2-3-2 Electronic Aids to Navigation

There are various systems in electronic aids to navigation: sattelite navigation and OMEGA navigation systems for world-wide services, Loran for long range services, Decca and MF radiobeacon systems for short to medium range services, microwave systems such as Radar beacon, Transponder beacon, Course beacon, etc. for short range services.

The present status of electronic aids to navigation in Indonesia stands in rather developing stage, and only a few of them have recently been installed, namely the three Radar Beacon stations were established in 1984 at One Fathom Bank, Nanka Island and Kalan Jamuang.

Radar Beacon is a microwave short range aids to navigation to identify the radar image of navaids or to mark obstructions to navigation, displaying the signal information on marine radar PPI.

In order to meet the increasing installations of marine radars on board large to small-size vessels, Racon has recently become effective means of identifying landfalls, navigational dangers and other objects, and the need is growing day by day.

DGSC has already initiated installation of racon along main traffic-routes. The number now fitted is extremely lower than that is needed.

The current installation of racon is as follows:

No.	Name of Station	District of Navigation
1	One Fathom Bank	Dumai
2	Nanka Is.	Palembang
3	Kalan Jamuang	Surabaya

They are co-located at the lighthouses and the sites are shown **Fig. 2-3-2.** In case of the failure, the fact will be reported possibly by ship users to the District of Navigation in charge and then to the Regional Headquarters, through which to the central Headquarters via coast stations or DGSC's local offices.

Number of the ships fitted with radar equipment onboard has recently increased considerably, and installation of Radar beacons will be of a great assistance in identifying landfalls, navigation dangers and so forth.

The implementation of 1st phase project is already undergoing for the establishment of eighteen (18) medium wave radiobeacon stations throughout the country with an emphasis particularly on Jawa Sea areas, where sea traffic is most congested.

The Indonesian flag vessels fitted radar installations on board by regulations numbers 228. There are a number of vessels engaged in RLS and Local Services and other government ships as well as foreign flag vessels, in addition to the chartered ships numbering 392. They are generally fitted with radars on board.

The types of Racons are detailed in **APPENDIX-17.**

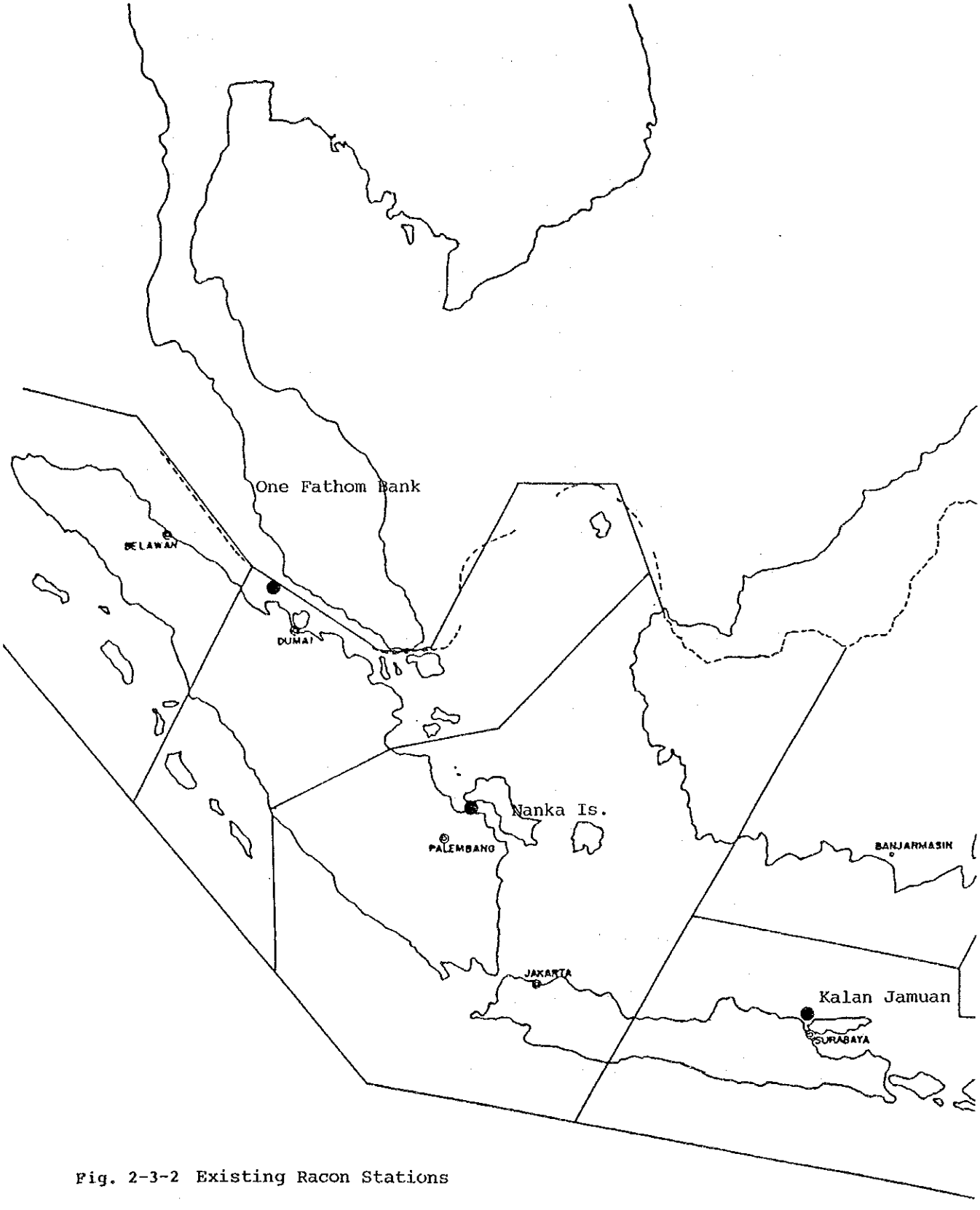


Fig. 2-3-2 Existing Racon Stations

2-3-3 Development Status of Aids to Navigation

The development of aids to navigation in Indonesia has been more or less in steady progress, and this is convinced by the recent on-going plans for lighthouses and electronic aids as given in **Table 2-3-3/1**. Especially with the ILS system taken into account, substantial requirement exists for further development.

(1) Visual Aids to Navigation

The visual aids to navigation in Indonesia numbered only 489 in 1969 as the situations remained un-improved after the war, and availability was as low as around 30% then.

Development and improvement plans had been established subsequent to the surveys made by Netherlands for the aids to navigation, and the plans were implemented with the financial aids by France, England, FRG, Sweden and Japan. **Table 2-3-3/2** describes the foreign aids provided.

A great progress was made in 1971, 1977 and 1982 in the development implementing large scale projects, especially for the navaids of beacons and light buoys approaching ports and harbours.

In parallel with the development of the navaids, improvement was also made in the supporting facilities of seven buoy tenders and three supply vessels from 1972 through to 1979.

The above has brought a remarkable achievement in the availability up to 90.5% in 1983. **Fig. 2-3-3** shows the flow of funds provided from overseas.

Table 2-3-3/1 On-Going Plan for Aids to Navigation

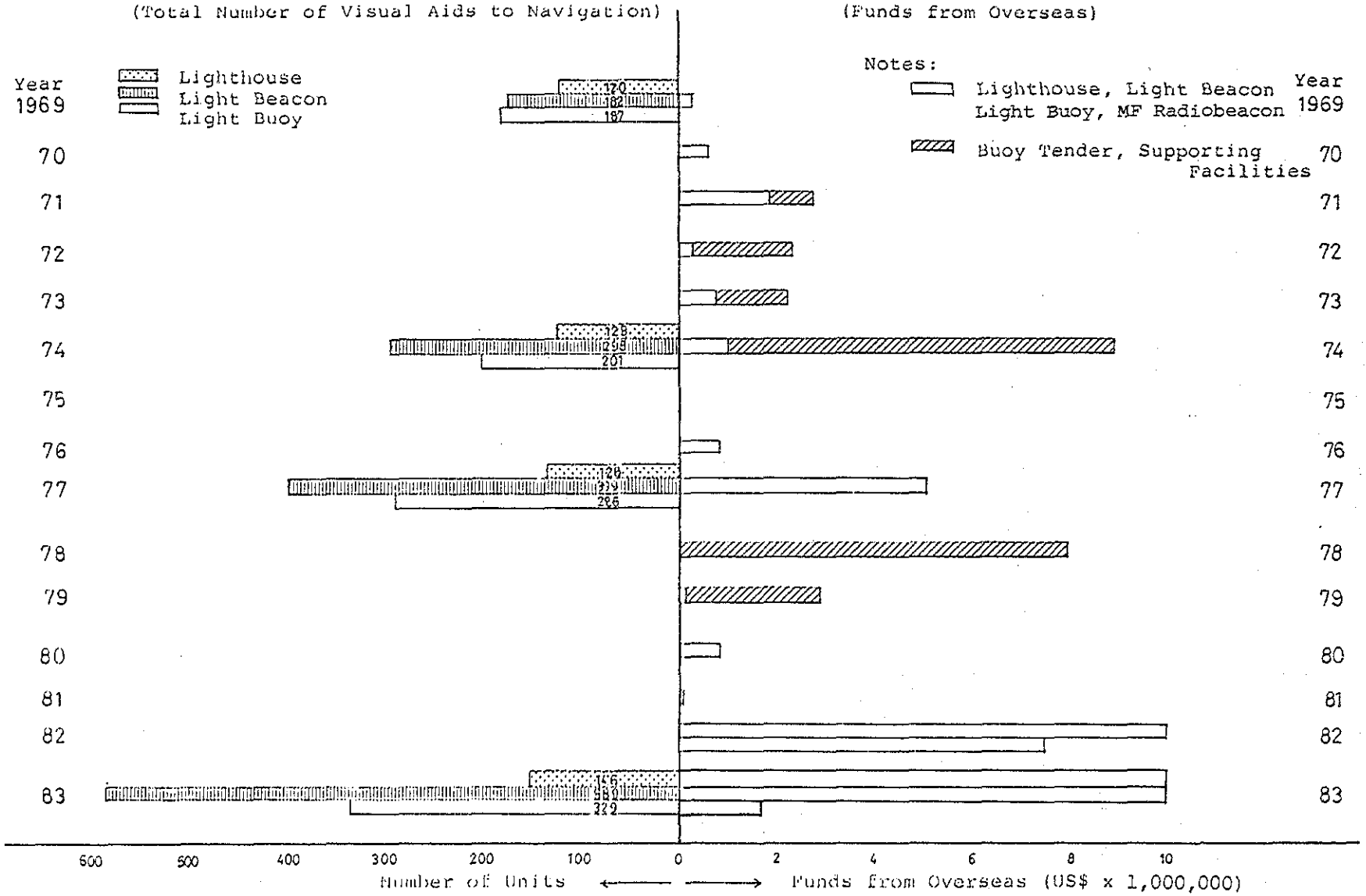
ACTIVITY	84/85	85/86	86/87	87/88	88/89
Aids To Navigation					
1. Credit Export	Construction		← 20 L.H. from England		
2. French Aid					
3. IV Development Plan	a b c	a b c	a b c	a b c (Survey / Design / Construction)	a b c
4. Maritime Sector Development Plan	Survey	Design	Construction		
5. MF Radio Beacon	Design	Construction			

Table 2-3-3/2 Foreign Aids Projects

Year	Japan	England	France	Federal Republic of Germany	Sweden	Approximate Amount
1968			F.Fr.9,799,804 6 x Light House Devices			US$ 1,762,000
1869				DM.617,794 24 x Buoys, etc.	SwKr.447,253.26 Spare Parts	256,000
1970	¥19,290,000 5 x Buoys		F.Fr.2,780,000 10 x Light House Devices			558,000
1971		£735,000 39 x Buoys, etc.	F.Fr.3,700,000 13 x Light House Devices			2,700,000
1972	¥690,886,000 22 x Light Devices 5 x Buoys 2 x Buoy Tenders					2,279,000
1973	¥420,432,900 Workshop Equip. Spare parts		F.Fr.3,397,024 8 x Light House Devices			2,158,000
1974	¥2,386,901,000 6 x Buoys, etc. 2 x Buoy Tenders 2 x Supply Vessels		F.Fr.3,392,998 12 x Light House Devices			8,883,000
1975	---	---	---	---	---	---
1976	¥59,030,000 Solar Cells, etc.		F.Fr.2,936,952 4 x Light House Devices			819,000
1977	¥18,365,000 Flasher Devices, etc.	£2,139,724 4 x Light House Devices 65 x Buoys	F.Fr.5,880,590 21 x Light House Devices			5,035,000
1978	¥1,821,549,000 2 x Buoy Tenders 1 x Supply Vessels					7,920,000
1979	¥656,010,000 Flasher Devices 1 x Buoy Tender					2,852,000
1980	¥187,057,000 Spare Parts Equip.					813,000
1981	¥13,965,000 1 x Buoy					61,000
1982		US$14,500,000 20 x Light House Devices	F.Fr.10,000,000 4 x Light House Devices			17,435,000
1983	¥4,970,000,000 18 x MF Beacons					21,608,000
Total	¥11,164,836,750	£2,874,724 US$14,500,000	F.Fr.41,887,368	DM.617,794	SwKr.447,253.26	US$ 75,139,000

Notes: Annual average exchange rates applied for each currency.

Fig. 2-3-3 DEVELOPMENT STATUS OF NAVAIDS & FUNDS FROM OVERSEAS



(2) Electronic Aids to Navigation

1) Medium-wave Radiobeacon Stations

The implementation status of electronic aids to navigation in Indonesia is in its developing stage.

In order to meet the needs of shipping industry in Indonesia, especially for small types of vessels such as people's shipping and fishing vessels, the establishment project of 18 MF radiobeacons is underway with foreign aids and as the first implementation of electronic navaid in Indonesia. Installation of racon stations is also in the initial stage: only three stations have so far been installed.

The implementation of 1st phase of a long term development for medium-wave radiobeacons established by Indonesian Government has been in progress as F-ST-3C to establish the eighteen stations with the site configuration covering Jawa Sea mainly for cross bearing and other areas for homing purposes.

The names of radiobeacon stations are as follows:

1.	SABANG	10.	BENOA
2.	SIMEDANG ISLAND	11.	BALIKPAPAN
3.	TG PRIOK	12.	TG MANGKALIHAT
4.	PONTIANAK	13.	TG MANDAR
5.	PESEMUT ISLAND	14.	U.PANDANG
6.	MANDALIKA ISLAND	15.	AMBON
7.	CILACAP	16.	BITUNG
8.	JAMUANG ISLAND	17.	RAM SORONG
9.	TG SELATAN	18.	MERAUKE

Fig. 2-3-3/1 shows the allocation of eighteen (18) Medium-Wave Radiobeacon stations.

This project is a three-year plan to complete. The basic concept of arranging the geographical allocations has been that all the stations are sited on or not far from the existing lighthouses and that all the stations would be unattended, and accordingly remote-monitoring will be carried out at the nearby coast stations of 24-hour watch-keeping.

A considerable potentiality may exist in the use of MF radiobeacons by such smaller-sized vessels as motorized sailing and sailing ships as well as fishing vessels.

The stations are all unattended and are so designed that remote monitoring may be conducted through the use of either HF or VHF radio network to be established as a part of the system at the same time when the stations are to be established. The choice of HF or VHF will be subject to the distances between radiobeacon stations and the nearby coastal stations, which are responsible for the watch-keeping.

The radiobeacon stations transmit the two types of signals; directional beacon transmissions are for use by such a simple type as a radio receiver, and omni-directional transmissions are for radio direction finder fitted vessels onboard. The both are based on the use of radiobeacons in conjunction with aural null receivers.

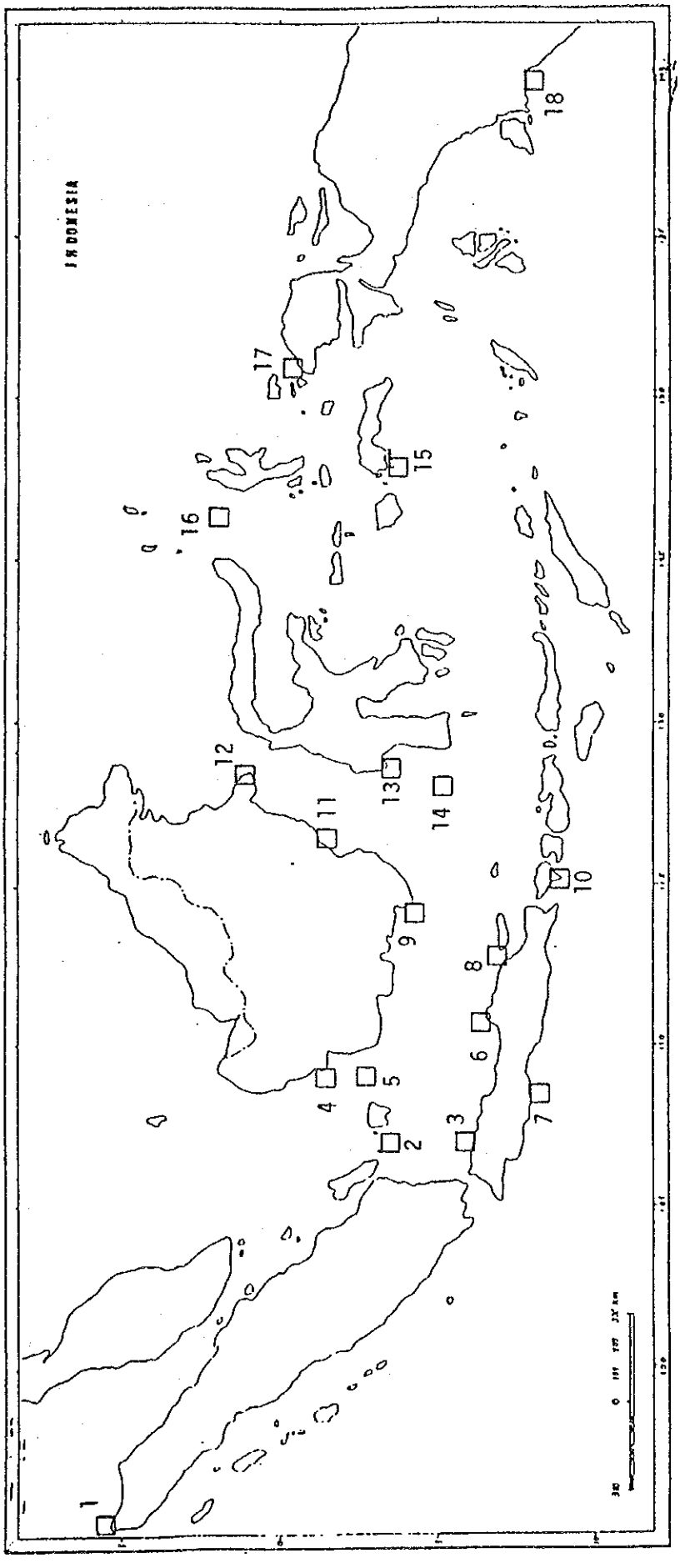


Fig. 2-3-3/1 Allocation of Medium Wave Radio Beacon Stations (18 Stations)

A directional radiobeacon transmit a rotating 8-letter shaped pattern using a goniometer so that a user with receiver may measure the direction for the radiobeacon through aural null method. By a pair of stations, a user may fix its position by cross bearing.

The omnidirectional radiobeacon requires a radio direction finders, which measure the bearing to radiobeacons.

2) Monitoring Stations

The operational status of each radiobeacons will be monitored at the individual monitor stations, and in case of failure of the main equipment in operation, automatic change-over will be made and at the same time the fact will be reported to the monitoring station for their action of restoration of the operational functions.

3) Maintenance

Maintenance of the radiobeacon stations is planned to be carried out according to the following method.

a) Regular maintenance

The maintenance personnel in charge stationed at the relevant coast stations with monitoring stations installed are to visit the stations on a regular basis for checking and necessary changes of pre-determined various items as protective means of maintenance procedures.

b) Emergency maintenance

Failure and/or disorder of the radiobeacon stations are to be immediately aired to the relevant monitoring stations and automatic changeover is to be made to a stand-by equipment. In this case, maintenance personnel are to be despatched without delay for the emergency repair and checking.

2-3-4 Training of Personnel

The training for maintenance and operation of visual navaids consists of the two courses of ordinary and special training, which are detailed below.

The existing training courses are also available for the radio engineers and technicians, who are to engage in the maintenance and operation of electronic aids to navigation, and the summary is given in **Table 2-3-4/1** and **Table 2-3-4/2.**

(1) Ordinary Training

There are the two training courses presently available for the personnel working for visual aids to navigation as described below:

1) Basic Courses

a) Lighthouse keepers

Training Frequency : Once/year
Number of Trainees : 30 (usually from Sea Comm. but some are to be recruited from outside with the approval by Personnel Board)
Place of Training:
Theoretical training -- BPLP, Tg Priok (Port Education Training Center for Sea Comm)
Facility is borrowed for the training.

Practical Training -- District Navigasi, Tg. Priok

Level of Trainee : These days, a number of high school leavers are increasing, as compared with the past, when only elementary school leavers applied.

Subject of Training: See below:-

Subjects	Study Hour
Propane and Acetylane	48
Motor	40
Electricity	44
Generator and Diesel Motor Practice	40
Electrical lights practice	46
P.3 Gas lights practice	40
SSB Practice and Theory	40
P.3 Lights Science	32
Five Principles 1945 Basic Constitution	40
Mathematic	40
Health Science	40
Total	450

Assignment : Those who receive this course will be assigned to lighthouses.

Instructors : All from Sea Comm.

b) Aids to Navigation Technicians

Training Period : 3 months

Training Frequency	:	once/year
Number of Trainees	:	10 (usually from Sea Communication, but some are to be recruited with the approval from outside by Personnel Board)
Place of Training	:	Same as for lighthouse keepers
Level of Trainees	:	Same status as for lighthouse keepers
Subject of Training	:	See below:

Subjects	Study Hour
General Technique P.3	40
Motor	84
Electricity	50
Mathematic and Algebra	52
Geometry	52
Mechanics	40
Material and work safety science	108
Physics	32
Drawing	50
SSB Theory and Practice	45
Health Science	42
Execution Science	52
English	52
P.3 Electrical lights practice	48
P.3 lights practice	48
Diesel Motor and Generator Practice	80
Five Principles 1945 Basic Constitutions	52
General Lecture	25
Total	1,000

Assignment : Those who receive this course will be assigned to workshops and buoy bases.

2) Advanced Course

Training Purpose : Lighthouse Technicians. Those who receive this course are selected among lighthouse keepers and aids to navigation technicians through the appointment.

Training Period : 6 months

Training Frequency : Once/year

Number of Trainees : 10 (all from Sea Comm. i.e. lighthouse keepers and aids to navigation technicians)

Place of Training : Same as for the Basic Course

Subject of Training : See below:

Subjects	Study Hour
Theory Gas/Propane, Acetylane	40
Gas light science	40
SSB Theory and Practice	40
Generator/Motor Practice	60
Motor Theory	40
Five Principles/Basic Constitutions 1945	24
Gas lights practice	60
Electrical lights practice	44
Gen. Batt. Electrical Theory	52
Total	400

Assignment : Those who finish this course will be appointed as chief of lighthouse, workshop and/or buoy base.

Lighthouse keepers and aids to navigation technicians are on the same level.
Lighthouse technicians are on higher level than the above.
Examination and tests will be conducted towards the end of the individual courses.

(2) Special Training Courses

Special training courses are also available and are carried out for various projects at the time of implementation. They also include domestic and overseas training.

(3) Others

The government recruitment system refers to the following ranking system:

GOVERNMENT RECRUIT V.S. RANKING SYSTEM

GROUP	I	A	B	C	D	
GROUP	II	A	B	C	D	
GROUP	III	A	B	C	D	
GROUP	IV	A	B	C	D	E

	Starting level	Top Ranking
Elementary School Leavers	IA	IC
Secondary School Leavers	IB	IIC
High School Leavers	IIA	IIIA
Institute Graduates	IIB	IIIC
University Graduates	IIIA	IIID

Remarks: The position of LH keepers is in I - II: currently, a number of high school graduates are increasing while in the past only elementary school leavers took the job.

Table 2-3-4/1 TRAINING PROGRAMME FOR MARINE RADIO ENGINEERS

NO.	KIND OF TRAINING	TRAINING PERIOD	TRAINEES AND REQUIREMENTS	NUMBER OF TRAINEES	PURPOSE OF TRAINING
1.	Second class Marine Radio Engineer	11 Months	Academy degree holder in the field of Electronics and Radio Engineering or third class Marine Radio Engineer with at least 3 years experience at coastal Radio Station	15 each for training implementation	To upgrade and enable skilled Radio Engineers to be employed as: - Junior Marine Radio engineer at first coastal Radio Station. - Chief Marine Radio Engineer at second class coastal Radio Station. - Junior staff at Sub-Directorate of Marine Electronics and Telecommunications.
2.	Third Class Marine Radio Engineer	9 Months	Marine Radio Technician with at least 3 years experience at coastal Radio Station, or Technical High School graduate in the field of Electronics and Radio Engineering		To upgrade and enable skilled Radio Engineers to be employed as: - Chief Marine Radio Engineer at third class coastal Radio Station. - Junior Marine Radio Engineer at second class coastal Radio Station.

NOTE: There are four kinds of certificates in the field of Marine Radio engineering to be issued by the Directorate-General of Sea Communications, i.e.:

1. First class Marine Radio Engineer Certificate
2. Second class Marine Radio Engineer Certificate
3. Third class Marine Radio Engineer Certificate
4. Marine Radio Technician Certificate.

Table 2-3-4/2 TRAINING PROGRAMME FOR RADIO OFFICERS

NO.	KIND OF TRAINING	TRAINING PERIOD	TRAINEES AND REQUIREMENTS	NUMBER OF TRAINEES	PURPOSE OF TRAINING
1.	General Certificate Radio Officer	10 Months	Second class certificate Radio Officer, at least 3 years	15 each for training implementation	To upgrade and enable Radio Officers to be employed as: - Chief of second class coastal Radio Station. - Staff members at first class coastal Radio Station. - Junior staff at Sub-Directorate of Marine Electronics and Telecommunications.
2.	Second Class Certificate Radio Officer	9 Months	Third class certificate Radio Operator having at least 3 years on-board experience and at coastal Radio Station, or High School graduate	20 each for training implementation	To upgrade and enable Radio Officers to be employed: - Onboard the first class ships of Directorate General of Sea Communications. - As Radio Officer at first or second class coastal Radio Station. - As staff members at second class coastal Radio Station. - As Chief of third class coastal Radio Station.

NOTE: There are four kinds of Radio Telegraph Operator certificates and two kinds of Radio Telephone Operator certificates to be issued by the Government of the Republic of Indonesia i.e.:

1. General Radio Telegraph Operator Certificate
2. First class Radio Telegraph Operator Certificate
3. Second class Radio Telegraph Operator Certificate
4. Third class Radio Telegraph Operator Certificate
5. General Radio Telephone Operator Certificate
6. Restricted Radio Telephone Operator Certificate

2-4 Maritime Activities

2-4-1 Introduction

Indonesia is the largest maritime nation in the world comprising approximately 13,000 large to small islands scattered around in the vast areas of about 5,000 km east to west and about 2,000 km north to south, and has the population of about 150 million inhabiting on more than 3,500 dispersed islands.

Under these geographical and environmental conditions, maritime activities in Indonesia play extremely important role in developing and maintaining the national life in the fields of transportation of daily necessities, food and other various products, shipping as a means of transportation, fishery securing protein resources for national population, as well as development of mineral resources.

Summary picture of the maritime activities is as follows:

(1) Sea Transportation (1982)

	No. of Ships	DWT	Cargo Volume (tons)
Ocean-going shipping	158	1,602,000	8,457,500 (1981)
Domestic shipping	7,564	2,792,000	26,010,000

(2) Fishing Activities (1981)

No. of Ships	Haul	Production
277,000	1,914,500 tons	Rp882,400 mil

(3) Other Activities

The development of mineral resources in Indonesia has recently been in active progress around Jawa Sea and East Kalimantan areas, and it more or less affects the vessels traffic in these areas.

The present situation of maritime pleasure shows that it has little effect on sea traffic due to its initial developing stage.

2-4-2 Sea Transportation

Continuous increase was seen in the number of national ships during REPELITA III in the respective shipping sectors of RLS, Local, Traditional Pioneer and Special services of the domestic shipping, and general and special services of the foreign shipping, and the cargoes transported during the same period showed the similar trend in the individual services. These are seen in **Table 2-4-2/1** for 1978 and 1982.

Indonesian shipping may be divided into the two sectors of domestic and foreign as given in the said **Table**, and the descriptions are made therefore as given hereunder:

(1) Ocean-going Shipping

The ocean-going shipping in Indonesia consists of general ocean-going and special ocean-going: the special service is playing an important role as industrial carriers for crude oil, cement, fertilizer, woods and so forth using exclusive-use ships, while the general service is for other dry cargoes.

Table 2-4-2/1 Capacity of National Fleet and Volume of Cargo Transported

Year / Item / Kind of Shipping	1978			1982		
	No. of VSL	DWT or BRT	Cargo (tons)	No. of VSL	DWT or BRT	Cargo (tons)
Domestic						
RLS	343	348,162D	5,277,279	397	5033,371D	7,457,610
Local	1,363	118,923B	1,899,484	1,049	129,476B	2,444,677
Traditional	2,182	96,019B	1,012,553	3,486	180,447B	2,155,316
Pioneer	21	11,171D	52,661	36	20,805D	98,016
Special	1,941	1,222,646D	38,075,048	2,501	2,267,740D	54,812,073
		265,032B			578,875B	
		281,338HP			379,226HP	
Foreign						
General	52	512,705D	12,121,164	62	827,227D	18,464,696
Special	97	620,296D	96,755,385	96	774,603D	101,063,658

Source: Ncana Pembangunan Lima Tahun Ke Empat
Departemen Perhubungan 1984/85 - 1988/89

1) Cargo Flow

The trade structure in Indonesia has a pattern of exporting such primary products as mineral resources, fishery products, etc. and of importing industrial and semi-industrial products.

According to the data published by the Central Statistic Bureau of Indonesia, the export recorded in 1982 reached the total volume of 8,400 million tons with US$19,900 million in value **(APPENDIX-6)**. The annual average growth rate recorded during the past five years of 1978 to 1982 has shown an increase of 14.3% in volume and decrease of 4.6% in value.

The ocean-going cargoes by provinces represent that Sumatera dominates both in volume and in value, followed by Kalimantan: those in 1982 showed that approximately 85% of the total volume are dealt with in Sumatera, giving 5,200 million tons (61.9%), and in Kalimantan, giving 1,950 million tons (23.3%), as shown in **Fig. 2-4-2-(1)/1**.

Oil and the associated products are undoubtedly the main items among the export goods, accounting for almost 80% of the total import, followed by such raw materials as minerals. Those items collectively give about 90% of the total **(APPENDIX-6)**.

The import reached in 1982 the total volume of 22,820 thousand tons in volume and US$16,680 million in value **(APPENDIX-6)**.

The annual average growth during the past five years of 1978 to 1982 has shown an increase of 14.3% in volume and that of 25.7% in value.

The import by province represent that Jawa dominates both in volume and in value, followed by Sumatera: those in 1982 shows that approximately 90% of the total volume are imported into the both provinces, respectively representing 15,430 thousand tons (67.6%) in Jawa and 4,890 thousand tons (21.4%) in Sumatera, as shown in **Fig. 2-4-2-(1)/2.**

Among the import commodity items, oil related products are the main, followed by manufactured goods. Machinery and transport related equipment account for nearly 35% in value though they give only about 5% in volume. The import of food also gives considerable volume of 3,146 thousand tons, representing 17% (**APPENDIX-6**).

With regard to the trade partner nations, the export is mainly to Japan, U.S.A. and Asean nations, while the import is mainly from Asia, Asean and Japan (**APPENDIX-6**).

The collective volume of both import and export by province represents that Sumatera accounts for the majority of 53.3%, followed by Kalimantan and then by Jawa.

The trade partner nation in this context is Japan, standing highest at its volume of 42.8%, followed by USA/Canada areas at 23.1%, both of which represent nearly 70% of the total trade.

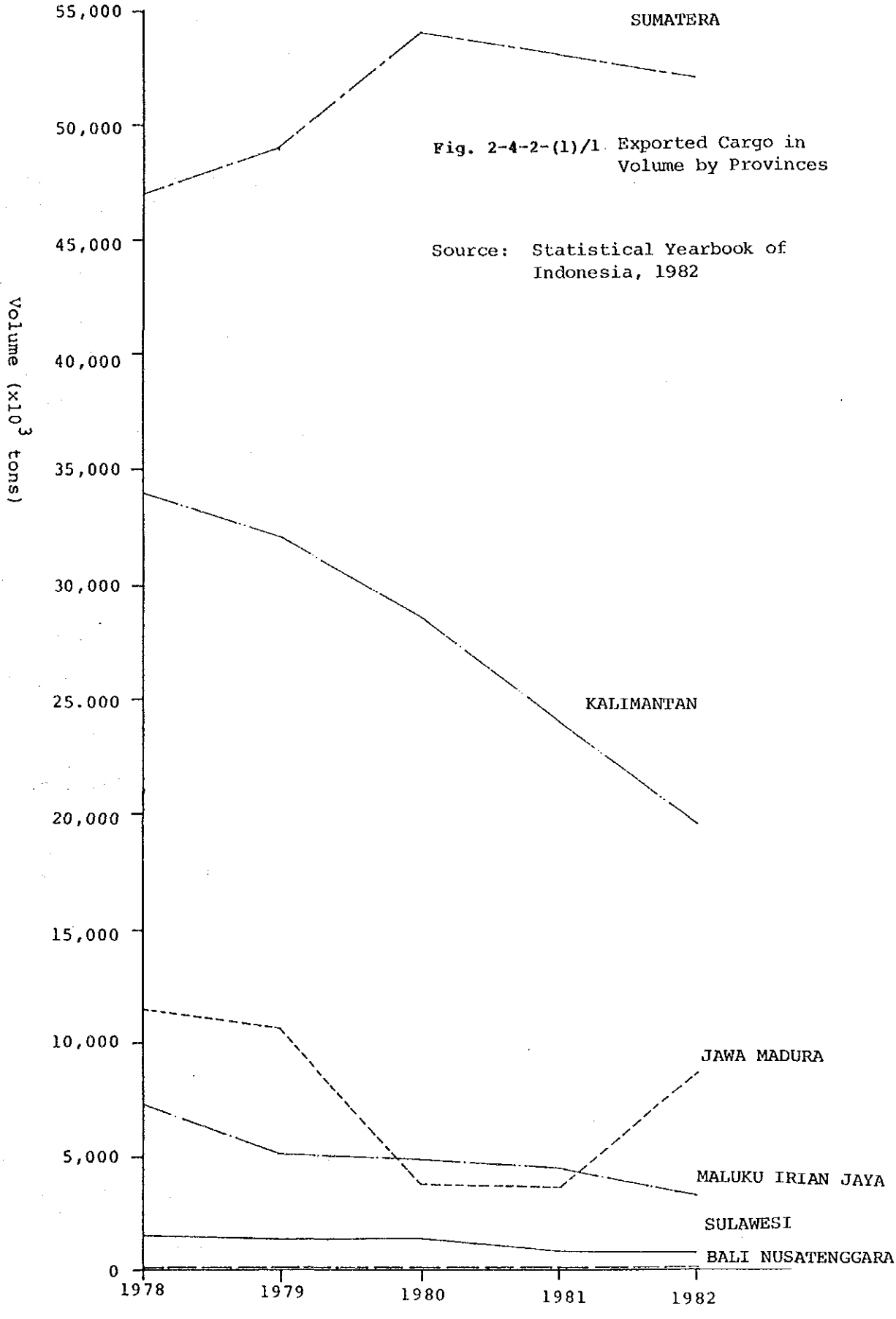


Fig. 2-4-2-(1)/1 Exported Cargo in Volume by Provinces

Source: Statistical Yearbook of Indonesia, 1982

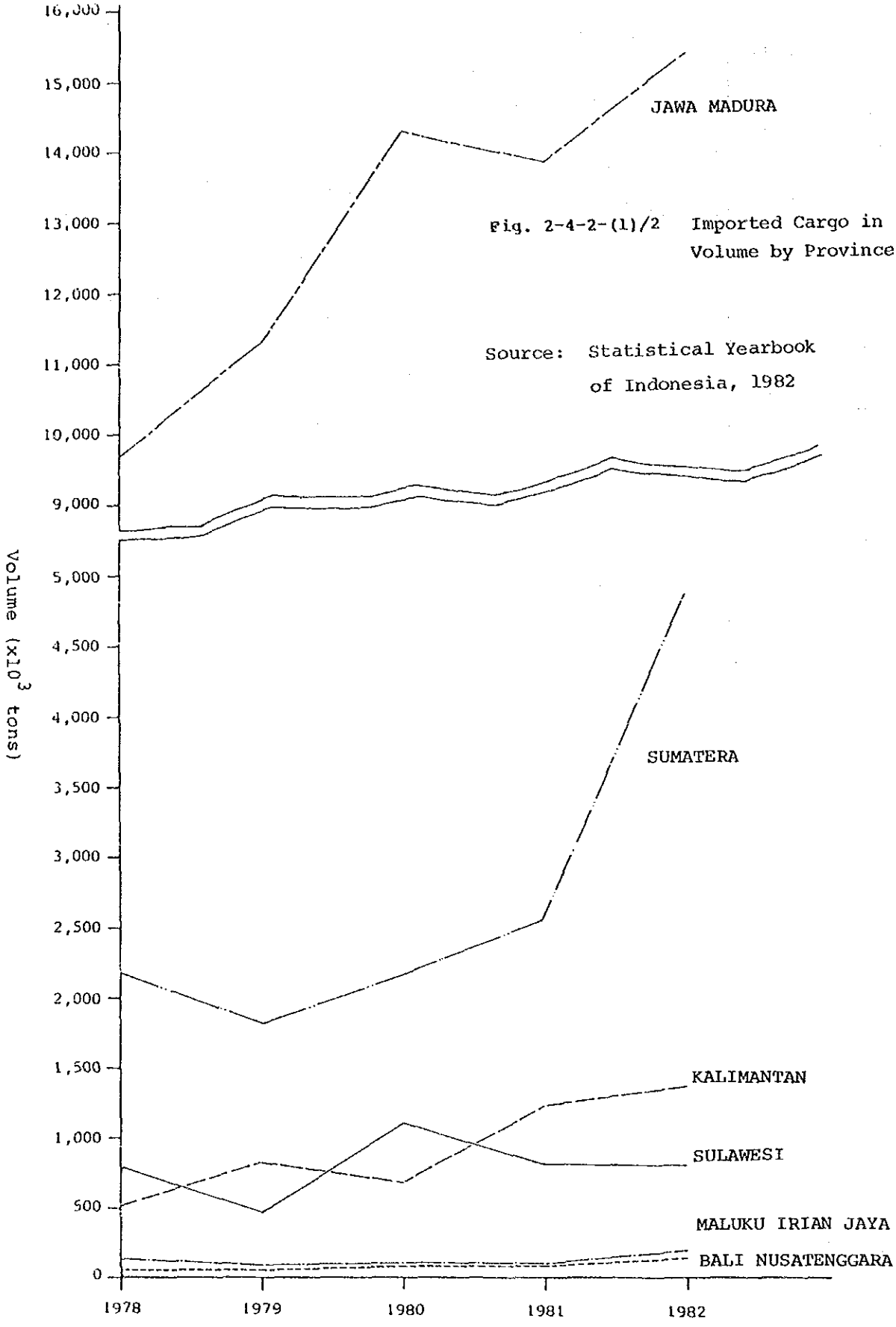


Fig. 2-4-2-(1)/2 Imported Cargo in Volume by Province

Source: Statistical Yearbook of Indonesia, 1982

2) Fleet

The number of ships and their tonnage of ocean-going ships in Indonesia during 1978 to 1982 are given in **Table 2-4-2-(1)/2.**

Table 2-4-2-(1)/2 Number and Tonnage of Ocean-going Ships

Type of Service	1978		1979		1980	
	No. of VSL	DWT	No. of VSL	DWT	No. of VSL	DWT
General	52	512,705	50	513,103	58	667,270
Special	97	620,296	89	569,106	89	582,663
Total	149	1,133,001	139	1,082,209	147	1,249,933

Type of Service	1981		1982	
	No. of VSL	DWT	No. of VSL	DWT
General	61	796,619	62	827,227
Special	96	636,285	96	774,603
Total	157	1,432,904	158	1,601,830

Source: Annual Report, '82
Directorate General of Sea Communication

A) General Ocean-going Shipping

The number and tonnage of Indonesian general ocean-going ships in 1982 were 62 and 827

thousand DWT respectively, and the annual average growth rates during the five years period of 1978 to 1982 were 4.5% in number and 12.7% in tonnage.

B) Special Ocean-going Shipping

There were in 1982 96 ships of special ocean-going ships with the total DWT of 774 thousand in Indonesia, and the annual average growth rates showed negative 0.3% in number and positive 5.7% in tonnage during the past five years of 1978 to 1982.

3) Service Route

A) Liner Service

The regular liner service networks established around Indonesia cover not only Europe but also Japan, Middle East, South Korea and North America.

The records in 1982 show that the total number of 694 ships in 8,435 thousand DWT achieved 1,224 voyages having carried the cargoes of 8,530 thousand tons, which are equivalent to 6.9% of the total cargoes carried by ocean-going ships. Among those, the total number of 187 Indonesian flag vessels in 1,710 thousand DWT carried 3,486 thousand tons cargoes through 441 voyages, giving 40.9% in its share **(APPENDIX-6)**.

The route-wise cargoes carried show that Japan

has the highest figure followed by Europe and then by U.S.A. (**APPENDIX-6**).

B) Tramper Service

The tramper service transported in 1981 the total cargo volume of 9,338 thousand tons through 1,831 voyages by the total number of 1,019 ships in 15,278 thousand DWT.

In 1982, the service carried the total cargo volume of 9,935 thousand tons, which are equivalent to 8.1% of the total ocean-going cargo volume.

Among those cargoes, the total cargo of 2,069 thousand tons were transported in 1981 by 171 Indonesian flag vessels in 1,817 thousand DWT through 313 voyages having the share of 22.2%, while those in 1982 increased to 2,184 thousand tons (**APPENDIX-6**).

C) Special Service

The contents of cargo carried by the special service were dry cargo consisting mainly of woods, and liquid cargo mainly of crude oil. The former were destined for Japan and Korea while the latter for Japan and America. Cargoes carried by the special service are mostly for export, leaving only 990 thousand tons for import. Share of cargo flow by the national flag vessels showed approximately 38% (2,787 thousand tons) for dry cargo and only 2.7% for liquid cargo (**APPENDIX-6**).

As a result, share of cargoes carried in 1982 by Indonesian flag vessels respectively showed 4.1% in export and 27.8% in import, and 8,458 thousand tons out of the total cargo volume of 123,287 thousand tons were carried by the national flag vessels, giving the share of only 6.9%.

(2) Domestic Shipping

The domestic shipping in Indonesia is classified into the following five sectors according to their role in service and modes of their operation.

Regular Liner Service (RLS)
Local Liner Service
Traditional Service
Pioneer Service
Special Service

Those services provide mutually complementary nation-wide links between the ports totalling about 210 located throughout the country for transportation of both cargoes and passengers (**APPENDIX-22**).

1) Cargo Flow

The inter-island cargo volume carried in 1981 showed that crude oil and oil related products accounted for 13,000 thousand tons, about 50% of the total volume of 26,000 thousand tons, followed by food and then by fertilizer.

The annual average growth rate in cargo volume during the recent five years of 1977 to 1981 indicated 7.4% (**APPENDIX-5**).

The inter-island cargo volume carried by province in 1981 represented that Jawa and Madura held the top position at 41.9% (20 million tons), followed by Sumatera at 28.8% (1.4 million tons) and then by Kalimantan. Approximately 70% of the total volume carried were for Jawa Madura and Kalimantan **(APPENDIX-5)**.

2) Fleet

The flow of national ships by type of service is as shown in **Fig. 2-4-2-(2)** for the period of 1978 to 1982 **(APPENDIX-5)**.

With regard to the number of ships, the traditional shipping stands at its top due undoubtedly to their small average size.

On the other hand, the special shipping holds higher position in the total tonnage as it deals with a greater volume of cargoes.

The annual average growth rate during the five years period of 1978 to 1982 showed the increase of 6.3% in DWT and that of 15.3% in BRT.

A problematic point concerned with Indonesian national shipping is their old ages, i.e. the aged ships of 15 years old or older occupy 54.4% of the total number. Especially, 61.5% of RLS and 49.8% of Local shipping are presently by those of 15 years or older, and only 7.5% and 3.4% of them are by those of 5 years old or younger.

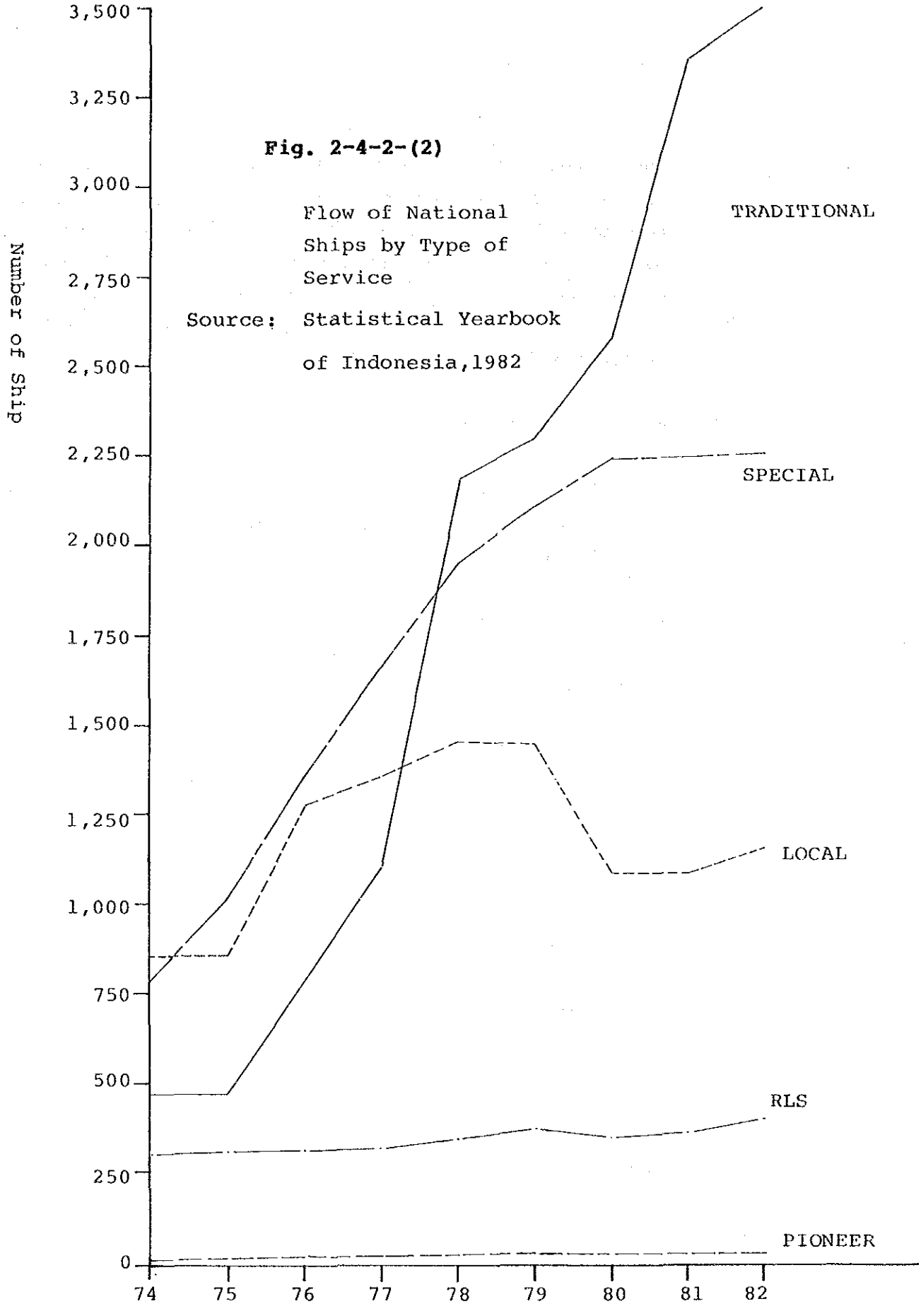


Fig. 2-4-2-(2)

Flow of National Ships by Type of Service

Source: Statistical Yearbook of Indonesia,1982

3) Service Route

The service routes networks of domestic shipping are organized complementarily each other and controlled by the government.

The total cargo flow in 1982 by the respective services showed that the total volume of 67,340 thousand tons was transported, out of which 82.2% (55,230 thousand tons) were by the special shipping service, followed by RLS at 11.1% (7,460 thousand tons), and the both services carried 93.3% of the total volume.

A) Regular Liner Service (RLS)

The Regular Liner Service covers the entire areas of Indonesia and partly extends to Singapore, Malaysia and other areas (**APPENDIX-2**).

In 1982, the total volume of 74,600 thousand tons cargoes was carried by RLS, indicating the share of 11.1% of the total domestic cargoes, for which the total number of 397 ships were used in the total DWT of 503,371 tons.

The plan for 1984-1989 includes the total of 68 routes and 1,258 voyages.

B) Local Liner Service

The local liner service generally operates between the ports located within each District Sea Communication area, administratively divided into nine, with some exceptions of links between Districts and even with Singapore (**APPENDIX-3**).

There were 148 service routes in all in 1981, and the local service plays a role of transporting passengers, more than 500 thousand of which were carried during the same period (**APPENDIX-5**).

In 1982, the total cargo volume of 2,450 thousand tons was transported by the total number of 1,049 ships and 129,476 BRT, indicating the share of 3.6% of the whole domestic cargoes.

The plan for 1984 - 1989 includes the total of 148 routes and 889 ships.

C) Traditional Service

The traditional service, originating from sailing ships, supplement RLS and local shipping services, and even at present about 40% are shared by sailing ships in its service. The service routes extend far to Malaysia, Singapore and some other Asian areas.

In 1982, the traditional service carried 348 thousand passengers, playing also as a transportation means (**APPENDIX-5**).

The total cargo volume of 2,155 thousand tons was carried, having the share of 3.2% of the total domestic cargoes, by the total number of 3,486 ships in 180,477 BRT. The total of 41,000 visits was recorded.

A motorization project for sailing ships has produced the following result in 1982.

Types \ Item	No. of Ships	BRT	Ratio
Sailing Boat	1,284	52,979	36.8
Motorized Sailing Boat	1,362	110,793	39.1
Motor Boat (35 BRT or less)	840	11,675	24.1

Source: Annual Report (Laporan-Tahunan), 1982 Directorate General of Sea Communication.

D) Pioneer Service

The pioneer shipping inaugurated its service in 1974 under the government aids, for the purposes of developing remotely-located and isolated areas, where no commercially based operations would be feasible, and of improving life and welfare of local community.

In 1982, there were 35 service routes in all (**APPENDIX-5** and **APPENDIX-4**), and the total cargo volume of 54 thousand tons was carried by the total number of 36 ships with 20,805 DWT. Although the ratio of cargo volume carried in relation to the whole domestic cargo volume showed only 0.1%, more than 160 thousand passengers were transported by the service.

In 1984/85 plan, 25 routes and 522 voyages are further envisaged.

E) Special Service

As in the case of ocean-going service, the transportation of fertilizer, cement, oil, wood, etc. is

categorized as the special domestic shipping, which also includes transport service to offshore and that by tug boats.

In 1982, the total cargo volume of 55,225 thousand tons was transported by the total number of 2,501 ships with 2,267,740 DWT, 578,875 BRT and 379,226 PS* this cargo volume accounted for the highest percentage of 82.2% of the total domestic cargo carried.

Notes: Barge and log carrier are represented in BRT, and tug boat in PS.

2-4-3 Fishing Activities

The fishery in Indonesia may be classified into the two sectors of marine and inland fisheries, with the former referring to the marine fishing subsectors of inshore and coastal zone and the latter to the fishing in inland open water and culture.

According to the fishery statistics of Indonesia 1981, the fishery production in 1981 shows 1,408,000 tons in marine and 506,000 tons in inland totalling 1,914 thousand tons, and in terms of value 504,200 million Rupiah in marine and 378,200 million Rupiah in inland totalling 882,400 million Rupiah.

The present productivity in fishery in Indonesia seems still low, leaving space for further uphill development including culture fishing.

The following describes the present status mainly of marine fishery in Indonesia.

(1) Production

1) Fishery production in quantity and value

The flow of fishery production in quantity and value during the past years is graphed in **Fig. 2-4-3/1** and **Fig. 2-4-3/2 (APPENDIX-8)**.

The growth during the past five years of 1977 to 1982 indicates 1.22 times in quantity and 2.72 times in value. Comparison in share between marine fishery and inland fishing for 1981 shows that marine fishery had 73.6% with inland fishery at 26.4% in quantity, while the former had 57.1% with the latter at 42.9% in value. This represents that there are more species of high quality fish in inland culture fishery.

The development of fishery production within the five years period made an increase of 5% in annual average both in marine and in inland fishery.

The fishery production by province in 1981 shows that the highest demands areas of Jawa had 28.7% (25.2% of the total marine fishery, and 38.5% of the total inland water fishery) of the total production in volume, followed by Sumatera and then by Kalimantan **(APPENDIX-8)**.

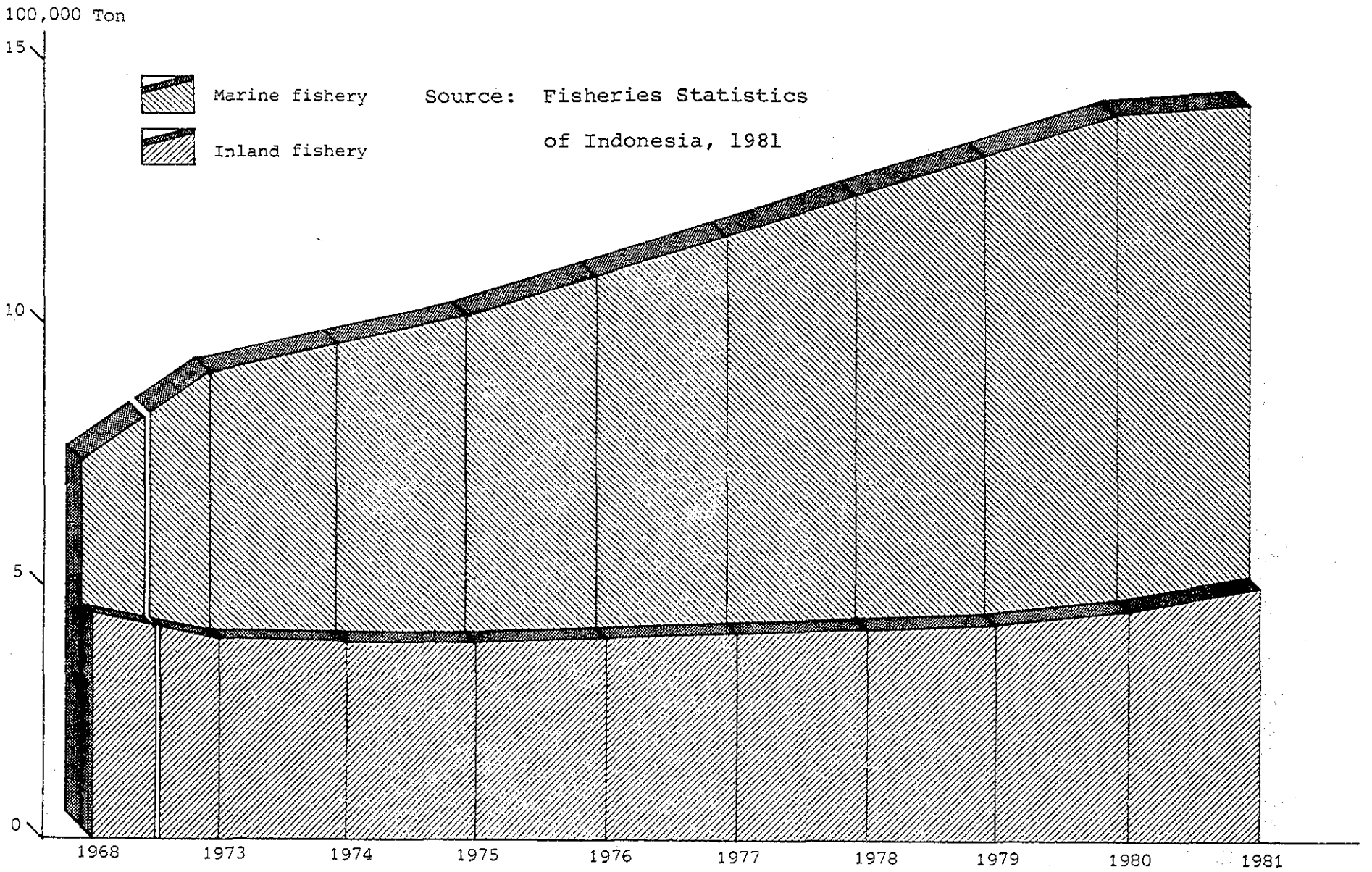


Fig. 2-4-3/1 Fishery production, 1968, 1973-1981

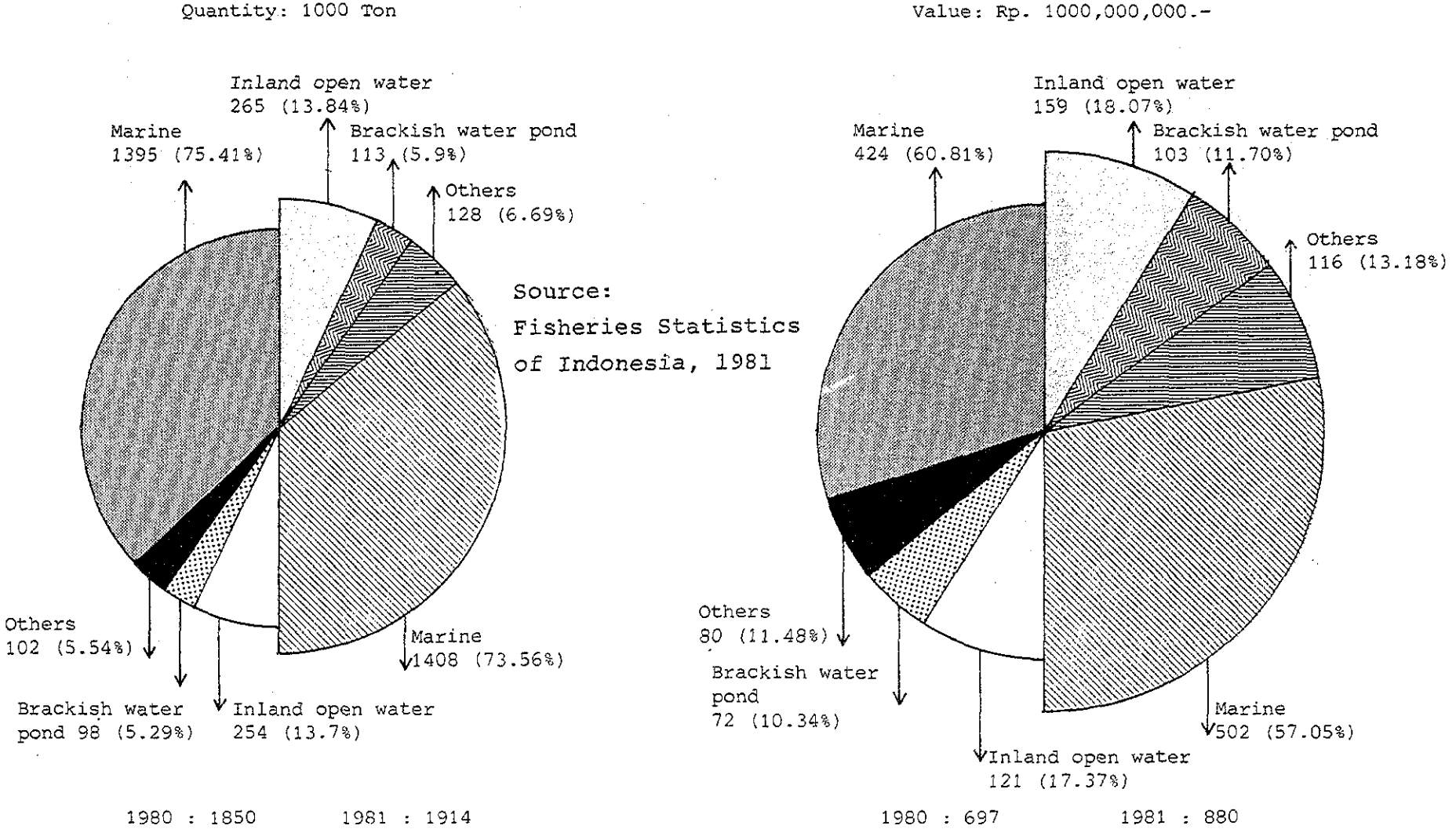


Fig. 2-4-3/2 Fishery production, 1980 and 1981

2) Species

There are variety of species in marine fishery: in 1981 fishes hold the major part of 1,206 thousand tons (85.7%) followed by crustaceans of 140 thousand tons (9.9%).

The value-wise production represents that fishes had 367,800 million Rupiah (72.9%) with crustaceans in 126,800 million Rupiah (25.2%) **(APPENDIX-8)**.

The annual average growth during the five years period of 1977 to 1981 showed the former at 5% and the latter at 28.4%.

(2) Marine Fishery Vessels

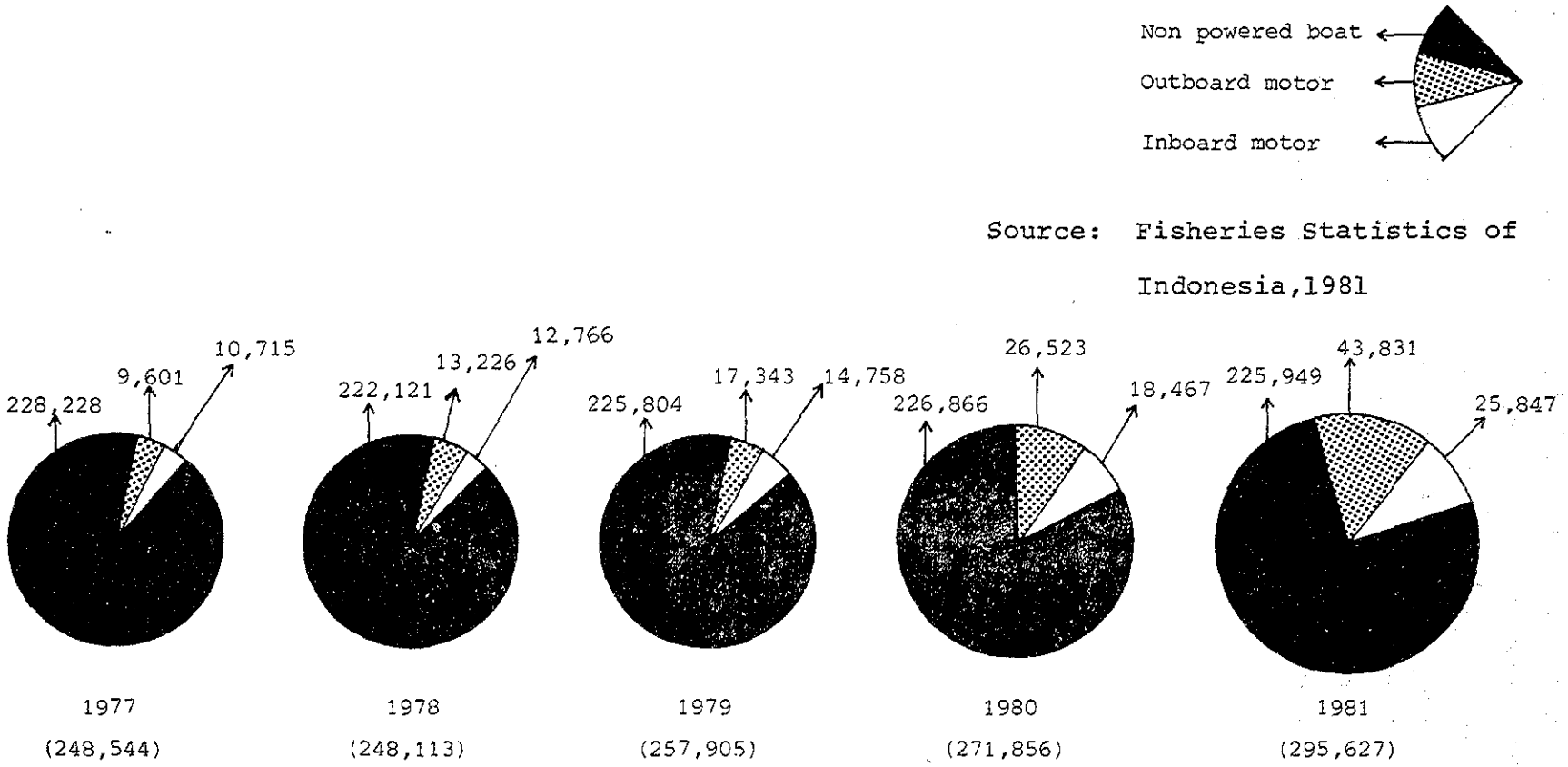
There were approximately 277,000 marine fishing vessels in 1981, out of which 81.6% (226,000 ships) were non-powered and only 18.4% (51,000 ships) were motorized. The low productivity is considered to have stemmed from the fact that there are a number of small sized ships **(APPENDIX-8)**.

Fig. 2-4-3/3 illustrates the flow in number of marine fishing vessels.

The annual average increase in number of fishing vessels during the five years period of 1977 to 1981 showed 2.7%, which is approximately half of the annual average growth in fishery production, i.e. 5%.

This indicates that modernization of fishing vessels and gears are being gradually implemented **(APPENDIX-8)**.

The geographical distribution of marine fishing vessels in 1981 showed that there is higher concentration of motorized vessels in Sumatera and Jawa areas, where the production is higher in volume in contrast to the existing number of vessels. In Bali and Maluku/Irian areas, number of large-sized vessels is higher, which is considered to be due to fishing operation bases located.



Source: Fisheries Statistics of Indonesia,1981

Fig. 2-4-3/3 Number of marine fishing boats, 1968, 1973-1981

(3) Fishing Grounds

The fishing grounds for marine fishery is shown in **APPENDIX-8.**

1) Coastal Fishing

There are apparently no fishing bases specifically established for this purpose, but the bases are rather scattered along coastlines of the entire country.

It is frequently the case that their mode of fishing operation is they go out for fishing in the evening and return to bases early in the following morning.

Seasonal conditions frequently prohibit them from going out due to heavy rain and rough sea, especially October through to January.

2) Inshore Fishing

The fishing grounds for inshore operations are generally about 100 miles offshore in Indian Ocean. Tuna fishing is mainly carried out by 100 - 300 tons of fishing vessels in the areas.

(4) Others

1) Fishermen

There were in 1981 about 1,105 thousand marine and about 446 thousand inland open water fishermen, and among them full timers were 576 thousand (52.4%) in

marine and 161 thousand (36.0%) in inland fishery **(APPENDIX-8)**.

The per capita productivity is rather low, representing 1.27 tons in volume and 456,000 Rupiah in value.

2) Disposition of Marine Fishery

Most of the marine fishery products have been supplied in fresh and through dried/salted process, leaving a few percentage of catch frozen and/or canned.

In 1981, among the total volume of 1,408 thousand tons in marine catches, 690 thousand tons (49%) were supplied in fresh and 465 thousand tons (33%) dried/salted, and only 49 thousand tons (3.4%) were supplied frozen **(APPENDIX-8)**.

The disposition ratio during the past five years has shown more or less similar trend to that in 1981.

2-4-4 Other Maritime Activities

(1) Ocean Development

In Indonesia, an oil producing country, ocean development has been undergoing: oil exploration at sea by oil rigs. Although the detailed data on at-sea structurers suitable for the Study was not available, the general overall situation may be pictured by reviewing the sea bottom oil fields and their exploration status.

The oil fields in Indonesia are found in many places in the country, and among all the sea areas off central Sumatera, East Kalimantan and Jawa sea area are the most important regions. The volume of oil produced during the past few years has been rather in its stagnation, and that in 1980 compared to the previous year's gave 1,570,000 b/d, minus 20%. However, the figure shown was the largest in South East Asia. The main areas covered are illustrated in **APPENDIX-23** including the following sea fields.

1) Around Jawa Sea

Arjuna Oil Field
About 125 km East of Jakarta
Production Volume: 98,691 b/d (1979)
Oil Reserves: Approx. 400 mil. barrel or over

Krisna Oil Field
About 120 km NNW of Jakarta
Production Volume: 47,530 b/d (1980)

Cinta Oil Field

About 100 km NW of Jakarta

Production Volume/peak: 55,704 b/d (1976)
24,574 b/d (1980)

Salatan Oil Field

About 10 km SW of Cinta

The productivity made considerable increase since two platforms were completed in 1979.

Rama Oil Field

About 98 km NW of Jakarta

Production Volume/Peak: 47,168 b/d (1977)
23,695 b/d (1980)

2) Around East Kalimantan

Attoka Oil Field

150 km NE of Balikpapan

Production Volume: 102,237 b/d (1979)
95,070 b/d (1980)

Eight platforms are in operation.

Oil Reserves: 400 mil. barrel
(Residue approx. 1.3 mil)

Handil Oil Field

About 65 km NE of Balikpapan

Production Volume: 166,912 b/d (1979)
163,621 b/d (1980)

Oil Reserves: 400 mil. barrel or over

Bekapai Oil Field

About 80 km ENE of Balikpapan

Production Volume: 47,649 b/d (1979)
36,685 b/d (1980)

The productivity increased to 55,000 b/d since new platforms completed in 1976.

As described above, a number of platforms are in operation over the wide areas off South Sumatera, Jawa Sea, East Kalimantan and some other areas, and it may also be expected the number will further increase. This will inevitably cause some effects on the maritime traffic.

(2) Maritime Pleasure

The natural environment of geographical and tropical conditions leads Indonesia to have a great potentiality of developing maritime pleasure industry. There have so far been only a few number of yachts, motor boats, trolling boats, etc. However, the present status still is in a primitive stage, and only limited areas currently seem to indicate the potential growth. It may be said that there exists a possibility of the industry's development and growth in such way that a policy of tourist attraction would be implemented through the financial backup.

Consequently, it is too early at this stage to come to some conclusion on the possible effect to cause on the maritime activities as a whole.

2-5 Marine Casualties

Analysis has been made for the marine accidents occurred for the period of 1979 through to 1983 (up to October): the areas of occurrence were plotted to show the density as shown in **APPENDIX-7.**

The high density areas are along the northern coasts of Jawa, specifically in the vicinity of Tg. Priok Port to Sunda Strait, south-east of Sumatera, Cirebon to Semarang, and Surabaya to Madura areas. Other areas are the eastern coast of central Sumatera, namely in the islands areas near Singapore, Belawan areas, east to south-eastern coasts of Kalimantan and Makassar areas. The total number of accidents occurred during the past five years amounted to 1,913 as shown in **APPENDIX-7.**

The types of casualties possibly caused by lack or insufficiency of aids to navigation may be collisions and strandings. The past two years records in 1982 and 1983 show that there occurred 112 strandings (14.4%) and 106 collisions (13.7%) giving 28% out of the total number of 776 casualties.

APPENDIX-7 also shows the area distribution of collisions and strandings only during the three years, which has the similar trend of concentration to the whole locations. Among them, south of Bangka, Tg. Priok, Semarang, Surabaya to Madura, Cilacap, Samarinda and Makassar are the high density areas.

It is evidently shown that the casualties areas are concentrated on the higher density of traffic and fishing areas.

The marine casualties occurred during the recent two years period of 1982 and 1983 are given in **Table 2-5/1.**

The total number recorded was 776; 446 in 1982 and 330 up to October, 1983 (396 equivalent to the whole year), and 218 out of 776 were either collisions or strandings occupying 28% of the total. With regards to the accidents by type of ships, cargo vessels have the highest figure of 610, in which 68 (11.1%) were collisions and 89 (14.6%) were strandings. As regards the size of vessels, ships of 100 G/T or over account for 64%, 389 out of 610. Consequently, cargo vessels of 100 G/T or over had 45 collisions (11.6%) and 68 strandings (17.5%). The ratio of collisions and strandings in relation to the number of accidents of all cargo vessels is 7.4% in collisions and 11.1% in strandings.

Other vessels like tug boats, dredging boats and barges stand in the second position, followed by fishing vessels, in number of casualties giving 65. However, the number of collisions and strandings was 16 (24.2%) and 8 (12%) respectively.

Fishing vessels had 62 casualties, out of which 15 collisions (24%) and 8 strandings (13%) were recorded without specific concentration on the size of vessels. However, the records do not include non-motorized vessels. If a great number of sailing ships and non-powered fishing boats would be included in the statistics, then greater number of marine accidents could have been recorded.

Table 2-5/2 shows the marine casualties occurred in 1982 and 1983 by areas and tonnage.

Table 2-5/1 Marine Casualties Occurred in 1982 and 1983
By Type of Ship and Tonnage

Type of Ship	Gross Tonnage	Collision	Stranding	Others	Total
Cargo Vessel	less than 5 G/T	1	-	2	3
	5 - 20	7	4	19	30
	20 - 100	15	17	156	188
	100 G/T and over	45	68	276	389
	Total	68	89	453	610
Passenger Vessel	100 G/T and over	1	3	13	17
	Total	1	3	13	17
Tanker	100 G/T and over	6	4	11	21
	Total	6	4	11	21
Others	less than 5 G/T	4	-	3	7
	5 - 20	2	-	-	2
	20 - 100	5	4	14	23
	Total	16	8	42	66
Fishing Vessels	less than 5 G/T	4	1	4	9
	5 - 20	3	2	12	17
	20 - 100	4	2	17	23
	100 G/T and over	4	3	6	13
	Total	15	18	39	62
Grand Total		106	112	558	776

Source: Marine Casualties, KPLP, DGSC.

Table 2-5/2 Marine Casualties Occurred in 1982 and 1983
By Area and Tonnage

Type of Ship	Gross Tonnage	Collision	Stranding	Others	Total
In Port	less than 5 G/T	3	1	1	5
	5 - 20	2	1	1	4
	20 - 100	6	2	24	32
	100 G/T and over	40	8	69	117
	Total	51	12	95	158
Less than 3 miles	less than 5 G/T	5	-	4	9
	5 - 20	9	4	8	21
	20 - 100	11	20	22	53
	100 G/T and over	9	76	33	118
	Total	34	100	67	201
3 - 12 miles	less than 5 G/T	-	-	3	3
	5 - 20	2	-	12	14
	20 - 100	6	-	44	50
	100 G/T and over	8	-	82	90
	Total	16	-	141	157
12 miles and over	less than 5 G/T	1	-	1	2
	5 - 20	-	-	9	9
	20 - 100	1	-	93	94
	100 G/T and over	3	-	152	155
	Total	5	-	255	260
Grand Total		106	112	558	776

As seen in the **Tables**, the highest ratio of accidents is by ships of 100 G/T or over in the areas 12 miles off coast or further, and as far as collisions and strandings are concerned ships of 100 G/T or over in the areas within 3 miles off shore had the highest records totalling 9 collisions and 76 strandings, having amounted to 85 (42%), out of the total 201. Strandings are especially higher in number.

The data obtained and made available has no records on causes of collisions and strandings. Therefore, reference is made to similar data compiled for by the Marine Accidents Inquiry Agency, belonging to Ministry of Transport, Japanese Government, for the analysis on causes: strandings are attributed 32% to "wrong selection of routes, misunderstanding of navaids, lack or insufficient checking of current", and among all these "misunderstanding of navaids" reached to 26%.

According to a Japanese data extracted for reference, the relationship between size of vessels and the rate of occurrence is as given in **Table 2-5/3.** In this case, the rate of occurrence is the ratio of number of casualty ships over the registered total.

Table 2-5/3 Relationship between Size of Ship and Rate of Accidents Occurrence

Size of ship	3,000 G/T -	500 - 3,000 G/T	100 - 500 G/T	20 - 100 G/T
Rate of Casualty Occurrence	1.45	1.65	0.60	0.14
Rate of Collision Occurrence	1.06	1.20	0.36	0.066
Rate of Stranding Occurrence	0.27	0.30	0.14	0.020

Source: Maritime Traffic Engineering
Dr. Y. Fujii

It shows that the smaller the size of ships is, the extremely lesser collisions and strandings occur. However, it may be thought that those vessels might have not reported on their accidents to the authority due to possible light damages because of their slow speed, although fishing vessels are large in number and different in the operating status.

Nevertheless, it seems there are considerable number of marine accidents not included in the current records of casualties, because there scattered plenty of islands and remarkable number of sailing boats and non-powered fishing boats come and go throughout the country although the motorization project for sailing and non-powered ships has been implemented.

Note should also be made that 516, 66.5% out of the total 776 accidents recorded during the last two years occurred within 12 miles including ports and harbours, and this reflects the factual status of traffic congestion in these areas, and indicates that placing emphasis on ports

and near coasts for prevention of accidents is considered to be effective.

2-6 Ports and Harbours

Along the immense length of coastlines extending along Indonesian coasts, a number of ports have developed to function obviously as port cities.

The whole nation is administratively divided into the nine Districts, each of which has District Headquarters of Sea Communication. Each District has, under its jurisdiction, Harbour Masters, Port Administrators and other organizations for their local ports, the total number of which amounts to about 300. **Table 2-6/1** gives the number of ports by District and Class, and **Fig. 2-6/1** shows the distribution of main ports.

Table 2-6/1 Number of Ports by Districts and Classes

Class / District	1	2	3	4	5	Others	Total
I	1	0	3	2	4	19	29
II	0	2	2	3	6	26	39
III	2	3	3	3	4	31	46
IV	1	2	3	7	5	25	43
V	0	2	2	3	6	11	24
VI	1	0	1	1	0	16	19
VII	0	1	1	2	0	25	29
VIII	0	1	1	0	1	23	26
IX	0	1	1	2	2	8	14
Total	5	12	17	23	28	184	269

Notes: Classification by Port Administrator

As seen in **Fig. 2-6/1**, a number of ports, large to small, are scattered around Indonesia with its focus in Jawa. Indonesia is by nature an archipelago nation surrounded by vast sea areas, and thus it is evident that the sea transportation stands in an important position for transportation of cargoes and passengers as compared to the air transportation.

The expansion in flow of cargoes as well as in foreign trade through REPELITA scheme has accelerated the necessity of steady development of ocean-going as well as inter-islands routes, and also increasing importance of port development has recently been recognized together with the promotion of local development and immigration schemes.

As Indonesian economy develops, the cargo volume dealt in each port has been increasing year by year, and the factual results are listed in **Tables 2-6/2** and **2-6/3** for main ports, i.e. the total volume of cargoes dealt by the ten top ports accounts for approximately 70% of the grand total of cargo volume handled by all the ports in Indonesia.

In order to cope with the uphill importance of sea transportation, Indonesian Government has planned the development of nation-wide liner routes, in parallel with the improvement of transportation efficiency and the development of national fleet, and has been proceeding with the modernization of ports. Namely, in the fourth Five Year Development Project (REPELITA IV) started April 1984, the Gateway Port System has been adopted selecting the four major ports of Belawan, Tg. Priok, Surabaya (Tg. Perak) and Ujung Pandang for export drive of the commodities except oil. The four Gateway ports will have Collector

Ports and Trunk Ports, the total number of which is 43 (see **APPENDIX-21**).

The Gateway system derives from the "export drive" policy, which is a part of the ILS system, in which complexed inter-islands routes will be rationalized in order to improve the maritime traffic efficiency. The Gateway policy basically forms a nucleus of Inter-island Liner Service, and the Regular Liner Service consists of Trunk Service operating between main ports, Feeder Service running ILS-ports and Feeder ports and Local Service connecting feeder ports with even smaller local ports.

Further services are to be provided by Pioneer shipping operating in remote areas, and Special (Khusus) shipping freely operating upon necessity between various ports other than ILS ports.

Such a variety of services setup as mentioned above constitutes the domestic sea transportation system complementing each other.

The Gateway system has selected 32 ILS ports, with 11 others having potentiality to be further designated, with reference to the transportation modes in terms of geographical locations, port facilities and current cargo volumes and so on. Namely, in this System, the main ports nation-wide are categorized as shown in **Table 2-6/4**, and the improvement in operational functions of each port is now the key target for development of sea transportation capability.

Fig. 2-6/1 Districts and Main Ports in Indonesia

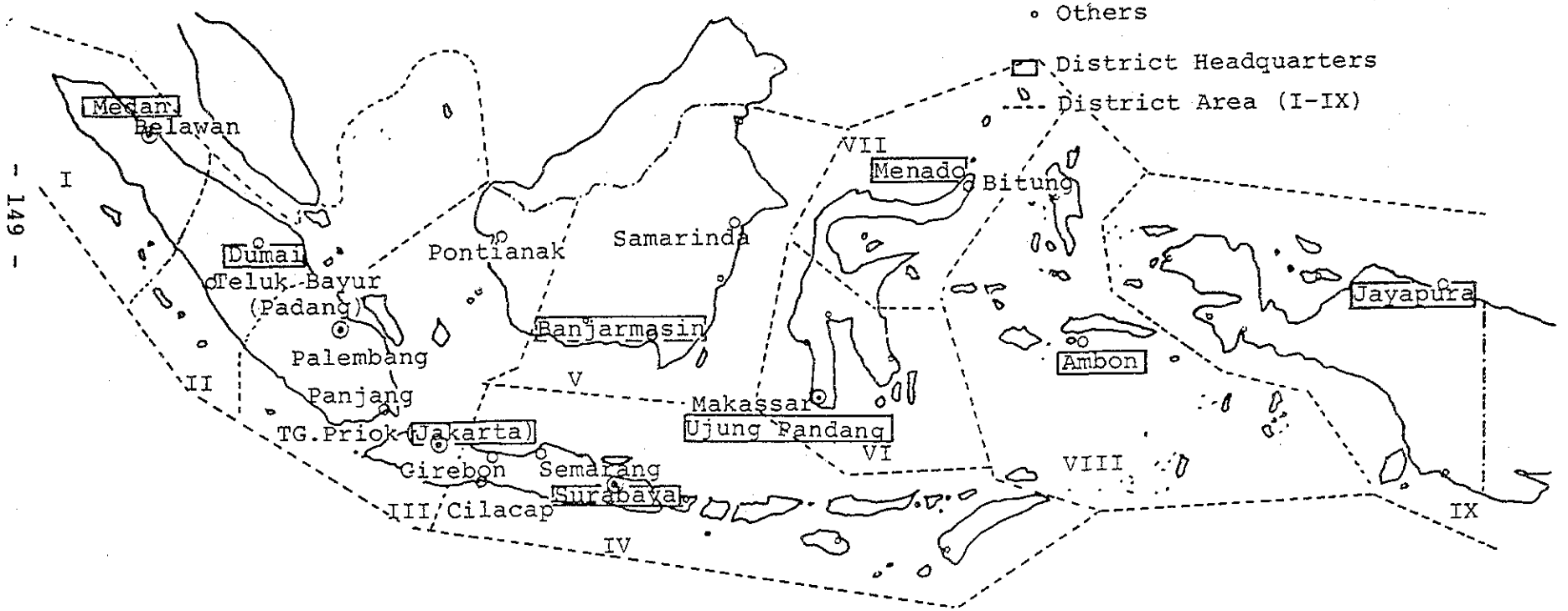


Table 2-6/2 VOLUME OF EXPORTS BY PRINCIPAL PORTS 1978 - 1982

1,000 M/T

PORT	1978	1979	1980	1981	1982
Tanjung Priok	9,897	6,557	871	833	2,910
Cirebon	390	2,605	1,578	1,435	728
Surabaya	645	962	863	868	419
Belawan	936	915	1,246	809	436
Pakanbaru, Dumai	37,070	34,287	33,664	33,298	12,560
Pangkalan Susu	1,027	901	864	922	444
Palembang	891	947	1,055	568	283
Balikpapan	5,920	6,141	8,190	2,708	828
Samarinda	15,733	12,354	9,895	12,711	3,696
Ujun Pandang	219	235	208	139	55
Total (A)	72,728	65,904	58,434	54,291	22,359
Total Volume of Exports (B)	101,267	98,268	92,512	86,182	42,016
(A)/(B)	71.8%	67.1%	63.2%	63.0%	53.2%

Source: Statistic Indonesia '82

Table 2-6/3 VOLUME OF IMPORTS BY PRINCIPAL PORTS 1978 - 1982

1,000 M/T

PORT	1978	1979	1980	1981	1982
Tanjung Priok	4,816	4,978	5,400	5,703	2,722
Cirebon	421	495	455	319	267
Semarang	972	968	575	858	431
Surabaya	1,039	1,444	2,237	2,917	1,567
Belawan	1,165	864	1,375	1,551	989
Teluk Bayur/Padang	133	144	319	309	185
Palembang	174	155	221	151	94
Panjang	81	118	127	72	832
Balikpapan	391	699	380	988	546
Ujung Pandang	602	320	838	406	195
Total (A)	9,794	10,185	11,927	13,274	7,828
Total Volume of Improt (B)	13,349	14,509	19,008	18,632	11,411
(A)/(B)	73.4%	70.2%	62.7%	71.2%	68.6%

Source: Statistic Indonesia '82

Table 2-6/4 Gateway Ports and Allocated ILS Ports

	GATEWAY PORTS AND ALLOCATED ILS - PORTS			
GATEWAY	BELAWAN	TG PRIOK	TG PERAK	U.PANDANG
REGIONAL/ COLLECTOR PORT	Lnok Seumaweh Dumai Batam	Palembang Panjang Padang Pontianak	Semarang Lembar Kupang Balikpapan	Bitung Kendari Ambon Sorong
TRUNK PORT I	Krueng Raya Sibolga	Bengkulu Cirebon	Cilacap Meneng BJmasin Tarakan Samarinda	Gorontalo Pantoloan Ternate Jayapura
TRUNK PORT II	Pekanbaru Kuala Tanjung	Jambi Sintete	Kalianget Sampit Benoa	Pare-pare Toli-toli Biak Merauke

The System has the four main ports of Belawan, Tg. Priok, Surabaya and Ujung Pandang as the Gateway Ports.

2-7 Coast Stations and SAR Telecommunications

The coast stations and SAR telecommunications together with the development of aids to navigation play an important role in securing the safety of life and property at sea.

There are two categorical functions of coast stations: one is the general coast stations dealing normally with general public telecommunications with ship stations, and the other is the exclusive use for maritime SAR telecommunications. The former also deals with the emergency frequencies.

2-7-1 General Coast Stations

The development program F-ST-12 is currently under its implementation for improvement, modernization and rehabilitation of the main coast stations:

The improvement and modernization are being carried out for the following stations mainly for their transmitters, receivers and other associated equipment:

Jakarta	Ujung Pandang
Belawan	Bitung
Dumai	Ambon
Surabaya	Jayapura
Semarang	

Also, rehabilitation is being carried out for following stations mainly for their antenna system and some receiving equipment:

Sorong
Merauke

It is also to be followed by the second phase project, F-ST-12-2nd, which will complete the improvement of the main coast stations in a few years time.

The following stations will be installed with new radio transmitters, receivers and some other associated equipment:

Banjarmasin	Balikpapan
Sorong	Palembang

Improvement in the mobile service will be carried out for the following stations including selective call equipment.

Jakarta	Surabaya
Medan	Ujung Pandang

Other installations are also to be carried out in addition to the above.

The coast stations are the part of the responsibilities of Districts of Navigation, and deals with the telecommunications serivces with general ships at sea as well as the internal telecommunications between the various levels of organizations including the management, operation and maintenance of aids to navigation.

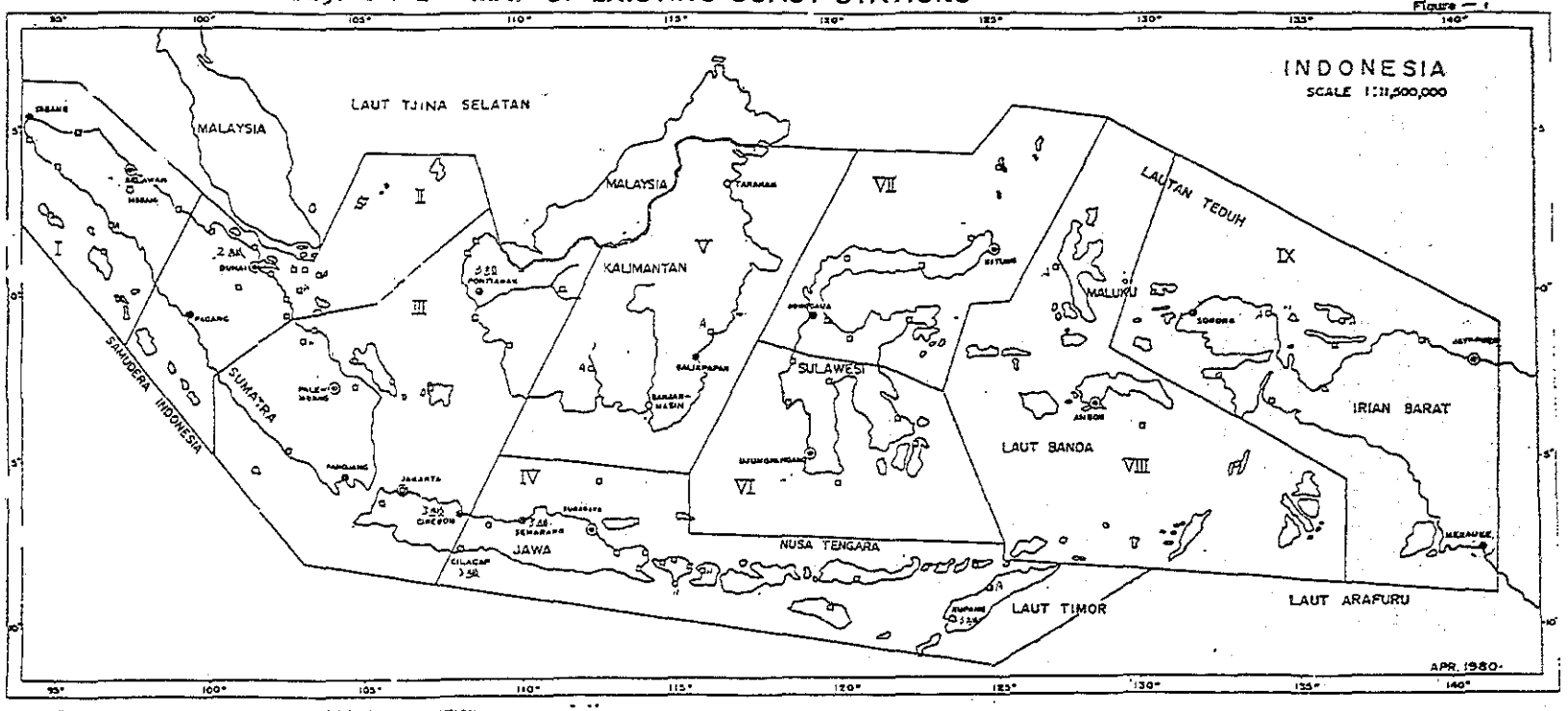
With regard to the maintenance and operation of electronic aids to navigation, the coast station personnel are providing the technical support on a provisional basis.

When the 1st phase implementation of MF radiobeacons will have completed in the near future, the aids to navigation personnel qualified will be in charge of the maintenance and operation of the radio aids.

In the general coast stations of 1st, 2nd and 3rd classes, 2 - 3 maintenance personnel are staffed.

Fig. 2-7-1 shows the locations of existing coast stations.

Fig. 2-7-1 MAP OF EXISTING COAST STATIONS



2-7-2 Maritime SAR Telecommunications

Development of communication networks for the exclusive use of maritime SAR is already programmed for the implementation due to the vital necessity of prompt and reliable communications, which are essential as they will provide the maritime task force of Sea and Coast Guard (KPLP), DGSC with alerting information without delay and will permit KPLP to promptly despatch their units and facilities to search areas and maintain reliable two-way contact with them for the duration of SAR operations.

For this purpose, the following are to be implemented:

(1) Operation Center

(i) Central Operation Center

The Central Operation Center is based in Jakarta for the centralized continuous monitoring of the movements of all KPLP owned SAR ships for the overall command of all the Regional Operation Centers as well as of the SAR Fleet, which is under the direct control of the Central Center.

The Center also co-ordinates the Regional Centers for despatch of SAR ships from one Regional Center to the other upon necessity and carries out inter Regional Center co-ordination required for maritime SAR operations. The Center is the main contact of the central co-ordination by SAR National including international SAR operations.

Location: Central Headquarters (Jakarta)

(ii) Regional Operation Center

The Regional Operations Centers are established in each District Headquarters of Sea Communication for the continuous monitoring of the movement of all of their respective SAR ships and for control of the Detachments within their own Districts. A Regional Center also makes liaison with other Regional Centers via the Central Operation Center in order to solidify the operation system. The Regional Centers are the contacts for SAR co-ordination by KKR/SKR (Rescue Coordination Center/Sub-Rescue Coordination Center) and with other SAR organizations.

Location:

I	Regional Headquarters (Medan)
II	Regional Headquarters (Dumai)
III	Regional Headquarters (Jakarta)
IV	Regional Headquarters (Surabaya)
V	Regional Headquarters (Banjarmasin)
VI	Regional Headquarters (Ujung Pandang)
VII	Regional Headquarters (Menado)
VIII	Regional Headquarters (Ambon)
IX	Regional Headquarters (Jayapura)

(2) SAR Radio Operation Station (SAR ROS)

The SAR Radio Operating Stations linked with the relevant coast stations are established in nine (9) KPLP Detachments which cover important water areas. The SAR ROS' are to be under 24 hours operation, carry out continuous watch on the important frequencies, maintain contacts with SAR ships, broadcast information on navigation safety and make communications for other SAR

activities. And all the messages and information on marine accidents, direction finding and such are sent into the Operation Centers from SAR ROS'.

Location:

(i) SAR Radio Operating Station (ROS)

Belawan Detachment	(Region I)
Tg. Uban Detachment	(Region II)
Tg. Priok Detachment	(Region III)
Surabaya Detachment	(Region IV)
Balikpapan Detachment	(Region V)
Ujung Pandang Detachment	(Region VI)
Bitung Detachment	(Region VII)
Ambon Detachment	(Region VIII)
Sorong Detachment	(Region IX)

(ii) Coastal Radio Stations

Belawan	(1st Class Station, Region I)
Tg. Uban	(4th Class Station, Region II)
Jakarta	(1st Class Station, Region III)
Surabaya	(1st Class Station, Region V)
Balikpapan	(2nd Class Station, Region VI)
Ujung Pandang	(1st Class Station, Region VII)
Bitung	(1st Class Station, Region VIII)
Sorong	(3rd Class Station, Region IX)

2-8 Problematic Points

(1) Improvement of Management and Operation System for Aids to Navigation

The management and operation of aids to navigation in Indonesia have been carried out by the 24 dispersely located Districts of Navigation belonging to the relevant Regional Headquarters of Sea Communication (KANWIL), with the whole nation divided into the nine administrative districts.

The coverage of averaged coastlines per District of Navigation extends as long as 1,370 nautical miles.

The wide geographical coverage of management and operation system as such may be considered to be extremely difficult to implement an appropriate operational setup for the navaids under their coverages, from the view points of coping with the routine and emergency maintenance and maintaining the status quo operation and performance.

For the purpose of overall improvement in the operational performance, reliability and availability of aids to navigation taking also into account future social and technical development, needs exist to develop an effective organizational setup for the management and operation of aids to navigation in order to streamline the existing arrangement.

(2) Maintenance of Buoys

The relevant authorities in the world have headaches in executing the heavy burden of maintenance of buoys, different from that for fixed aids, due to their adverse operational conditions at sea.

The best method of maintenance for buoys is that it should be carried out in such way that buoys are to be unloaded up on board for their return to the base for the thorough checking of bodies and associated devices, the replacements of tear and wear parts and the careful re-painting. This method is applied in a number of countries.

The present situation in Indonesia is that they are being maintained on the decks of buoy tenders, generally twice a year but rather on a temporary basis at the sites at sea. This obviously has led to the possible outcome of shortening the life time of buoys due to the insufficient maintenance in anti-rust measures and re-painting, because of so-called "floating repairs."

Setting up of necessary maintenance system is an urgent subject to be executed for the scheduled total replacement of buoys, procurement of spare buoys, replacement of spare parts, rehabilitation and improvement of buoy bases and necessary machines, as well as the checking and repair facilities.

(3) Stand-By Power Source for Light Beacon

As commercial power becomes available with its higher stabilization, the number of lights using commercial power is expected to increase, especially for those to be built near cities and towns.

Lights will become maintenance free, but necessary countermeasures should always be taken for power failure due possibly to storms and heavy rain, etc.

Accordingly, installation of stand-by power source is the vital requirement when commercial power will be in use, especially for important major lights and harbour lights.

(4) Securing the Safety for Aids to Navigation Facilities

There are a number of framed iron tower structures in use for aids to navigation facilities in Indonesia, and human dangers may be foreseen for the maintenance personnel to carry out their works since some of them have considerable degree of corrosion, rust and injuries on the steps, stairs, handrails and so forth due to aging.

There have also been spotted during the Field and Site Surveys, at some of the light beacon sites, safety of the personnel on the service vessels has not been secured because of insufficient availability of jetties and mooring facilities.

Due consideration should be paid to the former to apply anti-corrosion materials (concrete, FRP, etc.) for substantial extension of the life time, and to the latter for their construction at the time of new installations.

(5) Remote Monitoring System

There are a number of lighthouses situated in isolated islands and remote areas, where some measures need to be taken especially from the view point of human safety and improvement in the living environment.

For this purpose, demanding and a remote monitoring system ,therefore, should be considered for some specific lighthouses.

3. INTERNATIONAL TREND IN AIDS TO NAVIGATION

3. International Trend in Aids to Navigation

For the purpose of contemplating the international unification and coordination of aids to navigation in the world, the International Association of Lighthouse Authorities (IALA) provides the member nations with necessary advice and recommendations on the technical and operational aspects of aids to navigation on a world-wide basis either directly or through IMO.

3-1 Visual Aids to Navigation

International unification of the buoyage system was agreed in 1980 at the Tokyo Conference of IALA, and each nation concerned has been proceeding with the implementation of the system in accordance with the agreement.

Studies on an international level are being carried out on the improvement of visibility and visual perception of aids to navigation, colorimetric specifications, necessity of possible commonality for equipment hardware specifications, improvement in reliability and availability of navaids and other relevant subjects.

IALA also makes studies on application of the renewable energy sources for aids to navigation like solar cells, wave-activated generators, wind generators. Shift-over from gas energy to electric power supply including batteries are in a fast development anywhere in the world.

Furthermore, the workshops covering special subjects have been arranged to discuss between the parties concerned such items as ice effect on lighthouse structures and floating aids.

3-2 Electronic Aids to Navigation

There are presently a number of radionavigation systems available to mariners.

The electronic aids to marine navigation may be categorized as follows from the view point of marine user requirements:

- World-wide navigation aids system
- Long range navigation aids system
- Intermediate range navigation aids system
- Short/harbour and harbour approach navigation aids system

(1) World-wide navigation aids system

This phase includes OMEGA, a VLF ground station system and the NAVSTAR Global Positioning System (NAVSTAR GPS), a satellite system, which is to replace NNSS.

- GPS

NAVSTAR GPS has currently been under the development by the U.S. government for national security. It will have an ability, however, to provide highly accurate radionavigation to civil users anywhere in the world. Civil users will experience some degradation of NAVSTAR GPS navigation signal accuracy to protect the national interests of the United States and NATO. Six research and development satellites are in orbit. The system will comprise 18 operational and 3 operating spare satellites in six coplanar orbits, and the 18 satellite constellation is planned to be operational in 1989. NAVSTAR GPS has the potential to meet users needs for oceanic and

coastal navigation applications. One of the disadvantages is repeatable accuracy, and studies are also being made on the differential mode to improve the accuracy and availability.

- OMEGA

OMEGA is a Very Low Frequency (VLF), phase comparison, hyperbolic electronic aid to navigation system, in which the total number of eight transmitting stations is geometrically allocated over the globe to provide the world wide service coverage, especially for ocean-going vessels. The OMEGA navigation system is operated through international cooperation of the seven nations:

Designation	Location
A	Alora, Norway
B	Monrovia, Liberia
C	Haiku, Hawaii, USA
D	La Moure, North Dakota, USA
E	La Reunion Island, France
F	Golfo Nuevo, Argentina
G	Woodside, Australia
H	Tsushima, Japan

The last of eight stations in Australia completed and came on air in 1982. Each station transmits the signals on 10.2, 11.05, 11.33 and 13.6 kHz as well as a frequency unique to that station at the output power of 10 kW. Measurement of phase difference of OMEGA signals from three or more stations is to provide its users with the positioning information in latitude and longitude.

The main advantages of OMEGA are the world-wide all

weather coverage and the fact that it is internationally operated and used. The significant disadvantages are its limited accuracy and unpredictable propagation anomalies.

It is esteemed that the OMEGA system will be used as a back-up of GPS when it becomes fully operational.

(2) Long Range Navigation System

The long range navigation system widely in use is Loran-C, which was designated by the U.S. Government as their navigational system for the coastal confluence zone in 1974.

Loran-C is a phased hyperbolic navigation system operating in the frequency band of 90-110 kHz, providing users within its coverage with all weather precision positioning information.

There are seventeen chains in operation, and the U.S. Coast Guard participate in the operation of fourteen of these chains. Four more chains are in various stages of construction, but the U.S. is not a principal in any of the new Loran-C chain construction.

The U.S. Coast Guard presently operates the chains covering the special operating areas of the Northwestern Pacific Ocean, South Korea, the North Atlantic Ocean, the Norwegian Sea and the Mediterranean Sea. However, discussions are under way between the U.S. Coast Guard and the nations concerning possible transfer of the chains, established in these areas, to each country due to the recent U.S. announcement on 1992-1996 phase out of the system overseas due to the projected GPS implementation.

Loran-A had previously been in wide-use by marine users. Extensive tests for the much improved system of Loran-C were carried out between 1952 and 1955, and its superiority in the coverage and accuracy brought about the downfall of Loran-A.

The phase out of Loran-A was announced in 1974 and all the chains in North America have already been phased out in favour of Loran-C. The only Loran-A chains existing today are in Japan due to the continuing users demands.

(3) Medium Range Navigation System

The Decca navigator system is a hyperbolic, phase comparison, high precision navigation system. Medium-wave radiobeacon is the most commonly used, internationally standardized navigation system providing bearing information.

- Decca

The Decca navigator system widely in use is a medium to short range electronic aids to navigation intended for coastal and landfall applications. The frequencies transmitted are in the low frequency band and cover the range of 70 -130 kHz.

There are in total 51 Decca chains either in operation or under construction. Following the introduction of the first chain in 1946, coverage has grown steadily. The high accuracy of the all weather system is available from north of Norway to south of Lisbon, eastern seaboard of Canada, in the Gulf, Bombay and Culcutta areas of India, in Bangladesh and whole Japanese waters. The coverage

also exists over the coast of South Africa and north west Australia: 25 chains in Europe, 3 chains in India, 5 chains in South Africa, 4 chains in Nigeria, 2 chains in Australia, 6 chains in Japan and some more in other areas.

- MF radiobeacon

Marine radiobeacon is the basic system of medium to short range electronic aids to navigation, and has widely been in general use world wide, among the nations concerned, the following stations have been in operation in 1982:

U.S.A.	201 stations
Canada	97 stations
Japan	47 stations
France	39 stations
England	37 statoins

The medium-wave radiobeacon has various advantages especially of the low cost and operational easiness. User equipment can be purchased at a low cost and operated with little or no special training.

The marine radiobeacon has recently experienced re-evaluation of the usefulness and effectiveness through the changes of technology and time, overcoming a cornerstone, as an useful radionavigation aids. This can be seen, for example, both in the improvement program, recently implemented by the U.S. Government, having modernized 199 existing radiobeacons and established 21 new stations, and in the recent movement in European Region I for re-arrangement of stations and frequency and sequential improvement of the system, i.e. revision of: the so-called "Paris Plan 1951", which was the

Regional Agreement, Paris 1951 drawn up for Region I in combining the preceding arrangements with the political frontiers in the Region and the changes in frequency allocation taken into account.

The radiobeacons may transmit the data portion of the station identification, latitude and longitude, additional navigational information like weather report as required. The local weather broadcasting system may be incorporated in a medium-wave radiobeacon to transmit real time local weather conditions as a part of non-directional radiobeacon signals through modulation of a carrier frequency.

- Differential OMEGA -

The limited accuracy of OMEGA can be improved through a differential mode of operation, which is Differential OMEGA system. The system employs an OMEGA receiver at a known location acting as a reference station to determine the real time phase corrections necessary to compensate for local propagation variations. The phase corrections are then transmitted through phase modulation of an existing radiobeacon station. There are currently more than ten Differential OMEGA stations, located mainly in Europe and Africa, and only one station is in experimental operation in the U.S.

The major advantage of the Differential OMEGA system is a low cost way to provide reasonably accurate navigation in selected areas. The major disadvantage of the system is its higher user equipment cost, i.e. OMEGA receiver plus additional device, either incorporated or separate.

(4) Coastal and Harbour Approach Aids

Racon is widely accepted as an useful aid to navigation for marking landfalls, inconspicuous coastlines and so on. There are also a number of VTS system in wide use for narrow channels and confined waters.

- Radar Beacon (Racon)

There are about 350 racons in operation in the world.

Canada	68
France	54
U.S.A.	45
Japan	38
England	33

Due to the increasing trend in installation of marine radars on board vessels, racons are becoming more and more important to improve safety of radar-fitted vessels when they become encumbered by poor visibility. Racons are being installed as effective means to mark navigation aids, landfalls, navigation dangers and so on.

The swept frequency racons are currently in wider use, but has the disadvantages of low information rate and degradation of information. The frequency agile racons will overcome many of the problems of swept frequency racons, and has been in experimental use in some countries.

- VTS (Vessel Traffic Services)

The Vessel Traffic Services (VTS) system is intended to improve safety and efficiency of vessels traffic enhancing the safety of navigation, efficient flow of

traffic, efficiency of port operations, protection of the environment and support of allied activities through the operational functions of gathering and evaluating information, supplying information to the traffic and surveying the traffic. There are currently over seventy stations in operation in the world.

The maritime user of the radionavigation systems has some navigation needs that can be classified as economic rather than safety. These economic needs tend to relegate a particular radionavigation system to a particular user nearly as much as the safety of navigation requirements do. The large ocean going vessels may derive an economic benefit from a long range radionavigation system in spite of moderate accuracy or infrequent fixes, the commercial fisherman and coastal trade vessel is frequently at an economic disadvantage with these same characteristics. In the oceanic phase of navigation economic benefits are most often derived from a system that provides from 10 to 460 meters 2 drms accuracy and a maximum fix interval of from 1 to 5 minutes. In the coastal phase of navigation, requirements to obtain economic benefits, vary from an accuracy of 1 meter 2 drms for science, hydrography and resource exploration, to an accuracy of 460 meters 2 drms for most other users. Other maritime operations, such as commercial fishing, derive economic benefits from a radionavigation system that provides a very high, 18 to 90 meter, repeatable accuracy thus permitting return to a particular location without regard to its precise geographic coordinates.

No single system can suffice the complexity of needs for variety of marine users.

The advantage of Administrations controlling their own accurate and automatic coastal radionavigation service can not be overlooked, especially when the system is less costly to provide and operate than other electronic navigation aid systems.

A number of nations operate a multitude of the electronic aids to navigation systems that benefit the civil communicity, and the combined systems are in practical application.

On the other hand, a world-wide trend in user equipment shows that a hybrid system is being widely used incorporating various units of individual systems into a single unit.

Table 3-2 shows electronic aids to marine civil navigation implemented in the world as of 30 September 1982.

Fig. 3-2 shows future movement of electronic aids to navigation in the world.

(References: . Proceedings of the Surface Transportation user Conference on Navigation, U.S. Dept. of Transportation, DOT-TSC-RSPA-83-1
. Proceedings of the National Technical Meeting, Jan. 1984, The Institute of Navigation, USA.)

Table 3-2 ELECTRONIC AIDS TO NAVIGATION IMPLEMENTED IN THE WORLD

AIDS TO NAVIGATION IN USE ON 30th SEPTEMBER 1982	RADIO AIDS																	RADAR REFLECTORS
	Radiobeacons and radio leading lines					Radionavigation systems						Radar beacons			Surveillance radars		Other aids	
	Non-directional radiobeacons: > 10 miles	Non-directional radiobeacons: < 10 miles	Directional radiobeacons	Radio leading lines	Other radiobeacons	Consol	Decca chains	Loran A stations	Loran C stations	Toran chains	Omega stations	Racons: > 500 mW	Racons: < 500 mW	Ramarks	Harbour stations	Coastal stations		
Algeria*	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
Australia*	11	-	-	-	-	-	2	-	-	-	1	-	6	-	-	-	2	43
Australia, Port of Melbourne	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2
Barbados*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Belgium, Administration de la Marine*	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	94
Belgium, Groupe Maritime de l'Escaut*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Benin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	3	-
Bermuda	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	6
Brazil*	13	-	-	-	-	-	-	-	-	-	-	-	3	-	-	2	-	-
Cameroon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Canada*	80	17	-	-	11	-	3	3	3	-	-	45	23	-	8	6	1	2,265
Chile*	7	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	69
Cuba*	2	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-

AIDS TO NAVIGATION
IN USE ON 30th SEPTEMBER 1982

	RADIO AIDS																	RADAR REFLECTORS
	Radiobeacons and radio leading lines					Radionavigation systems						Radar beacons			Surveillance radars		Other aids	
	Non-directional radiobeacons: > 10 miles	Non-directional radiobeacons: < 10 miles	Directional radiobeacons	Radio leading lines	Other radiobeacons	Consol	Decca chains	Loran A stations	Loran C stations	Toran chains	Omega stations	Racons: > 500 mW	Racons: < 500 mW	Ramarks	Harbour stations	Coastal stations		
Denmark*	24	1	-	-	-	-	1	1	2	-	-	-	21	-	-	-	-	-
Djibouti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Ecuador*	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
England & Wales, Trinity House*	31	4	2	-	-	-	-	-	-	-	-	-	33	-	-	-	-	447
England, Associated British Ports, Humber*	-	1	-	-	-	-	1	-	-	-	-	-	1	-	-	-	2	75
England, Associated British Ports, Southampton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
England, Gloucester	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Finland*	14	-	-	-	-	-	1	-	-	-	-	-	54	-	-	-	-	123
France, Metropolitan*	10	29	-	1	13	1	1	-	-	5	-	5	17	-	-	6	5	621
France, Overseas Territories*	-	1	-	-	1	-	-	-	-	1	1	-	-	-	-	-	-	38
Gaboon*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	13
German Dem. Rep.*	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	249
Germany, Fed. Rep.*	12	2	-	-	6	-	1	-	-	-	-	-	15	-	1	28	11	10
Greece*	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	7
Guinea	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-

AIDS TO NAVIGATION
IN USE ON 30th SEPTEMBER 1982

	RADIO AIDS																				
	Radiobeacons and radio leading lines					Radionavigation systems							Radar beacons			Surveillance radars		Other aids	RADAR REFLECTORS
	Non-directional radiobeacons		Directional radiobeacons	Radio leading lines	Other radiobeacons	Consol	Decca chains	Loran A stations	Loran C stations	Toran chains	Omega stations	Racons		Ramarks	Harbour stations	Coastal stations		
	> 10 miles	< 10 miles										> 500 mW	< 500 mW						
Hong Kong*	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	58
India*	13	-	-	-	-	-	3	-	-	-	-	-	6	-	-	-	-	-
Iran*	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	162
Ireland*	13	-	-	-	4	-	-	-	-	-	-	-	10	-	-	-	-	124
Israel*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Italy, Lighthouse Service*	17	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
Japan*	35	-	17	5	-	-	5	11	-	-	1	1	12	25	4	-	11	184
Kenya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Korea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	116
Madagascar*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
Malaysia	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	3
Morocco*	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
Netherlands*	8	-	-	-	2	-	2	-	-	1	-	7	-	-	5	4	-	1,100
New Zealand*	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway*	42	-	-	-	-	-	-	-	-	-	1	7	-	-	1	-	-	-

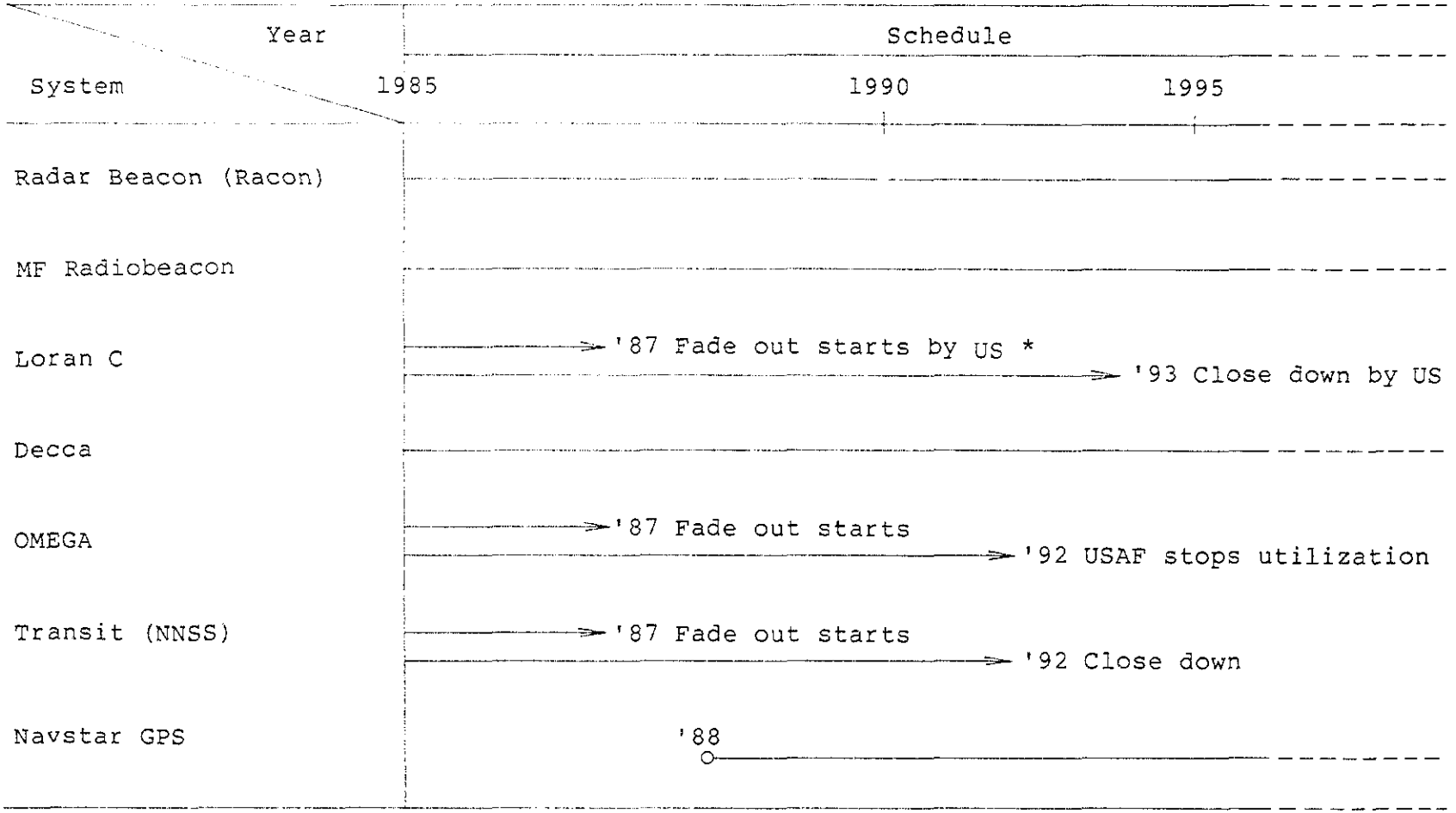
AIDS TO NAVIGATION IN USE ON 30th SEPTEMBER 1982	RADIO AIDS																		RADAR REFLECTORS
	Radiobeacons and radio leading lines					Radionavigation systems							Radar beacons			Surveillance radars		Other aids	
	Non-directional radiobeacons: > 10 miles	Non-directional radiobeacons: < 10 miles	Directional radiobeacons	Radio leading lines	Other radiobeacons	Consol	Decca chains	Loran A stations	Loran C stations	Toran chains	Omega stations	Racons: > 500 mW	Racons: < 500 mW	Ramarks	Harbour stations	Coastal stations			
Panama*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		9
Papua New Guinea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		50
Poland*	7	-	-	-	3	-	-	-	-	-	-	-	3	-	-	-	-		431
Portugal	5	7	-	-	3	-	-	-	-	-	-	-	-	1	-	-	-		120
Rumania*	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-
Scotland, Northern Lighthouse Board*	18	1	-	-	-	-	-	-	-	-	-	-	26	-	-	-	1		57
Senegal*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-
Singapore*	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-		12
South Africa*	27	-	-	-	-	-	5	-	-	-	-	-	-	-	5	-	-		97
Spain*	25	-	2	-	3	-	2	-	-	-	-	-	4	-	-	-	-		-
Sweden, Lake Vanern*	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-		-
Sweden, Port of Gothenburg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1		1
Thailand*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-
Tunisia*	3	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-		20
United Kingdom, Overseas Territories*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-

AIDS TO NAVIGATION IN USE ON 30th SEPTEMBER 1982	RADIO AIDS																	RADAR REFLECTORS
	Radiobeacons and radio leading lines					Radionavigation systems						Radar beacons			Surveillance radars		Other aids	
	Non-directional radiobeacons: > 10 miles	Non-directional radiobeacons: < 10 miles	Directional radiobeacons	Radio leading lines	Other radiobeacons	Consol	Decca chains	Loran A stations	Loran C stations	Toran chains	Omega stations	Racons: > 500 mW	Racons: < 500 mW	Ramarks	Harbour stations	Coastal stations		
United States of America, US Coast Guard*	201	-	-	-	18	-	-	-	43	-	2	-	45	-	17	-	28	15,957
United States of America, St. Lawrence Seaways Development Corp.*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yemen*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Yugoslavia*	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11
MENAS*	1	-	-	-	-	-	1	-	-	-	-	24	-	-	-	-	-	-
Total	649	79	21	8	66	0	28	15	49	7	5	47	268	27	36	38	60	20,112

Source: Statistics as at the 30 September, 1982
IALA Bulletin 1983/3

Notes: * Had completed the same questionnaire for 1980/1981.

Fig. 3-2 Future Movement of Electronic Aids to Navigation



Note : * US is prepared to transfer to host nations.

4. DEVELOPMENT AND IMPROVEMENT PLAN

4. DEVELOPMENT AND IMPROVEMENT PLAN

4-1 Basic Approach

The Republic of Indonesia is one of the largest maritime nations in the world, consisting of about 13,000 small to large islands and extending the total coastline of approximately 33,000 miles.

Thus, with the factors of expansion in size of vessels and their increasing speed taken in due consideration in order to cope with the rapid development of national industries and further expansion of international trade, substantial necessities exist for development and strengthening of sea transport efficiency. Especially, for the steady growth of national economy and for the export drive, study has been carried out on the Integrated Sea Transport, which proposes the Integrated Linear Service (ILS). ILS is also a part of the Gateway Policy within the framework of Integrated Sea Transport Study (ISTS).

The development of the Four Gateway Ports and such other satellite ports as Collector and Trunk Ports has already been proposed as shown in **APPENDIX-21.**

The increasing maritime traffic being recently experienced has brought the situations where growing dangers are to be foreseen in vessels traffic in main water areas in terms especially of collisions and strandings, and thus the smooth traffic may be hampered.

Aiming further at securing the safety of navigation at sea, establishment of navaids and other relevant facilities has been in progress, namely development and re-

habilitation of coast stations, 1st phase implementation of MF radiobeacon stations, SAR projects, etc.

In the light of the above, the basic approach establishing a Master Plan for development of aids to navigation up to the year of 2000 must take all the following factors into account to constitute the basis for examining the future demands for aids to navigation.

(a) Socio-economy
(b) Main traffic routes and potentially congested waters
(c) Marine fishery activities areas
(d) Main channels
(e) Local meteorological and sea conditions
(f) Marine accidents, especially stranding and collisions
(g) Existing aids to navigation

Reference has also been made in the planning to:

(a) Coordination and adjustment with the on-going and other planned projects concerned with aids to navigation
(b) Relevant laws and regulations

Visual and electronic navigation aids are complementary. One does not suffice the other in overall situations. Visual range is limited and weather-affected, while electronic range is extended and all-weather.

It is most desirable for mariners that both visual and electronic navaids provide the facility of position fixing by cross bearing.

The development and improvemnt criteria are set up for both visual and electronic aids to navigation. A Master Plan is established according to the criteria worked out for the year 2000.

(1) Role of Visual Aids to Navigation

The functional roles of visual aids to navigation are to provide ships with the immediate assistance and guidance in precise positioning, land approaching, avoiding dangers (isolated small islands, shoals, reef, wrecks, etc. in traffic routes), marking turning points on traffic routes, so that they may cruise to their destinations safely and effectively.

- A number of traffic routes run through, between islands, the vast water areas extending about 5,000 km east to west and 2,000 km north to south. Therefore, such aids to navigation are vitally required in these waters as coastal aids for positioning of vessels, navaids to indicate navigational dangers, entrances to channels, turning points, landfalls and so on. The ports and harbours are situated being surrounded by shoal waters and coral reef. Also, some of the approach channels to ports are quite long. Accordingly, utilization of visual aids to navigation is extremely important. The visual aids are readily recognized by mariners through the visual perception, and, therefore, demonstrate high efficiency.

- Development and improvement of aids to navigation will greatly contribute to securing the safety of invaluable human life and property at sea, and to bringing about the improvement in traffic efficiency,

and thus in social development. It should also be noted that due to the currently available low rate of per-100 miles-units of visual navaids in Indonesia as compared to that in other developed maritime nations, rather urgent development needs to be implemented in the country.

- From the above view points, the role of visual aids to navigation is fundamentally important, and the effectiveness of financial investment in them will be high.

(2) Role of Electronic Aids to Navigation

Electronic aids to navigation are all weather, extensive in range, and functionally free from fog and rain, which are the outstanding particulars different from lighthouses and buoys. However, a receiving device is required for the utilization.

Accordingly, the selection of system to be adopted should be done with due consideration given to the financial capabilities of users.

The pulse-typed medium-wave radiobeacon is a navaid system easily used by a simple type of receiver, and most suitable for fishing vessels, motorized sailing and sailing ships, cargo vessels as well as other ships.

Omni-directional radiobeacons are also useful for the ships equipped with radio direction finders on board.

Racon is an extremely useful system to mark turning points in traffic routes, navigational dangers and such. Rapid progress in electronic technology has recently brought the costs of radar equipment down, and the expansion in number of users may be expected in the future. Further expansion in the implementation of racon stations will be required.

4-2 Examination on Future Demands for Aids to Navigation

4-2-1 Desirable Target for Establishment of Aids to Navigation Systems

Aids to navigation are lighthouses, light beacons, buoys, fog signals, radio stations and other facilities which are to be used as aids for ships at sea, port and harbours, bays, straits, channels, estuaries and such other areas by means of lights, radios, symbols, colours and sounds.

Aids may include aids to navigation establishments, notice to mariner and weather broadcast and natural landscape of remarkable features as shown below:

Obviously, the aids to navigation under consideration in this Study are those constructed, operated and maintained by the national authority.

The basic functions attributed to aids to navigation are divided into two: improvement in traffic efficiency for a ship navigation from one point to another how to reach the destination in the most economical way; safety of navigation providing forewarnings to mariners on nagivation dangers such as shoals, sunken rocks, wreckages, etc. In actual practice, these normally function in complexed ways.

The most desirable arrangements for aids to navigation will be such that the highest rate of availability exists regardless of any number of ships available. Namely, allocation of navaids facilities should be so arranged that cross bearings may be obtained within 10 miles off coast as for visual aids and within the

nominal coverage as for electronic aids like MF radio-beacons, hyperbolic systems and so on. Regarding the function indicating navigation dangers, establishment of lights, racons, etc. will be most preferred on all such dangers.

However, the implemented status differs in the actual practice due to various restriction factors of economic, technical and local requirements.

The present status of lighted navaids establishment in Indonesia is given **Fig. 4-2-1**, in a form of comparison with other nations.

Taking into due account the potential growth in shipping, fishery, marine accidents and other maritime fields in Indonesia, and also of the Gateway/ILS system, the implementation up to 2000 should be envisioned in planning.

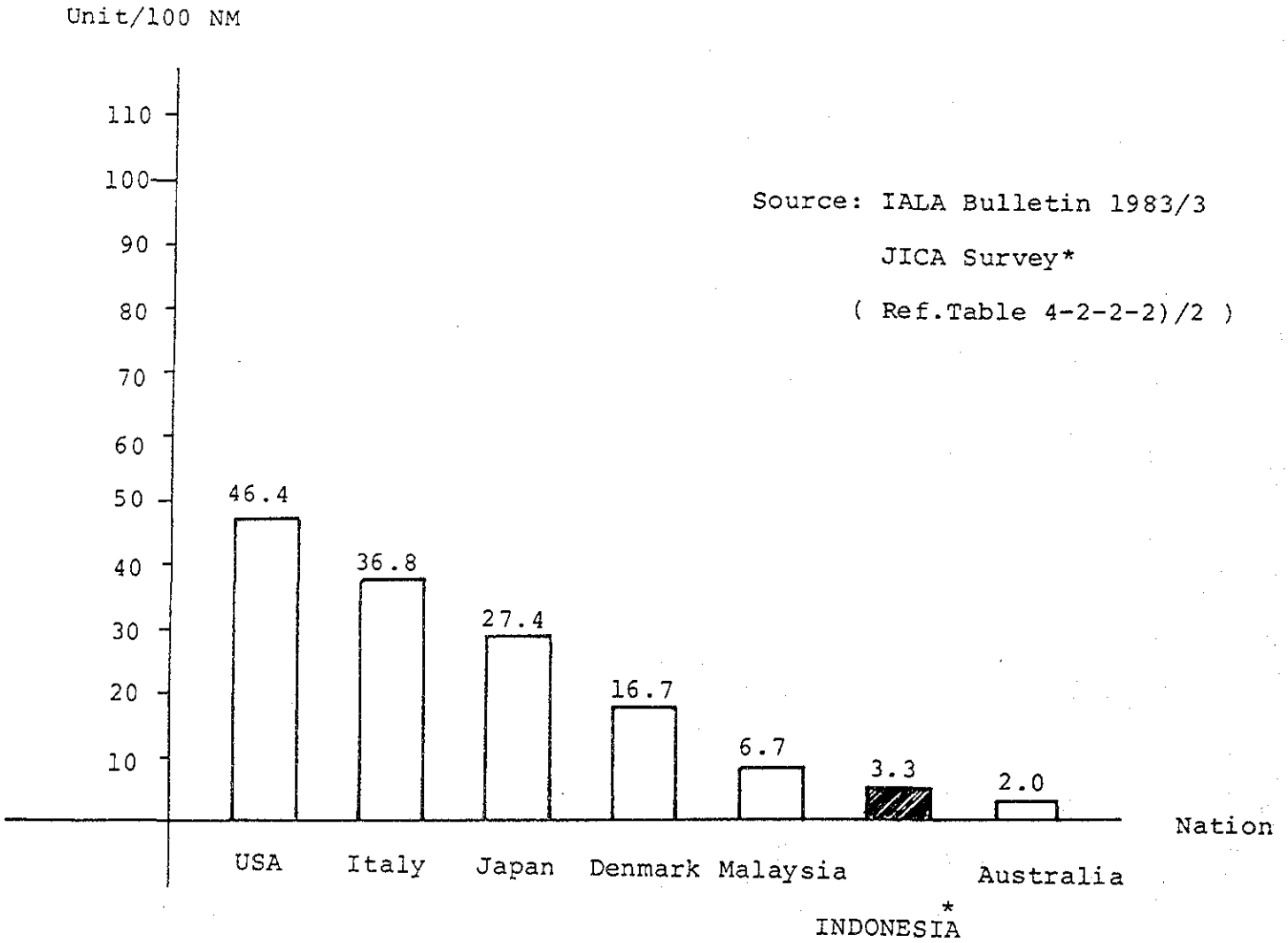


Fig. 4-2-1 No. of Lighted Aids/100 Nautical Miles in the world

(1) Visual Aids to Navigation

1) Coastal Aids

In order for ships at sea to be able to fix their positions, it is ideally desirable for them to be able to find 2 or more marks for their cross bearing on a continuous basis. Indonesia being a huge maritime nation extending about 33,000 miles long coastlines, it will be beyond the practice of reality to establish such huge number of visual navaids within a limited period of time to meet the above ideal requriements due to the vast amount of fund involved.

- Approximate number of visual aids to be needed for obtaining single bearing within 10 miles off coast:

Covering ranges of lighted aids are estimated as follows:

Large-type	15 - 25 NM ...	Average 20 NM
Medium-type	10 - 14 NM ...	Average 12 NM

When the averaged range is assumed to be (20 + 12) x 1/2 = 16 NM, then the separation between lights is given as approximately 24.9 NM.

Therefore, the number of lights to be needed is given as follows:

$$\frac{\text{(Total length of coastline)}}{\text{(Separation between lights)}} = \frac{33{,}017 \text{ NM}}{24.9 \text{ NM}}$$

= 1,326 units

- Approximate number of visual aids to be needed for obtaining two bearings within 10 miles off coast:

  In the same way as quoted above, and the number of lights is given as follows:

$$\frac{\text{(Total length of coast line)}}{\text{(Separation between lights)}} = \frac{33{,}017 \text{ NM}}{12.4 \text{ NM}}$$

$$= 2{,}662 \text{ units}$$

2) Other Aids to Navigation

- Special lights will be installed on such navigation dangers as reef, rock, tiny islands, etc. located on traffic routes and their vicinity.
- Landfall aids will be installed around the mouth of bays and entrance to ports.
- Navaids marking an entrance will be installed at the entrances to approach channels with the cardinal marks properly spaced to indicate the restricted navigable waters.
- Navaids indicating the entrances to channels and straits will be installed with the cardinal marks properly separated showing the limit of navigable waters.
- Navaids will be installed at turning points on traffic routes.
- Navaids will be installed on breakwaters.
- Leading lights will be installed as approaching aids to ports and harbours.
- Navigational marks will be installed on structures at sea to mark their existence.

(2) Electronic Aids to Navigation

The desirable setup for MF radiobeacon stations and racon stations may be summarized as follows:

1) Medium-wave radiobeacons should provide the overall coverage for the capes and remarkable landscape features approaching from seawards, the important traffic routes running through between the Gate ports, Collector and Trunk ports proposed in the Gateway system, the active areas of fishing operations, and the RLS routes contributing to the stabilization of public welfare.

2) Racon should be established to mark landfalls of islands and ports as well as sunken reef, turning points and such along the main traffic routes mentioned 1) above.

4-2-2 Future Demands for Aids to Navigation up to 2,000 and 1988/89

(1) Matters for Consideration

1) Up to 2,000

(A) Socio Economy

The third Five Year Project (REPELITA III) started in 1979 was successful in both social and economic aspects through increase in oil export price and improvement in economic policy. Namely, the high annual growth rates were recorded in GDP and in 1980 the GDP per capita exceeded over US$500.

Such environment was based in one aspect on the economic constitution inherent to Indonesia as an oil producing nation, which heavily relied upon the oil income, and this brought about the severe economic situations of considerable devaluation of Rupiah in 1983 due to aggravation of the world-wide economic recession and the oil market.

However, the economic scale of Indonesia has made great strides during the period, and it may be said that a great step was forwarded directing to a target of forming the rigid basis for "Fair and Prosperous Society" by the year of 2000.

On the basis of the records accomplished during this period, forecast is made for future flow of the main factors of socio-economy up to 2000.

a) Population

The population in Indonesia in 1980 shows 147, 490 thousand according to a result of national census carried out, i.e., the annual growth rate from 1961 to 1971 showed 2.10%, and that up to 1981 since increased to 2.32%.

As clearly shown in **Table 4-2-2-(1)/1** and **Table 4-2-2-(1)/2,** the distribution of population is concentrated in Jawa and Sumatera: in 1980, Jawa had 91,269 thousand accounting for approximately 62% of the total, while Sumatera had 28,016 thousand, about 19%. With regard to population density per square kilometer, Jawa has 690, followed by 96 in Nusa Tenggara and then by 59 in Sumatera: Jawa has overwhelming figure as compared to other areas.

In REPELITA IV started in 1984, the annual growth rate of population is predicted as 2% or less at the end of REPELITA IV. This rate is considered to be reasonable from the view point of present situations as well. On the basis of the result of 1980 population census, i.e., 147,490 thousand, and the annual growth rate of 2%, future prediction is made as shown in **Table 4-2-2-(1)/3,** Forecast of Population Up to 2000.

Table 4-2-2-(1)/1 POPULATION BY PROVINCE/ISLAND AND ANNUAL POPULATION GROWTH

PROVINCE/ISLAND	POPULATION			ANNUAL POPULATION GROWTH RATE (%)	
	1961	1971	1980	1961 - 1971	1971 - 1980
SUMATERA	15,739,363	20,808,148	28,016,160	2.86	3.32
JAWA	63,059,575	76,086,327	91,269,528	1.91	2.02
NUSA TENGGARA	5,557,656	6,619,074	8,487,110	1.78	2.01
KALIMANTAN	4,101,475	5,154,774	6,723,086	2.34	2.96
SULAWESI	7,079,349	8,526,901	10,409,533	1.90	2.22
IRIAN JAYA MALUKU	1,547,930	2,013,005	2,584,881	2.69	2.79
TOTAL	97,085,348	119,208,229	147,490,298	2.10	2.32

Source: STATISTIC INDONESIA 1982

Table 4-2-2-(1)/2 POPULATION IN INDONESIA

Province	Area		Population (1980)		Population per km^2
	Square km	%	x 1,000	%	
SUMATERA	473,606	24.67	28,016	19.00	59
JAWA	132,187	6.89	91,269	61.88	690
NUSA TENGGARA	88,488	4.61	8,487	5.75	96
KALIMANTAN	539,460	28.10	6,723	4.56	12
SURAWESI	189,216	9.86	10,410	7.06	55
IRIAN JAYA MALUKU	496,486	25.87	2,585	1.75	5
TOTAL	1,919,443	100.00	147,490	100.00	77

Source: STATISTIC INDONESIA 1982

Table 4-2-2-(1)/3 FORECAST OF POPULATION UP TO YEAR 2000

Unit: 1000 persons

Year	Population	Year	Population
1985	162,841	1993	190,794
1986	166,098	1994	194,610
1987	169,420	1995	198,502
1988	172,808	1996	202,472
1989	176,264	1997	206,521
1990	179,789	1998	210,651
1991	183,385	1999	214,864
1992	187,053	2000	219,161

Source: Statistic Indonesia 1982

b) GDP

REPELITA III, started in 1979, had a successful accomplishment since the external factor of price increase in crude oil rather favourably affected the project during its early stage of implementation, and also improvement in various policies was successfully carried out. Accordingly, the annual growth rate of GDP during the period steadily made high increase, i.e., 6.3% in 1979, 9.9% in 1980, 7.6% in 1981, and in 1981 GDP reached US$510, which went beyond for the first time a line of US$500. Indonesia joined a club of "Medium Income Earner", which is classified in World Bank Data. However, as in the case of other oil producing developing countries, Indonesia

was blessed with the high oil prices in 1979 to 1980 and import expanded positively. It was at that time when demands for oil gradually turned into down-hill and ordinary revenue and expenditure were considerably affected since.

World economy faced a long recession since after 1980, and turned into the longest recession period ever since 1930's. Especially, the year of 1982 was a difficult one; few nations in the world achieved the growth rate higher than the previous year's, and more than 20 countries accomplished negative growth in GDP.

The flows of GDP by industry and province are respectively shown in **Tables 4-2-2-(1)/4** and **4-2-2-(1)/5.**

The recession in oil market and poor export business all together had hit the country, and this put the Indonesian economy, which made remarkable growth during the past few years, into the situations of having to control the growth rate, previously established, directing to the substantial decrease although the per capita income has been on its increase.

The flow of GDP during the past ten years is given in **Table 4-2-2-(1)/6.**

Table 4-2-2-(1)/6 Flow of GDP and annual growth rate from 1973 to 1982

(Unit: Rp 1,000 mil)

Year	GDP	Year	GDP
1973	6,753 (11.3%)	1978	9,567 (7.7%)
1974	7,269 (7.6%)	1979	10,165 (6.3%)
1975	7,630 (5.0%)	1980	11,169 (9.9%)
1976	8,156 (6.9%)	1981	12,017 (7.6%)
1977	8,882 (8.9%)	1982	*12,287 (2.25%)

Source: Statistics Indonesia 1982

It is extremely difficult to predict, at this point, a pattern of economy growth in Indonesia up to 2000. However, as long as the recovery in world economic environment and positive effort in the effective use of natural resources will be seen there, then recovery of the propulsive power for the positive growth is considered to be possibly made.

An external important factor of promoting national economy in developing countries is a matter of how to evaluate the economic development in advanced countries. However, a forecast made by World Bank on the basis of their own analysis gives the annual GDP growth of about 3.8% up to 1990 and that of approximately 3.5% thereafter; with those conditions made as its basis and

additional national domestic factors taken into consideration, the annual growth rate of GDP from 1985 to 1995 is forecast in the figures of 5.3 - 5.8% for a medium income oil exporting developing country.

The GDP growth rate in Indonesia, which decreased considerably in the previous year, is considered to settle down at around 3% in 1983. The target growth rate during REPELITA IV starting in 1984 is set at about 5% per year. On the other hand, there exists possibility of rapid re-increase in energy demands in world market in late 1980's. With all those factors taken into account, annual average growth rate of GDP in Indonesia up to the year 2000 may reasonably be about 5.5% as the preliminary predictable figure forecast by World Bank. GDP prediction up to the year 2,000 made through the application of this annual average growth rate of 5.5% is given in **Table 4-2-2-(1)/7.**

Source: STATISTIC INDONESIA 1982

Table 4-2-2-(1)/4 Flow of GDP in Value by Industry

(Unit: Rp x Billion)

Item \ Year	1973		1979	1980	1981	1982			
	Value (nominal)	Ratio	Value (nominal)	Value (nominal)	Value (nominal)	Value (nominal)	Ratio	Value ('73 cost)	Ratio
Agriculture, Livestock, Forestry and Fishery	2,710	40.1	8.996	11,290	13,643	15,668	26.3	3,670	29.8
Farm Food Crops	2,048	30.3	6,683	8,356	10,333	12,214	20.5	3,038	24.6
Livestock and Products	173	2.6	690	991	1,258	1,418	2.4	230	1.9
Forestry	355	5.3	1,048	1,142	1,140	982	1.6	196	1.6
Fishery	134	2.0	575	803	912	1,053	1.8	204	1.7
Mining and Quarrying	831	12.3	6,980	11,673	12,971	11,708	19.6	940	7.6
Manufacturing Industries	650	9.6	3,311	5,288	5,822	7,681	12.9	1,901	15.4
Electricity, Gas Water Supply	30	0.5	149	225	288	380	0.6	106	0.9
Construction	262	3.9	1,790	2,524	3,118	3,507	5.9	758	6.2
Wholesale and Retail Trade	1,118	16.6	4,775	6,391	7,966	8,865	14.9	2,159	17.5
Transport and Communication	257	3.8	1,422	1,965	2,353	2,795	4.7	717	5.8
Banking and Other Financial Intermediaries	183	1.2	655	752	1,404	1,604	2.7	258	2.1
Ownership of Dwelling	143	2.1	914	1200	1,439	1,703	2.9	377	3.1
Public Administration and Defence	405	6.0	2,200	3,142	3,905	4,429	7.4	1,115	9.0
Services	264	3.9	835	796	1,119	1,293	2.2	326	2.6
Gross Domestic Product	6,753		32,025	45,446	54,027	59,633		12,287	
Ratio to Previous Year			40.8	41.9	18.9				
National Product			10,165	11,169	12,017	12,287			
			6.3	9.9	7.6	2.25			

Table 4-2-2-(1)/5 Comparison of Regional Gross Domestic Product by Province at Constant 1975 Market Prices 1975 - 1979

(Unit: Million Rp)

PROVINCE \ YEAR	1975	1976	1977	1978	1979
SUMATERA	3,589,526	3,746,550	3,828,535	3,951,147	4,350,448
JAKARTA	5,964,039	6,440,910	6,799,489	7,513,510	8,018,439
KALIMANTAN	812,239	1,034,875	1,352,499	1,454,407	1,577,409
SULAWESI	615,660	639,093	783,263	820,199	872,801
NUSA TENGGARA	347,144	378,181	406,896	442,403	477,899
MALUKU IRIAN JAYA	315,021	367,367	401,976	445,651	419,944

Source: STATISTIK INDONESIA 1982

Table 4-2-2-(1)/7 Forecast of GDP up to Year 2000

(Unit: Rp1,000 mil)

Year	GDP Forecast	Year	GDP Forecast
1983	12,963	1992	20,988
1984	13,676	1993	22,142
1985	14,428	1994	23,360
1986	15,221	1995	24,645
1987	16,059	1996	26,000
1988	16,942	1997	27,430
1989	17,874	1998	28,939
1990	18,857	1999	30,531
1991	19,894	2000	32,210

Source: Statistical Yearbook of Indonesia, 1982

(B) Sea Transportation

The Government of Republic of Indonesia has been striving for further and substantial development of national fleet, ports and harbours, and transportation efficiency as well as for improvement of port facilities and other relevant sectors, in order to meet the increasing importance of maritime transportation in the country.

The Gateway policy has been under its implementation for the export drive and for development and rationalization of the domestic shipping routes which were previously rather unorganized. It is considered that the implementation of the policy will greatly contribute

to the improvement in transport efficiency and the service.

An estimate is made in REPELITA IV for the growth in national fleet and in volume of cargoes, as given in **Table 4-2-2-(2)**, targeted at the end of the said Five Year Plan.

Table 4-2-2-(2) Estimate of National Fleet and Volume of Cargo at the End of REPELITA IV

Item / Type of shipping	Fleet (DWT)	Cargo (tons)
Domestic Service	1,216,000	23,120,000
RLS	736,000	14,750,000
Local	217,000	4,200,000
Traditional	245,000	3,400,000
Pioneer	18,000	770,000
Ocean-going Service	1,149,000	23,700,000

Source: NCANA PEMBANGUNAN LIMA TAHUN KE EMPAT DEPARTMEN PERHUBUNGAN 1984/85 - 1988/89

A) Cargo Flow

(a) International Cargo Flow

The annual growth rates in export value during the fourth Five Year Development

Plan estimated by Indonesian Government are 7.6% for oil and oil related products and 15.8% for others respectively, predicting the total annual average growth rate of 10%.

Those in import value during the same period are estimated at 5.4% for oil and oil related products and 8.4% for others, predicting the total annual average growth rate of 7.7% at its maximum.

The overall annual average growth rate for both export and import is thus estimated at approximately 9%.

On the other hand, the international cargo flow in 1982 amounted to 123 million tons, and the annual average growth rate during the period of 1978 - 1982 showed 3.2% **(APPENDIX-6)**.

International cargo flow is dependent on the economic situations in the world, and its forecast is considered to be extremely difficult to make.

However, taking due consideration of future increase in export of industrial products other than oil, and of possible change in energy structure (decrease in the oil dependency), the estimated growth rate of around 4% in cargo flow may be considered to be reasonable, provided that various basic factors, constituting future economic

movement, may not change in principle. It may be predicted that the resultant growth in 1988 deriving from the above will be approximately 1.27 times (156 million tons) that in 1982, and the growth in 2000 will reach about 2 times (250 million tons) that in 1982.

(b) Domestic Cargo Flow

The domestic cargo flow in 1982 amounted to the total volume of 67 million tons, and the annual average growth rate during 1978 to 1982 showed 9.9% (**APPENDIX-5**).

The Domestic cargo flow involves the factors of (i) increase in population and their distribution, (ii) growth in GDP - national income - improvement in living standards, and (iii) progress in development projects: Approximately 7% annual growth rate in cargo flow may be reasonably applied, taking the predicted 5% GDP growth rate into due consideration, and in 1988 the total cargo flow will reach 1.5 times (110 million tons) that in 1982, and that in 2,000 is estimated to double in figure (228 million tons).

Full implementation of ILS/Gateway policy will also accelerate the flow, further increasing by about 28%.

B) Fleet

(a) Ocean-going Shipping

The national fleet in 1982 amounted to 1.6 million in DWT with the past growth rate of 9%.

The share of Indonesian flag vessels in terms of total cargo volumes carried by ocean-going shipping decreased to 6.9% in 1982 from 11.6% recorded in 1978, showing that the cargo carriage by the national flag indicated negative growth despite the positive growth in the fleet volume.

It will be required that similar growth rate to that of fleet volume be maintained, in order to hold the present share by the national flag vessels. If 4% would be estimated and applied to the annual growth rate of national fleet, the prediction is, then, made that in 1988 it will require 1.27 times (2,030 thousand tons in DWT) the total national fleet in 1982 and 2 times (3,240 thousand tons in DWT) in the year of 2000.

The considerable problem currently involving Indonesian vessels rests in their high percentage of deterioration in age both for ocean-going and domestic shipping, as previously referred, and the expeditious modernization and size enlargement are to be required together with necessary devel-

opment and improvement of ports and harbours and their facilities as well as improvement in the operational performances and efficiency.

(b) Domestic Shipping

The number of ships in the domestic shipping showed 7,469 in 1982, with the past growth rate of 6.3%: 15.3% increase in DWT, 15.9% in BRT. This indicates a steady improvement in the operational efficiency and enlargement in size (**APPENDIX-5**).

Assuming that the growth rate of cargo flow would be estimated at 7% as previously stated, the predictable number will be about 5% since further improvement in the operational performances is envisioned due to the size enlargement and modernization: forecast may be made for 1988 at 1.34 times (10 thousand ships) that in 1982 and for 2000 at 2.41 times (18 thousand ships).

Taking into account the increase in cargo volume due to the full implementation of ILS/Gateway policy, further increase by 28% may be required. However, this additional increase is considered to be compensated by the improvement of efficiency.

C) Service Frequency

The service frequency-wise forecast is extremely difficult to quantify. It may be

predicted that the service frequency as a whole in Indonesian waters will be augmented due to on-going and future developments of national fleet and ports and harbours as well as to the improvement in port facilities. The maritime shipping environment in Indonesia will experience further complexity.

(C) Fishery

The estimated potentiality of marine fishing catches in Indonesian waters may reach as high as 6,600 thousand tons. However, the fishery productivity is still low as stated before. Indonesian Government plans to make full use of the 200 miles economic zone, to develop and modernize fishing ports, vessels, gears techniques and training, storage and process, and distribution system, and to improve national nutrition as well as increase in the export.

The fishery production in Indonesia up to the year 2000 is projected in the "Fisheries Statistics of Indonesia (Statistik Perikanan)", issued by the Fishery Agency, as given in **Fig. 4-2-2-(3) (APPENDIX-9)**.

The predicted annual average growth rate for marine fishery is aimed at 5.1% for the period up to 1988, when the total catches are estimated at 1.22 times (2,020 thousand tons) and at 1.7 times (2,810 thousand tons) respectively those in 1984.

With regard to the number of fishing vessels, there were 277,000 in 1981. With an assumption that the growth would be maintained at a constant rate, it will grow to 1.43 times (397,000 vessels) in 1988 and 2 times (553,000 vessels) in 2000 respectively those in 1981.

Improvement in fishing methods, motorization of fishing vessels and enlargement in size will undoubtedly create further productivity. Assuming that the growth rate in number would be half (2.5%) that in catches, the number of fishing vessels may be estimated at 1.2 times (332,000 vessels) in 1988 and 1.44 times (398,000 vessels) in 2000 in comparison respectively with those in 1981.

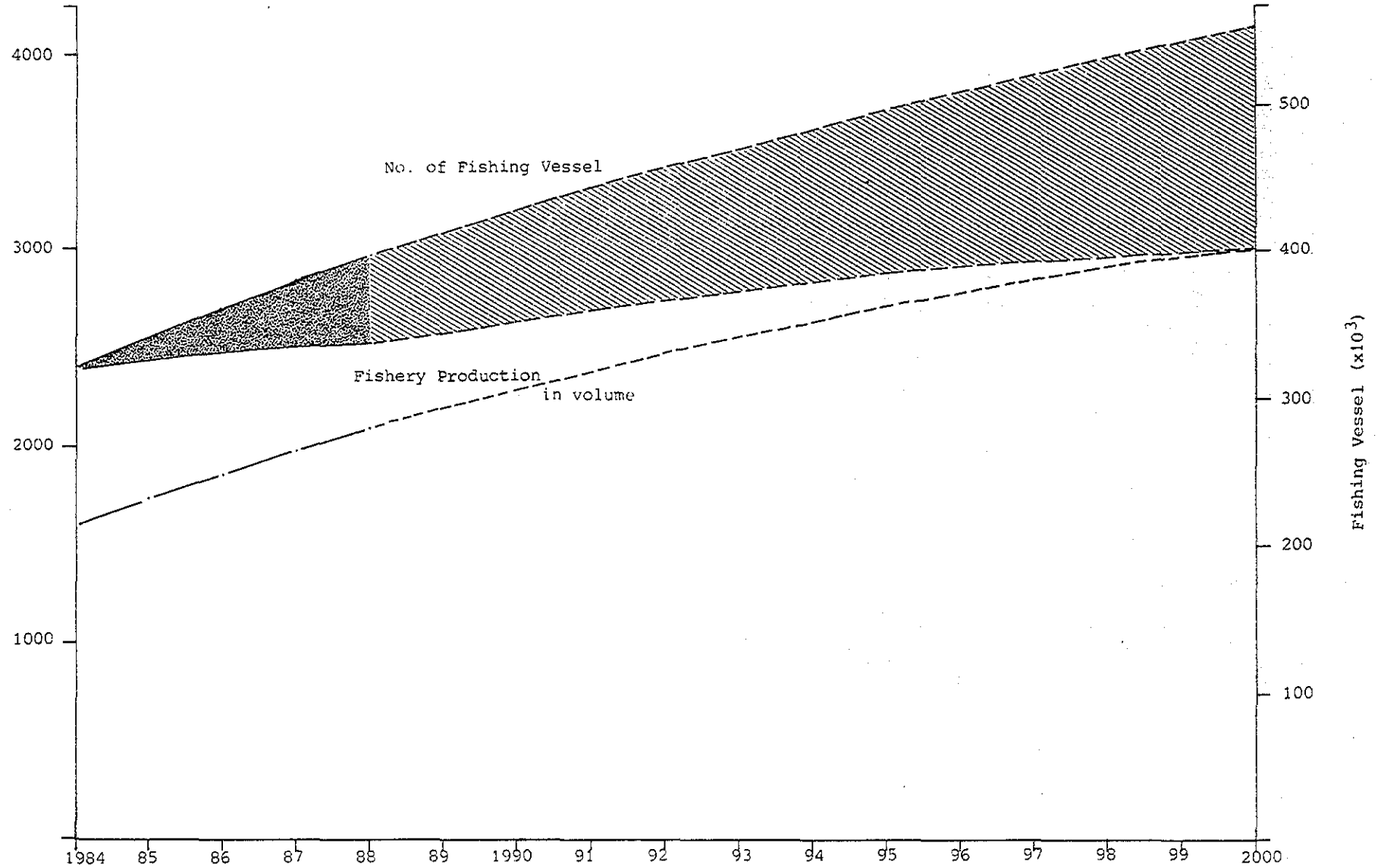


Fig. 4-2-2-(3) FORECAST OF MARINE FISHERY

(D) Port Construction and Improvement Plans

Expansion and reinforcement of the maritime sea transportation performances in Indonesia necessitate further development of national fleet as well as substantial improvement in the shipping sector through newbuilding projects for a number of the existing aged vessels.

In addition to such development and improvement in the shipping capability itself, mention should not be needed on the necessities of expansion and development of port facilities and of improvement of port operations such as smooth mooring, effective loading and unloading of cargoes and so on.

All the ports in Indonesia are state-operated, and their management and control are under the direct administration of the government. The problems involved with the existing ports are:

a) Most of the ports are lack of sufficient mooring facilities, causing considerable degree of stuck for incoming vessels, which forces ships to load and unload cargoes offshore.

b) There are still a number of old port facilities, which are deteriorated and extremely inefficient in their operation.

c) There are a number of river ports or estuary ports, most of which do not have such surrounding establishments as

breakwaters but have rather soft grounding. This requires frequent dredging for maintaining sufficient water depth in traffic routes and berths.

The port development in Indonesia is one of the important Five Year Development Projects, which also include the development of infrastructures, establishment of self supply system of food. In view of the enormous amount of funds to be required for the projects envisaged, the port development, as in the case of large scale projects in other fields, has been in progress by technical and financial cooperation provided by advanced nations.

The total 1982 budget for port development amounted to about 60,200 million Rupiah: Rp 51,200 million for development of port facilities, and Rp. 9,000 million for maintenance dredging.

The actual situations, however, are such that the implementation works have not necessarily been in smooth progress due to the fact that the development covers a number of ports.

The port development projects for main ports in Indonesia have been in their implementation mainly through foreign financial aids during the past ten years: Tg. Priok port has been developed mainly by IBRD aids for the facilities of container berths and inter-insular shipping berths;financial aids from ADB have been provided for the development of both

Surabaya port, domestic shipping berths, and Belawan port for ocean-going shipping berths. Regarding the two ports of Semarang and Dumai, technical cooperation has been extended by Japan International Coóperation Agency (JICA): in 1978 an urgent development plan was established by JICA for Semarang port for the construction of large scale piers to solve the problem of offshore loading and unloading, and it is expected that the completion of port will contribute greatly to the local development of central Jawa through rationalization of transportation of goods. The development of Semarang port consists mainly of construction of the total length of 5,250 meters breakwaters and the piers with the water depth of 9 meters, three berths, extending 605 meters. The total project costs are estimated at approximately 25,500 million yen.

The engineering service is planned for Dumai port.

The Government of Indonesia has already been proceeding with the implementation of Gateway Policy established on the basis of the overall development plan for Integrated Sea Transport Study carried out by a Netherlands study team for selection of domestic shipping traffic routes, development respectively of national fleet and main ports, etc. The Directorate General of Sea Communication has initiated the development implementation, based thereupon, of the Gateway and Truck ports, totalling 43 in all, with the target year of 1988/89, in order

to meet the development policy of reinforcing inter-insular shipping.

The overall plans are in progress for development of the ports, requesting advanced nations for their technical and financial cooperation: as given in **Table 4-2-2-(4)** out of the 43 ports, 12 are aided by IBRD, 11 by ADB, 6 by Holland, 1 by Japan and 11 are to be planned by IBRD since Semarang port is already in its implementation by Japanese aids and Batam port is within the scope of Batam Is. overall development plan.

The port development plans for the forty-one ports as stated above will hopefully be completed according to their schedule, i.e. up to 1988/89, through foreign aids, and contribute to the development of national life and society.

Table 4-2-2-(4) Port Development Plan in Indonesia

Funding Body/nation	Consultant	Ports
IBRD	Canada	* Lhok Seumawe, Sibolga, * Teluk Bayur, * Panjang
	Holland	* Pontianak, Palembang, Cilacap
	Britain	** Tanjung Priok
	U.S.A.	* Bitung, ** Ujung Pandang, * Lembar, Kendari
ADB	Britain	** Belawan
	Britain	** Surabaya
	Japan	* Banjarmasin, * Balikpapan
	Unknown	Meneng, Tarakan, Samarinda, Sampit, Toli-toli, Donggala, Parepare
Japan	Japan	* Semarang
		* Dumai
Holland	Holland	* Ambon, Ternate, * Sorong, Jayapura, Merauke, Tenau
	-	Kalianget, * Cirebon, Krueng Raya, Gorontalo, Bengkulu, Kuala Langsa, Benoa, Pakanbaru, Jambi, Sintete, Biak
		* Batam

Source: Situation of Port Development Projects in Indonesia by Mr. H. Endo, JICA Expert

Notes: * = Collector Port
** = Gate Way port
No mark = Trunk Port

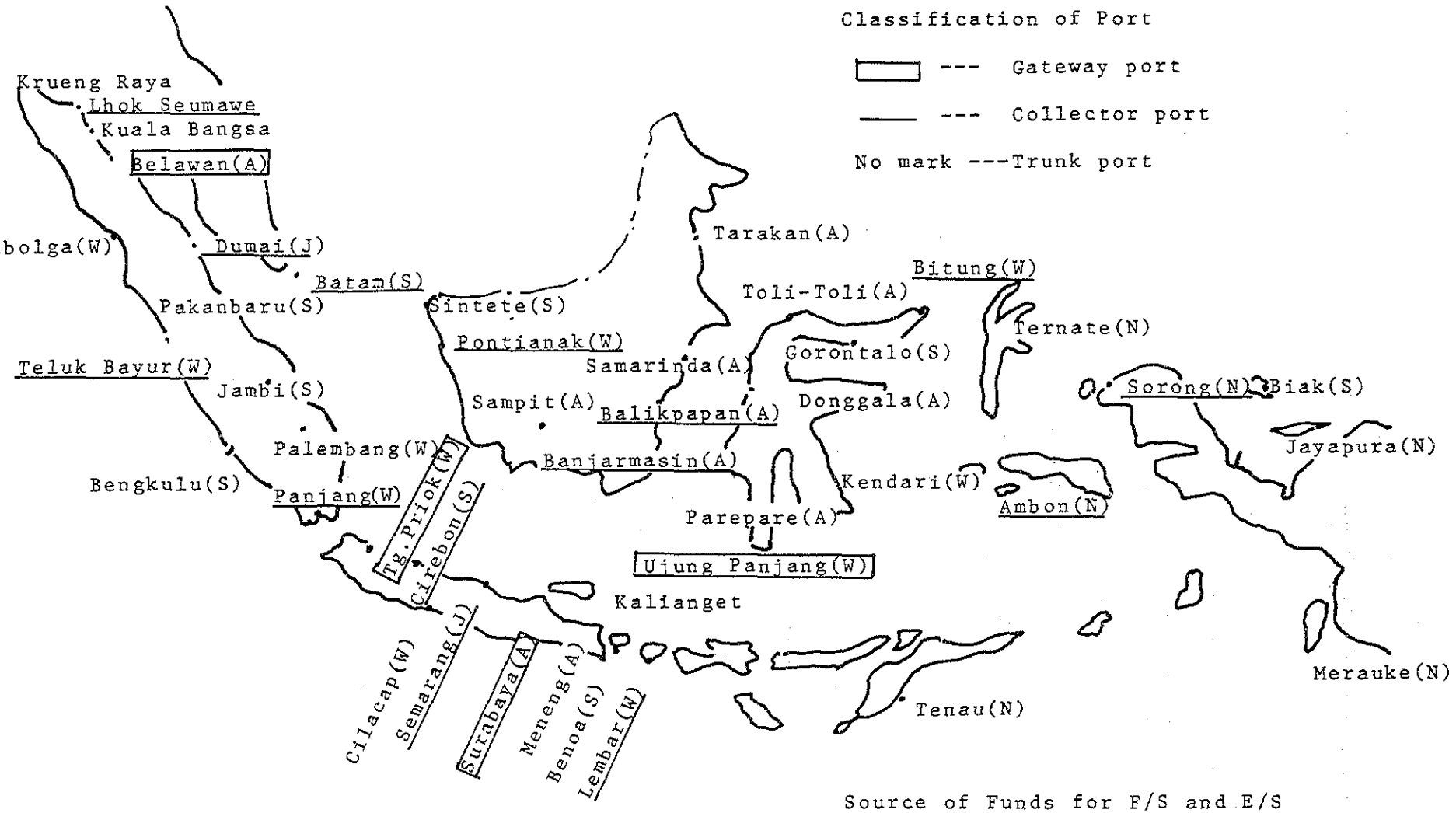


Fig. 4-2-2-(4) Port Development Project in Indonesia(1982 - 1988)

Source of Funds for F/S and E/S

(W) World Bank (J) Japan
(A) Asian Development Bank (S) Sea Communication
(N) Netherland

(E) Ocean Development

The volumes and resources of oil and natural gas in Indonesia in 1980 are as given in **Table 4-2-2-(5)/1.** Although it shows that room is still left for further development of new fields, the exploration activities have recently been rather in hanging-low situations, and thus, a few findings have been developed leaving fewer confirmed reserves.

Table 4-2-2-(5)/1 Resources of Oil & Natural Gas in Indonesia

Unit: Oil .. 100 mil barrel
Gas .. billion cf

		Possible Gross Reserves	Found Re-serves	Pro-duced	Re-mained	Un-found
Oil		300-400	190	95	95	110-210
Gas		70	40	10	30	30
South East Asia: Total	Oil	414.6-514.6	246.6	122.9	123.7	168-218
	Gas	137	77.7	15.6	62.1	59.3

Source: Asia Keizai Kenkyu-sho "Oil Industry in South East Asia - Present Status and Future -" by T.Kanbara, T.Saito and S.Hatayama.

The export value recorded in 1980 for oil and associated materials was US$15,700 million out of the total export value of US$21,900 million, and showed 62.2% increase as compared to the previous year's. This figure, however, more or less reflected the substantial increase in oil price. As regards the volume produced, it has

been declining, as shown in **Table 4-2-2-(5)/2** since 1977, when the peak volume of 1,685,000 b/d was recorded.

Table 4-2-2-(5)/2 Flow of Oil Production in Indonesia

(Unit: 1,000 b/d)

Year / Nation	1975	1976	1977	1978	1979	1980
Indonesia	1,306	1,508	1,685	1,635	1,590	1,570
South-East Asia: Total	1,607	1,904	2,135	2,124	2,187	2,137

Forecast was made in 1980 for the five year period up to 1985 as shown in **Table 4-2-2-(5)/3:** the level of 1,600,000 b/d would be maintained due to development of the new oil fields around the existing fields.

However, further production will depend largely on the demand, especialy by such large consumption areas as Japan and West Coast of U.S.A.

Statistic shows that the production volume of natural gas in 1979 was 2,735 mil. cf/d with its effective use of 2,114 mil. cf/d.

The effective volume in 1980 was approximately 2,273 mil. cf/d, on the basis of which **Table 4-2-2-(5)/3** was produced to indicate the approximation.

Table 4-2-2-(5)/3 Estimated Production of Oil and Natural Gas in Indonesia

Unit: Oil .. 1,000 b/d
Gas .. mil cf/d

		1981	1982	1983	1984	1985
Oil		1,600	1,625	1,650	1,625	1,600
Gas		2,350	2,440	3,310	3,730	3,900
South-East Asia: Total	Oil	2,176	2,224	2,231	2,212	2,187
	Gas	3,627	3,374	4,971	5,867	6,437

The exploration activities, showed the lowest record in 1977, have turned out to be more active in 1980 onward. Further development is expected in the future: following the exploration by CALTEX in central Sumatera, Atlantic Richfield and Liapco are actively developing the fields respectively in Jawa Sea and off South East Sumatera.

Arjuna oil fields for the former, and Cinta, Kitty, Krisna and some others for the latter are under intense exploration, and some new fields are subsequently being found though they are small-scaled. The productivity has also been on its increase, and future prospectus is rather optimistic.

It may be foreseen that such development and exploration as stated above will cause to increase at-sea structures of oil rigs and platforms alongside the coastal areas of Jawa Sea from south-east Sumatera to Jawa, as well as south-east of Kalimantan. Consequently, the

maritime traffic, especially the inter-insular services, in those areas, may possibly be more or less affected.

(F) Maritime Pleasure

The maritime pleasure in Indonesia currently seems still in a developing stage as described in Section 2-4-4, 2), and the present situations are such that little effects are being caused by yachts, motor boats on the sea traffic routes.

Indonesia being blessed with the natural environment of geographical and tropical surroundings, a great potentiality rests in the maritime nation to expand its tourism resources in future if a policy of tourist attraction would be implemented with the promotion in financial support as a part of the acquisition of foreign funds.

At that point of time in future, the maritime pleasure in Indonesia will be taken into account as one of the factors affecting maritime traffic.

(G) Marine Casualties

The total number of marine accidents occurred in 1982 in Indonesia was 446 as shown in **Table 4-2-2-(7)/1**, and 126 out of 446 were either collision (62) or stranding (64) accounting for 28.3% of the total recorded as given in **Table 4-2-2-(7)/2**. Similarly, when the total number

in 1983 is assessed to be 396 on the basis of the figure recorded up to October, 1983, 111 out of it would be either collision (53) or stranding (57), occupying 27.7% of the estimated total number. The proportions for the both years represent similar trend.

It can be conveniently imagined that some of the major factors involved in marine casualties in relation to aids to navigation could be strandings and/or collisions, and such accidents as fire, etc. were excluded in the estimation (ref. **APPENDIX-7**).

One of the primary parameters required for forecasting marine casualties in future will be the estimation of growth in number of ships. When the annual growth rate of five percent is applied to the number of ships, the estimated number of ships in 2000 will be 380 for ocean going and 18,583 for domestic shipping, based upon the 1982's number, i.e. 158 for oceangoing and 7,564 for domestic.

The rate of occurrence could be estimated on a trial basis in the following way for both 1982 and 1983. In this case, the rate applies to

the ratio of the number of ships involved in accidents in relation to that registered.

Table 4-2-2-(7)/1 Number of Marine Accidents Occurred in 1982 and 1983

Item / Year	Total No. of Accidents Occurred	No. of Ships Registered	Rate of Occurrence (times/year)
1982	446	7,722	0.058
1983	396*	8,108**	0.049

Notes: * No. converted to correspond to the total year
** Annual growth rate of 5% applied.

Then, collisions and strandings are similarly estimated as follows:

Table 4-2-2-(7)/2 Number of Collisions and Strandings Occurred in 1982 and 1983

Item / Year	Collision		Stranding	
	No. of Accidents	Rate of Occurrence	No. of Accidents	Rate of Occurrence
1982	62	0.008	64	0.0082
1983	53	0.0065	58	0.0072

In other words, the aggregate rate of occurrence for both collisions and strandings is as given below:

1982 0.0080 + 0.0082 = 0.0162
1983 0.0065 + 0.0072 = 0.0137

On the basis of above, average annual rate of occurrence for collisions and strandings may be

estimated as given below for the accidents recently occurred.

Rate of Occurrence: -

Collisions	0.00725
Strandings	0.0077
Total	0.01495

As described above, the estimated total number of ships in 2000 is 18,583 according to the average annual growth rate of 5%.
Accordingly, the following number derives from it respectively for collisions and strandings:

Estimate Number of Collisions: -

$18,583 \times 0.00725 = 134.7 \fallingdotseq 135$

Estimated Number of Strandings

$18,583 \times 0.0077 = 143.1 \fallingdotseq 143$

The total estimated number of marine casualties in 2000 including collisions and strandings is calculated as follows, applying 28% as the relevant ratio.

$(135 + 143) \div 0.28 = 992.86 \fallingdotseq 993$

Namely, the total annual number reaches 993, out of which 278 are collisions and strandings.

Evidently, those figures are estimated on conditions that various parameters taken into account the estimation of trend in marine accidents during the last five years would remain unchanged for the coming 18 years up to year 2,000.

However, necessary countermeasures will be taken in reality to try to prevent marine disasters through improvement in ships performances, training and education of ships crew, establishment and improvement of aids to navigation. Also, needs for marine transportation might be substantially influenced in case where an economic panic like the oil shock would occur again in future.

Any fluctuation and changes under such situations will inevitably affect the status of marine accidents presently estimated.
The above data applied for the analysis and forecast is based on the list of marine casualties provided by KPLP.

Also provided was a copy of the original list of maritime casualties. It shows that the total number of accidents occurred during the five year period of 1979 - 1983 amounted to 2,027, giving the annual average of 405. 240 out of 405 are either collisions or strandings. Accordingly, there exists some discrepancy in the number between those two data.

However, the records of marine casualties occurred during the two years period have been taken up for the analysis of marine accidents for the reason that application of longer period data may infavourably affect the firm grasp of actual recent situations of intensely changing sea transportation.

With regard to the growth rate in number of ships up to the year of 2000, forecast is quite a difficult matter as previously mentioned, and involves various factors of motorization of sailing ships, scrapping plan of aged ships and so forth as well as the forecast for overall cargo flow in Indonesia.

2) Up to 1988/89

Indonesia, lying between the two oceans of the South Pacific and Indian oceans and the two continents of Asia and Australia, is one of the largest maritime nations in the world composed of five major islands and a large number of scattered islands in the vast sea areas extending approximately 5,000 km from east to west and approximately 2,000 km from north to south, and the total population of about 160 million, as of the end of 1983, is inhabited in over 3,500 islands.

Under these geographical environment and conditions, maritime activities are vital necessities for the development of national economy in Indonesia.

The results of maritime sector development within REPELITA I, REPELITA II and III materialised an increase of the infrastructure and facilities belonging to the respective maritime factors and provided better services to the public as well as enabled the fulfilment towards demands in sea transportation and services. Within the REPELITA IV the development of maritime sector shall be integratedly stepped up so that all relevant

factors may be appropriately balanced within inter-insular transportation, and inter-provincial as well as overseas transportation. The development of maritime sector within REPELITA IV constitutes the improvement and more substantial form of services to the extent of being more equalized and integrated so that they may become a solid support within the national development. In order to achieve that objective, systematization and wide spread maritime sector services are endeavoured together with the continued development of telecommunication networks.

Therefore, wider extension of maritime services are to be made available, which are better organized, smooth, efficient and well balanced among the various kinds of maritime-related facilities/infrastructure as well as the capability of rendering more reasonable services. In line with the aforesaid, management capabilities are also intensified to support well balanced services and improved efficiency and effectiveness in maritime sector management. Discipline is also being stepped up in the interest of safety of goods and passengers so that accidents in the transportation sector can be minimized.

It is self-evident that trade plays an important role in Indonesian economy, and that the sea transportation occupies key part in the expansion of trade for furtherence of economic growth, transportation of daily necessities, furtherence of local development/immigration policy, together with the fishery supplying the nation's protein source and also being one of the important export items.

The active role of maritime transportation and fishing activities in Indonesia as described above may be summarized as follows:

a) Sea transportation

The development of national fleet continuously implemented throughout REPELITA III, and the total volume cargoes increased during the period are as given below:

Table 4-2-2-2)/1 CAPACITY OF NATIONAL FLEET & VOLUME OF CARGO TRANSPORTED DURING REPELITA III

KIND OF SHIPPING	1978			1982		
	NO. OF VSL	DWT/ BRT	CARGO (TONS)	NO. OF VSL	DWT BRT	CARGO (TONS)
Domestic Trade						
RLS	343	348162D	5277279	397	503371D	7457610
LOCAL	1363	118923B	1899484	1049	129476B	2444677
TRADITIONAL	2182	96019B	1012553	3486	180,447B	2155316
PIONEER	21	11171D	52661	36	20805D	98016
SPECIAL	1941	1222646D	38075048	2501	2267740D	54812073
		265032B			578875B	
		281338HP			379226HP	
Foreign Trade						
GENERAL	52	512705D	12121164	62	827227D	18464696
SPECIAL	97	620296D	96755385	96	774603D	101063658

Source: STATISTIC INDONESIA 1982

Estimate is made for the national fleet and volume of cargoes at the end of REPELITA IV as given below;

Table 4-2-2-2)/1-1 ESTIMATE OF NATIONAL FLEET & VOLUME OF CARGO AT END OF REPERITA IV

KIND OF SHIPPING	FLEET (DWT)	CARGO (TONS)
Domestic		
RLS	736,000	14,750,000
LOCAL	217,000	4,200,000
TRADITIONAL	245,000	3,400,000
PIONEER	18,000	770,000
Foreign		
GENERAL	1,149,000	23,700,000

Source: NCANA PEMBANGUNAN LIMA TAHUN KE EMPAT
DEPARTEMEN PERHLIBUNGAN 1984/85 -1988/89

b) Fishery

Indonesia has the water areas of 7.9 million square kilometers comprising 5.4 million for resource zone and 2.5 million for economic zone, and the annual potential catch is estimated at 6.4 million tons in the areas.
However, the catch in marine fishery in 1981 recorded only 1.4 million tons.

Table 4-2-2-2)/1-2 FISHING ACTIVITIES 1981

	NO. OF SHIP	PRODUCTION	
		VOLUME (Tons)	VALUE (MIL RP)
MARINE FISHERY	277005	1408272	504214
INLAND FISHERY	-	506233	378165
TOTAL	277005	1914505	882379

Source: Fisheries statistics of Indonesia 1981

In order to improve the low fishing productivity, a target is established as given below for REPELITA IV, in which the income increase for fishermen, improvement of national nutrition, development of 200 mile economic zone for the sake of export increase, modernization of fishing ports, vessels and gears, and the development of fishing technique, training, storage and processing as well as the improvement of distributive machinery are raised on the menu.

Table 4-2-2-2)/1-3 TARGET OF FISHERY PRODUCTION (1988)

	PRODUCTION (tons)	NO. OF SHIP
MARINE FISHERY	2058600	396948
INLAND FISHERY	752000	-
TOTAL	2811300	396948

Source: Data Issued by Fishery Agency dated 15, Dec., 1983

As such, the sea transportation and fishery activities, which will increasingly become necessary in future, require that the aids to navigation facilities securing the safety of navigation are vital factors to be developed.

The existing establishments of aids to navigation in Indonesia are, however, considered to be inadequate to meet the development of maritime activities.
The development and improvement of aids to navigation are an urgent subject to be fulfilled.

(2) Forecast for Needs of Visual Aids to Navigation up to Year 2000

1) Development Target

The total number of 1,092 lighted aids to navigation are presently established giving 3.3 units/100 NM in Indonesia along the entire coastlines of 33,017 miles as shown in **Fig. 4-2-1**, while in the developed countries the index gives 25 units/100 NM or over. Accordingly, it may be said that the present development status of aids to navigation in Indonesia is behind that of other maritime developed nations.

In view of the importance of maritime transportation growing due to the social development in Indonesia, a plan is made for the establishment of the following number of aids to navigation up to the target year of 2,000.

Development Plan for New Establishment of Visual Aids to Navigation in Indonesia.

Types of Lights	Long Term Plan	Short Term Plan
Lighthouse (on land)	212	72 (35)*
Lighthouse (off shore)	11	2
Light Beacon	347	111 (59)*
Harbour Light	46	46 (22)*
R.L.B.	30	12 (4)**
Lighted Buoy	409	254 (222)*
Sub-total	1,055	497 (342)

Existing	1,092	1,092
Total	2,147	1,589
No. of Units/100 NM	6.50	4.81

Notes:

* :the number in ( ) shows for on-going projects

**:the number in ( ) shows for malacca/ Singapore Straits.

The above plan requires new establishment of 1,055 lighted aids up to the year 2,000 with the total number giving 2,147 units at 6.50 units/100 NM, and it resultantly gives 4.3% of the annual average growth rate.

2) Current Development Status of Visual Aids to Navigation in the World and in Indonesia

The annual average growth rate of new establishments of visual aids to navigation during the 10 years period of 1972 - 1982 in the world was 1.22% for fixed light aids and 2.52% for floating light aids and others, totalling 1.73% as shown in **Table 4-2-2-2/3.**

In Indonesia, the annual average growth rate achieved during the five years period of 1977 -1982 shows 6.8% for fixed light aids and 2.9% for floating light aids totalling 5.5%.

3) Forecast for Budgetary Resources

The resources invested in the development of visual aids to navigation in Indonesia consist of the

national budget and the funds from overseas, namely Japan, England, France, West Germany and Sweden. The total amount of the latter during the sixteen years period of 1968 - 1983 amounted to approximately US$75 million, and about US$39.1 million during the three years period of 1981 - 1983 giving the annual average of US$13 million.

On the other hand, the national budget for the navaids during the five years period of 1979 - 1984 amounted to approximately Rp. 30,000 million giving the annual average of Rp. 6,000 million.

If an assumption would be made that the budget to be invested for navaids would be proportional to 5.5% of the growth of GDP with the annual average made for its basis, i.e. US$13 million and Rp. 6,000 million respectively for foreign and national resources, then the grand total amount to be estimated for the sixteen years up to 2,000 will be US$338 million and Rp. 156,000 million respectively.

4) Reasonable Number of Visual Navaids to be Developed

The establishment status of lighted navaids installations in Indonesia has been rather in a developing stage as compared to that in major maritime nations. It is desirable that in such a great maritime nation as Indonesia the installation target for lighted aids is to be set at higher than 20 units/100 NM. This will, however, require enormous amount of budgetary resources and period for implementation to achieve it.

Therefore, the development plan should be worked out taking into due account the social and economic development in Indonesia as well as the budgetary resources to be possibly made available for this purpose.

The development of aids to navigation in Indonesia during the five years period of 1977 to 1982 showed a rapid growth of 5.5% as given in **Table 4-2-2-2)/4**, and it will be necessary in future that along with the development of visual aids the establishment of electronic aids to navigation as well as supporting systems should be considered together with necessary training for the personnel.

In view of the above, the development of lighted aids to navigation in Indonesia up to the year 2,000 shall be within the scope of coping with the development respectively of ports, national fleet and fishery based on the development criteria given in Section 4-3-1, (1), (A), and the target may preferably be set as follows:

Annual average growth rate in development of visual aids; 3.5 - 4.0%
Number of visual aids to be established, 800 - 953 units

Table 4-2-2-2)/2 Number of Lights/100 N.M.

Item / Country	TOTAL LENGTH OF COAST LINE (N.M.)	LIGHTS	NO. OF LIGHTS (A) AND NO. OF LIGHTS PER 100 MILES (B)						Remarks
			1972/DEC		1977/DEC		1982/SEPT		
			A	B	A	B	A	B	
U.S.A.	35,240	ON FIXED STRUCTURES ON FLOATING MARKS TOTAL			12,284 4,008 16,292	46.2	12,113 4,261 16,374	46.4	
ITALY	3,135	ON FIXED STRUCTURES ON FLOATING MARKS TOTAL	949 78 1,027	32.7	1,013 132 1,145	36.5	1,027 128 1,155	36.8	
DENMARK	4,005	ON FIXED STRUCTURES ON FLOATING MARKS TOTAL	281 270 551	13.7	291 358 649	16.2	297 372 669	16.7	
NETHERLANDS	899	ON FIXED STRUCTURES ON FLOATING MARKS TOTAL	503 489 992	110.3			483 525 1,008	112.1	SOURCES: IALA BULLETIN 1974-3 1979-2 1983-3
JAPAN	16,064	ON FIXED STRUCTURES ON FLOATING MARKS TOTAL	2,579 1,231 3,810	23.7	2,908 1,332 4,240	26.3	3,059 1,353 4,412	27.4	
INDONESIA	33,017	ON FIXED STRUCTURES ON FLOATING MARKS TOTAL	(a) 423 201 624	1.9	527 286 813	2.5	(b) 748 344 1,092	3.3	(a) KANEKO REPORT (b) JICA SURVEY 1984/3
AUSTRALIA	APPROX. 20,000	ON FIXED STRUCTURES ON FLOATING MARKS TOTAL			268 35 303	1.5	370 42 412	2.0	
MALAYSIA	3,432	ON FIXED STRUCTURES ON FLOATING MARKS TOTAL			106 63 169	4.9	137 94 231	6.7	

Table 4-2-2-2)/3 World-Wide Growth Rate of Lighted Aids

Aids / Year	Fixed Lighted Aids		Floating Aids		Other Lighted Aids		Total	
	No. of unit	Growth %	No. of unit	Growth %	No. of unit	Growth %	No. of unit	Growth %
1972/ 1973	12,534 12,414	-0.95	18,658 17,194	-7.84			31,192 29,608	-5.0
1973/ 1974	28,959 29,354	+1.36	51,773 54,754	+5.75			80,732 84,108	+4.18
1974/ 1795	33,059 32,921	-0.41	10,604 10,870	+2.5			43,663 43,791	+0.29
1975/ 1976	32,674 32,943	+0.8	12,317 12,687	3.0			44,991 45,630	+1.42
1976/ 1977	29,460 30,190	+2.48	10,112 10,306	+1.92	223 216	-4.93	39,795 40,712	+2.29
1977/ 1978	34,137 34,552	+1.22	13,057 13,280	+1.70	168 182	+8.33	47,362 48,014	+1.37
1978/ 1979	34,552 35,729	+3.41	13,280 14,240	+7.22	182 208	+14.28	48,014 50,177	+4.49
1979/ 1981	22,377 22,670	+1.3	9,291 9,426	+1.45	172 263	+52.90	31,840 32,359	+1.63
1981/ 1982	23,747 23,792	+0.20	9,689 9,774	+0.88	129 125	-3.10	33,565 33,691	+0.38
TOTAL	251,499 254,565	+1.22	148,781 152,531	+2.52	874 994	+13.72	401,154 408,090	+1.73

Source: IALA BULLETINS

Table 4-2-2-2)/4 Development Status of Lights on Fixed Structures and on Floating Marks in Indonesia during 1969 - 1982

Year / No. & Rate / Aids	1969	1974		1977		1982			Total Growth during 1969-1982 (%)	Annual Average Growth (%)
	No. of Unit	No. of Unit	Growth in 5 Yr. from Dec. 1969 to Dec. 1974 (%)	No. of Unit	Growth in 3 Yr. from Dec. 1974 to Dec. 1977 (%)	No. of Unit	Growth in 5 Yr. from Dec. 1977 to Dec. 1982 (%)	Annual Average Growth (%) in 5 Yr.		
LIGHT HOUSE	120	125	4.16	128	2.34	146	14.06	2.7	21.66	1.8%
LIGHT BEACON	182	298	63.73	399	33.89	589	47.61	8.1	223.62	9.5%
LIGHT BUOY	187	201	7.48	286	42.28	329	15.03	2.9	75.93	4.5%
TOTAL	489	624	27.60	813	30.28	1.064*	30.87	5.5	117.58	6.2%

Sources: IALA BULLETINS for up to 1977
JICA SURVEY 1984/2 for 1982
OECF SURVEY REPORT FOR INDONESIAN PROJECTS, March 1970 for 1969

Notes: * The total number of units as of 1984/3 shows 1,092 (1,064 + 28 units:

Lighthouse	3
Light Beacon	5
Harbour Light	5
RLB	2
Light Buoy	13
Total	28)

(3) Forecast for Needs of Electronic Aids to Navigation up to Year 2,000

1) Development Target

A) Medium-wave radiobeacon stations

A long term development plan has been included in "SHORT TERM DEVELOPMENT PLAN FOR AIDS TO NAVIGATION, AUGUST 1983 to establish the total number of 64 MF radiobeacon stations, and the first phase project is in its implementation in REPELITA IV.

There are such other intermediate-short range electronic navigation aids systems as Decca and Loran, which provide higher accuracy and wider covering range. The prime reason of having firstly introduced the medium-wave radiobeacon stations other than such other hyperbolic systems is the economical aspect involved: the construction costs of stations and user equipment are fairly less expensive as compared with those for other systems. Project initiation for other systems such as hyperbolic ones in Indonesia may be considered appropriate to be implemented when further requirements for electronic navaids arise as a result of the ongoing and planned maritime development, especially from the user sector.

B) Radar beacon (racon) stations

Installation of radar equipment onboard is compulsory for all the vessels of 1,600 G/T or

upwards on international voyage according to SOLAS Convention, and those of 500 G/T or upwards constructed on and after 1st September, 1984 will be included in the same category. Those apply to Indonesia.

It should be noted that the increasing number of vessels not only of large types but also of smaller than the afore-mentioned types has recently been fitted radar equipment onboard, and reference is also made to this point in the "Short Term Development Plan for Aids to Navigation" prepared by Directorate General of Sea Communication.

2) Current Development Status of Electronic Aids to Navigation in the World and in Indonesia

The development status in the total number of electronic aids to navigation for the 62 member countries of IALA is as shown in **Table 4-2-2-(3)**, for the past ten years of 1972 to 1981 which indicates the annual average increase of approximately 5.5%, although there are ups and downs ranging from 19.5% to 0.8%.

Of the electronic aids to navigation, the development status of MF radiobeacons and racons (including ramark beacons) is graphed in **Fig. 4-2-2-(5)**: MF radiobeacons made a slight annual increase by 1.05%, while racons did the annual increase of about 12.5%.

Fig. 4-2-2-(5) Flow of Number of MF Radiobeacon and Racon in 62 Member Countries of IALA

Source: IALA Bulletins

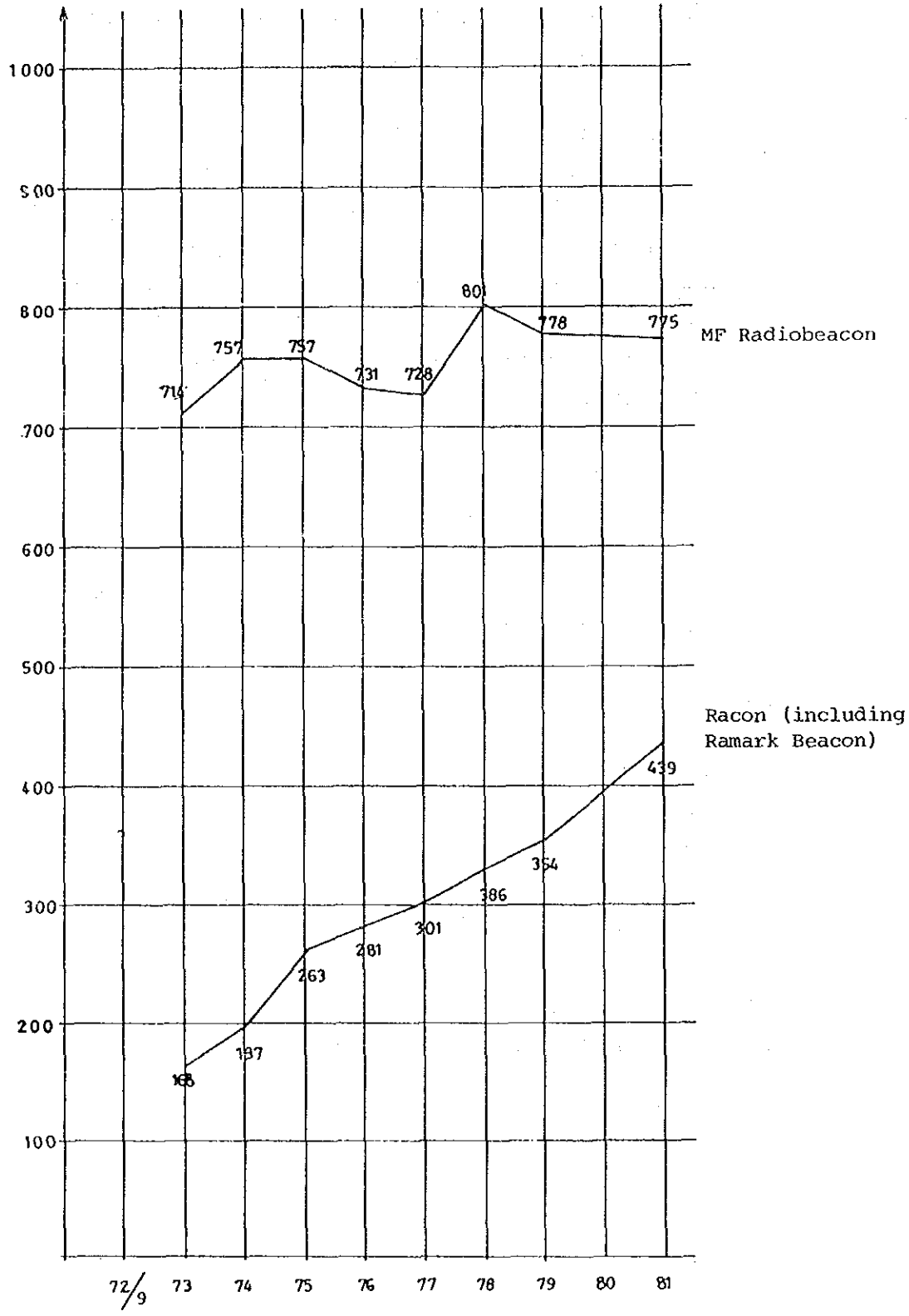


Table 4-2-2-(3) World-wide Growth Rate of Electronic Aids to Navigation

Year	Growth Rate
1972 - 1973	19.5%
1973 - 1974	2.0
1974 - 1975	4.4
1975 - 1976	2.4
1976 - 1977	2.8
1977 - 1978	6.1
1978 - 1979	0.8
1979 - 1981	17.1
Annual Average for the Period of 1972 - 1981	5.51%

Source: IALA Bulletins

Assuming that the individual growth rates mentioned above would be maintained up to 2,000, the number of MF radiobeacons and racons would be estimated respectively at about 940 stations, showing the increase of 165 stations as compared to that in September, 1982, and at about 4,120 stations, showing the increase of about 3,680 stations during the same period. It, nevertheless, shows that the both stations show an increasing trend in number. Accordingly, it is considered that the MF radiobeacon system will be expanded mainly in the developing countries and that racons will be implemented not only world-wide but also further in such nations other than advanced ones.

In Indonesia, the eighteen MF radiobeacon stations are currently being implemented, and only three racon stations are established. The implementation of these electronic aids to navigation in Indonesia is only at its starting point.

3) Reasonable Number of Electronic Navaids to be Developed

The long term development plan for electronic aids to navigation is established aiming at the target year of 2,000 in order to meet the future development of ports, and traffic routes as well as maritime activities of shipping, fishery and other relevant sectors.

The Republic of Indonesia has been proceeding with the implementation of Gateway policy, in which the development of 43 major ports are projected on a long term basis. With the Gateway system integrated as the nucleus, the development of inter-insular shipping of Regular Liner Service (RLS), Local and Pioneer Services is under progress.

On the other hand, the long term forecast for number of ships and their tonnage indicates a rising curve, and it is considered that the future trend of cargo flow will follow the increasing curve, the volume of which will in general be proportional to the density of traffic routes, more concentrating on the main routes with the rest flowing through branch routes, when the total social development (GDP) is taken into account.

As regards fishery, the fishing grounds are almost equally scattered around the geographical areas of the country, and both fishing catches and number of fishing vessels will be on an increase trend in future.

Area-wise analysis on occurrence of marine casualties has shown that Jawa Sea has overwhelming

majority in terms of the total number of accidents occurred followed by Makassar Strait and then by Flores Sea.

Among those casualties recorded, there are no specific areas where the strandings and collisions, possibly related to aids to navigation, collectively occurred except Surabaya area, where the highest density of accident exists, and almost equal distribution is seen for those navaids related accidents in terms of geography.

The above may be summarized as follows:

GATEWAY SYSTEM	G-G	G-C	C-C	C-T
ILS System	RLS	RLS / Local	Local	Local / Pioneer
Fishing ground	o	o	o	
Marine casualties	o	o	o	
Definition of Water Areas	Very Important Waters (VIW)	Important Waters (IW)	Main Waters (MW)	
Water Areas	Java Sea	Makassar Strait Flores Ceram South-West of Sumatera North-West Banda	North Smatera North-West of West Irian Molucca Sea Banda Sea	

The development of electronic navaids should note the following points:

i) Already established national policy on ILS/Gateway system

ii) Huge geographical areas, where the quantum development is needed.

iii) Relatively late start, in terms of a point of time, in the project implementation, which should be compensated through acceleration.

In view of the above, the implementation of electronic navaids is rather an urgent matter.

In order to provide the necessary coverages for VIW, IW and MW by MF radiobeacon stations, as defined in the development criteria, the following is to be required:

Medium-wave radiobeacon: 57 stations including 18 under implementation

The establishment of racon stations is in conformity with the same concept as referred to above, while racons are to indicate main land falls, navigation dangers, and turning points covering VIW, IW and MW. The number of racon stations is as follows:

Radar beacon: 70 stations including existing 3