup>m</sup> 2 oil Wharves 2 × (10 <sup>m</sup> × 15 <sup>m</sup> ) 3 Cargo Wharves 3 × (10 <sup>m</sup> × 5 <sup>m</sup> ) Nil	Dimensions (L × W × Depth) SEATEC's Alternative Port: at Ban Pak Nakhon (F/S only) FMO's Proposal: Construction of new faci- lities in 1984, 1985
(4) Seasonal Influence	The entrance to the port is protected from the NE Monsoon.	
(5) Shipping Company	Srithamaraj Transport Co. Ltd.	

Table A.19-3 (2) Out-line of Coastal Ports, Pak Phanang

II. Dredging

Item	Record or Programme			
(1) Capital Dredging	Year 1981*	Budget M฿ 1.5	Volume M <sup>3</sup> -	Dredger K 19 & 21
(2) Maintenance Dredging  Record of Maintenance Dredging including Annual Budget, Volume & Dredger's Name for recent 5 years	Year 1978 1979 1980 1981* 1982	Budget M฿ Nil Nil a/m 7.3	Volume M <sup>3</sup> Nil Nil a/m 1,255,000	Dredger Nil Nil a/m K 19 & 21
(3) Dredging Programme  Capital/Maintenance Dredging Programme up to 1986	Year 1983 1984 1985 1986	Budget M฿	Volume M <sup>3</sup>	Dredger K 21 K 21 K 19 & 29 K 21
(4) Dredging Method including Disposal Area	Disposal area is located along the channel. (Approx. 200 m. behind)			
(5) Siltation/Sedimentation ie. Littoral Drift affecting Navigation Channel	i) Estimated Maintenance Volume 250,000 M <sup>3</sup> p.a. ii) Silt Rate 0.14 M p.a.			
(6) Remarks	* Capital dredging to be 1981 - 1984			

Table A.19-4 (1) Out-line of Coastal Ports, Songkhla

I. Port Activity

Item	Existing Operations (including On-going Project)	Future Plan (Existing Development Proposal)								
(1) Approach Channel	<table border="0"> <tr> <td>Inner</td> <td>Outer</td> </tr> <tr> <td>Width (m)</td> <td>250      100</td> </tr> <tr> <td>Length (m)</td> <td>4.000      3.000</td> </tr> <tr> <td>Depth (m)</td> <td>-5.5      -5.5</td> </tr> </table>	Inner	Outer	Width (m)	250      100	Length (m)	4.000      3.000	Depth (m)	-5.5      -5.5	
Inner	Outer									
Width (m)	250      100									
Length (m)	4.000      3.000									
Depth (m)	-5.5      -5.5									
(2) Tidal Conditions	<table border="0"> <tr> <td>HWS (m)</td> <td>(HAT) + 1.40</td> </tr> <tr> <td>MSL (m)</td> <td>(LLW) + Varies</td> </tr> <tr> <td>LWS (m)</td> <td>- 0.00</td> </tr> </table>	HWS (m)	(HAT) + 1.40	MSL (m)	(LLW) + Varies	LWS (m)	- 0.00			
HWS (m)	(HAT) + 1.40									
MSL (m)	(LLW) + Varies									
LWS (m)	- 0.00									
(3) Facilities	Dimensions (L × W × Depth)	Dimensions (L × W × Depth)								
Government Wharf	Local government wharf is leased as private wharves. (ex. SEA Land Co., Ltd.)	Deep-sea Port plan by ADB loan								
Municipal Jetty	Ferry Jetty	(*) Navy Pier (12 <sup>m</sup> wide × -4.0) H/D Pier (85m long × -6.0) Marine Police Pier (-3.5) State Railway Pier - Oil (50m × 15m × -6.0)								
FMO Wharf	90m long × -4.0									
CSO Plant	Nil									
Private Fish	Numerous Fishery Berths	(Private wharves:)								
Oil	Nil	1. TBH Pier (50m × 15m)								
Cargo	See (*)	2. TMN Pier (90m × 20m × -5.0)								
Others	See (*)	3. Harinsuit Co., Pier 4. Hua Huphin Co., Pier 5. Repair Yard (3 company Max 200 GT. Ave 30 GT)								
(4) Seasonal Influence	Port operated all year round									
(5) Shipping Company	Harinsuit Transport Co., Ltd. Tharoe Chakrwad Co., Ltd.									

TBH Teck Bee Hang Co., Ltd.  
TMN Thai Maritime Navigation Co., Ltd.

Table A.19-4 (2) Out-line of Coastal Ports, Songkhla

II. Dredging

Item	Record or Programme			
(1) Capital Dredging	Year	Budget M฿	Volume M <sup>3</sup>	Dredger
	1967	0.6	337,500	K 3
(2) Maintenance Dredging  Record of Maintenance Dredging including Annual Budget, Volume & Dredger's Name for recent 5 years	Year	Budget M฿	Volume M <sup>3</sup>	Dredger
	1978		34,300	K 2
	1979	Nil	Nil	Nil
	1980	Nil	Nil	Nil
	1981	0.9	102,600	K 2
	1982	1.6	140,000	K 4
(3) Dredging Programme  Capital/Maintenance Dredging Programme up to 1986	Year	Budget M฿	Volume M <sup>3</sup>	Dredger
	1983			
	1984	Inner Every 3 years		
	1985	Outer Every 2 years (or Every year if necessary)		
	1986			
(4) Dredging Method including Disposal Area	Disposal area is located behind Ko Nu. (the distance from approach channel is approx. 3 km) Vessel engaged in M/Dredging is hopper dredger.			
(5) Siltation/Sedimentation ie. Littoral Drift affecting Navigation Channel	i) Estimated Maintenance Volume 500,000 M <sup>3</sup> p.a. ii) Silt Rate M p.a.			
(6) Remarks	Dredging had been carried out every year from 1967 to 1977  Total Budget. more than 23 M฿ Total Volume. approx. 9,500,000 M <sup>3</sup>			

Table A.19-5 (1) Out-line of Coastal Ports, Pattani

I. Port Activity

Item	Existing Operations (including On-going Project)	Future Plan (Existing Development Proposal)
(1) Approach Channel Width (m) Length (m) Depth (m)	60 4,000 -3.0	
(2) Tidal Conditions HWS (m) MSL (m) LWS (m)	+1.1 +0.8 +0.6	
(3) Facilities Government Wharf Municipal Jetty FMO Wharf CSO Plant Private Fish Oil Cargo Others	Dimensions (L x W x Depth) Pattani Port Started in 1982 and will be finished in 1984 * Nil 100m x 12m (1972) 75m x 3m Cold store (1980) 7 Private wharves (84m x 49m) Nil	Dimensions (L x W x Depth) *for 1,000 GRT. (195m x 26m) 75m long timber wharf
(4) Seasonal Influence	Operations restricted by NE Monsoon (Nov. - March)	
(5) Shipping Company		



Table A.19-5 (2) Out-line of Coastal Ports, Pattani

II. Dredging

Item	Record or Programme			
	Year	Budget M฿	Volume M <sup>3</sup>	Dredger
(1) Capital Dredging	1969	18.4	1,044,900	K 1
(2) Maintenance Dredging	Year	Budget M฿	Volume M <sup>3</sup>	Dredger
Record of Maintenance	1978		479,200	K 3
Dredging including	1979	Nil	Nil	Nil
Annual Budget. Volume	1980	1.0	232,700	K 3
& Dredger's Name for	1981	Nil	Nil	Nil
recent 5 years	1982	Nil	Nil	Nil
(3) Dredging Programme	Year	Budget M฿	Volume M <sup>3</sup>	Dredger
Capital/Maintenance	1983			
Dredging Programme	1984			
up to 1986	1985	IBRD loan	-	K 8
	1986			
(4) Dredging Method including Disposal Area	Disposal area is located adjacent to river bank, therefore the dredging is not effective because of backing into navigation channel.			
(5) Siltation/Sedimentation ie. Littoral Drift affecting Navigation Channel	i) Estimated Maintenance Volume 145,000 M <sup>3</sup> p.a. ii) Silt Rate 0.6 M p.a.			
(6) Remarks	* Capital dredging had been continued till 1970 Total Budget 3.1 M฿ Total Volume 1,650,000 M <sup>3</sup>			

Table A.19-6 (1) Out-line of Coastal Ports, Narathiwat

I. Port Activity

Item	Existing Operations (including On-going Project)	Future Plan (Existing Development Proposal)
(1) Approach Channel Width (m) Length (m) Depth (m)	40 2,000 -3.0	
(2) Tidal Conditions HWS (m) MSL (m) LWS (m)	+1.0 +0.5 +0.0	
(3) Facilities Government Wharf Municipal Jetty FMO Wharf CSO Plant Private Fish Oil Cargo Others	Dimensions (L x W x Depth) Nil Nil Nil Nil Many small berths Nil 40m long wharf	Dimensions (L x W x Depth)
(4) Seasonal Influence	Port closed during NE Mon- soon Season Lightering only possible March - Oct.	
(5) Shipping Company		

Table A.19-6 (2) Out-line of Coastal Ports, Narathiwat

II. Dredging

Item	Record or Programme			
	Year	Budget M฿	Volume M <sup>3</sup>	Dredger
(1) Capital Dredging	1969		97,800	K 15
(2) Maintenance Dredging	Year	Budget M฿	Volume M <sup>3</sup>	Dredger
Record of Maintenance	1978	Nil	Nil	Nil
Dredging including	1979	a/m	a/m	a/m
Annual Budget. Volume	1980	1.0	189,500	K 3
& Dredger's Name for	1981	1.0	164,500	K 1
recent 5 years	1982	Nil	Nil	
(3) Dredging Programme	Year	Budget M฿	Volume M <sup>3</sup>	Dredger
Capital/Maintenance	1983			K 19
Dredging Programme	1984			
up to 1986	1985			K 1
	1986			
(4) Dredging Method including Disposal Area	Disposal area is located along the channel. (Approx. 200m behind)			
(5) Siltation/Sedimentation ie. Littoral Drift affecting Navigation Channel	i) Estimated Maintenance Volume 90,000 M <sup>3</sup> p.a. ii) Silt Rate 0.5 M p.a.			
(6) Remarks	* Capital dredging had been continued until 1980. Total Budget 1.4 M฿ Total Volume 203,700 M <sup>3</sup>			

Table A.19-7 (1) Out-line of Coastal Ports, Phuket

I. Port Activity

Item	Existing Operations (including On-going Project)	Future Plan (Existing Development Proposal)
(1) Approach Channel Width (m) Length (m) Depth (m)	Khlung-Thachin 60 4,000 -3.0	
(2) Tidal Conditions HWS (m) MSL (m) LWS (m)	+3.4 +1.9 +0.3	
(3) Facilities Government Wharf Municipal Jetty FMO Wharf CSO Plant Private Fish Oil Cargo Others	Dimensions (L x W x Depth)  with Cold Storage (121m x 17m)  Mani Fisher Berths Oil Berth & Depot Timber wharf (50m long) : Lighter with container	Dimensions (L x W x Depth)  Deep-sea Port Plan under the assistance of ADB loan As well as Songkhla Port. The construction will be commenced in 1984.  The CSO propose to build a new plant adjacent to FMO wharf. (180m long)
(4) Seasonal Influence	Port is usable all year round.	
(5) Shipping Company		

Table A.19-7 (2) Out-line of Coastal Ports, Phuket

II. Dredging

Item	Record or Programme			
(1) Capital Dredging	Year 1970	Budget M฿ 1.4	Volume M <sup>3</sup> 404,600	Dredger K 7
(2) Maintenance Dredging  Record of Maintenance Dredging including Annual Budget. Volume & Dredger's Name for recent 5 years	Year 1978 1979 1980 1981 1982	Budget M฿ Nil Nil 1.6 Nil 2.4	Volume M <sup>3</sup> Nil Nil 121,600 Nil 182,700	Dredger Nil Nil K 4 & 7 Nil K 2 & 5
(3) Dredging Programme  Capital/Maintenance Dredging Programme up to 1986	Year 1983 1984 1985 1986	Budget M฿	Volume M <sup>3</sup>	Dredger
(4) Dredging Method including Disposal Area	M/Dredging is carried out by Cutter and Hopper.			
(5) Siltation/Sedimentation ie. Littoral Drift affecting Navigation Channel	i) Estimated Maintenance Volume M <sup>3</sup> p.a. ii) Silt Rate M p.a.			
(6) Remarks	M/Dredging had executed from 1971 to 1977 continuously Total Budget more than 7.60 M฿ Total Volume approx. 3,200,000 M <sup>3</sup>			

Table A.19-8 (1) Out-line of Coastal Ports, Tha-Sala

I. Port Activity

Item	Existing Operations (including On-going Project)	Future Plan (Existing Development Proposal)
(1) Approach Channel Width (m) Length (m) Depth (m)	40 800 -2.0	
(2) Tidal Conditions HWS (m) MSL (m) LWS (m)	Unknown	
(3) Facilities Government Wharf Municipal Jetty FMO Wharf CSO Plant Private Fish Oil Cargo Others	Dimensions (L x W x Depth) Nil Nil Nil Nil Fisher boat berths only Nil Nil	Dimensions (L x W x Depth)
(4) Seasonal Influence		
(5) Shipping Company		

Table A.19-8 (2) Out-line of Coastal Ports, Tha-Sala

II. Dredging

Item	Record or Programme			
(1) Capital Dredging	Year	Budget M\$	Volume M <sup>3</sup>	Dredger
	1969	0.5	97,000	K 3
(2) Maintenance Dredging	Year	Budget M\$	Volume M <sup>3</sup>	Dredger
Record of Maintenance	1978	Nil	Nil	Nil
Dredging including	1979	a/m	a/m	a/m
Annual Budget. Volume	1980	1.3	152,400	K 1 & 3
& Dredger's Name for	1981	Nil	Nil	Nil
recent 5 years	1982	Nil	Nil	Nil
(3) Dredging Programme	Year	Budget M\$	Volume M <sup>3</sup>	Dredger
Capital/Maintenance	1983			
Dredging Programme	1984			
up to 1986	1985			
	1986			
(4) Dredging Method including Disposal Area				
(5) Siltation/Sedimentation ie. Littoral Drift affecting Navigation Channel	i) Estimated Maintenance Volume		M <sup>3</sup> p.a.	
	ii) Silt Rate		M p.a	
(6) Remarks				

Table A.19-9 (1) Out-line of Coastal Ports, Sichon

I. Port Activity

Item	Existing Operations (including On-going Project)	Future Plan (Existing Development Proposal)
(1) Approach Channel Width (m) Length (m) Depth (m)	40 800 -2.0	
(2) Tidal Conditions HWS (m) MSL (m) LWS (m)	Unknown	
(3) Facilities Government Wharf Municipal Jetty FMO Wharf CSO Plant Private Fish Oil Cargo Others	Dimensions (L x W x Depth) Nil Nil Nil Nil Fisher boat berths only Nil Nil	Dimensions (L x W x Depth)
(4) Seasonal Influence		
(5) Shipping Company		



Table A.19-9 (2) Out-line of Coastal Ports, Sichon

II. Dredging

Item	Record or Programme			
(1) Capital Dredging	Year 1982	Budget M\$ 1.1	Volume M <sup>3</sup> 114,000	Dredger K 1
(2) Maintenance Dredging  Record of Maintenance Dredging including Annual Budget. Volume & Dredger's Name for recent 5 years	Year 1978 1979 1980 1981 1982	Budget M\$  Nil  a/m	Volume M <sup>3</sup>    a/m	Dredger     a/m
(3) Dredging Programme  Capital/Maintenance Dredging Programme up to 1986	Year 1983 1984 1985 1986	Budget M\$  Nil  	Volume M <sup>3</sup>    	Dredger    
(4) Dredging Method including Disposal Area	Capital dredging in 1982 was carried out by mean of cutter suction dredger.			
(5) Siltation/Sedimentation ie. Littoral Drift affecting Navigation Channel	i) Estimated Maintenance Volume ii) Silt Rate			M <sup>3</sup> p.a. M p.a.
(6) Remarks				

JICA