

8.3 Navigational Aids

A comprehensive study to remedy navigational aids aiming at 2000 in Indonesian waters was carried out by JICA in 1985. Ever since the endorsement for the said recommendation by the Government, the state of navigational aids has been steadily improving in accordance the phased schedule.

However, a further installation with updated equipment to meet the coming situation, namely, the expected rapid development of both international/domestic shipping routes, establishing three new international sea lanes in the Indonesian territorial waters and extending the separation traffic zone at the Maraca/Singapore strait, in particular, would be indispensable.

In addition, existing navigational aids should be maintained rigorously, because the actual functional conditions of marks, according to an annual report by some Navigation District, is reportedly 74% in terms of reliability.

Hereafter, another detailed study on extension/upkeep of navigational aids in entire Indonesian waters should thus be conducted as one of the important issues of DGSC.

The progress of installed facilities/equipment, tenders and work force concerning navigational aids as of 1984 and 1997 is shown in Table 8.1, Table 8.2 and Table 8.3, respectively.

Table 8.1 Installed Nav. Aids (as of 1984/1997)

District	Lighthouse		Beacon		Lt. Buoy		Unlighted Bn.		Unlighted B'y	
	1984	1997	1984	1997	1984	1997	1984	1997	1984	1997
Sabang	4	9	19	27 (7)	13	5	2	4	28	2
Belawan	3	6	17	44(18)	24	38 (1)	6	-	34	1
Sibolga	1	7	7	39 (1)	-	(5)	1	3(2)	-	-
Teluk Bayur	9	8	18	39 (5)	-	(1)	6	2	26	-
Tg. Pinang	19	24	25	63(37)	15	24(22)	13	30	63	11
Dumai	2	5	19	34(13)	29	51(15)	7	5	7	1
Palembang	-	4	39	63 (1)	22	17 (6)	2	8	3	4
Pontianak	-	3	12	35	10	13 (1)	1	6	19	2
Tg. Priok	26	27	48	107(44)	34	44(14)	4	22	44	45(2)
Cilacap	2	5	13	16(11)	20	5(37)	-	(10)	23	(20)
Semarang	7	8	11	27 (2)	6	13 (4)	2	26	2	4
Surabaya	10	19	22	45(11)	19	20(27)	7	2 (2)	20	-
Benoa	9	17	18	39 (3)	5	8 (1)	2	11	15	-
Kupang	10	15	-	50 (2)	3	-	15	12	-	-
Banjarmasin	6	7	14	38(16)	20	25 (1)	2	7	8	4
Balikpapan/Tarakan	1	2	8	23	11	6 (36)	-	1	6	-
Samarinda	2	5	51	46(105)	68	16(110)	2	7 (22)	35	7 (2)
Uj. Pandang	11	18	7	40 (1)	4	9	10	33	5	3
Kendari	1	6	17	51 (7)	-	-	5	9	-	-
Bitung	12	21	4	77 (8)	1	6	34	(11)	15	-
Ambon	4	10	11	67 (3)	-	5	29	3 (11)	19	(3)
Sorong	4	6	29	52(14)	19	17 (9)	3	3 (4)	28	(3)
Jayapura	2	8	18	29	3	2	4	4 (1)	14	-
Merauke	1	1	4	26	3	4	1	-	1	4 (1)
TOTAL	146	241	431	1,077 (309)	329	328 (290)	158	198 (63)	415	105 (27)

Source: DGSC, Subdirektorat Ditnav. Oct.1997. Bracketed figures are private assets.

Table 8.2 Tenders for Nav. Aids (as of 1984/1997)

Port	Class I		Class II		Class III		Class IV		Class V	
	1984	1997	1984	1997	1984	1997	1984	1997	1984	1997
Sabang	-	-	-	-	2	2	-	-	-	-
Belawan	-	-	-	1	3	2	-	-	-	-
Sibolga	-	-	-	-	1	1	-	-	-	-
Teluk Bayur	-	1	-	-	1	-	-	-	-	-
Tg. Pinang	-	-	-	1	-	2	-	-	-	-
Dumai	1	2	1	-	3	4	2	-	-	-
Palembang	-	-	-	-	6	6	1	-	-	-
Pontianak	-	-	-	-	2	2	-	-	-	-
Tg. Priok	2	4	2	-	4	2	1	2	6	1
Cilacap	-	-	-	-	3	1	-	-	-	-
Semarang	-	-	-	-	3	3	-	-	-	-
Surabaya	2	3	2	-	4	3	1	-	-	-
Benoa	-	-	-	1	1	-	-	-	-	-
Kupang	-	-	-	1	2	-	-	-	-	-
Banjarmasin	-	-	-	1	1	1	1	-	-	-
Balikpapan/Tarakan	-	-	-	-	1	1	-	-	-	-
Samarinda	1	1	-	-	2	2	1	-	-	-
Uj. Pandang	-	-	-	-	1	2	-	-	-	-
Kendari	-	-	-	-	1	1	-	-	-	-
Bitung/Manado	-	-	-	1	3	2	-	-	-	-
Ambon	-	-	-	2	1	-	1	-	-	-
Sorong	1	1	1	2	2	-	3	1	-	-
Jayapura	-	-	-	2	-	-	8	1	-	-
Merauke	-	-	-	-	-	1	2	1	-	-
BTKP	-	1	-	-	-	2	-	-	-	-
TOTAL	7	13	6	12	50	40	22	6	6	1

Class 1,2: Mother vessels(500 - 1,300 GRT) providing installation, supply services mainly.

Class 3,4,5: Supporting vessels(under 100 GRT) providing inspection and other supporting services mainly.

BTKP: Shipping Safety Technology Office (JAKARTA)

Source: Sub Directorate Navigational Aids, DGSC, Oct.1997.

**Table 8.3 Officials attached to the Directorate of Navigation
as of 1984 and 1997**

No.	Head Office & District of Navigation	General Affair		Light House		Coastal Station		Tender Crew		Work Shop Employee		TOTAL	
		1984	1997	1984	1997	1984	1997	1984	1997	1984	1997	1984	1997
		1	Headquarters	N.A.	119	N.A.	-	N.A.	-	N.A.	-	N.A.	-
2	Tg. Priok	109	58	107	135	83	155	266	243	186	183	751	774
3	Surabaya	67	55	36	95	64	95	198	122	41	86	406	453
4	Dumai	26	68	43	25	28	64	110	120	-	45	207	322
5	Tg. Pinang	25	5	86	120	2	33	57	96	-	13	170	267
6	Samarinda	20	15	8	20	7	32	98	59	19	40	152	166
7	Ujung Pandang	23	15	84	87	44	77	24	45	44	38	219	262
8	Ambon	14	8	32	45	33	65	32	54	13	26	124	198
9	Sorong	18	43	10	25	5	38	89	74	9	23	131	203
10	Belawan	18	65	35	14	30	61	40	49	-	15	123	204
11	Palembang	20	41	27	20	14	23	66	73	10	41	137	198
12	Teluk Bayur	14	64	62	40	10	19	24	28	-	32	110	183
13	Semarang	15	43	18	40	12	50	32	34	15	32	92	199
14	Benoa	21	53	23	72	4	31	12	24	8	21	68	201
15	Banjarmasin	12	28	31	35	13	33	40	43	17	32	113	171
16	Manado/Bitung	25	17	60	77	32	81	40	60	32	32	189	267
17	Balikpapan/Tarakan	10	9	-	10	10	10	12	14	-	5	32	48
18	Kupang	19	12	49	65	25	39	32	38	7	23	132	177
19	Jayapura	18	24	10	20	18	51	76	35	15	31	137	161
20	Sabang	11	16	18	40	13	26	16	26	-	13	58	121
21	Sibolga	6	24	5	35	5	7	12	20	5	12	33	98
22	Cilacap	12	45	9	15	3	11	8	30	-	13	32	114
23	Pontianak	18	14	13	15	6	18	16	14	3	41	56	102
24	Kendari	19	49	9	15	-	14	12	23	-	13	40	114
25	Merauke	5	6	5	5	6	9	15	20	31	30	62	70
26	BTKP	-	48	-	-	-	26	-	88	-	54	-	216
TOTAL		545	944	780	1070	467	1068	1327	1432	455	894	3574	5408

Source: Sub Division of General Administration, Directorate of Navigation, DGSC

8.4 Pilotage System

In accordance with the Ministerial Decree(KM.22,1990), 50 compulsory pilotage waters and 20 extraordinary(not compulsory) pilotage waters are specified in entire Indonesian waters. These designated waters are shown in Table 8.4.

Table 8.4 Pilotage Waters

COMPULSORY PILOTAGE WATERS			EXTRAORDINARY PILOTAGE WATERS
1 Malahayati	18 Banten	38 Bitung	1 Sabang
2 Lhokseumawe	19 Tanjung Priok	39 Ternate	2 Lhok Nga
3 Pangkalan Susu	20 Pontianak	40 Ambon	3 Teluk Semanga
4 Belawan	21 Cirebon	41 Sorong	4 Telok Air
5 Kuala Tanjung	22 Cilacap	42 Manokwari	5 Kube Kecil
6 Dumai	23 Tanjung Emas	43 Biak	6 Pulang Pisau
7 Sungai Pakning	24 Tanjung Perak	44 Jayapura	7 Lembar
8 Pekanbaru	25 Tanjung Wanji	45 Merauke	8 Tanjung Santan
9 Tembilihan	26 Meneng	46 P.Baai/Bengkulu	9 Lawi-Lawi
10 Pulau Sambu	27 Banjarmasin	47 Pare-Pare	10 Senipah
11 Pulau Batam	28 Bena	48 Kendari	11 Nunukan
-Sekupang	29 Tenak/Kupang	49 Mekar Putih	12 Tanjun Pandan
-Batu Ampar	30 Kotabaru	50 Dilli	13 Sei Guntung
-Kabil	31 Balikpapan		14 Tg. Balai Karimun
12 Tanjung Uban	32 Bontang/L'tuan		15 Teluk Paku
13 Tanjung Pinang	33 P.Bunyu		16 Sts. Karimun
14 Teluk Bayur	34 Tarakan		17 Sampit
15 Jambi	35 Samarinda		18 Kuala Snok
16 Palembang	36 Makassar		19 Belinyu
17 Panjang	37 Pantolon		20 Panjkal Balam

Source: Sub Directorate Pilotage, DGSC

Since 1995, status of the licensed pilot has been transferred from the Government(MOC) officials to the staff attached to the Indonesian Port Corporation(I-IV). Present pilot force stationed at each IPC is as follows:

IPC-I;	96
IPC-II;	142
IPC-III	104

IPC-IV	78
Total	420

Recently, vocational training for the pilots became centralized and is conducted by Indonesian Port Corporation-II at Jakarta under the control of DGSC.

Qualifications of a pilot are: 1) the certification shall be MPB-III and higher which is equivalent to the 3rd class navigation officer provided in The STCW International Convention, 2) the sea career shall be longer than three years, 3) the age shall be older than 35 years, 4) shall be qualified by DGSC after one year training at the said training center which consists of half a year of theoretical learning and another half a year of practice as an apprentice pilot, and 5) a physical aptitude.

From the outline of the pilotage system mentioned above, following points could be pointed out to minimize future sea accidents:

- The designated pilotage waters of 50 compulsory and 20 not compulsory are insufficient for the 656 Public Ports in entire Indonesian waters. Considering that there are over 80 existing international ports, in particular, further specified pilotage waters should hereafter be established to cope with the increasing vessel traffic.
- Existing Pilot Training Center, which is operated by IPC at Jakarta should be reinforced as a vocational training institute with updated equipment and competent teaching staff.
- The present objective piloting vessels of 150 GRT and larger should be reconsidered to raise the limit to about 500 GRT from the viewpoint of easier maneuverability in turn low rate of accident of smaller vessels.
- In order to support pilotage servicing, the aged facilities such as tugboat, pilot boat, pilot station and communication devices should be replaced. Out of the total of 69 tugboats, 121 pilot boats, 60% of those facilities have reached 15 years of use.

8.5 Sea Accidents

According to a summarized report by the Ship Accident Section; Directorate of Maritime Safety, the number of sea accidents involving Indonesian vessels in the period of 1982/83-1996/97 was 3,837, resulting in the loss of 868 lives and 196,991 tonnes of cargo.

The incidence of sea accidents shows a steady decrease (374 in 1982 to 141 in 1996) throughout the period of 14 years, and several trends can be pointed out as follows:

- as for the type of vessels; motor vessel group(2,604<68%>) are involved in the most accidents, followed by motorized sailing vessel group(852<22%>),
- the number of cases classified by vessel size is almost equal in each group regardless

of their sizes,

- as for the kind of accidents, sinking is the largest case(1,481<42%>), followed by others(1,110<32%>, including engine/rudder trouble, man overboard, human injuries or fatalities, etc.) and followed by grounding(410<12%>) and collision (358<10%>),
- as for the causal factors, so-called Force Majeure owing to mainly unusual weather/sea conditions is the major cause(1,318<38%>), followed by human error(1,302<37%>), and structural defects(868<25%>).

An outline of sea accidents(1982/83 - 1995/96), arranged by the Section of Ship Accidents based on the reports from various sub sections, is shown in Table 8.5.

8.6 Strategy for Promoting Navigation Safety in Ports

This chapter has dealt with certain aspect of navigation safety in ports. It is a complex issue, however, involving physical, structural conditions as well as human behavior.

The main focus of study hereafter, through the period for the Interim Report and the second site survey, will be on matters closely relevant to the subject including;

- seaworthiness of Indonesian merchant fleet and their survey system,
- training and certification of Indonesian seafarers,
- search and rescue activities for sea accidents in Indonesian waters,
- introducing Vessel Traffic Service wherever it is necessary for raising safety and productivity.

Table 8.5 Outline of Sea Accidents (1982/83 - 1995/96)

Year	Type of Ship				Gross Tonnage			Kind of Accidents				Causal Factor						
	Motor Ship	Motor w/Sail	Sailing Ship	Barge	Total	under 35	35-75	over 75	Collision	Ground-ing	Fire	Sink-ing	Others	Total	Human Caused	Force Majeur e	Struc-tural	Total
1982/83	230	106	30	8	374	99	180	95	37	47	15	171	98	368	163	116	89	368
1983/84	208	108	11	4	331	77	155	99	26	37	5	121	117	306	100	106	100	306
1984/85	191	111	28	5	335	94	158	83	30	34	12	138	109	323	123	110	90	323
1985/86	211	106	30	10	357	137	129	91	14	30	4	158	141	347	114	146	87	347
1986/87	195	59	17	11	282	93	112	77	19	23	9	107	115	273	55	111	107	273
1987/88	193	50	6	7	256	85	99	72	24	26	7	107	68	232	75	112	45	232
1988/89	201	53	17	17	288	112	86	90	12	30	7	120	94	263	84	117	62	263
1989/90	177	51	15	19	262	92	88	82	24	24	2	101	86	237	81	125	31	237
1990/91	187	34	18	22	261	90	82	89	23	29	15	79	76	222	91	91	40	222
1991/92	160	40	16	15	231	85	60	86	17	30	6	82	63	198	86	68	44	198
1992/93	171	34	4	13	222	80	64	78	23	25	12	75	47	182	92	44	46	182
1993/94	120	22	3	7	152	60	40	52	14	24	3	65	27	133	63	38	32	133
1994/95	125	40	8	10	183	55	43	85	30	26	13	62	24	155	71	49	35	155
1995/96	126	27	0	9	162	44	60	58	21	13	21	54	22	131	51	46	34	131
1996/97	109	11	6	14	141	30	37	74	18	12	16	40	22	108	53	39	16	108
Total	2,604	852	210	171	3,837	1,233	1,393	1,211	332	410	147	1,480	1,109	3,478	1,302	1,318	868	3,478

Source: Section of Ship Accident, DGSC

8.7 Dredging

During the nineteen sixties, dredging works was conducted by the government, that is the Dredging Service under the Directorate General of Sea Communications. In 1964, the Dredging Department became a part of the Harbour State Enterprise(Port Administration).

In 1984, the status of Dredging Service was transformed into PERUM PENERUKAN (Public Corporation for Dredging Service), which is one of the State Owned Company under the Department of Communications.

In accordance with the company development, the status of Public Corporation was changed to be a limited liability company which called PT.(Persero) Pengerunkan Indonesia or abbreviated as PT. RUKINDO(Indonesia Dredging state limited Company), in 1991.

8.7.1 Dredging Area and Volume

Dredging works are conducted at about forty ports in Indonesia. The name of ports, dredged volume and site conditions are listed in Table 8.7.1.

8.7.2 Dredging Vessels

Now, PT. RUKINDO has a fleet of twenty seven dredgers consists of fourteen Trailing Suction Hopper Dredgers, four Cutter Suction Dredgers, two Sand Pump Dredgers and seven Grab/Clamshell Dredgers.

(1) Trailing Suction Hopper Dredger

Fourteen trailing suction hopper dredgers are working at several ports in Indonesia. Table 8.7.2 shows names, specifications, working areas and dredging realizations of trailing suction hopper dredgers.

(2) Grab/Clamshell Dredger

There are seven grab/clamshell dredgers and working at several ports in Indonesia. Table 8.7.3 shows names, specifications, working areas and dredging realizations of grab/clamshell dredgers.

(3) Cutter Suction Dredger

There are four cutter suction dredgers and working at several ports in Indonesia. Table 8.7.4 shows names, specifications, working areas and dredging realizations of cutter suction dredgers.

(4) Sand Pump Dredger

There are two sand pump dredger in Indonesia. Table 8.7.5 shows names, specifications, working areas and dredging realizations of sand pump dredgers.

8.7.3 Dredging Implementation

Implementation of the dredging works at ports and shipping channels are listed in Table 8.7.6 for 30 years. Table 8.7.7 shows National budget for port development, maritime safety and pioneer shipping. Figure 8.7.1 shows dredged volume, Figure 8.7.2 shows dredging cost, and Figure 8.7.3 shows specific cost of dredging by fiscal years.

Table 8.7.1. The names of ports and dredged volume

Unit: '000m³

No.	Name of Port	Abbreviation	Realization of Year I 1994/1995	Realization of Year II 1995/1996	Realization of Year III 1996/1997	Realization of Year IV 1997/1998	Plan of Year V 1997/1998	Site			Slope
								Length(m)	Width(m)	Depth(m)	
1	Belawan	Bel	1,655.77	1,805.88	1,800.00	1,800.00	1,800.00	15,500	100	9.5	1:5
2	Kuala Langsa	Plg	2,300.00	2,300.00	2,300.00	2,300.00	2,300.00	80,000	100	6.5 to 7	1:6
3	Palembang										
4	Pangkal Balam										
5	Tanjung Pandan										
6	Muntok										
7	Jambi	Jbi	350.00	350.00	350.00	350.00	350.00	8,100	70	4.5	1:8
8	Kuala Tungkal										
9	Muara Pandang										
10	Air Bangis										
11	Bengkulu	Bkl	250.00	1,172.55	193.20	250.00	1,000.00	2,700	80	10.0	1:4
12	Cirebon										
13	Karangantu	Crb	350.23	75.06	350.00	350.00	350.00	4,000	100	10.0	1:5
14	Samarang										
15	Juwana										
16	Tegal	Teg	100.00	80.00	100.00	100.00	100.00	2,000	50	3.0	1:4
17	Batang										
18	Pekalongan										
19	Rembang										
20	Cilecep	Sba	800.00	800.00	800.00	800.00	800.00	10,000	100	9.5	1:5
21	Surabaya										
22	Probolinggo										
23	Pasuruan										
24	Kalianget										
25	Pontianak	Ptn	1,700.00	1,700.00	1,700.00	1,700.00	1,700.00	12,000	80	5.5	1:5
26	Sintete										
27	Banjarmasin										
28	Samarinda										
29	Kumai	Kum	780.00	2,169.46	1,333.33	500.00	700.00	14,000	60	5.5	1:6
30	Sampit										
31	Pulang Pisau										
32	Gorontalo										
33	Manado	Smd	1,477.43	90.00	90.00	90.00	90.00	23,435	60	7.0	1:6
34	Luwuk										
35	Benoa										
36	Lembar	Lem	100.00	100.00	100.00	100.00	100.00	1,200	60	6.0	1:8
37	Nabire										
38	Serui										
39	DKI Jakarta										
40	Tanjung Emas	Tpk	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	2,100	100	9.0	1:4
41	Tanjung Priok										
TOTAL			10,162.08	11,859.13	12,006.77	13,358.20	16,340.00				

Source: DGSC

Table 8.7.2 Trailing Suction Hopper Dredgers

Name of Ship	Overall Length (m)	Mudged Breadth (m)	Mudged Dept (m)	Loaded Draught (m)	Gross Tonnage (TON)	Net Tonnage (TON)	Output Propulsion Machinery	Power of Dredgers Pumps	Dredging Depth (m)	Hopper Capacity (m ³)	Dredging Capacity		Dredging Realization (m ³ /Year)	Shipyard	Ports
											Water (m ³ /h)	Mixture (m ³ /h)			
BALI II	124.40	18.04	8.05	7.00	10,420.00	8,620.00	2x3,000kw	800/1,300KW	30	5,000	12,000	5,400	3,000,000	V&W/Germany 1993	Plg,Bel,Tpk
ARU II	124.40	18.04	8.05	7.00	10,420.00	8,620.00	2x3,000kw	800/1,300KW	30	5,000	12,000	5,400	3,000,000	V&W/Germany 1994	Tpk
IRIAN JAYA	109.88	18.04	8.05	6.33	5,179.20	2,469.08	2x1,795HP	2x898HP	20	4,000	7,970	3,580	2,000,000	O&K/West Germany/1981	Bel,Smld,Tpk,Plg,Bel
KALIMANTAN	109.88	18.04	8.05	6.33	5,097.52	2,469.08	2x1,795HP	2x898HP	20	4,000	7,970	3,580	2,000,000	O&K/West Germany/1981	Bel,Tpk,Sba
SULAWESI II	92.50	16.00	8.00	7.33	4,179.85	1,179.00	2x1,900HP	2x900HP	20	3,000	7,500	3,375	1,200,000	IHC/Holand/1975	Tpk,Plg
BETUAH	92.50	16.00	8.00	7.33	3,932.00	1,179.00	2x1,900HP	2x900HP	20	3,000	7,500	3,375	1,500,000	IHC/Holand/1977	Bjm,Smld,Tpk,Sba
SERAM	92.50	16.00	8.00	7.30	3,932.00	1,179.00	2x2,100HP	2x900HP	20	3,000	7,500	3,375	1,500,000	IHC/Holand/1981	Ptn,Tpk
HALMAHERA	92.50	16.00	8.00	7.33	3,932.00	1,179.00	2x2,100HP	2x900HP	20	3,000	7,500	3,375	1,500,000	IHC/Holand/1983	Bjm,Smld,Tpk
TIMOR	95.00	18.40	7.00	3.00	4,145.34	1,989.34	2x2,100HP	2x550HP	20	2,000	5,000	2,250	1,000,000	IHI/Japan/1980	Plg,Tpk
FLORES	95.00	18.40	7.00	5.00	4,145.34	1,989.34	2x2,100HP	2x550HP	20	2,000	5,000	2,250	1,000,000	IHI/Japan/1983	Ptn,Bjm,Tpk
BANDA	71.10	14.00	4.90	4.05	1,629.34	797.80	2x846HP	1x438HP	14	1,000	2,500	1,125	600,000	IHC/PT,Doc/IND/1984	Ptn,Smld,Sba,Crb
NIAS	84.90	14.00	4.90	4.05	1,629.34	797.80	2x846HP	1x438HP	14	1,000	2,500	1,125	600,000	IHC/PT,Doc/IND/1984	Ptn,Smld,Spt,Sba
NATUNA	84.90	14.00	4.90	4.05	1,629.34	797.80	2x488HP	1x438HP	14	1,000	2,500	1,125	600,000	IHC/PT,Doc/IND/1984	Sba,Crb
LOMBOK	64.90	13.00	5.48	3.50	1,660.37	560.45	2x750HP	1x700HP	10	750	4,800	2,160	100,000	IHI/Japan/1974	Tpk

Source: PT. RUKINDO

Table 8.7.3 Grab/Clamshell Dredgers

Name of Ship	Overall Length (m)	Moulded Breadth (m)	Moulded Depth (m)	Grab Capacity	Dredging Dept (m)	Machinery For Grab	Dredging Capacity		Dredging Realization (m ³ /Year)	Shipyard/Build Year	Ports
							Water (m ³ /h)	Mixture (m ³ /h)			
SINGKARAK	26.00	11.00	2.50	5.50m ³	14.00	1x325HP	180	162	200,000	Indonesia/1981	Tpk,Sba
BATUR	28.00	13.00	2.60	7.00CbY	20.00	1x455HP	240	216	200,000	Pelita Bahari/IND/1985	Dum,Bel
RANAU	28.00	13.00	2.60	7.00CbY	20.00	1x455HP	240	216	300,000	Pelita Bahari/IND/1985	-
POSO	28.00	13.00	2.60	7.00CbY	20.00	1x455HP	240	216	300,000	Pelita Bahari/IND/1985	-
TONDANO	28.00	13.00	2.60	7.00CbY	20.00	1x455HP	240	216	300,000	Pelita Bahari/IND/1985	-
MANINJAW 93/III	25.92	9.13	2.03	3.50m ³	7.00	1x211HP	180	162	150,000	Singapore/1976	Sba
TOWUTI	26.00	13.00	1.60	2.50m ³	7.00	1x160HP	180	162	100,000	PT.Dok/IND/1977	-

Source: PT. RUKINDO

Table 8.7.4 Cutter Suction Dredgers

Name of Ship	Overall Length (m)	Moulded Breadth (m)	Moulded Depth (m)	Diameter of Suction pipe (inch)	Dredging Depth (m)	Power of Dredging Pump	Dredging Capacity		Dredging Realization (m ³ /Year)	Shipyard	Ports
							Water (m ³ /h)	Mixture (m ³ /h)			
BATANG ANAI	80.00	18.50	7.00	30	24.00	1x2,650KW	9,000	2,000	1,600,000	V&W/Germany/1994	Bkl.Sba
MUSI 30	41.45	13.41	2.90	30	17.68	1x3,600HP	4,800	1,200	600,000	Ellicott/USA/1977	Bim.Sba
KAPUAS 30	41.45	13.41	2.90	30	17.68	1x3,600HP	4,800	1,200	250,000	Ellicott/USA/1977	Bkl.Sba
MAHAKAM 24	41.45	13.41	2.90	24	17.68	2x1,225HP	4,000	1,000	250,000	Ellicott/USA/1976	Bim.Sba

Source: PT. RUKINDO

Table 8.7.5 Sand Pump Dredgers

Name of Ship	Overall Length (m)	Moulded Breadth (m)	Moulded Depth (m)	Dredging Dept (m)	Power of Dredging Pump	Dredging Capacity		Dredging Realization (m ³ /Year)	Shipyard	Ports
						Water (m ³ /h)	Mixture (m ³ /h)			
AGUNG	48.10	14.66	4.10	40.00	1x681KVA				O&K/West Germany/198 Modification 1996	-
MERAPI	48.10	14.66	4.10	40.00	1x681KVA	1,800	600	250,000	O&K/West Germany/198 Modification 1992	-

Source: PT. RUKINDO

Table 8.7.6 Implementation of dredging

No.	FISCAL YEAR	VOLUME OF MUD DREDGED (m ³ SITU SOIL)		COST (Rp.)	
		PLAN	REALIZATION	PROVIDED	REALIZATION
1	1969/1970	9,741,000	9,772,679	1,028,000,000	838,044,888.13
2	1970/1971	6,096,424	10,484,462	724,400,000	551,038,275.34
3	1971/1972	9,600,000	11,207,263	1,600,000,000	1,323,308,030.34
4	1972/1973	9,000,000	12,100,172	1,499,900,000	1,411,656,855.25
5	1973/1974	5,164,755	7,568,793	1,600,000,000	1,581,088,211.00
6	1974/1975	7,035,000	9,118,026	2,192,500,000	1,968,411,505.00
7	1975/1976	9,177,950	12,091,052	3,665,500,000	2,884,017,877.00
8	1976/1977	9,350,245	12,413,950	4,000,000,000	3,827,689,448.00
9	1977/1978	11,284,408	12,247,168	5,021,300,000	4,906,139,671.00
10	1978/1979	12,536,000	15,764,843	5,272,500,000	4,888,812,311.00
11	1979/1980	15,040,540	15,737,908	5,212,200,000	5,090,220,560.75
12	1980/1981	17,082,950	19,841,068	6,801,011,600	5,111,073,091.50
13	1981/1982	17,207,625	19,623,400	7,545,012,000	7,523,998,769.69
14	1982/1983	16,894,425	19,387,117	7,986,052,000	6,151,287,088.00
15	1983/1984	15,727,000	16,385,609	6,445,601,000	6,447,739,744.00
16	1984/1985	13,030,400	14,186,449	6,211,855,000	6,201,000,000.00
17	1985/1986	11,416,534	12,582,272	6,023,000,000	6,010,000,000.00
18	1986/1987	11,817,773	11,972,165	5,618,955,000	5,600,800,000.00
19	1987/1988	7,200,122	7,570,665	3,315,725,000	3,314,300,000.00
20	1988/1989	9,014,850	11,934,050	9,128,515,000	9,125,450,000.00
21	1989/1990	12,020,000	12,793,247	13,450,024,000	13,445,250,000.00
22	1990/1991	16,254,000	16,130,448	16,850,000,000	16,838,750,000.00
23	1991/1992	21,886,982	14,366,127	26,785,000,000	26,775,600,000.00
24	1992/1993	14,933,000	13,707,522	25,549,738,000	24,444,203,000.00
25	1993/1994	21,106,257	13,349,700	42,045,850,000	22,874,000,000.00
26	1994/1995	10,400,000	10,162,080	26,808,000,000	26,587,990,000.00
27	1995/1996	14,181,000	11,859,130	40,328,000,000	31,796,360,000.00
28	1996/1997	10,650,000	12,006,770	32,531,000,000	32,282,880,000.00
29	1997/1998	14,115,000	13,358,200	48,234,000,000	42,119,400,000.00
30	1998/1999	10,725,000	15,400,000	40,422,000,000	51,583,640,000.00

Source: DGSC

Table 8.7.7 National budget for port development, maritime safety and pioneer shipping
(Unit: million Rp.)

Item		FY1995	FY1996	FY1996
Port development	Government	119,925	124,844	133,186
	Foreign loan	137,560	101,972	150,894
	Total	257,485	226,816	284,080
Maritime safety (FASP) *()=for dredging	Govrnmnt	75,594 (31,864)	82,823 (32,500)	97,805 (42,341)
	Foreign loan	196,871 (0)	43,482 (0)	41,943 (0)
	Total	272,465 (31,864)	126,305 (32,500)	139,748 (42,341)
Pioneer shipping (Artis=Armada Perintis)	Government	24,455	40,689	41,333
	Foreign loan	0	0	0
	Total	24,455	40,689	41,333
Grand total	Government	219,974	248,356	272,324
	Foreign loan	334,431	145,454	192,837
	Total	554,405	393,810	465,161

Source: DGSC

Figure 8.7.1 Dredged Volume

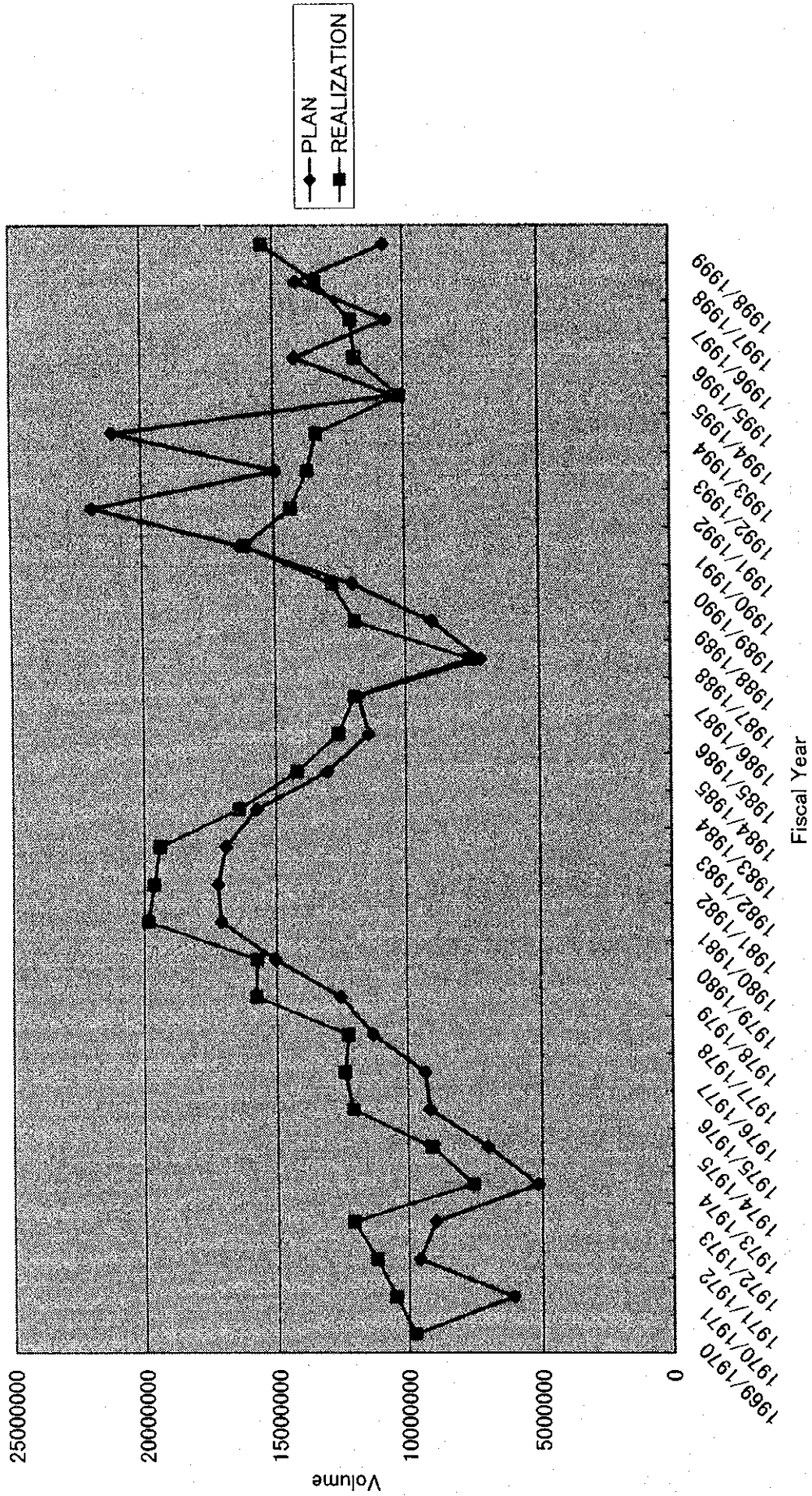


Figure 8.7.2 Dredging Cost

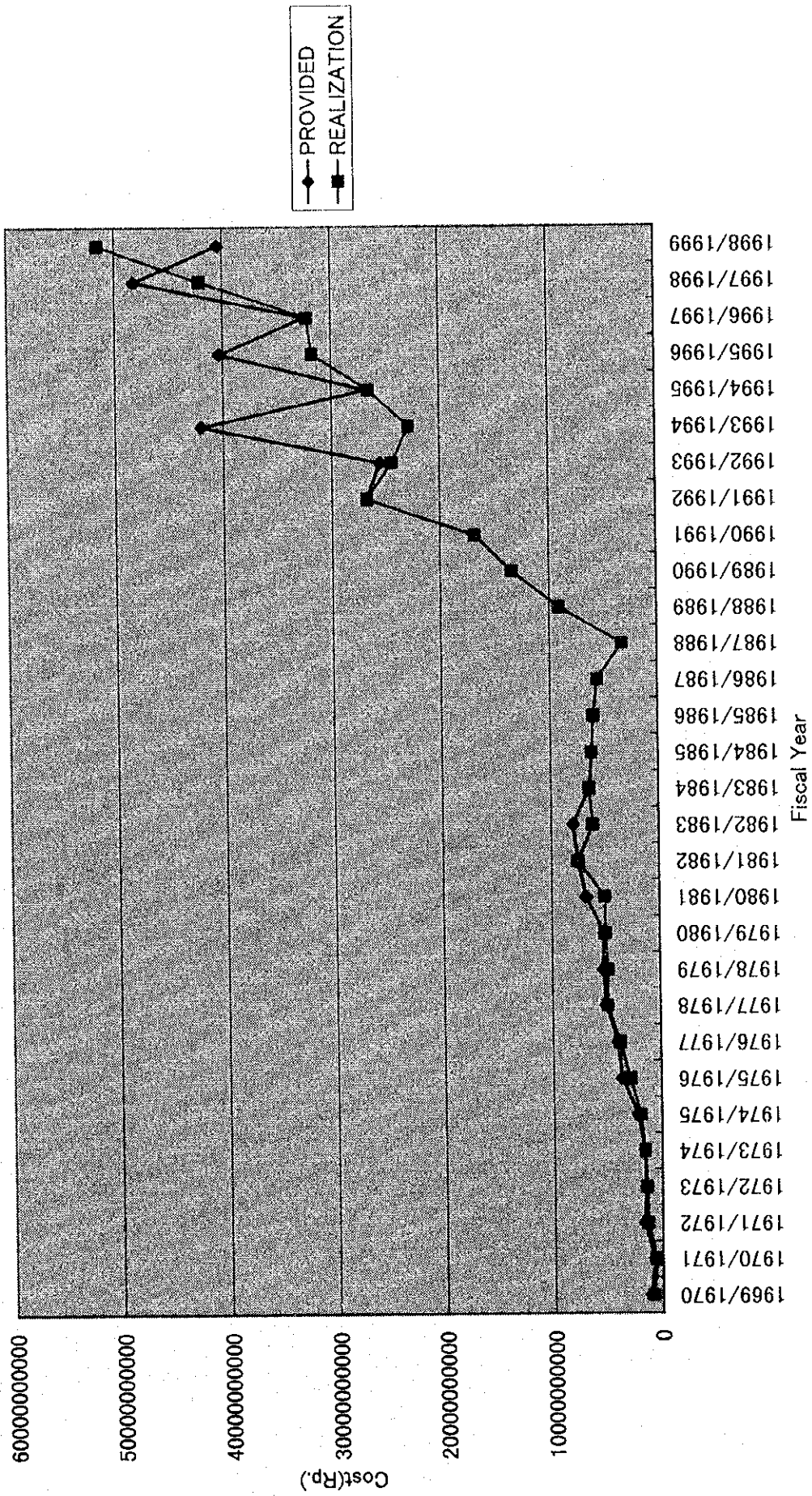
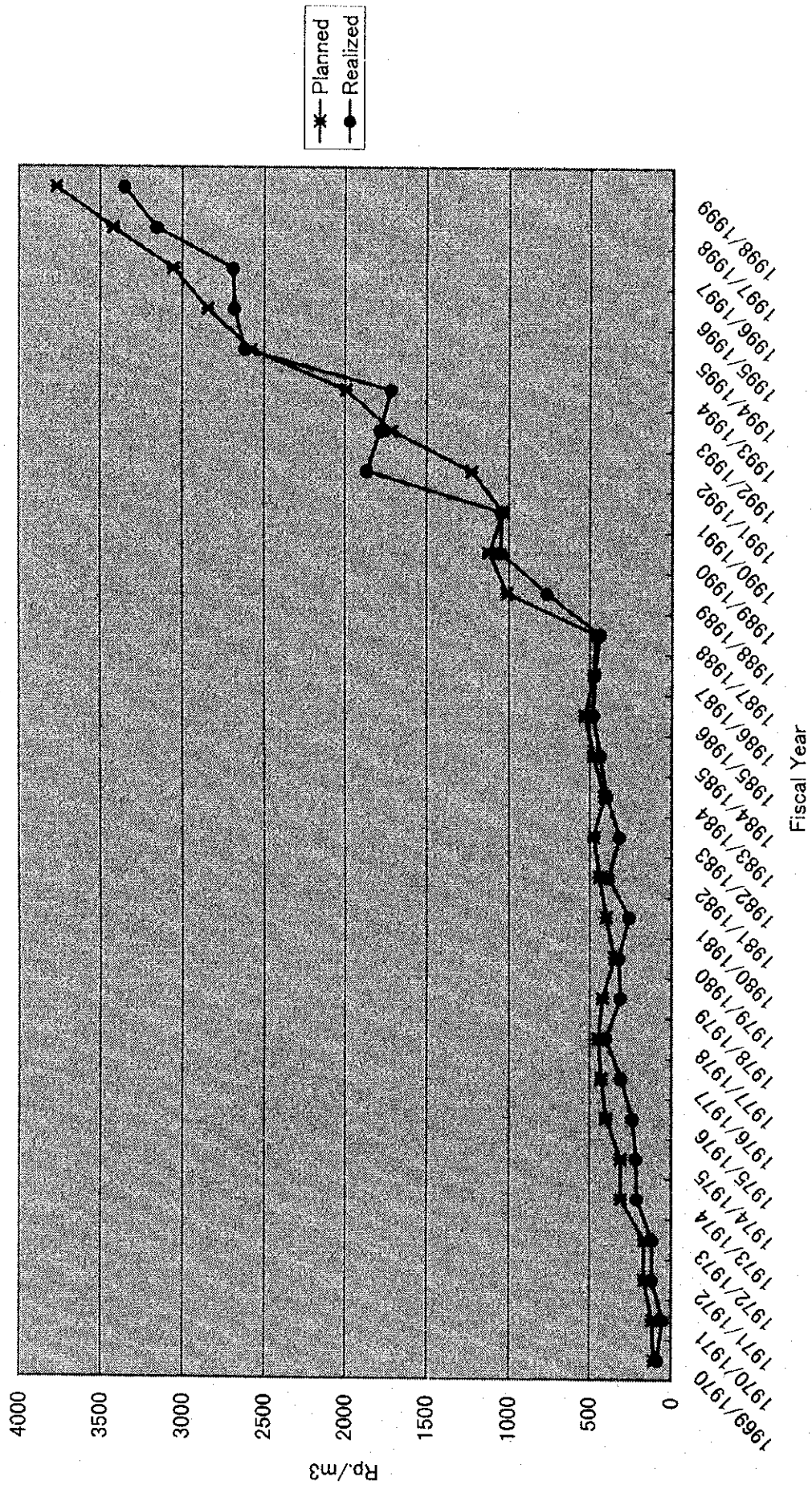


Figure 8.7.3 Specific Cost of Dredging



Chapter 9 PORT FACILITIES

9.1 Port Facilities

9.1.1 Port System in Indonesia

(1) General

The seaports in Indonesia are categorized into two kinds of port in accordance with shipping law No.21/1992. One is public port to support public service under the Ministry of Communication and the other is special port to support a certain industrial purpose under the private company. Besides these ports, there are ferry terminals under the Ministry of Communication, Directorate General of Land Transportation (DGLT) and fishery ports under the Ministry of Agriculture, Directorate General of Fisheries and Provincial Government.

(2) Public Port

The Public ports in Indonesia are classified into two categories, commercial port and non-commercial port. The commercial ports are managed by four State owned companies (Indonesian Port Corporation I ~IV) and non-commercial ports are directly managed by government local offices (KANPEL) or its working units (SATKER). The number of ports located in each province is summarized in Table 9.1.1.

The 112 commercial ports are mainly operated to conduct international and major domestic trade and the operational bodies (Indonesian Port Corporation I ~IV) are established based on PR56,57, 58,59/1991 in order to improve business efficiency and effectiveness of port.

The almost every non-commercial port are located in relatively small hinterland or remote area and supporting to transport the commodities and passengers for local residents with small ship service (PERLA and PERINTIS). In 1998, two non-commercial ports are transferred to commercial port (Tg.Balai Karimun and Kuala Enok in RIAU Province) under IPC I , and 544 non-commercial ports are officially registered at present.

(3) Special Port and Special Wharf

Based on the data in 1994, there are 1,233 special ports and the port facilities are constructed and operated by private companies to handle specified commodities and passengers such as wood products, oil product, fish, fertilizer tourism and so on. The special port or wharf is developed under the permission of Minister of Communication.

In the case that the port facilities are located in commercial port working area (Special wharf), the maritime operation is controlled by Indonesia Port Corporation and in the other case (Special port) that is controlled by KANPEL. It is prohibited to use the special port for public purpose except in special circumstance such as natural disasters with Government permission.

(4) Ferry terminal

Ferry transportation is carried out using sea, river and lake and is defined as "shuttle service" linking two points/terminals in Ministry degree No.64/1989. At present 108 routes with 153 ferry terminals are operating whole region of Indonesia including long distance service (for example between Jakarta and Surabaya).

Table 9.1.1 Number of ports in each province

Province	Commercial Port		NonCom Port	Special	Ferry	Total
	Adn.	Number				
1. D.I Aceh	IPC I	6	10	25		
2. North Sumatra	I	8	45	53		
3. Riau	I	12	43	115		
4. West Sumatra	IPC II	3	6	7		
5. Jambi	II	3	8	45		
6. South Sumatra	II	8	3	69		
7. Bengkulu	II	1	3	2		
8. Lampung	II	1	11	5		
Sub-Total		42	129	321	27	519
9. West Jawa	IPC II	3	13	35		
10. DKI. Jakarta	II	3	0	23		
11. Central Jawa	IPC III	3	10	56		
12. Yogyakarta	III	0	0	1		
13. East Jawa	III	8	18	35		
14. Bali	III	3	7	18		
Sub-Total		20	48	168	19	255
15. West Kalimantan	IPC II	7	4	196		
16. Central Kalimantan	IPC III	8	3	111		
17. South Kalimantan	III	2	4	94		
18. East Kalimantan	IPC IV	5	13	138		
Sub-Total		22	24	539	26	611
19. South Sulawesi	IPC IV	4	37	7		
20. Southeast Sulawesi	IV	1	33	9		
21. Central Sulawesi	IV	2	22	42		
22. North Sulawesi	IV	3	36	30		
Sub-Total		10	128	88	19	245
23. West Nusa Tenggara	IPC III	3	12	19		
24. East Nusa Tenggara	III	5	30	19		
25. East Timor	III	1	9	2		
26. Maluku	IPC IV	3	56	25		
Sub-Total		12	107	65	47	231
27. Irian Jaya	IPC IV	6	108	32	15	161
Total		112	544	*1,213	**153	2,022

Note : * Number of special ports in each province is based on data at 1994

** Number of ferry terminals is based on "the development study on nationwide ferry service route in Indonesia"

Source : DGSC

9.1.2 Port Facilities Development During REPELITA I ~ VI

(1) Outline of Port Facilities Development during REPELITA I ~ VI

During REPELITA I ~ VI various kind of port facilities were developed based on a phased approach. In initial phase of port facilities development, it is focused on to provide adequate facilities at four major ports (Tg.priok, Tg.perak Belawan and Makassar). In second phase, the master plan and detail design of main 43 ports identified in Integrated Sea Transportation System (ISTS) are prepared. In recent phase corresponding to rapid growth of container cargo, the development of container handling terminal started in REPELITA V at main port (Tg.priok, Tg.perak and Belawan) and the government budget allocated for construction and/or rehabilitation of non-commercial port, especially in remote area and eastern Indonesia.

Table 9.1.2 History of the Port Development Facilities until the end of REPELITA VI

	Quay (m)	Shed (m ²)	Open Strage / Container Yard	
			Conventional (m ²)	Container (m ²)
In the bigining of REPELITA I	28,363	583,327	35,167	
In the end of REPELITA I (During REPELITA I)	29,545 (1,182)	595,027 (11,700)	35,167 (0)	
In the end of REPELITA II (During REPELITA II)	39,204 (9,659)	630,831 (35,804)	70,784 (35,617)	
In the end of REPELITA III (During REPELITA III)	50,045 (10,841)	675,161 (44,330)	216,024 (145,240)	
In the end of REPELITA IV (During REPELITA IV)	60,067 (10,631)	700,731 (25,570)	400,974 (184,950)	
In the end of REPELITA V (During REPELITA V)	71,051 (10,374)	740,205 (39,474)	565,243 (164,269)	524,583 (524,583)
In the end of REPELITA VI (During REPELITA VI)	87,607 (16,556)	769,305 (29,100)	(1,594,436) (1,029,193)	

Source : DGSC

From REPELITA I to REPELITA V, port facilities and equipment has been developed either through national budget or through foreign loan (IBRD, ADB, KFW, OECF, DUTCH, etc.). But during REPELITAVI the activities of IPC/Private are very effective for development of port facilities and 65% of expenditure is supported by IPC/Private.

(2) Review of Port Facilities Development during REPELITAVI

1) Basic Principle for Port Facilities Development

Based on general and basic direction for sea transportation, the basic principle for development of port facilities during REPELITAVI is as follows.

- Increasing the number of international ports which are open to directly international cargo and passenger
- Upgrading full or semi-container ports corresponding to rapid growth of containerization
- Increasing the handling capacity of dry and liquid bulk
- Improve non-commercial port activity to support the living standard in isolated area

2) Plan for Port Facilities Development

The main targets of port development which are planned to be constructed during REPELITAVI are as follows.

(a) Berth	14,850	m
(b) Shed	80,000	m ²
(c) Open storage	900,000	m ²
(d) Passenger Terminal	24,250	m ²
(e) Equipment	50	Unit

And main facilities planned to be developed and its location are as follows.

(a) Container Berth	25 Ports	
- Full	8 ports	Belawan, Tg.priok, Tg.Perak (started during REPELITA V) Panjang, Tg.Emas, Makassar, Bojonegara, Batam
- Semi	7 ports	Tg.Pinang, Pekanbaru, Pontianak, Banjarmasin, and others)
- Conventional	10 ports	Lhok Seumawe, Dumai, Palembang, Balikpapan, Samarind, Tenau, Bitung, Ambon, Sorong, Biak
(b) Break bulk	36 ports	
(c) Dry/Liquid bulk	13 ports	
(d) Passenger	23 ports	
(e) Pioneer/Rakyat	158 ports	(Pioneer port 80 and Rakyat port 78)

3) Result of Port Facilities Development until 4th year of REPELITAVI

The realization of main port facilities until fourth year of REPELITAVI are shown in Table C.9.1.2 in Appendix C. The realization ratio of each facility are as follows.

Table 9.1.3 Result of Port Facilities Development

		Main Tergt	Until 4th year Result	Realization Ratio (%)
1	Berth (m)	14,850	14,358	96.6
2	Shed (m ²)	80,000	25,990	32.5
3	Open storage (m ²)	900,000	725,005	80.6
4	Passenger Terminal (m ²)	24,250	18,952	78.1
5	Equipment (Unit)	50	22	44.0

Source : DGSC

The estimated value of main target for fifth year of REPELITAVI is also shown in Table C.9.1.2. According to this estimation, all main target except shed facilities will be realized.

But for government portion the realization ratio is 53% by expense and for IPC/Private portion the realization ratio is 187% by expense. IPC/Private, therefore, mainly supports the realization of the main target.

Main port facilities constructed until fourth year of REPELITAVI are as follows.

- (a) Full Container Berth 5 Ports
Tg.priok Panjang Tg.Emas Tg.Perak Makassar
- (b) Semi Container Berth 4 ports
Pontianak Banjarmasin Teluk Bayur Palembang
- (c) Conventional and Break bulk 26 ports
Belawan, Dumai, Tg.Pinang, Teluk Bayur, Panjang, Dili, Tg.Emas, Bima, Lembar, Kendari, Ambon, Biak, Pakanbaru, Pare-Pare, Merauke, Anggrek, Gresik, Muala Sabak, Talang Dukuh, Sampit, Makassar, Samarind, Batulicin, Parwang, Balikpapan, Kotabaru
- (d) Pioneer/Rakyat 136 ports

4) Container Berth Development

Container berth development in REPERITAV and VI is summarized as follows and detail data is shown in Table C.9.13 of Appendix C. Total berth length of full container terminal is 4,495m and 800m in Sumatra, 3,205m in Jawa, 490m in Sulawesi, in each region, respectively.

Belawan port	Gobion Berth	Full Container	500m	Semi Container	350m
Tg.priok port	CT I	Full Container	900m		
	CT II	Full Container	510m		

	CTIII	Full Container	450m
Tg.Perak Port	TPK I	Semi Container	420m
	TPK II	Full Container	500m
	TPKIII	Full Container	500m
	Inter Island	Semi Container	450m
Panjang	Berth E	Full Container	300m
Tg.Emas	Container	Full Container	345m
Makassar	New Hatta	Full Container	490m
Banjarmasin	Trisakti	Semi Container	200m
Pontianak	Wharf 07/08	Semi Container	200n
Teluk Bayur		Semi Container	100m

5) Non-commercial Port Development

One of the main targets of REPELITAVI is to improve the non-commercial port activity to support the living standard in isolated area. Until fourth year of REPELITAVI, 113 berthing facilities are constructed or upgraded in 23 province and 60% of them are developed in eastern part of Indonesia including 11 ports facilities financed by Maritime Transportation Sector Loan (by OECF). But still 282 non-commercial ports have not efficient berthing facilities. The other hand, according to the result of technical studies performed for port development, 25 new locations are selected to construct port facilities because of the feasibility or environmental condition especially in wave condition (breakwater construction required for ordinary service). Detail data for non-commercial port development are summarized in Table C.9.1.4 and C.9.1.5.

6) External Assistance in the port facilities development

The external assistance during REPELITA V (1988/1989-1993/1994) and REPELITA VI (1994/1995-1998/1999) and future assistance plan (during REPELITAVI and proposal for external assistance) are summarized in Table C.9.1.6 in Appendix C. The port facilities developments with foreign assistance during REPELITAVI are mainly supported by OECF and ADB and the development projects are effectively supporting social economic and transportation activities.

9.1.3 Existing Port Facilities

(I) Main Ports

In order to understand the present situation of the port facilities in Indonesia, 88 ports are selected as main ports based on the national transportation system (SISTRANAS) in which classification of the each port designated and considering the activities and the location of commercial ports. And some non-commercial ports are selected to supplement some region located far away from commercial port. The detail data for each port are collected and

summarized in Table C.9.1.7 in Appendix C.

According to these data several ports are characterized as follows.

Well developed port	Belawan	Tg. Priok	Tg. Perak	
Long access channel	Pakanbaru	Dumai	Palembang	Tg. Perak
	Kuala Kapus	Samarinda	Kotabaru	
Large land area	Belawan	Palembang	Pangkal Balam	Bengkulu
Large sea are	Kuala Langasa	Ambon	Sorong	Tarakan

(2) Other ports

Other ports are mainly developed for local economic society and its facilities are very limited, in general, such as up to 100m length of berth with 5m depth detouched type berth. And about 50% of non-commercial port and some commercial ports have no berthing facilities, see Table C.9.1.4 and C.9.1.5 in Appendix C.

(3) Special port

Special ports were constructed only for private use and prohibited, in general, to use public purpose. Therefore, there are a lot of kind of port facilities included very large industrial port such as PT.Kurakatau Steel, PT.Asahimas Subetra Chemical, PT.Cilegon Fabricator in Banten area or rather small tourism Pier such as PT.Pembangunan Jaya Ancol, PT.Pulau Seribu Paradise, PT. Matahari Impian Indah in Tg.Priok area. And some data indicate that larger volume of cargo are handled by special port compared to public port (for example 85% of cargo handled by non public wharf in IPCIV area described in "Port Development in Eastern Indonesia"). The total number of special port in each province and their main activity are summarized in Table C.9.1.8 in Appendix C.

9.1.4 Port Master Plan

At 43 main port, master plan has been prepared funded by IBRD, ADB, OECF, Dutch and K.F.W during the end of 1970's and the beginning of 1980's and several port master plans revised these days.

In 1996 Government Regulation 70/1996 is issued in which detail requirement for port affairs are defined and all ports have to prepare port master plan.

The master plan concept study has been started on main port in order to clarify the role of each port and define the port working area with related organization such as local government, Ministry of Home Affair and so on. In 23 commercial ports, the master plan concepts are prepared in 1996 to define the main function of the port and future development plan until 2018. The summary of preparation and review of master plan and master plan concept are shown in Table 9.1.4

Table 9.1.4(1) Port Master Plan and Master Plan Concept

No.	Province	Location	Port Classification by SISTRANAS	Port Master Plan Study				Master Plan Concept		
				Prepared Updated Not yet	Final Report Date	Target year	Name of Study	Fund & Consultant	Target year	Study Name
1 (1)	ACEH	Sabang		(FS)Prepared	Jun.1998	2003	Detail development study for Sabang			
		Lhok Seumawe	Tertiary	Prepared Updating	1985 Mar.1998	2018	Master Plan and Feasibility Study Review of Master plan	IBRD, Halcrow/PCI IPC I, PT Widya Pertiwi Eng.	2018	Master Plan for Lokseumawe Port at 2018
		Malahayati	Regional	Not Yet					2000	Master Plan for Malahayati Port at 2000
		Melaboh		Not Yet						
		Kuala Langsa	Regional	Prepared	1986	2005	Master Plan for Kuala Langsa Port	DIP/IBRD Swakelola	2000	Master Plan for Kuala Langsa Port at 2000
		Pangkalan Susu		Not Yet						
		Belawan	Secondary	Prepared Updated	1983 Nov.1996	2003 2018	Master Plan and Feasibility Study of Belawan Technical Assistance TAN No.286 Port	ADB, Sir Bruce, Wolfe, White, Barry, William Halcrow & part Ltd.	2018	Master Plan for Belawan Port at 2018
		Kuala Tanjung	Regional	(FS)Prepared	Jun.1998	2003	Detail development study for Kuala Tanjung			
		Tg.Balai Asahan		Not Yet						
		2 (1)	SUMATRA	Sibolga	Regional	Prepared Updated	1984 1987	2004 2007	Master Plan for Sibolga Review fo Master plan for Sibolga	IBRD Lavalin-Geodata IPC I, PT Widya Pertiwi Eng.
Dumai	Tertiary			Prepared Updated	1985 1993	2000 2013	Master Plan and Eng Design Review fo Master plan for Dumai	JICA PCI(Japan) IPC I, PT Widya Pertiwi Eng.	2018	Master Plan for Dumai Port at 2018
Tg.Pinang	Tertiary			Prepared (FS)Prepared	1993 1996	2003 2015	Review fo Master plan Review of indication and F/S	IPC I, PT Indah Karva IPC I, PT Widya Pertiwi Eng.	2015	Master Plan for Tg. Pinang Port at 2000
Pekanbaru	Tertiary			Prepared (FS)Prepared	1986 1995	2005 2015	Master Plan for Pekanbaru Port Review fo Master plan for Pekanbaru	IBRD/DIP Individual Expert/DGSC IPC I, PT Widya Pertiwi	2015	Master Plan for Pekanbaru Port at 2000
Bagan Siapiapi				Not Yet						
Bengakalis				Not Yet						
Selat Panjang				Prepared	1990		Master Plan for Selat Panjang Port	IPC I		
Tembilahan				Not Yet						
Kuala Enok				(FS)Prepared	1995	2015	Master Plan for Kuala Enok Port	IPC I PT. Widya Pertiwi Eng.	2015	Master Plan for Kuala Enok Port at 2000
Tg.BalaiKarimun				(FS)Prepared	1995	1999	feasibility Study for Tg. Balai Karimun	IPC I		
Rengat		Not Yet								
Batam	Primary	Prepared	1991			Private(E/VERGREEN)				

Source : DGSC

Table 9.1.4(2) Port Master Plan and Master Plan Concept

No.	Province	Location	Port Classification by SISTRANAS	Port Master Plan Study				Master Plan Concept	
				Prepared/Updated/Not yet	Final Report Date	Target year	Name of Study	Fund & Consultant	Target year
4	WEST SUMATRA	Teluk Bayur	Tertiary	Prepared/Updated	1985/1997	2005/2020	Master Plan for Teluk Bayur Port Perencanaan Studi Tinjau Ulang	IBRD, LAVALIN(Canada) IPC II, PT. Sarana Antar Nusa	
5	JANBI	Air Bangis		Not Yet			Master Plan for Teluk Bayur Port	DIP/IBRD, Swakeloa	
5	JANBI	Jambi	Regional	Prepared/Updated	1986/Dec.1994	2005/2020	Studi Master Plan Tg. Duku & Jambi	IPC II, PT. Deserco Development	
6	SOUTH SUMATRA	Palembang	Tertiary	Prepared/Updated	1985/1997	2005/2021	Studi Master Plan for Palembang Port Studi Tinjau Ulang Master Plan	IBRD, HASKONING(Netherlands) IPC II, PT. Raditia Puspita	
6	SOUTH SUMATRA	Tg. Pandan		Preparing	1998		Studi Masterplan Pelabuhan Tanjung Pandan	IPC II, PT. Raditia Puspita	
7	BENGGKULU	Pangkal Balam	Regional	Preparing	-		Pangkal Balam dan Pelabuhan Kawasannya		
7	BENGGKULU	Bengkulu	Regional	Prepared	1986		Master Plan for Bengkulu Port	DIP/IBRD Swakeloa	
8	LAMPUNG	Panjang	Secondary	Prepared/Updated	1985/1997		Master Plan for Panjang Port	IBRD, Javalin(Canada)	Master Plan for Panjang Port at 2018
9	EAST JAWA	Banten (Ciwanda)		Prepared	Dec.1993	2020	Studi Tinjau Ulang Masterplan	IPC II, PT. Raditia Puspita	
9	EAST JAWA	Banten (Bojonegara)	Secondary	Prepared	Revaluating		Studi Tinjau Ulang Rencana Induk Pengambilan Pelabuhan Ciwandan dan Studi Penyisipan Rencana Induk Pelabuhan Umum Bojonegara	IPC II, PT. Sarana Antar Nusa Perekayasa	
9	EAST JAWA	Sunda Kelapa		Prepared	1996	2020	Studi Master Plan Pelabuhan Sunda Kelapa	IPC II, PT. Hung Jaya Consulting	Master Plan for Tg. Priok and Sunda Kelapa Port 2020
10	CENTRAL JAWA	Tg. Priok	Secondary	Prepared/Revised	1984	2004	Master plan for Tanjung Priok Port	IBRD, P. Frankel Wiratman IPC II	Master Plan for Tg. Priok Port at for 2018
10	CENTRAL JAWA	Cirebon	Tertiary/Regional	Prepared/Reviewed	1986/1995	2006	Master Plan for Cirebon Port	DIP/IBRD, Swakeloa	
10	CENTRAL JAWA	Tg. Emas	Secondary	Prepared/Updated	1978/1991		Studi Masterplan Pelabuhan Cirebon	IPC II, PT. Adhiyasa Mertani	Master Plan for Tg. Emas Port in 2018
10	CENTRAL JAWA	Tegal	Regional	Not Yet			Review of Master Plan	JICA, JFC(Japan)	
10	CENTRAL JAWA	Cilacap	Tertiary	Prepared	1984	2004	Master Plan for Cilacap Port	IBRD, HASKONING(Netherlands)	
11	EAST JAWA	Tg. Perak	Secondary	Prepared/Reviewed	1982/July 1994	2002/2010	Master Plan for Tanjung Priok Perencanaan dan kajian region port development project	ADB, R.P.T. Indulexco ADB, PCI/PT DIAGRAM/PT INDULEXCO	Master Plan for Tg. Perak and Gresik Port at 2018
11	EAST JAWA	Probolinggo		Not Yet					
11	EAST JAWA	Menang (Tg. Wangi)	Regional	Prepared	1986	2006	Master Plan for Menang Port	ADB, SOFREMER(France)	
11	EAST JAWA	Kali Anget		Prepared	1986	2006	Master Plan for Kali Anget	DIP/IBRD Swakeloa	
11	EAST JAWA	Pasuruan	Regional	Not Yet					
11	EAST JAWA	Gresik	Regional	Prepared	Nov.1996	2018	Balickapan, Banjarmasin and Gresik port development project	ADB, PCI/PT DIAGRAM / PT INDULEXCO	Master Plan for Tg. Perak and Gresik Port at 2018

Table 9.1.4(3) Port Master Plan and Master Plan Concept

No.	Province	Location	Port Classification by SISTRANAS	Port Master Plan Study					Master Plan Concept	
				Prepared Updated Not yet	Final Report Date	Target year	Name of Study	Fund & Consultant	Target year	Study Name
12 (III)	BALI	Benoa	Tertiary	Prepared Reviewed	1986 1991		Master plan for Benoa Port	DIP/IBRD - Swakelola Nippon Koei	2018	Master Plan for Benoa Port at 2018
		Celukan Bawang		Not Yet						
		Lembar	Regional	Prepared	1984	2004	Master Plan for Lembar Port	IBRD, P.R.C-Sollens		
13 (III)	WEST NUSA TUNGGARA	Badas	Local	Not Yet						
		Bima	Regional	Not Yet						
		Tenar/Kupang	Tertiary	Prepared Reviewed	1985 Mar 1994	2005 2005	Master Plan for Tenar Port The study for development modernisation plan for sea transportation	Holland J. T.T.A - Inconeb IGA, OGDI//IPC		
14 (II)	EAST NUSA TUNGGARA	Waingapu		Not Yet						
		Ende	Regional	Not Yet						
		Mamere	Regional	Not Yet						
		kalabahi		Not Yet						
		Dilli	Regional	Not Yet						
		Singkawang		Not Yet						
16 (II)	WEST Kalimantan	Pontianak	Tertiary	Prepared Updating	1985 1998	2005	Master Plan for Pontianak Port Studi Masterplan Pelabuhan Pontianak & Pelabuhan Kawasanyu	IBRD, HASKONING(Netherland) IPC II, PT Sarana Antar Nusa	2018	Master Plan for Pontianak Port at 2018
		Sintete		Prepared	1986	2006	Master Plan for Sintete Port	DIP/IBRD, Swakelola		
		Telok Air		Not Yet						
		Sambas		Not Yet						
		Kuala Kapus		Not Yet						
17 (III)	CENTRAL Kalimantan	Kumai	Regional	Not Yet						
		Sampit	Tertiary Regional	Prepared	1986	2006	Master Plan for Sampit Port	ADB, SOFREMER(France)		
		Banjarmasin	Tertiary Regional	Prepared Revised	1979 Nov 1996	1999 2018	Master Plan for Banjarmasin Port Revisi Masterplan Banjarmasin and Gresik port development project	ADB, PCI/PEDIGRAM DIAGRAM/PT INDOEKO	2018	Master Plan for Banjarmasin Port at 2018
18 (III)	SOUTH Kalimantan	Bau Lucin	Tertiary	Not Yet						
		Kotabaru		Not Yet						

Table 9.1.4(4) Port Master Plan and Master Plan Concept

No.	Province	Location	Port Classification by SISTRANAS	Prepared Updated Not yet	Final Report Date	Target year	Name of Study	Fund & Consultant	Target year	Master Plan Concept	
										Study Name	Study Name
19 (IV)	EAST Kalimantan	Balikpapan	Tertiary	Prepared	1979	1999	Master Plan for Balikpapan Port	ADB, PCI/PT-DIAGRAM	2018	Master Plan for Balikpapan Port at 2018	
		Samarinda	Tertiary	Revised	Nov.1996	2018	Baliyapan, Banjarmasin and Gresik port development project	ADB, PCIFRT, INDIJENCO			
		Nunukan	Local	Prepared	1986	2006	Master Plan for Samarinda Port	ADB, SOFREMER(France)			
20 (IV)	SOUTH SULAWESI	Tarakan	Regional	Not Yet	1986	2006	Master Plan for Samarinda Port	ADB, SOFREMER(France)			
		Makassar	Secondary	Prepared	1984	2020	Master Plan for Ujung Pandang Port Review Master Plan	IBRD, P.R.C.Soilens	2018	Master Plan for Makassar Port at 2018	
		Pare-Pare	Regional	Reviewed	1992	2003	Master Plan for Pare-Pare port	OECE, Nippon Koei(Japan)			
21 (IV)	SOUTHEAST SULAWESI	Kendari	Tertiary Regional	Prepared	1986	2004	Master Plan for Pare-Pare port	ADB, SOFREMER(France)			
		Pantoloan	Regional	Prepared	1984	2003	Master Plan for Kendari Port	IBRD, P.R.C.Soilens			
		Toli-Toli	Local	Prepared	1986	2003	Master Plan for Pantoloan Port	ADB, SOFREMER(France)			
22 (IV)	CENTRAL SULAWESI	Luwuk	Regional	Prepared	1986	2003	Master Plan for Toli-Toli Port	ADB, SOFREMER(France)			
		Bitung	Secondary	Not Yet	1984	2004	Master Plan for Bitung Port	IBRD, P.R.C.Soilens	2018	Master Plan for Bitung Port at 2018	
		Manado	Local	Prepared	Mar.1994	2005	The study for integrated modernization plan for sea transportation	JACA, OCIDI/JPC			
23 (IV)	NORTH SULAWESI	Gorontalo	Regional	Not Yet	1986	2006	Master Plan for Gorontalo	DIP/IBRD, Swakelola			
		Angrek	Regional	Not Yet	1986	2006	Master Plan for Gorontalo				
		Ambon	Tertiary	Not Yet	1985	2005	Master Plan for Ambon Port	Holland, T.T.A - Inconebe			
24 (IV)	MALUKU	Temate	Regional	Prepared	1985	2005	Master Plan for Ternate Port	Holland, T.T.A - Inconebe			
		Sorong	Tertiary	Prepared	1985	2005	Master Plan for Sorong Port	Holland, T.T.A - Inconebe	2018	Master Plan for Sorong Port at 2018	
		Biak	Tertiary	Prepared	1986	2005	Master Plan for Biak port	DIP/IBRD Swakelola	2018	Master Plan for Biak Port at 2018	
25 (IV)	IRIAN JAYA	Jayapura	Tertiary	Prepared	1986	2005	Master Plan for Jayapura Port	Holland, T.T.A - Inconebe			
		Fak-Fak	Regional	Not Yet	1986	2005	Master Plan for Jayapura Port				
		Manokwari	Regional	Not Yet	1986	2005	Master Plan for Jayapura Port				
		Merauke	Regional	Not Yet	1986	2005	Master Plan for Jayapura Port				

9.2 Cost Estimation and Construction Cost

9.2.1 Cost Estimation Procedure

The annual budget for port development is estimated, in general, based on “ANCARAN-CAR HARGA SATUAN POKOK KEGIATAN PER DEPARTMEN/LEMBAGA “ (Unit price Estimation for Activities of each Department/Institute) and some data from market price. The following port development cost are indicated in this book as a standard.

Table 9.2.1 Cost Estimation for Sea Port facilities Development(1997/1998)

(Unit : Rupiah)

No.	Facilities	Unit	Construction Cost
1	Concrete wharf with steel pile	m ²	3,246,000
2	Concrete wharf with concrete pile	m ²	2,575,000
3	Wooden wharf with steel pile	m ²	1,500,000
4	Wooden wharf with concrete pile	m ²	1,350,000
5	Open storage	m ²	83,000
6	Revetment (height up to 2m)	m	1,338,500
7	Revetment (height up to 3.5m)	m	2,240,000

Regional Factor

Region 1	Jawa	: 0.80
Region 2	Sumatra,Bali	: 0.90
Region 3	Kalimantan, Southeast, Sulawesi, NTB, Central Sulawesi	: 1.00
Region 4	North Sulawesi, South Sulawesi, NTT	: 1.10
Region 5	Maluku, Irian Jaya, East Timor	: 1.20

Source : DGSC

The Basic cost in above-mentioned book is evaluated in “STANDARDISASI HARGA STAUAN BARANG/JASA DI LINGKUNGAN DEPERTEMEN PERHUBUNGAN” (Standardization on Unit Price of Material and Service Scope of MOC). Some example of detail data shown in this book are summarized in Table C.9.2.1 of Appendix C and the ratio of each area cost compared to West Jawa are shown Table 9.2.2.

According to this table, the labour cost is cheaper and material cost, mobilization cost and construction cost are more expensive than West Jawa except in Irian Jaya. The reasons of this cost difference are that some materials, experienced workers and equipment are only available in Jawa area and have to mobilize/demobilize and/or accommodate in construction site with special transportation service.

Table 9.2.2 Comparison of Basic Cost in 10 provinces

Province	North Sumatra	DKI Jakarta	West Jawa	Central Jawa	NTB
Material Cost	0.997	1.092	1.000	1.083	1.120
Labor cost	0.911	1.167	1.000	0.869	0.874
Working equipment	1.075	0.920	1.000	1.000	1.225
Construction cost	1.053	1.031	1.000	1.070	1.102
Quay construction	1.126	1.084	1.000	1.147	1.238
Preparation	1.492	1.420	1.000	1.420	1.635
Mobilization	1.125	1.000	1.000	1.000	1.375
Construction	1.109	1.073	1.000	1.142	1.213
Others	1.125	1.000	1.000	1.000	1.372
Province	Central Kalimantan	East Timor	South Sulawesi	Central Sulawesi	Irian Jaya
Material Cost	1.323	1.373	1.165	1.042	1.955
Labour cost	0.773	0.991	0.896	0.747	1.431
Working equipment	1.150	1.300	1.150	1.076	1.540
Construction cost	1.129	1.353	1.021	1.003	1.514
Quay construction	1.196	1.420	1.156	1.213	1.536
Preparation	1.563	1.057	1.563	1.635	1.835
Mobilization	1.250	1.500	1.250	1.375	1.500
Construction	1.176	1.432	1.133	1.185	1.524
Others	1.250	1.500	1.250	1.375	1.500

Source : DGSC and Prepared by The Study Team

In order to make the investment effective, from the beginning of planning and designing stage, the port development program should be conducted to use local material and local equipment intensively, taking into consideration such as type of facilities, local character, maintenance cost and available volume of materials.

9.2.2 Construction Cost

Seven example of construction cost executed in Tg.Priok port during REPELITAVII (from 1994 to 1997) are collected to evaluate the effectiveness and summarized Table 9.2.3.

Table 9.2.3 Material and Labor Cost in Tg.Priok (Unit : Rp.)

Material Cost					
Contract Date	1994	1994	1995	1997	Cost Estimation
Cement		6,500	10,000	11,000	10,500
Re-bar	1,200	1,120	1,300	1,200	1,500
Fine Aggregate		29,000	38,000	37,500	40,000
Concrete pile φ 600	145,000	121,000			
Concrete pile φ 500					210,000
Labour Cost (Per Day)					
Contract Date	1994	1994	1995	1997	Cost Estimation
Operator	25,000	10,000	21,000		17,500
Foreman	10,000	10,000	17,500	15,000	17,500
Skilled Worker	8,000	6,000	11,000	10,000	10,000
Construction Cost					
1994	Container Berth 14m (Concrete pile, Concrete deck)			3,868,600 Rp./m ²	
1995	Conventional Berth 7m (Concrete pile, Concrete deck)			1,628,800 Rp./m ²	
1995	Container Yard			262,600 Rp./m ²	
1996	Container Berth (Concrete pile, Concrete deck)			3,355,500 Rp./m ²	

Note : All cost not include tax

Source : IPC II

The construction works in Tg.Priok are rather cheap compared to the estimation cost applied in DGSC because the above-mentioned construction cost include the cost of revetment for container yard and development in Tg.Priok port is very effective for Indonesian economic activity.

The construction cost in local area is expensive compared to Jawa, Sumatra area. There are more than 200 non-commercial ports without berthing facilities. For an urgent port development in local area, therefore, it could be reasonable to use local low cost material and equipment available in neighboring area. The new technical guideline should be prepared for local port planning, designing and construction for urgent development.