THE REPUBLIC OF INDONESIA SURVEY REPORT ON IMPROVEMENT PLAN OF BELAWAN PORT

NOVEMBER 1978

OVERSEAS TECHNICAL COOPERATION AGENCY

JAPAN

PREFACE

Upon request of Indonesian government, Japanese government determined to conduct preliminary survey on the arrangement projects of Belawan port located at the northern part of Sumatra island as a part of overseas technical cooperation by Japan, and committed its implementation to OTCA (Overseas Technical Cooperation Agency).

OTCA then dispatched two members, Masao Ohno, the deputy director general of first district port construction bureau in Ministry of Transport, and Hideaki Kimoto, the assistant for policy division of third district port construction bureau, in Ministry of Transport, to the spot for survey work for 15 days from February 27 to March 13.

Due to insufficient time period and personnel, the work of survey team seemed to be extremely hard and crowded. However, the survey report was submitted by the team soon after they returned home.

It is my greatest pleasure that this report will be useful in promoting the arrangement of Belawan port, and in increasing friendly relationship between the two countries.

Finally, I wish to express my appreciation of the friendly cooperation given in implementation of this survey to us by Indonesian authorities, and the persons concerned in Japanese Embassy in Indonesia, in Ministry of Foreign Affairs, in Ministry of Transport, and in other organizations related.

May, 1973

Keiichi Tatsuki
Chairman of Board of Directors
OTCA

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FOREWORD

This report contains the results of survey conducted on the rehabilitation project of Belawan port and of a preliminary survey conducted on the feasibility of the expansion project of the port, and also contains results of discussions made with Indonesian authorities and the persons concerned in Japanese Embassy in Indonesia. The survey trip was made during 15 days from February 27 to March 13, in Jakarta and Belawan port and its hinterland area in Sumatra island of Indonesia. Because of insufficient time period and limitted number of personnel, perfection in surveying could not be arrived at. However, we hope that this report will be useful in promotion of the rehabilitation project and expansion project of Belawan port, and be an aid for increasing cooperation between Japan and Indonesia.

The aim of this survey team was not only to conduct preliminary survey on the feasibility of the projects, but also to conduct technical cooperation in determining the implementation program of the projects already committed to Yen-credit and the additional projects, and therefore detailed and careful examination was required in every aspect. Through the survey work in Indonesia, greatest cooperation and assistance were offered by the Indonesian authorities, the persons concerned in Japanese Embassy, in the marine transportation adviser group which is dispatched by Japanese government, and by the members of OTCA and OECF in Jakarta. Without their friendly and energetic cooperation and assistance, this report would not have been completed. We are pleased to acknowledge herein the considerable assistance and cooperation offered for us.

Belawan port arrangement project survey team

Masao Ohno

Hideaki Kimoto

SECTION I OUTLINE

1. Objects of survey

Request for Japanese aid in port projects of Indonesia has been made by Indonesian government in these several years. Relating to Yen credit projects offered by Japan, investigation of their feasibility was made by the specialists dispatched from OECF three times in three years. Among these projects, Yen credit of 4,500,000 US dollars and 1,000,000 US dollars have been committed by 1972 to the dredger construction project and rehabilitation project of Belawan port, respectively.

Although Japan committed an aid of about 100,000,000 dollars to Indonesia every year, aid for projects relating to marine transportation, especially port projects, was fallen quite behind of others due to various reasons. In February 1972, overall preliminary survey was conducted on the port projects already determined and the improvement and expansion plan of port under consideration, and the report was published on the possibility and range of Japanese cooperation and aid for the existing and future projects. (Refer to the Report of Indonesian Project Survey Team in 1972 on Port Problems; by Masao Ohno of Ministry of Transport.)

Upon the base of the above mentioned survey report, Japanese government indicated the policy to cooperate consistently with Indonesia in the rehabilitation project and improvement and expansion project for Belawan port, as the Yen-credit project for port sponsored by Japan.

On the other hand, upon request of Indonesian government for dispatching of specialists, this survey team was sent to cooperate in determining the implementation program, though the implementation program of 1,000,000 US dollars committed to Belawan port rehabilitation project in 1972 was not completed.

The objects of the survey team, dispatched from OTCA, were as follows:

(1) To re-examine the content of the project F-27 (rehabilitation of Belawan port, amounting to 100,000 US dollars) committed by Japan in

1972, to establish the content of the project, and to cooperate technically for determination of the implementation program.

(2) To examine the feasibility of the New Harbour rehabilitation project requested as the additional project for the F-27 project after IGGI conference in 1972, and to establish the content of the project and the amount of fund required, upon deliberation with Indonesian authorities. (Note: IGGI = Inter Governmental Group for Indonesia)

(3) To conduct preliminary survey on Belawan port improvement and expansion project (mainly as an industrial and circulation port) which is under consideration by Indonesian government (for the second five year project of economy development), and to examine possibility and range of cooperation of Japan.

2. Formation of survey team

The members of the survey team for Belawan port rehabilitation and expansion projects and the participants are as follows:

2-1 Japanese survey team

Head of team: *Masao Ohno, Deputy Director-General, Port Construction Bureau of Ministry of Transport*

Member of team: Hideaki Kimoto, Deputy Director, Planning Division of Port Construction Bureau of Ministry of Transport

2-2 Japanese participants in the spot

Harunobu Ono: Leader of Indonesian marine transportation advisor team

Kazuhiro Koshiro: Port advisor of Indonesian marine transportation advisor team

Tokuichiro Suzuki: *Shipping advisor of Indonesian Marine* transportation advisor team

Toshikazu Iwamoto: Secretary of Japanese embassy

Sadao Iwata: Secreatry of Japanese embassy

2-3 Indonesian participants

IR. FUONO BUDIARDJO:	Director of port bureau of sea communication
SINYOTO:	Chief of dredge division of sea communication
IR. MUSTAFA. S:	Director of Belawan port office
HIDAYAT. MAO. S. H.:	Chief of secretariate of Belawan port office
IR. MURTOLO:	Chief of engineering division of Belawan port office
T. J. ANWAR:	Chief of traffic division of Belawan port office
HARTONO:	Chief of service division of Belawan port office
ASMAT:	Chief of ship division of Belawan port office
M. ARBI:	Chief of dredge division of Belawan port office

2-4 Major interviewers in the spot

REAR ADMIRAL H. NIMPUNO:	Director general for sea communications
Vice governor of North Sumatra	state
IR. M. SIPAHAUTAR:	Chairman of development board for North Sumatra
DR SUREGAR:	Chief of transportation section BAPPENAS
ARSYAD IDROES:	Member of transportation section BAPPENAS

3. Survey schedule

Date	Place	Interviewer	Subject
Feb 27	Tokyo to Jakarta	Arrival at Jakarta	Departure
Feb 28	Jakarta	General shipping bureau director general; Port bureau general director; Minister and Mr. Iwata of Japanese embassy; Head of shipping advisor team, Mr. Koshiro	Greetings Previous arrangement on survey items and schedule
Mar 1	Jakarta	Port bureau general director of general shipping bureau	Asking opinion of the port bureau general director, requesting materials and data, and previous arrangement of schedule
Mar 2	Jakarta	BAPPENAS shipping bureau, and shipping advisor team	Requesting convenience for survey and collecting materials
Mar 3	Jakarta to Medan	Accompanied are: Mr. Koshiro and Mr. Suzuki of shipping advisor team; Mr. SINYOTO of general shipping bureau dredging division director general	
Mar 4	Medan to Purapat	Medan to Demsiantar to Prapat and Lake Toba	Inspection of industrial activities of the hinterland of Belawan port
Mar 5	Purapat to Belawan	Plapat to Brastagi to Medan to Belawan	Inspection of industrial activities of the hinterland of Belawan port

		Ir. MUSTAFA. S the director of bureau of Belawan port office; Chief of engineering division, chief of service division, chief of ship division, and vice chief of dredge division	Discussion and collecting materials
Mar 6	Belawan	Ir. MUSTAFA. S the director of bureau of Belawan port office; Ir. MURTOLO the chief of engineering division	Discussion and collecting materials, and inspection of port
Mar 7	Belawan	ditto	Asking opinion, collecting materials, and other operations
Mar 8	Belawan to Jakarta	Vice governor of North Sumatra; chairman of North Sumatra development committee	Greetings, discussion on North Sumatra development project, and collecting materials
Mar 9	Jakarta	Chief of general shipping bureau	Discussion on the result of investigation, and collecting materials
Mar 10	Jakarta	Japanese embassy	Reporting outline of results survey
Mar 11	Jakarta		Arranging materials and data obtained
Mar 12	Jakarta	BAPPENAS Dr. SIREGAR ARSYAD IDROES	Reporting outline of results, and discussion
Mar 13	Jakarta to Tokyo		Homecoming

4. Outline of survey

This survey team was, as mentioned previously, dispatched by Japanese government upon request of Indonesian government. The objects of the team were:

(1) Re-examination of overall Belawan port rehabilitation project, establishment of the project, to which Japanese government will give aid, in relation to the overall rehabilitation project of the port, and technical cooperation in determining the implementation program.

(2) Preliminary survey on the feasibility of the expansion project of the port, and survey on possibility of Japanese cooperation.

Since the establishment of the content of the project amounting to 100 million US dollars to the F-27 (4) project, to which Japanese government had committed last year, has a relation to the rehabilitation of the new harbour, the survey was performed in such a manner that may provide overall judgement on the problem.

Indonesia possesses a population of about 120,000,000, and covers an area of about 740,000 square miles (five times of the area of Japan). Agricultural development was begun from the era of Dutch rule. This country features abundant agricultural products, and forest and mineral resources including petroleum are also rich.

The land of this country comprises more than 3,000 of islands, and land transportation network such as highway and railway is still undeveloped today. The communication, then, must depend on shipping for the time being and in future.

At present, there are about 300 ports in Indonesia, and 44 of which are for foreign trading, 95 for domestic and coastal trading, and 160 are for coastal trading only. There are another 34 special port exclusively used for transportation of petroleum. Among these ports, the major ports are Tandjung priok port (Jakarta), Surabaja port and Tjirebon port

(Java island), Belawan port and Palembang port and Pandjan port, Dumai port, and Pangkalanberandan port (these are in Sumatra island), Makassar port, Bitung port (these are in Slauesh island), Balikpapan port (kalimantan island).

Most ports in Indonesia were established in the era of Dutch rule, and have been aged for more than several ten years. Though they had been good ports at that time, the engineering work and facilities of these ports have been superannuated and deteriorated due to lack of proper maintenance and improvement since then. The facilities for shipping service such as water supply, electricity supply, fuel supply, and communication facilities are all insufficient and deteriorated considerably. Collection and distribution system and loading and unloading system have been retained from the era of Dutch rule, and their complexity, inefficiency, and irrationality in management and control are comprising major causes that pushes up the loading cost of the port to extremely higher level.

The capacity of the ports in Indonesia is barely satisfying the present demend, and if these ports be left as it is, they will cause serious troubles over the entire development of the national economy of Indonesia.

To prevent this condition, Indonesian government established the Indonesian sea communication reconstruction project, and began to execute the project from 1969 by obtaining international cooperation for that purpose. The main body of this project was the rehabilitation project of the facilities in urgent requirement, and the rehabilitation of ports and dredging project were included in this project. The details of these project will be discussed in the latter section. The rehabilitation project of Belawan port was included as a sample of other ports that must be improved.

Belawan port is the largest foreign trading port, and is located at the northern part of the Sumatra island, 27km apart from Medan which is the central city in North Sumatra. (Fig. (1) - 1).

Sumatra island is the largest in Indonesia next to Karimantan

island, and has an area of 183,000 square miles (25% of the shile country) and a population of 20,000,000 (17% of the whole country). As compared to Java, which is the centre of this country, its area is threefold while its population is one third of Java. This island features abundant natural resources including agricultural products, and the capital income per population is larger than that of Java. Though the road system of this island is undeveloped, it has more than 40 ports, the number being four-times of Java.

North Sumatra where the port of Belawan is located has an area of 70,000 square meters and a population of 6,600,000. North Sumatra is a highly cultirated agricultural region, and its center is Medan, the largest foreign trading city in Sumatra having a population of 600,000.

Sumatra features abundant products of rubber, palm oil, tobacco, coffee, tea, rice, maise, Kasba, and vegetables including potato and cabbage. Rubber, palm oil, coffee, tea, tobacco and kasba are exported from Belawan port. These products are gaining the largest amount of foreign currency next to petroleum in Indonesia.

Belawan port is located at 3°48' north latitude and 98°43' east longitude, in a comparatively small island between Belawan and Deli rivers. The port is communicated with the city of Medan, about 27km apart from Belawan, by means of road and railway. The quay of the port comprises the Belawan Lama at west section, Udjung Baru (foreign and domestic trade) at the center north section, New Harbour at the east section, and Oil Jetty which is unusable at present. (See Fig. (1) - 2, General Lay-out of Port of Belawan.)

The actual record of the volume of cargo handled in this port is 1,854,000 tons (including petroleum of 493,000 tons) in 1971, and 2,079,000 tons (including petroleum of 351,000 tons) in 1972. The apron, fenders port roads, ware houses, and other port facilities are under rehavilitation work, and four burses for domestic trading are now under construction. In addition, a modern terminal building for passengers has been completed recently. On the other hand, facilities for electric

supply, water supply, fuel supply, fire extinguishing facilities, and tag-boats are all aged and insufficient in capacity, and their reinforcement coupled with improvement of port managing system make up the urgent problem to be solved.

Another important problem for this port is how to maintain the depth of water inside the port and the sea route.

This port is communicated with the open channel in the Marakka straight by means of the outer sea route of 12km. Although dredging is conducted every year and a volume of 2,000,000 to 3,000,000m^3 of earth is removed from the port and the sea route, the depth of water is maintained at -6.5 to 7 meters (standard depth is -9 meters). Besides, proper maintenance has not been conducted against burying of port due to breakdown of slope surface and flowing in of earth and sand from rivers. Maintenance of the depth of sea route and fundamental countermeasure against burying of port are, as pointed from long ago, the most important items that must be solved for future development of the Belawan port. However, on dredging of the sea route of 12km long, -9.5m deep dredging was carried out for about one year beginning from the last year under the aid of Netherland.

Under these conditions, Japanese cooperation was requested for rehabilitation and expansion project of Belawan port. Among the rehabilitation of Belawan port projects, items submitted by Indonesia and acknowledged by this survey team as of urgent necessity are as follows:

1. Rehabilitation of transit shed
2. Rehabilitation of lighting
3. Rehabilitation of road (including dock road)
4. Rehabilitation of water supply facilities
5. Rehabilitation of electricity supply
6. Rehabilitation of power supplier
7. Construction of tug boat
8. Improvement of fire fighting equipments
9. Construction of fence

10. Reconstruction of quay wall & apron

11. Replacement of rubber fenders

After discussion with Indonesian authorities, and through field survey work, (1) Facilities of electricity supply and (2) Facilities of water supply hav been adopted as the rehabilitation project for 1,000,000 US dollars which was committed previously, and the rehabilitation of New harbour project has been adopted as the supplement for rehabilitation project due to reasons mentioned in the later sections of this report.

Next, the results of preliminary survey on feasibility of the improvement and expansion project of Belawan port must be mentioned herein. After collecting opinions and conducting discussions with the Belawan port administration, vice governor of North Sumatra state, chairman of North Sumatra development committee as well as field surveying, the necessity and feasibility of expan plan of Belawan prot as the industrial and circulation port are seemed to be greatest even when judged from the standpoint of the whole nation of Indonesia. Japan, therefore, whould actively promote its economic and technical aids for this projct, first by dispatching the survey team for determining the expansion project of the port.

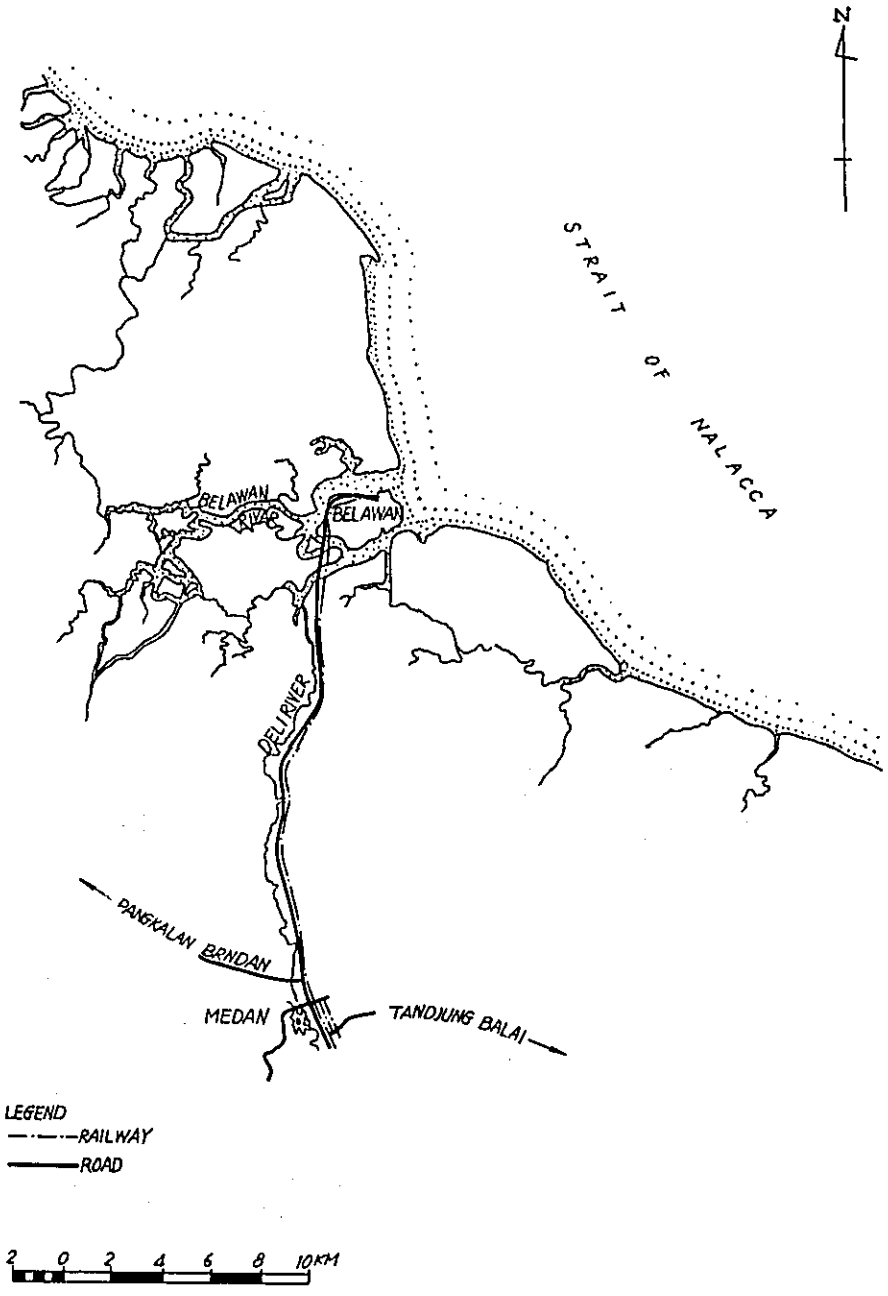


Fig. (1) - 1 Location of Belawan

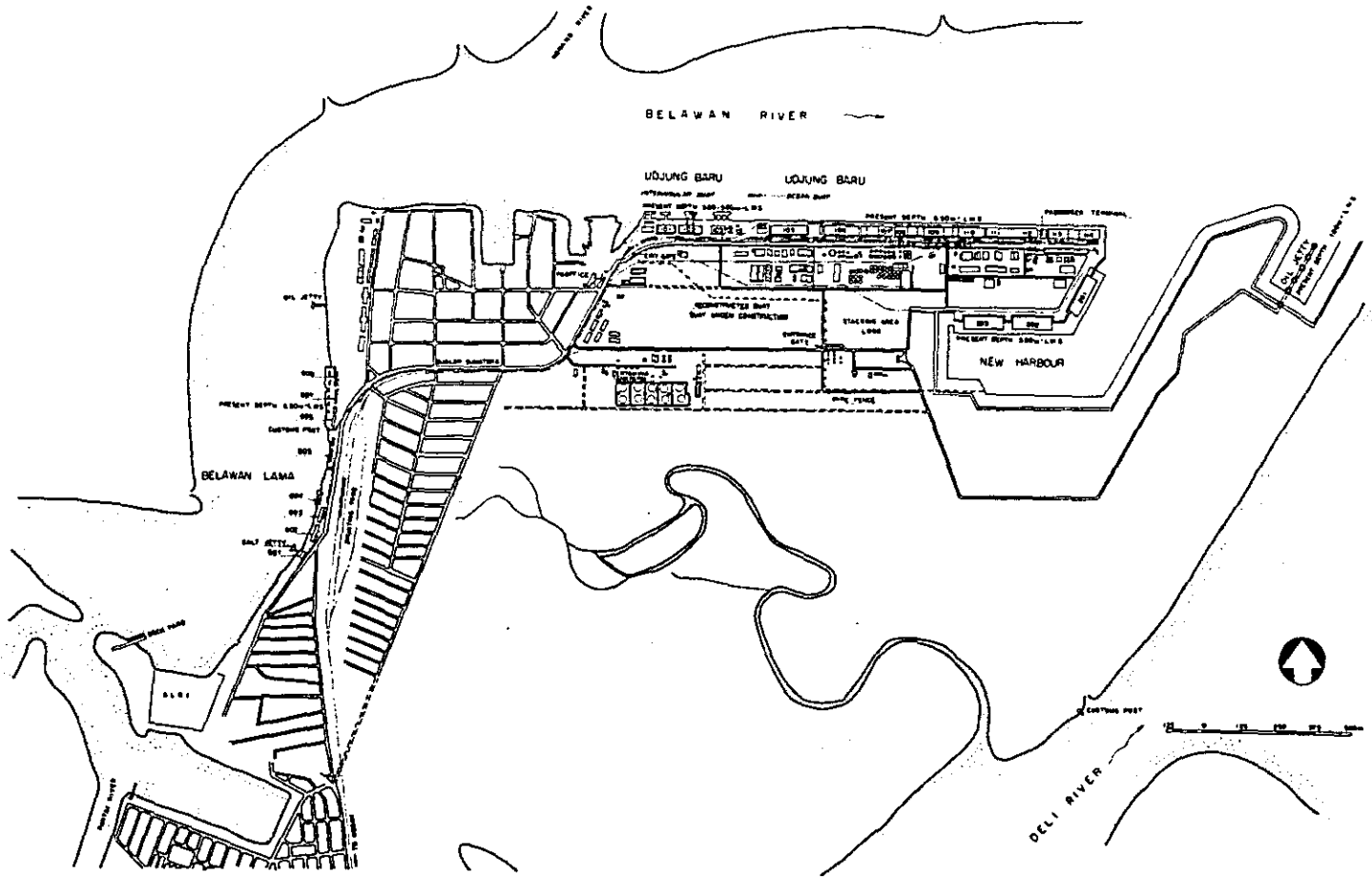


Fig. (1) - 2 General lay-out of Port of Belawan

SECTION II BELAWAN PORT REHABILITATION PROJECT

1. Outline

As mentioned in Chapter 4 of Section I, Outline of survey, it is generally believed that the importance of economic development of Indonesia is placed on the development of abundant agricultural and mineral products. However, Indonesia comprises mothe than 3,000 of islands, and the inland transportation system including road and railway is quite undeveloped today. In order to increase production in the fields of agriculture and mining industry, it is absolutely necessary to establish periodical sea transportation system covering whole land of Indonesia and its effective management.

On the other hand, a balanced development of domestic and foreign shipping in marine transportation is essential for cultivating and developing the hidden totential of the economy of Indonesia. With this arrangement, the national income will be increased not only by increased income due to exportation of products, but also by increased income except in trading obtained by transportation of materials.

In this sense, improvement and development of periodical shipping between islands have an important role on the distribution system of this country. For smooth development of periodical shipping and efficient management, it has become an urgent problem to arrange facilities relating to ship, port, marine transportation, and other auxiliary facilities quickly.

In 1969, a steering committee was established by Indonesian Ministry of Transportation and Communication, BAPPENAS, international Bank for Reconstruction and Development, Asian Development Bank, Embassies of Japan, French, USA, and Holland, TCAS team, and INSA, and the director general for sea communication of Indonesian Ministry of Transportation was elected the chairman. After discussion in this committee, the report was issued in October 1970. This report stated that the investment project should be immediately practicable as

urgent project, and be related to periodical service vessels, shipyard, port, and dredging operation. In the sections for port and dredging, the report said that the temporary project for the port and dredging operation should be that for increased service efficiency of periodical shipping, and the budget for that should be estimated on the amount required for during 1971 to 1973. It also stated that the temporary project for obtaining funds necessary for implementation of the recommended project should be completed by 1970. Dutch NEDESCO, requested for aid in project planning on port and dredging program on the consultant bases, and submitted the report in August of 1971 to Indonesian government.

Indonesian government, on the bases of the recommendation of the above mentioned committee and the report of NEDECO, submitted F-27 (rehabilitation of port) and F-28 (dredging program) projects to the IGGI conference, and these projects are now under implementation by the aids of each country and international organization related.

In the F-27 project (rehabilitation of port), importance is placed on the major ten ports in Indonesia including Tandjung priok, Tjirebon, Semarang, Surabaya, Belawan, Padang, Palembang, Bandjarmasin, Makassar, and Bitung. (Fig. (2) - 1.)

The outline of the rehabilitation project of Belawan port is mentioned in chapter 4 of section I, Outline of survey.

(a) Indonesia government initially presented the following projects to Japan for 1,000,000 US dollars of foreign currency which Japan has committed:

(1) Overlay pavement quay wall

(2) Dockroad pavement

(3) Tug boat (1500HP, one vessel)

(4) Electricity supplier (generator, one unit)

However, due to reasons that the items (1) and (2) are partially under implementation without foreign aids at present, and will not require large amount of foreign currency, and the tug boat in item (3) was to be constructed under Dutch aid, these items were withdrawn by the Indonesian

government. Instead, Indonesia requested to include arrangement of electricity supply facilities and water supply facilities into this project. After examination on the feasibility and necessity of the project, the survey team acknowledged its appropriateness, and for the most part attained agreement, through frank and friendly discussions with Indonesian authorities, on the content of the project, and adopted the following two projects:

(1) Facilities of electricity supply

(2) Facilities of water supply

(b) Rehabilitation of new harbour (1973/1974, 5 projects), on which Japan was requested for aid as additional project to F-27, is a plan that requires to build the bank protection on the opposite shore and to dredge the basin, and to increase the depth from -5.5m to -10.5m, for preventing breakdown of the opposite shore and burying of the front basin due to earth and sand sent from rivers, and thus restoring the function of the new harbour (extension: 625m) as the foreign trading quay.

In the report submitted to the OECF survey team on February 1972, the plan was to expand the shore wall apron, mainly on the foreign trading quay of Udjung Baru so that cargo handling capacity may be increased. After examination on the subject plan, it became clear for us that during the expansion work of the apron, the quay cannot be used for sometime until expansion work terminates, and judging from the present volume of cargo handled and its increasing tendency, the apron expansion work will not respond to the increase in the volume of cargo handling. Besides, it was considered that restoration of the existing new harbour facilities is better than expansion of the apron since it may increase cargo handling capacity of the whole port, and that there are a number of positive merits which will be resulted from the improvement and expansion of Belawan port. It is also considered that the project is quite effective and its priority as the rehabilitation project of this port is quite high.

The contents of the plan are:

(1) Retaining wall (A) (approx. 390m)

(2) Retaining wall (B) (approx. 440m)

(3) Basin and dredging

By building retaining wall on the opposite shore and by making additional work on the retaining wall (B), the harbour is expected to be used as a foreign trading quay.

In water supply capacity, the overall capacity will be 4,000 tons/day (press capacity is 1,500 to 2,000 tons/day), and water supply capacity for ships will be 1,000 tons/day. Electricity will be increased from present 300KVA to 1,500KVA, thus satisfying the requirement of 1,000 to 1,500KVA.

Another merit of rehabilitation of new harbour is that the foreign trade cargo handling capacity will increase by 300,000 tons/year.

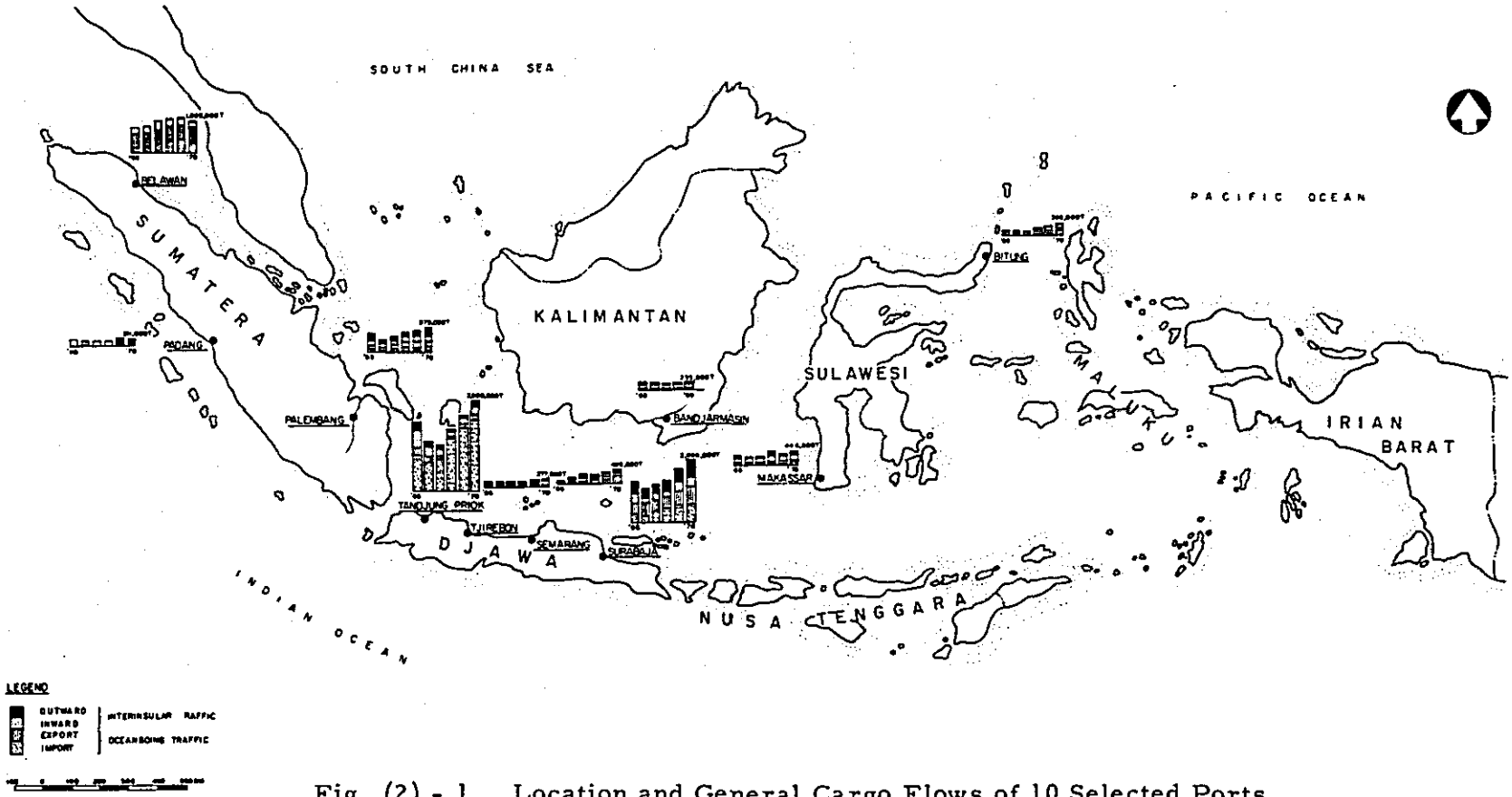


Fig. (2) - 1 Location and General Cargo Flows of 10 Selected Ports

2. Outline of Project

2-1 Electricity (power) Supply Facilities

(1) Power Situation in the Belawan Port District

There is not a single power generating plant in the Belawan district at present. Though the district is now supplied with 800 KVA of electricity by PLN (state-owned power company) in Medan, 500 KVA of which is consumed by local inhabitants and only the remaining 300 KVA is available for motive power and illumination of port facilities, thus creating a serious power shortage. The high tension 12 KVA power transmitted from PLN is received at a substation located in No. C (See Fig. (2)-2), where the voltage is dropped, transmitted to pole tranformers at various locations (See Fig. (2)-2, F, G, D, D, H, L) by overhead transmission line, where the voltage is further dropped, and is then distributed to transit sheds, warehouse, etc.

With the recent increase in the number of ships calling at Belawan port and in the volume of import and export cargo, the power shortage has become more acute and if the situation is left unattended, further aggravation of port functions will be unavoidable. On the other hand, however, the increase of power supply from PLN cannot be expected for the time being and it is most urgent to solve this problem by some means or other. The power energy required to maintain port functions for the present and in the immediate future as determined by the Belawan Port Administration is as follows.

Lighting of transit sheds, roads, quays and water pumps.	380 KVA
Passenger terminal	50 "
Palm oil pump	250 "
P. T. Tigus (asphalt mixing plant)	75 "
Good-year Co. (Latex)	75 "
P. T. I. (Deli tank installation) (Latex)	75 "
Telecommunication station	50 "

Cold storage	150 KVA
Total	1105 KVA

(2) Power Supply Facilities Construction Project

In order to alleviate the existing power shortage and meet the requirement for the above-mentioned port facilities and ensure stable power supply, the power supply facilities construction project aims at constructing a power generating plant with a minimum capacity of 1500 KVA of firm power. Facilities to be provided under the plan are as follows.

1. Transmission lines will be re-routed so that the 12 KVA power supply from PNL presently received at substation C may be received at the proposed new power plant. Also, necessary wiring and equipment will be arranged to enable switch-over of power supply from PLN within power plant.

2. In order to meet the 1105 KVA requirement, the capacity of the proposed new diesel engine generator will be set at 1500 KVA (allowing for transmission loss and station loss). Besides, two diesel generators of the same type will be arranged for parallel running for load balance and phase adjustment and one additional generator of the same capacity will be installed for standby.

3. In order to transmit the 6 KV power generated by the plant to main conductors as 20 KV/12 KV/6 KV (12 KV at present) power, a main transformer room will be provided.

4. Foundations and structures for the above facilities will also be provided. Therefore, facilities to be provided under the project may be summarized as follows:

(a)	Diesel engine 950 HP, 750 RPM	3 units
(b)	Generator 750 KVA, 6 KV, 50 Hz	3 units

(c) Main transformer system 6 KV/12 KV 3 sets

(d) Other electrict equipment and house 1 set

(See Fig. (2)-7).

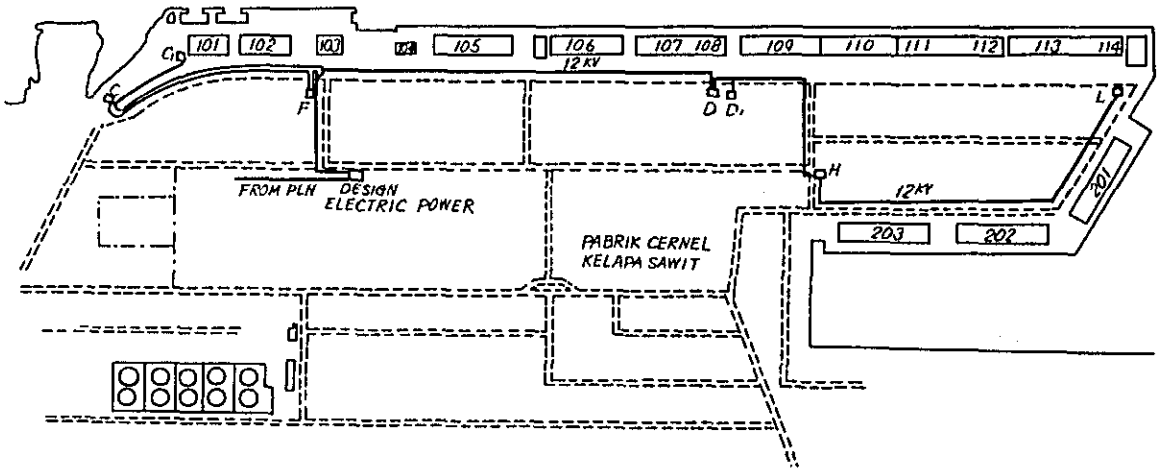


Fig. (2) - 2 Plan of Electric Power Station Purt of Belawan

2-2 Water Supply Facilities

(1) Present Water Supply Situation

In the Belawan port district water is pumped from artesian wells and supplied to port facilities and residential area either directly or after being stored in the tower tank. The wells located in the Belawan district area as follows.

No.	Location	Year of digging	Depth (m)	Pump capacity (m^3/h)
I	J. UJUNG BARU	1962	105	25
II	"	Pre-war period	200	8
III	J. HANAFLAH	1966	114	3
IV	Not in use			-
V	J. LANGKAT	1950	130	7.5
VI	J. SUMATERA	1951	130	6
VII	J. SEKONI	1952	120	6
VIII	Not in use			-
IX	J. KUBURAN	1961	130	100
X	UJUNG BARU	1970	160	80
XI	J. CIPANAS	1971	161	60
XII	KANPUNG SALAM	1971	119	60
XIII	MUKA GD 201	1971	122	60
XIV	BAGAN DELI	1971	124	60
Total				475.5

While the nominal pumping capacity is 475.5 m^3/h as indicated in the above table, the actual pumping capacity has dropped to 385 m^3/h due to

such reasons as again of facilities, etc. Beside the decrease of pumping capacity as mentioned above, the use of mains of diameters which do not confirm with the pumping capacity, coupled with deteriorated pipelines, is cousing a supply loss (leakage loss, etc.) by more than 30% and the total quantity of water available at the end of the water supply system is 270 m^3/h with the following breakdown.

Facilities supplied	Quantity m^3/h	Remarks
Ships	40	
Factories	10	
Offices	30	
Inhabitants	120	
Passenger terminal	5	
Port installation	3	
Others	2	
Total	270	

(2) Water Supply Facilities Construction Project

(i) *Outline of Project*

A survey by the Belwan Port Administration shows that against the requirement of 3000 m^3/day to 4000 m^3/day of water in the district, the quantity of water actually available is less than 2000 m^3/day due to the previously stated inefficiency of facilities coupled with a power shortage.

The proposed water supply facilities rehabilitation project, therefore, aims at providing facilities having a capacity of about 500 m^3/h (4000 m^3/day). While the nominal capacity of the existing water supply system to serve ships is 40 m^3/h, actual water supply is not adequate due to such reasons as insufficient pressure and others. Therefore, a majority of ocean-going vessels cannot be provided with adoquate water supply at the

port despite the fact that the port of Belawan is the last of their ports of call and are forced to replenish water at the port of Singapore or adjacent ports. In order to improve such a situation and realize complete water supply, it is necessary to secure a supply capacity of at least 1000 m^3/day for ships. The proposed project, therefore, gives top priority to the adequate water supply to ships and aims at ensuring smooth water supply to other sectors by constructing water supply facilities having a minimum capacity of 4000 m^3/day. The water supply project broken down into facility and purpose is as follows.

Water Supply Plan

Facilities to be supplied	Quantity m^3/h	Remarks
Ships	120	One hours 5 m^3/h
Factories	40	
Offices	45	
Inhabitants	252	
Passenger terminal	5	
Port installations	10	
Others	25	
Total	497 = 500	

(ii) Outline of Water Supply Facilities

Under the project, 4000 m^3/day of water is to be supplied to the Belawan port district. In order to ensure smooth water supply to the port-related facilities, particularly to ships, transit sheds, passenger terminal and port administration offices, water from adjacent wells will be stored in a tower tank once and will then be supplied by pressure head. Besides, additional artesian wells and pumps, replacement of defective pumps and replacement of existing mains (replacement with mains of larger diameters)

and extension of mains will also be planned.

The outline of the main facilities rehabilitation and expansion plan is as follows.

(a) Three new artensian wells, No. XV, XVI and XVII, will be dug to boost water supply capacity (See Fig. (2)-3).
These wells will have a depth of 160 ~ 200 m and will be equipped with deep well pumps. Pumping capacity of each well will be 60 m^3/h.

(b) A water collecting pit and a feed pump will be provided near each new well. Supply capacity will be 60 m^3/h.

(c) A water box will be provided to store water from new wells Nos. XV, XVI and XVII and from existing wells Nos. I, II, III, VII, X, XIII and XIV for adjustment of the quantity of pumping and the quantity of supply. The capacity of this water box will be 500 m^3.

(d) A tower tank will be provided adjacent to the water box to supply water under pressure. The capacity of this tank will be 200 m^3 and the capacity of the lift pump will be 180 m^3/h.

(e) The following lift pumps which have lost efficiency will be replaced. 2 - 60 m^3/h pumps and 3 - 200 m^3/h pumps.

(f) New mains will be installed for collection and supply of water and aged inefficient mains will be replaced.
In such a case, the diameter of pipes will be up graded by one rank. The total length (distance) of pipe lines will be as shown in the table below (See Fig. (2)-3).

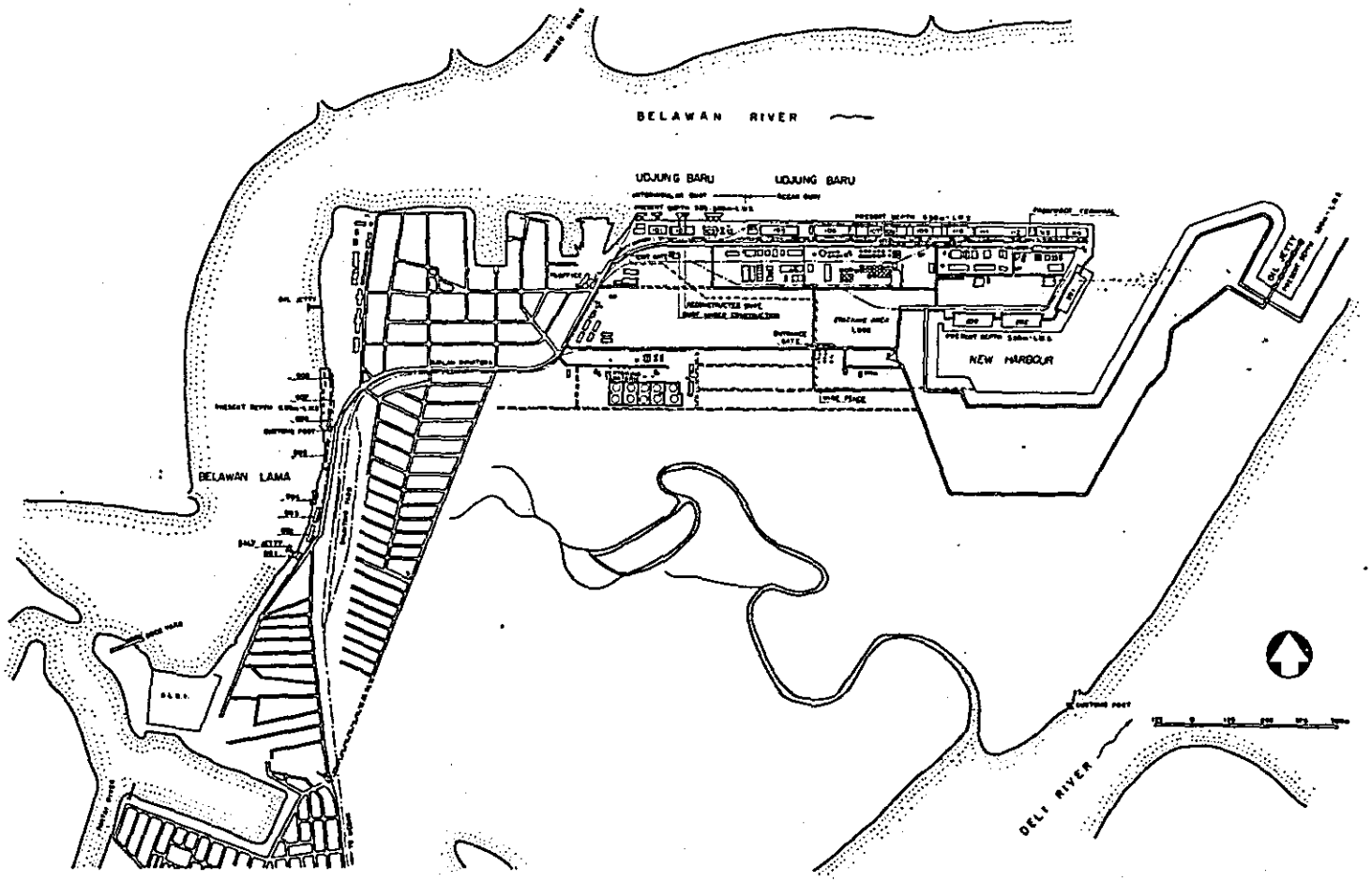


Fig. (2)-3 PLAN OF PIPE LAYOUT

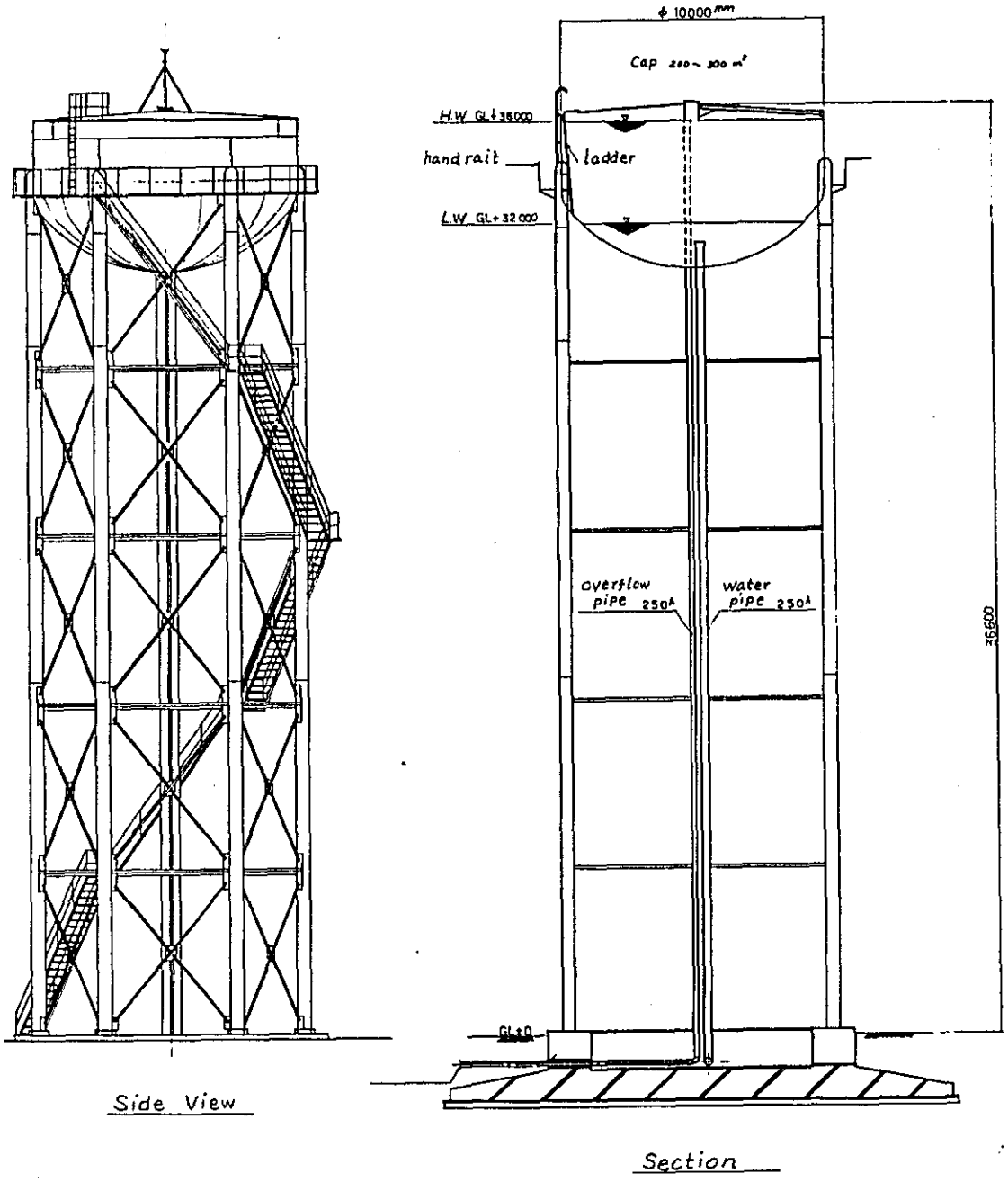


Fig. (2)-3 Water tower

Proposed Extension of Water Collection and Supply Lines

Diameter of pipe "(inch)(m/m)	Total length of existing line (Distance) (m)	Project		Total length (distance) upon completion of project (m)
		Abolition (m)	New installation or replacement (m)	
8" (200 m/m)	4,500	310	1,890	6,080
6" (150 ")	6,700	1,140	11,540	17,100
5" (125 ")	1,650	1,520		130
4" (100 ")	1,800	340	890	2,350
3" (75 ")	6,500	4,180		2,320
2" (50 ")	7,000		2,240	9,240
Total	28,150	7,490	16,560	37,220

(iii)Study of Planned Pumping Volume

(a) Quantity of water available from existing wells

No.	I	II	VII	X	XIII	XIV	Total
Quantity available (m^3/h)	25	8	6	80	60	60	239

(b) Quantity of water available from new wells

60 m^3/h x 3 = 180 m^3/h

(c) Quantity of water available daily. With a daily operating rate of

With a daily operating rate of 50%,

(239 + 180) m^3/h x 24 h x 0.5 = 5000 m^3/day

Therefore a daily supply of 4000 m^3 of water can be secured without difficulty.

(iv) Lift (head or height) of tower tank required for water supply.

Calculation of head required to secure supply of 120 m^3/h to ships and 95 m^3/h to other important port facilities or; (120 + 95) m^3/h x 8 h/day

= 1640 m^3/day as given in the attached sheet, shows that the proposed tower tank requires a height of about 25 m, and to doubly ensure the smooth water supply to other facilities, it requires a height of about 30 m.

2-3 *Retaining wall for rehabilitation of new harbour*

(1) Present situation and problems

Belawan port is an estuary port located at the estuary where the river of Belawan flows into Marakka straight. The new harbour is located at a position most adjacent to the mouth of the river, and is L-shaped toward south-west direction by digging. As shown in Fig. (2)-4, the north side of the basin is a shore wall having the extension of 620m and present depth of -5.50m, and west, south, and east sides are connected to the lower land, thus forming a natural sea shore. The width of the basin is about 200m.

The northern shore wall was designed in 1966 as a large scale quay with a depth of -10.50m for foreign trading. Afterwards, due to earth and sand which flows in from the river and breakdown of wall of the opposite lower land, the depth of the basin has been reduced to the present -5.50m. Large vessels, therefore, are unable to enter the port, and demand for increased number of vessels and increased transportation capacity corresponding to the development of economic activities of the hinterland is not satisfied. Besides, the soil condition around the slope line of the retaining wall designed for restoration of the function of this port is quite inferior, and this condition cannot be omitted in consideration.

(2) Design of retaining wall

In orer to restore original function of the new harbour by increasing the depth of water from the present -5.5m to -10.50m at the quay portion, it is necessary to dredge the earth and sand of the basin to -10.50m, and to take proper measure to maintain the depth at -10.5m.

First of all, it is necessary to stabilize the slope surface of the opposite shore land which may be considered to be a major cause of burying. To stabilize the slope surface, the retaining wall should be constructed, taking the following items into consideration·

(a) The design slope line should be determined taking the future expansion plan of the new harbour and stabilization factor of the slope surface by basin dredging into consideration.

(b) In planning the future expansion of the harbour, enlargement of the basin by digging the southern side of the basin and the possibility that the slope line of the retaining wall may be utilized as a quay water edge line should be taken into consideration.

(c) The future mooring facilities should have a quay of -10 to 12m deep.

(3) Location of retaining wall

The retaining wall should be constructed at the water edge line in eastern side, as shown in Fig. (2)-4, and the southern side should be digged to land portion for stabilization of the slope line, as the base of future expansion.

(4) Structure of retaining wall

Flexibility is required in designing the structure of the retaining wall so that it may correspond to future expansion as mentioned in (2) above. For this purpose, the type A should has a structure that gives stability to the slope surface and the type B should has a structure that may be utilized as a mooring facilities if some improvement and arrangement are made. (Fig. (2)-5, -6)

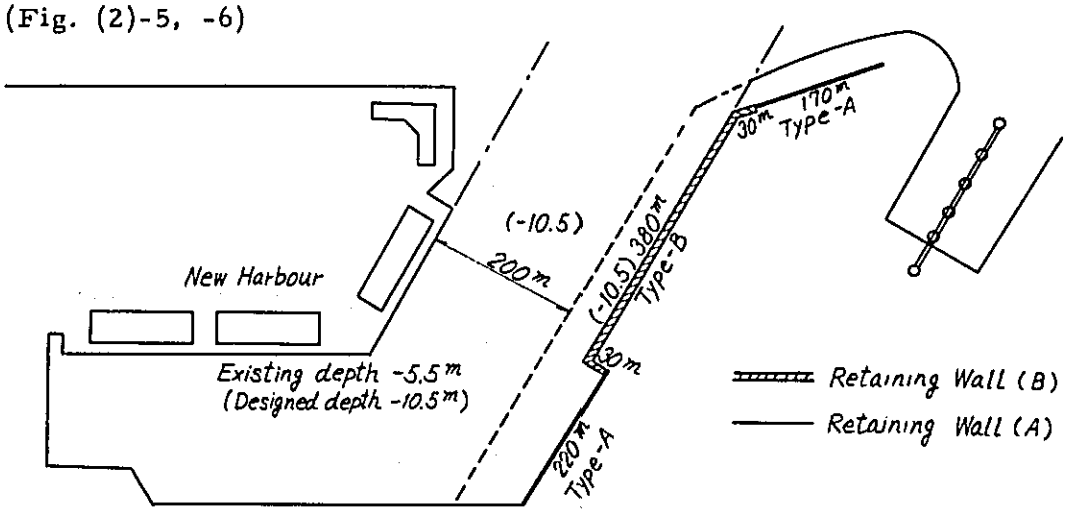


Fig. (2)-4 Rehabilitation Project of New Harbour

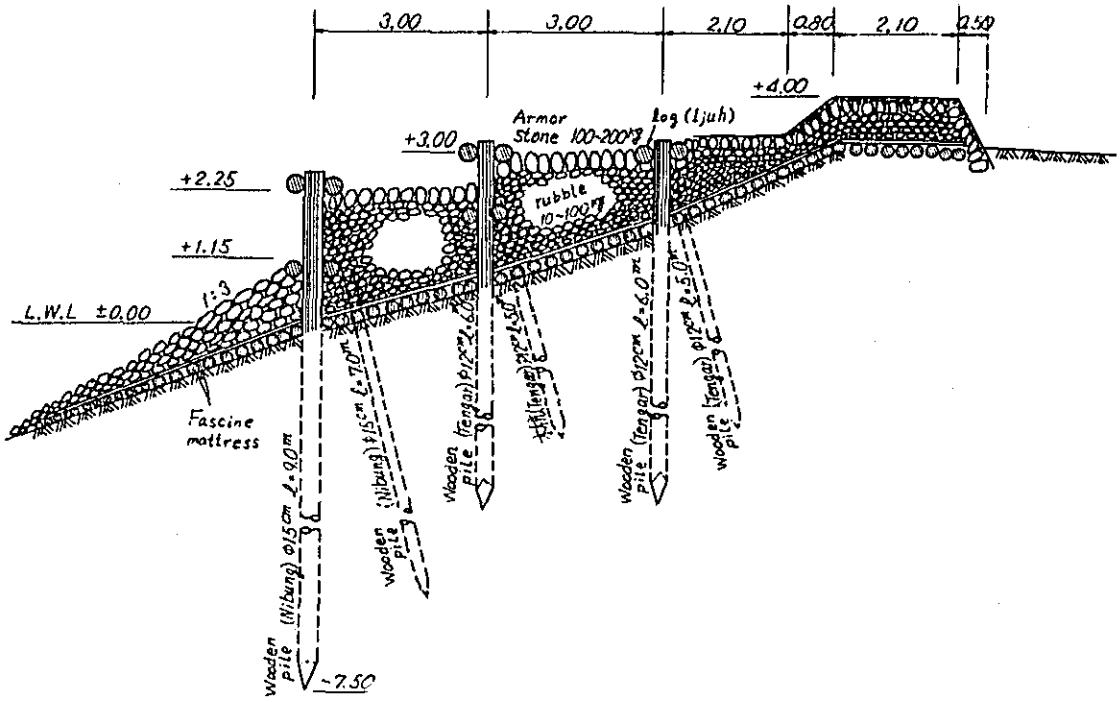


Fig. (2)-5 Standard sectional view of retaining wall (A)

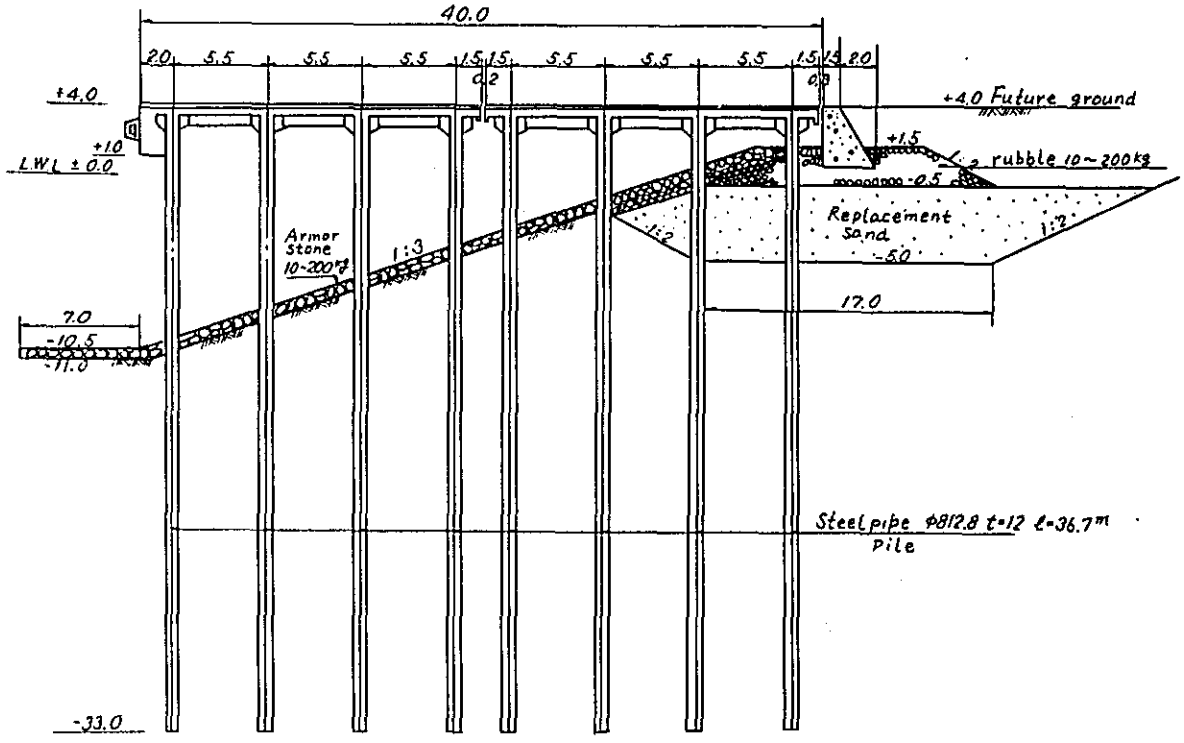


Fig. (2)-6 Standard sectional view of retaining wall (B)

2-4. Description of Equipment and Materials

(1) Equipment and Materials Required for Power Supply Facilities.

Diesel Electric Power Station (See Fig. (2)-7)

(A) 20 KV Equipment

A-1) 20 KV PLN INCOMING LINE CUBICLE 1 set

1 - Set of insulated bus, 100 amperes

1 - TPST manually link operated disconnects, 24 KV, 600 amperes

3 - SPST hook-stick operated disconnects, 24 KV, 600 amperes

3 - SPST hook-stick operated fused disconnects, 24 KV, 1 amperes

* 1 - 3-phase GPT, $\frac{11}{\sqrt{3}}$ KV/ $\frac{110}{\sqrt{3}}$ V/ $\frac{190}{3}$ V

* 3 - Lightning arrestors

* 1 - A-c voltmeter with a selector switch (0 - 15 KV)

1 - A-c voltmeter for grounding voltage

3 - Earth lamps

1 - Overvoltage ground relay

1 - Set of terminations for power cable entering from PLN's Transformer House "C"

1 - Circuit nameplate

A-2) 20 KV METERING OUTFIT CUBICLE 1 set

1 - Set of insulated bus, 100 amperes

* 1 - Set of metering outfit, 3-phase PT 11 KV/110 V, 3-phase CT 100/5A

1 - 3-phase watthour meter

1 - Maximum demand meter

1 - Circuit nameplate

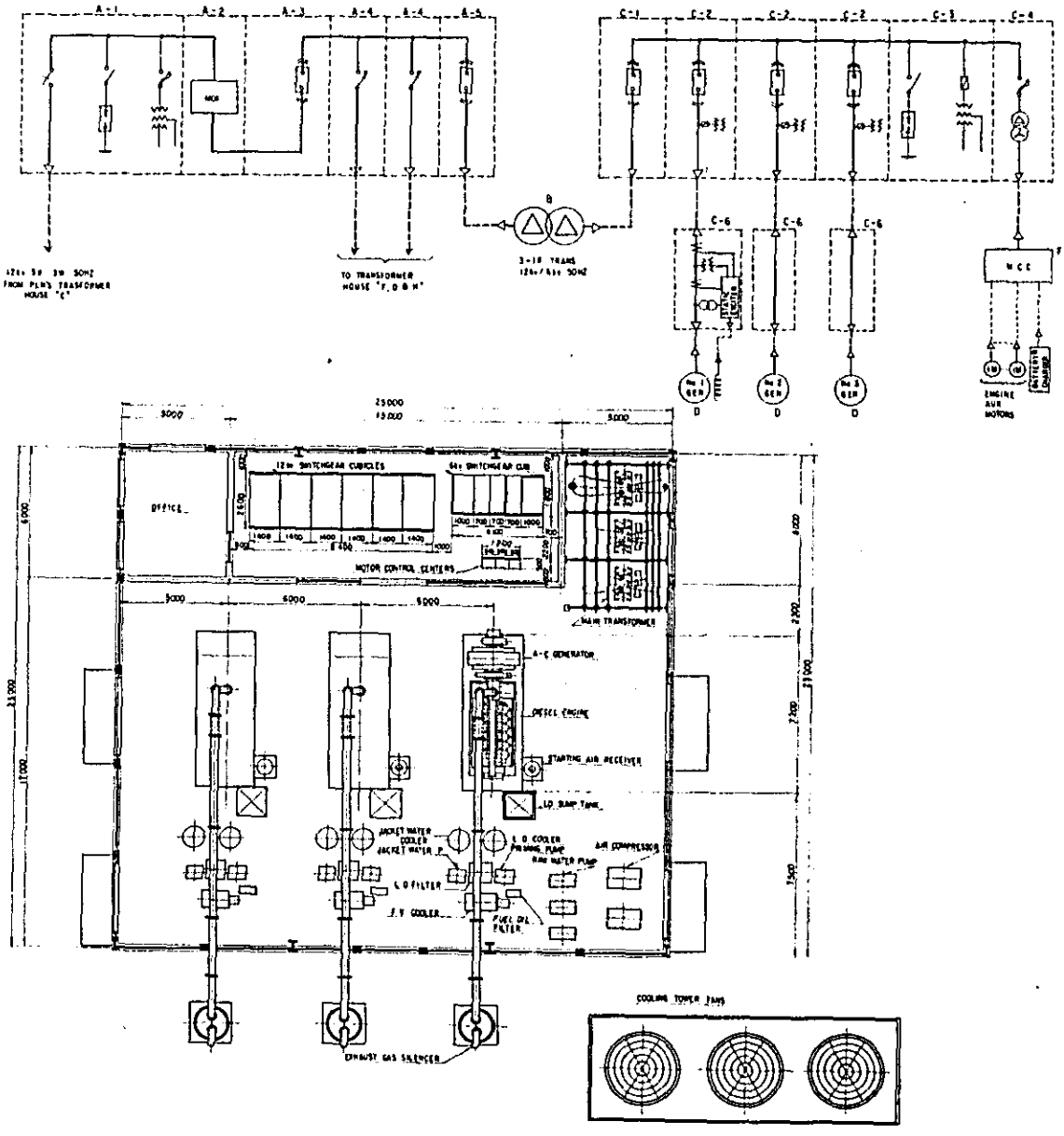


Fig. (2)-7 Power supply and transforme facilities

A-3) 20 KV RECEIVING BREAKER CUBICLE 1 set

1 - Set of insulated bus, 100 amperes

1 - TPST vacuum interrupter, 24 KV, 600 amperes, 100 MVA IC at 24 KV, d-c 100 V close and trip, horizontal drawout mechanism.

2 - Current transformers, 50-100/5A

1 - Circuit nameplate

1 - Breaker control switch with indicating lights

1 - A-c ammeter with an ammeter switch

1 - 3-phase watthour meter

1 - 3-phase wattmeter

1 - Reverse power relay

2 - Overcurrent relays

A-4) 20 KV FEEDER CUBICLES 2 sets

Each cubicle is equipped as follows

1 - Set of insulated bus, 100 amperes

1 - TPST manually link operated load disconnects, 24 KV, 600 amperes

2 - Current transformers, 50-100/5A

1 - Set of terminations for power cable going to Transformer House "F, D & H"

1 - Circuit nameplate

1 - A-c ammeter with an ammeter switch

1 - Load disconnects on-off indicating lights

A-5) 20 KV GENERATED POWER INCOMING LINE CUBICLE 1 set

1 - Set insulated bus, 100 amperes

1 - TPST vacuum interrupter, 24 KV, 600 amperes, 1000 MVA IC at 24 KV, d-c 100 V closed and trip, horizontal drawout mechanism

2 - Current transformers 50-100/5A

1 - Circuit nameplate

1 - Breaker control switch with indicating lights

1 - A-c ammeter with an ammeter switch

1 - 3-phase watthour meter

1 - 3-phase wattmeter

2 - Overcurrent relays

1 - Set of terminations for power cable entering from generator transformers

* Note: These equipment shall be replaced with 20 KV equipment when PLN supply voltage is changed to 20 KV.

(B) Generator Transformers 3 sets

Type	Single-phase, oil immersed, natural-cooling, indoor service.
Ratings	
KVA	750 KVA
Phase	Single
Frequency	50 Hz
Voltage	6 KV/12 KV
Accessories	Maker's Standard

Note: These transformers shall be used for stepping up the generator voltage to 20 KV in future by connecting H. V. side in Whe. Necessary provisions shall be made for this purpose.

(C) 6 KV Switchgears

C-1) 6 KV GENERATED POWER SENDOUT CUBICLE 1 set

1 - Set of insulated bus, 200 amperes

1 - TPST low-oil-content circuit breaker, 7.2 KV, 600 amperes, 160 MVA at 7.2 KV, d-c 100 V close and trip, horizontal drawout.

2 - Current transformers, 200/5A

1 - Circuit nameplate

1 - Breaker control switch with indicating lights

1 - A-c ammeter with an ammeter switch

2 - Overcurrent relays

1 - Set of terminations for power cable going to generator transformers.

C-2) 6 KV GENERATOR BREAKER CUBICLES 3 sets

each cubicle is equipped as follows.

1 - Set of insulated bus, 200 amperes

1 - TPST low-oil-content circuit breaker, 7.2 KV 600 amperes, 160 MVA at 7.2 KV, d-c 100 V close and trip, horizontal drawout.

2 - Current transformers, 100/5A

2 - Potential transformers, 6600/110 V with fuses

1 - Circuit nameplate

1 - Breaker control switch with indicating lights

1 - A-c ammeter with an ammeter switch

1 - A-c voltmeter with a voltmeter selector switch

1 - 3-phase power factor meter

1 - 3-phase watthour meter

1 - 3-phase wattmeter

1 - Hours run meter

1 - Reverse power relay

2 - Overcurrent relays

1 - Overspeed relay

1 - Voltage adjuster

1 - Governor switch

1 - Synchronizing switch

1 - Set of terminations for power cable entering from static exciter cubicle.

1 - Set of annunciator windows with test and cancel switches

1 - Set of auxiliary relays for engine malfunction alarm and shutdown controls

C-3) 6 KV BUS PT & LA CUBICLE 1 set

1 - Set of insulated bus, 200 amperes

1 - 3-phase GPT $\frac{6600}{\sqrt{3}}$ V/$\frac{110}{\sqrt{3}}$ V/$\frac{190}{3}$ V with fuses

3 - SPST disconnects, hook stick operated 7.2 KV, 600 amperes

3 - Lightning arresters

1 - Grounding voltmeter

1 - Overvoltage ground relay

3 - Earth lamps

1 - Circuit nameplate

C-4) 6 KV HOUSE SERVICE CUBICLE 1 set

1 - TPST fused disconnects, manually link operated 7.2 KV, 10 amperes

1 - 3-phase power transformer, 100 KVA, 6 KV/380 Y-220 V, 50 Hz Oil-filled self-cooled.

1 - Set of terminations for power cable going to motor control centers.

C-5) SYNCHRONIZING PANEL 1 set

2 - A-c voltmeters

2 - Frequency meters

1 - Synchroscope

2 - Synchronizing lamps

C-6) STATIC EXCITER CUBICLES 3 sets

Each cubicle is equipped as follows

1 - Set of terminations for power cable entering from generator

1 - Set of terminations for power cable going to generator breaker cubicle

1 - Circuit nameplate

1 - 3-phase excitation transformer with load current compounding features.

1 - Current transformer and resistor for cross current compensation

1 - Potential transformer for generator voltage detection

1 - Set of static exciter utilizing magnetic amplifiers

1 - Set of selenium rectifiers

(D) Generators 3 sets

Self excited synchronous generator, open-guarded, salientpole revolving field, with armortisseur windings, 750 KVA, 8p, 750 R/m, 6000-volts, 50 Hz, directly coupled to the diesel engine.

Each generator is equipped with the following accessories.

1 - Space heaters

1 - Tachometer generator

(E) Diesel Engines and Accessories

3 - Diesel Engines, 950 BHP, 750 R/M, 4-stroke, compression iguition, Six cylinders, in-line, operating on IDO, compressed air start, water-cooled, turbocharged and intercooled, with combined generator/engine bed.

1 - Fuel oil storage tank (outdoor)

1 - Set of cooling towers

1 - Set of heat exchangers for jacket water and lubricating oil systems.

1 - Set of pumps, valves, filters, piping and fittings necessary for 3 engines.

1 - Set of fuel oil service tank

1 - Set of air compressors and receivers

1 - Set of motor control centers for engine auxiliary motors

(F) D-C Sypply Cubicle 1 set

1 - Set of nickel cadmium storage batteries, 96 V 60 AH/5 HR

1 - Set of charger, d-c 80-150 V 30 amperes

1 - Set of d-c distribution switches

Note: Power generating facilities A, B, C, D, ---- , A-1 ---, C-1 correspond to symbols shown in Fig. (2)-7.

(For reference only)

Symbols Used for Power Generating Facilities

Mark	Name of instrument
A	Ammeter
V	Voltmeter
W	Indicating Wattmeter
WH	Watt-Hour Meter
F	Frequency Meter
PF	Power Factor Meter
PT	Potential Transformer
CT	Current Transformer
⊛ As	Ameter Change-Over Switch
⊕ Vs	Voltmeter
DS	Disconnecting Switch
LA	Lightning Arrester
TG	Tachometer Generater
SPST	Single Pole Single Throw
67	Power Directional Relay
12	Over speed Relay
14	Under speed Relay
27	Under Voltage Relay
51	Overcurrent Relay
51G	Overcurrent Ground Relay
64	Ground Relay
OCB	Oil Circuit Breaker
SS	Synchro Scope
Sy	Synchronizing Relay
Ex	Exciter
CLR	Current Limiting Resistor

(2) Materials and Equipments for Water Supply

(A) Materials

Description	Type & dimension	Unit weight (kg)	Quantity	Weight (kg)	Re-marks
Ductile iron pipe	FCDA ϕ200 L=5000	186.3	378	70,421.4	
"	FCDA ϕ150 L=5000	141.6	2,308	326,812.8	
"	FCDA ϕ100 L=4000	78.9	223	17,594.7	
Steel pipe	SPG A50 L-5500	30.195	408	12,319.56	
Collar	FCDA ϕ200 L=200	25.0	16	400	
"	FCDA ϕ150 L-200	19.0	75	1,425	
"	FCDA ϕ100 L=200	13.8	22	303.6	
Bend	FCDA ϕ200 45°	48.3	9	434.7	
"	FCDA ϕ150 45°	29.1	22	640.2	
"	FCDA ϕ100 45°	16.8	4	67.2	
"	FCDA ϕ200 22° 1/2	45.7	1	45.7	
"	FCDA ϕ150 22° 1/2	27.5	4	110	
Steel bend	SPG ϕ50 22° 1/2		1		
Bend	FCDA ϕ150 11° 1/2	33.8	4	135.2	
Tee	FCDA ϕ200 x ϕ200	74.4	1	74.4	
"	FCDA ϕ200 x ϕ150	70.1	1	70.1	

Description	Type & dimension	Unit weight (kg)	Quantity	Weight (kg)	Re-marks
Tee	FCDA ϕ150 x ϕ150	45.6	17	775.2	
"	FCDA ϕ150 x ϕ75	40.4	10	404	
Tee with flange	FCDA ϕ200 x ϕ75	55.1	11	606.1	
"	FCDA ϕ150 x ϕ75	37.6	40	1,504	
"	FCDA ϕ100 x ϕ75	26.7	1	26.7	
Recucer	FCDA ϕ200 x ϕ150	35.4	2	70.8	
Steel reducer	SPG ϕ75 x ϕ50		10		
Air relief valve	ϕ75 13		15		
Gate valve	ϕ200 L=300		4		
"	ϕ150 L=280		29		
"	ϕ100 L=250		1		
"	A50 L=100	6.0	11	66.0	with bronze screw
Flanged socket No. 1	FCDA ϕ200 L=120	25.7	4	102.8	
" spigot No. 2	FCDA ϕ200 L=700	44.2	4	176.8	
Flanged socket No. 1	FCDA ϕ150 L=120	18.7	29	542.3	
" spigot No. 2	FCDA ϕ150 L=700	28.9	29	838.1	
Flanged socket No. 1	FCDA ϕ100 L=120	13.3	1	13.3	
" spigot No. 2	FCDA ϕ100 L=700	19.2	1	19.2	
Accessories for Tyton Joint	FCDA ϕ200		433		with bolt, nut, packing
"	" ϕ150		2,544		"

Description	Type & Dimension	Unit wight (kg)	Quantity	Weight(kg)	Re-marks
Accessories for Tyton Joint	FCDA ϕ100		273		with bolt, nut, packing
"	" ϕ75		10		"
Accessories for mechanical joint	ϕ200		46		"
"	ϕ150		150		"
"	ϕ100		44		"
"	ϕ75		15		"
Fire extinguisher	ϕ75		30		with box and horse
Water horse	ϕ75		10		50m
Miscellaneous			Complete		

(B) Equipment

Description	Type & capacity	Quantity	Remarks
Submersible pump	ϕ100 H=65m, Capacity 60m3/h Motor 19 KW 220 V 50 Hz	3	Cable 55 m & accessories
Centrifugal pump	ϕ100 H=75 m Capacity 60m3/h Motor 22 KW 220 V 50 Hz	3	Cubicle type cable 4, 400 m
Centrifugal pump (to tower tank)	ϕ150 H=50m Capacity 180m3/h Motor 37 KW 220 v 50 Hz	1	"
Centrifugal pump	60 m3/h	2	Electric motor (Replacement)
"	200 m3/h	2	"
"	200 m3/h	1	Diesel motor (Replacement) of aged pump
Power cable		Complete	
Miscellaneous		Complete	

(C) Facilities

Description	Type & capacity	Quantity	Remarks
Steritizing facilities		Complete	

(D) Others

Description	Type & capacity	Quantity	Remarks
Tools for construction		Complete	

(3) Materials and equipment necessary for New harbour rehabilitation project

Retaining wall (A)

Material	Unit	Qty	Remarks
Wooden pile			
Nibung		2613	ϕ15, l = 9.0m
Nibung		195	ϕ15, l = 7.0m
Tengar		6513	ϕ12, l = 6.0m
Tengar		1170	ϕ12, l = 5.0m
Fascine mattress	m^3	4095	
Foundation rubble-mound	m^3	7215	10 - 100kg
Overburden	m^3	3432	100 - 200kg
Others			

Retaining wall (B)

Material	Unit	Qty	Remarks
Ground sil	m^3	76,560	
Replacement sand	m^3	57,640	
Foundation rubble-mound	m^3	12,232	10 - 200kg/each
Overburden	m^3	12,408	10 - 200 kg/each

Material	Unit	Qty	Remarks
Concrete	m^3	4,840	
Reinforced concrete	m^3	11,000	
Steel pipe pile	ton	5,676	ϕ812.8, t = 12
Rubber fender		39	With accessories
Mooring post		20	With accessories
Others			

2-5. Consultant Service

(1) Facilities of Electric Supply

(i) Scope of works

(a) Field survey

(b) Preparation of detailed specifications.

(c) Preparation of bid specifications and cooperation in bidding.

(d) Supervision and inspection at fabricating plant.

(e) Supervision of erection at site

(f) Observation of test operation and inspection.

(ii) Members to be engaged in consultant service

Manager	1
Senior engineer (electrical and mechanical)	2
Engineer	1
Total	4

(iii) Consultant fee

(a) Foreign currency (Yen)

Manager	:	¥680,000 x 1 month	= ¥ 680,000
Senior engineers	:	¥620,000 x 3 months x 2	= ¥3,720,000
Engineer	:	¥460,000 x 1 month	= ¥ 460,000
		Sub-total	¥4,860,000
		Administrative expenses (50%)	¥2,430,000
		Sub-total	¥7,290,000
		License fee (20%)	¥1,458,000
		Total	¥8,748,000

Airline fare (Tokyo - Djakarta): One passenger for three trips:

¥213,000 x 3 = ¥ 639,000

Grand Total ¥9,387,000

(One US$ = ¥308) US$ 30,000

(b) Local currency (Rupiah)

Cost of living : 18,000 Rps/day x 10 month x 30

5,400,000 Rp.

Transport cost	: 5,000 Rpx/day x 200 days =	1,000,000 Rp.
Communication charges	: 5,000 Rps/each x 1000 times =	500,000 "
Travel expenses	: 60,000 Rps/each x 3 person x 4 times	720,000 "
Wages for local employees:	1,000 Rps/person/day x 2 person x 200 days	400,000 "
Miscellaneous expenses:		280,000 "
	Total of local currency	8,300,000 Rp.
	(One US$ = 415 Rp)	US$20,000
Total consultant fee (a) + (b)		US$50,000
	Foreign currency (Yen)	US$30,000
	Local currency (Rupiah)	US$20,000

(2) Facilities of Water Supply

(i) Scope of works

(a) Field investigation and surveying

(b) Preparation of detailed specifications.

(c) Preparation of bid specifications and cooperation in bidding.

(d) Inspection of materials, parts and equipment (In Japan and Indonesia)

(e) Supervision and management of work at site.

(f) Observation of test operation and inspection.

(ii) Members to be engaged inconsultant service.

Manager	1
Senior engineer (Civil engineering and mechanical)	2
Engineer	1
Total	4

(iii) Consultant fee

(a) Foreign Corrency (Yen)

Manager	: ¥680,000 x 1 month	= ¥ 680,000
Senior engineer	: ¥620,000 x 13.8 month	= ¥8,556,000
Engineer	: ¥460,000 x 1 month	= ¥ 460,000
	Sub-total	¥9,696,000

Administrative expenses (50%)	¥4,848,000
Sub-total	¥14,544,000
License fee (20%)	¥2,908,000
Total	¥17,452,000

Airline fare (Tokyo - Djakarta): Five round trips:

: ¥213,000 x 5 = ¥1,065,000

Grand Total ¥18,517,000

(One US$ = ¥308) US$60,000

(b) Local currency (Rupiah)

Cost of living : 18,000 Rp/day/person x 12 month x 30 day = 6,480,000 Rp.

Transport cost : 5,000 Rp/day x 300 day = 1,500,000 "

Communication charges: 5,000 Rp/each x 150 times = 750,000 "

Travel expenses (Djakarta - Medan):

: 60,000 Rp/each x 5 x 4 times = 1,200,000 Rp.

Wages for local employees (office workers);

: 1,000 Rp/person/day x 2 person x 300 day = 600,000 "

Survey expenses (Surveying, field survey, water test, etc): 6,000,000 "

Miscellaneous expenses: 70,000 "

Total of local currency	16,600,000 Rps.
(One US$ = 415 Rps)	US$40,000

(c) Total consultant fee (a) + (b) US$100,000

Foreign currency (Yen)	$ 60,000
Local currency (Rupiah)	$ 40,000

(3) Rehabilitation on New Harbuor

(i) Scope of works

(a) Field survey (Surveying, Soil exploration, etc.)

(b) Preparation of detailed specifications.

(c) Preparation of bid specifications and cooperation in biding.

(d) Inspection of bid contents.

(e) Inspection of equipment and materials.

(f) Supervision and management of work.

(ii) Members to be engaged inconsultant service.

Manager	1
Senior engineer (Civil engineering)	2
Engineer (Civil 2 Mechanical 1)	3
Total	6

(iii) *Consultant fee*

(a) Foreign currency (yen)

Manager : ¥680,000 x 1 month x 1 person
= ¥680,000

Senior engineer : ¥620,000 x 10 month = ¥6,200,000

Engineer : ¥460,000 x 24 month x 1 person
4 month x 2 person
= ¥13,920,000

Sub-total	¥20,800,000
Administrative expenses (50%)	¥10,400,000
Sub-total	¥31,200,000
License fee (20%)	¥6,240,000
Total	¥37,440,000

Airline fare (Tokyo - Djakarta) : Ten round trips;
: ¥213,000 x 10 ¥2,130,000

Grand Total ¥39,570,000

(One US$=¥308 US$128,000)

(b) *Local currency* (Rupiah)

Cost of living	: 18,000 Rp/day x 70 day	= ¥1,260,000
	: 12,000 Rp/day x 500 day	= ¥6,000,000
Transport cost	: 5,000 Rp/day x 200 day	= ¥1,000,000
Airline fare (Medan-Djakarta)	: 60,000 Rp/each x 10 round trips	= ¥ 600,000
Communication charges	: 5000 Rp/each x 10 times	= ¥ 500,000

Wages of local employees :

: 1000 Rp/person/each x 2 person x 300 day = ¥ 600,000

Survey expenses : Surveying ¥ 6,000,000

Soil exploration (-40m ten point boring) ¥ 4,000,000

Total of local currency ¥14,560,000 Rp

(One US = 415Rp US$ 35.000)

(c) Total consultant fee

Total (a) + (b)	US$	163,000
Foreign currency (Yen)		128,000
Local currency (Rupiah)		35,000

3. Cost Estimation

3-1. Cost Estimation of Electricity Supply Facilities Construction Projet

(1) General

Total Project Cost	US$679,000
Foreign currency (Yen)	$559,000
Local currency (Rupiah)	$120,000

(2) Details

(i) Foreign Currency (Machinery & Equipment) (Yen)

CIF Port of Belawan

Description	Quantity	Unit price (Yen)	Amount(Yen)
(A) 20 KV EQUIPMENT			
A-1. 20KV PLN Incoming Line Cubicle	1 set		5,250,000
A-2. 20KV Metering Outfit Cubicle	1 set		3,230,000
A-3. 20KV Receiving Breaker Cubicle	1 set		4,040,000
A-4. 20KV Feeder Cubicles	2 sets	3,160,000	6,320,000
A-5, 20KV Generated Power Incoming Line Cubicle	1 set		4,300,000
A-6, 20KV & 6KV Cable & Termination	1 set		3,360,000
(B) GENERATOR TRANSFORMERS	3 sets	2,350,000	7,050,000
(C) 6KV SWITCHEARS			
C-1. 6KV Generated Power Sendout Cubicle	1 set		1,610,000
C-2. 6KV Generator Breaker Cubicles	3 sets	2,020,000	6,060,000
C-3. 6KV Bus PT & LA Cubicle	1 set		1,270,000
C-4. 6KV House Service Cubicle	1 set		1,610,000
C-5. Synchronizing Panel	1 set		270,000
C-6. Static Exciter Cubicles	3 sets	1,070,000	3,210,000
C-7. Cabling Materials	1 set		3,630,000
(D) 750 KVA DIESEL GENERATOR	3 sets		108,950,000
(E) ACCESSORIES OF DIESEL GENERATOR	1 set		

(F) D. C. SUPPLY SYSTEM	1 set	3,770,000
	Total	163,930,000
	Contingencies (5%)	8,196,000
	Grand Total	172,126,000
	(One $ = ¥308	= $559,000)

(ii) Local currency (Repiah)

Description	Quantity	Unit price	Amount(Rp)
1. Make foundation Diesel Generator set	3 sets		6,000,000
2. Price for works 4 generator set and testing so ready for use			17,000,000
3. Erection of diesel generator and transformer house			8,000,000
4. Power cable from PLN	2000 m		15,000,000
5. Transportation			1,500,000
	Total		47,500,000
	Contingencies (5%)		2,375,000
	Grand Total		49,875,000 Rp.
	(One $ = 415 Rp.	=	$120,000)

3-2 Cost Estimation of Water Supply Racilities Construction Project.

(1) General

Total Project Cost US$705,000

- Foreign currency (Yen) $351,000
- Local currency(Rupiah) $354,000

(2) Details

(i) Foreign Currency (Materials & Equipment) (Yen)

(A) Materials CIF Port of Belawan

Description	Dimension (JIS)	Quantity	Unit price (Yen)	Amount(Yen)
Ductile iron pipe	FCDA 200ϕ5,000m/m	378	18,000	6,804,000
"	" 15ϕx5,000 "	2,308	13,500	31,158,000
"	" 100ϕx4,000 "	223	7,500	1,672,500
Steel pipe	SGP A50x5,500 "	408	5,000	2,040,000
Collar	FCDA 200ϕ x 200 "	16	9,500	152,000
"	" 150ϕ x 200 "	75	7,500	562,000
"	" 100ϕ x 200 "	22	5,500	121,000
Bend	FCDA 200ϕ, 45°	9	10,500	94,500
"	" 150ϕ "	22	6,000	132,000
"	" 100ϕ "	4	4,000	16,000
"	" 200ϕ 22°1/2	1	10,500	10,500
"	" 150ϕ "	4	6,500	26,000
Steel bend	SGP A50 "	1	1,000	1,000
Bend	FCDA 150ϕ 11°1/4	4	5,500	22,000
Tee	FCDA 200ϕ x 200ϕ	1	17,000	17,000
"	" 200ϕ x 150ϕ	1	15,500	15,500
"	" 150ϕ x 150ϕ	17	10,500	178,500
"	" 150ϕ x 75ϕ	10	8,500	85,000
Tee with flange	FCDA 200ϕ x 75ϕ	11	18,000	198,000
"	" 150ϕ x 75ϕ	40	10,000	400,000
"	" 100ϕ x 75ϕ	1	7,000	7,000

Description	Dimension(JIS)	Quantity	Unit price (Yen)	Amount (Yen)
Ductile iron pipe	FCDA 200ϕ x 150ϕ	2	9,000	18,000
Steel reducer	SGP 75ϕ x 50ϕ	10	2,500	25,000
Air relief valve	75ϕ 13ϕ	15	18,000	270,000
Gate valve	200ϕ x 300 m/m	4	67,000	268,000
"	150ϕ x 280 "	29	44,000	1,276,000
"	100ϕ x 250 "	1	25,000	25,000
	A50 x 100 "	11	14,000	154,000
Flanged socket No. 1	FCDA 200ϕ x 120 m/m	4	8,000	32,000
" spigot No. 2	" 200ϕ x 700 "	4	8,000	32,000
Flanged socket No. 1	" 150ϕ x 120 "	29	5,500	159,500
" slogpt No. 2	" 150ϕ x 700 "	29	5,500	159,500
Flanged socket No. 1	" 100ϕ x 120 "	1	4,000	4,000
" spigot No. 2	" 100ϕ x 700 "	1	4,000	4,000
Accessories for Tyton joint	FCDA 200ϕ	433	1,000	433,000
"	" 150ϕ	2,544	800	2,035,200
"	" 100ϕ	273	500	136,500
"	" 75ϕ	10	400	4,000
Accessories for mechanical joint	200ϕ	46	2,500	115,000
"	150ϕ	150	2,000	300,000
"	100ϕ	44	1,500	66,000
"	75ϕ	15	1,000	15,000
Fire extinguisher	75ϕ	30	110,500	3,315,000
Water hose		10	100,000	1,000,000
Miscellaneous				2,000,000
Total				55,559,000

(B) Artesian well

Description	Type and capacity	Quantity	Unit price (Yen)	Amount (Yen)
Submersible pump	100ϕ 60m3/h H=65m 19KW	3	930,000	2,790,000
Centrifugal pump	100ϕ 60m3/h H=75m Cable 4,400m	3	2,460,000	7,380,000
" motor	22KW 220V	3	290,000	870,000
" panel		3	1,300,000	3,900,000
Centrifugal pump	150ϕ 180m3/h H=50m	1	780,000	780,000
" motor	37KW 220V	1	500,000	500,000
" panel		1	1,000,000	1,000,000
Replacement of aged pump. Centrifugal pump	Electric motor driven 60m3/h	2	2,300,000	4,600,000
"	" 200m3/h	2	2,300,000	4,600,000
"	Diesel motor driven 200m3/h	1	2,500,000	2,500,000
Power cable		Complete		500,000
Miscellaneous				2,000,000
Total				31,420,000
(C) Sterilizing facilities				15,000,000
(D) Tools for construction				1,000,000
		Total		102,979,000
		Contingencies (5%)		5,148,000
		Grand Total		¥108,127,000
		(1$ = ¥308 =		US$351,000)

(ii) Local Currency (Rupiah)

Description	Quantity	Unit price (Rp)	Amount (Rp)
1. Pump house	3		2,625,000
2. Housing for watch men	3		3,500,000
3. Sediment box (50m3)	3		8,400,000
4. Ashlt	1,460		365,000
5. Load	600		300,000
6. Jute	6,900		862,000
7. Iron saw	660		20,000
8. Fire wood	65		100,000
9. Sisal cord 1/2"	170		9,000
10. Foundation	3		105,000
11. Welding wire	14,600		464,000
12. Bulk 1/2" - 5/8" - 3/4"	4,640		464,000
13. Cost of transport etc.			11,000,000
14. Water reserve box (500m3)	1		11,424,000
15. Water tower	1		18,000,000
16. Cost of construction for water supply			82,494,000
	Sub-total		139,918,000
	Contingencies (5%)		6,995,000
	Grand Total		146,913,000
	(1$ = 415 Rp.		US$354,000)

3-3 Rough estimation of costs for New harbour rehabilitation project

-- Retaining wall (A) --- Rough estimation of construction cost (extension 390m) (Unit: Yen)

	Unit	Qty	Unit price	Amount	Foreign currency	Local currency	Remarks
Cost of main body of work				52,794,300		52,794,300	
Foundation work							
Foundation rubble mound	m^3	7,215	1,000	7,215,000		7,215,000	
Foundation level	m^3	6,825	100	682,500		682,500	
Overburden	m^3	3,432	1,200	4,118,400		4,118,400	
Overburden level	m^3	6,825	200	1,365,000		1,365,000	
Fascine mattress	m^3	4,095	100	409,500		409,500	
Main body of work							
Wood pile		2,613	1,000	2,613,000		2,613,000	ϕ15, l=9.0
Nibung		195	800	156,000		156,000	ϕ15, l=7.0
Nibung		6,513	300	1,953,900		1,953,900	ϕ12, l=6.0
Tengar		1,170	250	292,500		292,500	ϕ12, l=5.0

	Unit	Qty	Unit price	Amount	Foreign currency	Local currency	Remarks
Tengar		9,711	3,500	33,988,500		33,988,500	
Driving in of pipe				10,558,860		10,558,860	
Indirect costs of work				63,353,160		63,353,160	
TOTAL							

(1 US dollar = 308 Yen. 206,000US dollars)

--- Retaining wall (B) --- Rough estimation of construction cost (extension 440m) (Unit: Yen)

	Unit	Qty	Unit price	Amount	Foreign currency	Local currency	Remarks
Cost of main body of work				887,827,600	688,556,000	199,271,600	
Foundation work							
Overburden	m^3	12,408	1,200	14,889,600		14,889,600	
Overburden level	m^2	21,560	200	4,312,000		4,312,000	
Main body of work							
Steel pipe pile	ton	5,676	100,000	567,600,000	567,600,000		ϕ812.8, t = 12
Driving in of pile		660	35,000	23,100,000		23,100,000	ϕ812,8, t = 12 l = 36.7
Upper concrete	m^3	11,000	13,000	143,000,000	77,132,000	65,868,000	
Surface concrete	m^3	1,760	8,000	1,408,000	4,752,000	9,328,000	
Retaining work							
Ground digging	m^3	76,560	250	19,140,000		19,140,000	
Replacement sand	m^3	57,640	500	28,820,000		28,820,000	
Rubble-mound	m^3	12,232	1,000	12,232,000		12,232,000	

	Unit	Qty	Unit price	Amount	Foreign currency	Local currency	Remarks
Rubble-mound level	m^3	8,140	100	814,000		814,000	
Concrete block	m^3	3,080	8,000	24,640,000	8,272,000	16,368,000	
Incidental work				35,200,000	30,800,000	4,400,000	
Comstruction cost of of indirect work				177,565,520	137,711,200	39,854,320	
Sub-total				1,065,393,120	826,267,200	239,125,920	
Reserve fee				44,660,000	44,660,000		
TOTAL				1,110,053,120	870,927,200	239,125,920	

(1 US dollar = 308yen, 3.605,000 US dollar. 2,828,000 US dollar. 777,000 US dollar)

3-4 Cost Estimation of Rehabilitation of Belawan Port

Unit: US$

Exchange rate: 1 US$ = 308 Yen = 415 Rupiah

	Foreign currency (Yen)	Local currency (Rupiah)	Total
A. Facilities of electricity supply	589,000	140,000	729,000
1. Materials, equipments & works	559,000	120,000	679,000
2. Consultant service	30,000	20,000	50,000
B. Facilities of water supply	411,000	394,000	805,000
1. Materials, equipments & works	351,000	354,000	705,000
2. Consultant service	60,000	40,000	100,000
Sub-total (A + B)	1,000,000	534,000	1,534,000
C. Rehabilitation of New Harbour (Retaining walls)	2,956,000	1,018,000	3,974,000
1. Materials, equipments & works	2,828,000	983,000	3,811,000
2. Consultant service	128,000	35,000	163,000
Grand total (A + B + C)	3,956,000	1,552,000	5,508,000

4. Time Schedule for Implementation of Project

Time schedule for work progress and financial plans for the implementation of 1) Electricity Supply Facilities Project, 2) Water Supply Facilities Project and 3) New Harbour Rehabilitation (Construction of retaining wall and dredging) is shown in the following tables.

4-1. Time Schedule of Rehabilitation of Facilitation of Facilities of Electricity Supply

I. Work Schedule

Description \ Month & year	1973 Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	1974 Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	1975 Jan.	Feb.	Mar.
1. Preparation of implementation program																									
2. Preparation of implementation program																									
3. Presentation and approval of implementation program																									
4. Recommendation and selection of consultants																									
5. Approval and opening of L. C.																									
6. Contract with consultants and implementation of consultant service											Detailed engineering			Supervision of work									Inspection		
7. Construction work (Ordering and delivery of equipment)											Ordering							Delivery (Site)							
8. Construction work (Work at site)											Structures							Erection of equipment							Test operation
9. Completion																									

II. Financial Plan

Foreign currency (US$)	196,000	393,000
Local currency (Rupiah Fund in US$)	47,000	93,000
Total (US$)	243,000	486,000

4-2. Time Schedule of Rehabilitation of Facilities of Water Supply

I. Work Schedule

Description \ Month & year	1973 Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	1974 Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	1975 Jan.	Feb.	Mar.
1. Preparation of a report of survey	⊢	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2. Preparation of implementation program		⊢	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3. Presentation and approval of implementation program			⊢	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4. Recommendation and selection of consultants				⊢	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5. Approval and opening of L. C.					⊢	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6. Contract with consultants and implementation of consultant service											Delivery engineering					Supervision of work								Inspection	
7. Construction work (Ordering and *delivery of equipment*)														Ordering				Delivery (Site)							
8. Construction work (Work at site)														Work at site									Installation of equipment		Test operation
9. Completion																									⊢

II. Financial Plan

Foreign currency (US$)											137,000													274,000	
Local currency (Rupiah Fund in US$)											131,000													263,000	
Total (US$)											268,000													537,000	

4-3. Time Schedule of Rehabilitation of New Harbour

I. Work Schedule

Description \ Month & year	1973 Mar. Apr. May Jun. Jul. Aug. Sep. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May Jun. Jul. Aug. Sep. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May Jun. Jul. Aug. Sep. Oct. Nov. Dec.
1. Preparation of a report of survey	
2. Approval of project (by IGGI or between two countries)	
3. Preparation of implementation program	
4. Presentation and approval of implementation program	
5. Recommendation and selection of consultants	
6. Approval and opening of L. C.	
7. Constract with consultants and implementation of consultant service	Detailed engineering — Supervision of work — Inspection
8. Construction work (Ordering and delivery of equipment)	Ordering — Delivery (Site) — Delivery (Site)
9. Construction work (Work at site)	(A) — (A) (B)
10. Completion	

II. Financial Plan

Foreign currency (US$)	30,000	2,445,000	481,000
Local currency (Rupiah Fund in US$)	20,000	617,000	381,000
Total (US$)	50,000	3,062,000	862,000

5. Body organization responsible for project implementation

In Indonesia, Ministry of Communication controls all the administration of the transportation and communication divisions and the general bureau of sea communication possesses the direct authority over the administration on port and sea transportation.

The Belawan port administration is one of its local branch officies under the general bureau of sea communication, and the implementation of port construction project is undertaken by the Belawan port administration. (Fig. (2)-8)

Fig. (2)-8-1 Organization of Ministry of Communications

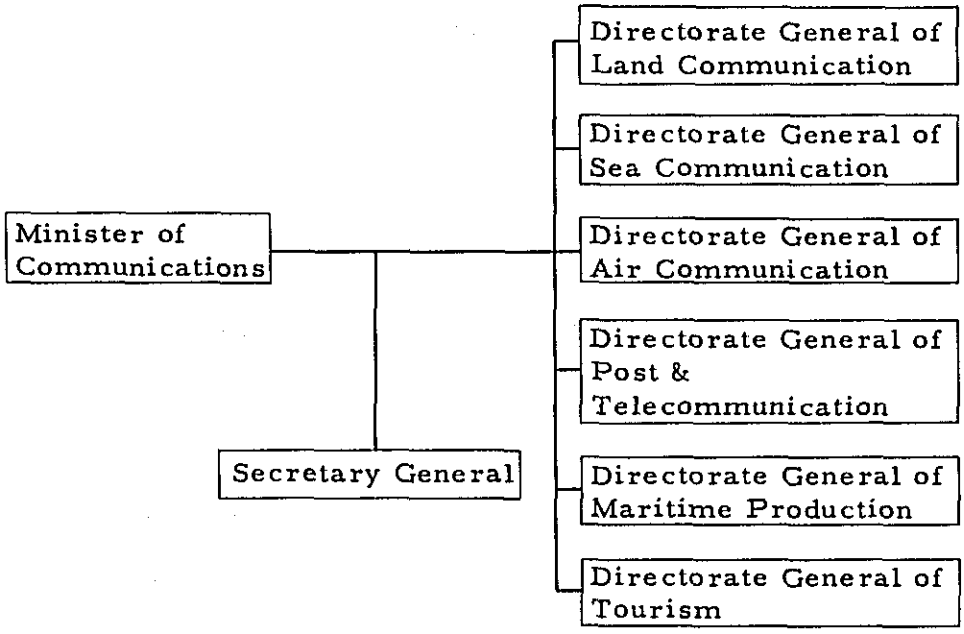


Fig. (2)-8-2 ORGANIZATION OF SEA COMMUNICATION

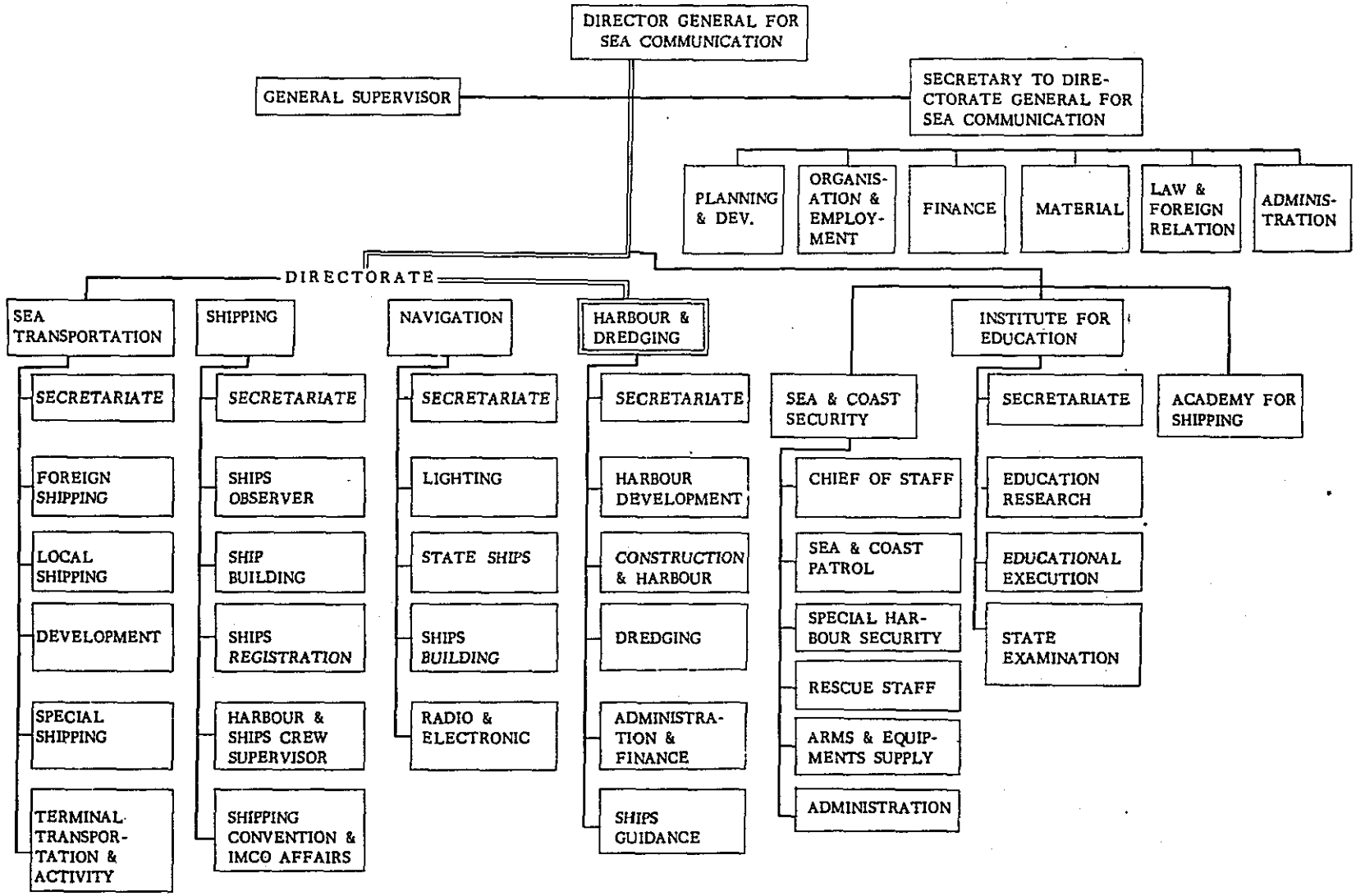
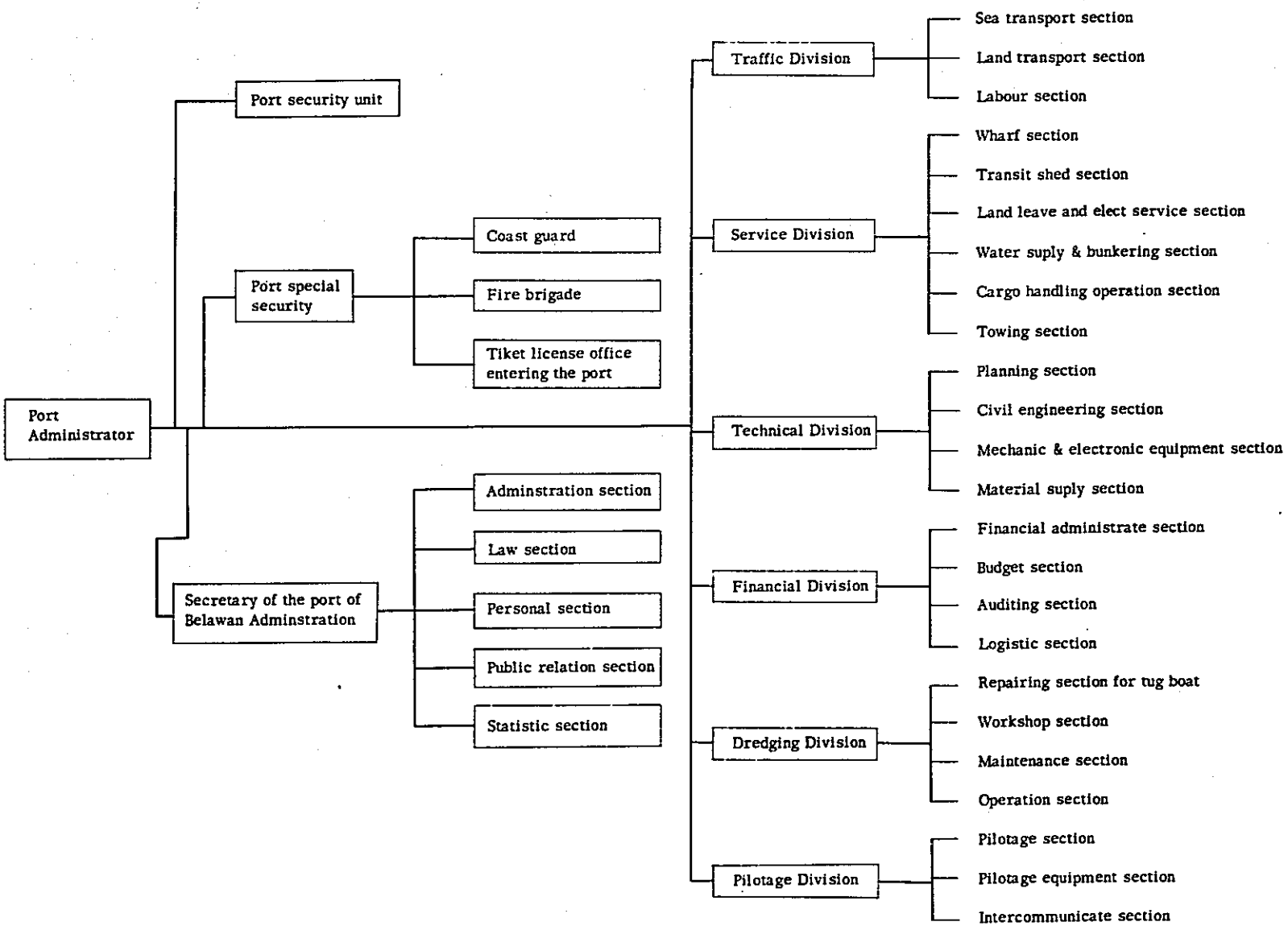


Fig. (2)-8-3 ORGANIZATION OF BELLAWAN PORT ADMINISTRATION



6. Benefit Derived From Implementation of Project

6-1. Benefit Derived From Power Supply Facilities Construction Project

As stated previously in (2)-1 and (2)-2, the power energy required for the maintenance of functions of the present Belawan port facilities excluding that required for the supply to inhabitants in and around Belawan is about 1100 KV. However, the power energy supplied by Indonesia's State-Owned Power Company (PLN) to the whole Belawan district is about 800 KV, of which 500 KV is absolutely required for the inhabitants and the most needed supply to the port facilities is limited to about 300 KVA, which is less than one-third of total demand. Moreover, supply of the required power energy by PLN cannot be expected for some time owing to various reasons.

Implementation of this project, therefore, will materialize stable supply of the required power energy to the Belawan port facilities and will help meet the increase of power demand following the increase of the volume of cargo handled in the port anticipated for next several years.

6-2. Benefit Derived From the Water Supply Facilities Construction Project.

As previously stated in the outline of the project, the demand for water in the Belawan port district including the supply to the port-related inhabitants amounts to about 4000 m^3 daily, and yet the actual supply of water is less than half of the demand because of the aging and deficiency of artesian wells and insufficient water pressure or leakage resulting from deterioration of water mains.

Implementation of this project, therefore, will firstly provide a capacity to supply water to ships (requirement is about 1000 m^3 daily) for complete services for ships and will also provide sufficient water supply to transit sheds, warehouse, passenger terminal, related factories and inhabitants, thus helping the port of Belawan function efficiently. Moreover, the completion of this project is expected to ensure stable water supply to portrelated facilities for some time.

6-3 Benefit derived from new harbour rehabilitation project

(1) Present situation and problems on utilizing of port

a. Cargo handling volume in port

The volume of cargo handled in this port has largely increased recently as shown in Table 6-1 and Fig. 6-1, reaching 21,000,000 tons in 1972. This value is 17,000,000 tons if petroleum is excluded. The foreign trading cargo occupies 65% of the total volume of cargo handled in this port (80% if petroleum is excluded).

Domestic trading cargo is mainly of petroleum, and export cargo is, as shown in Table 6-2, mainly agricultural products, 66% of which is occupied by palm oil and rubber, followed by latex, coconut, copra, and grains. The volume of imported cargo made a rapid increase due to development of economic activities of the hinterland region, and the ratio of import to export has gone up from 38% in 1966 to the present 1:1 ratio. The imported cargo is mainly cement, fertilizer, steel, machinery and other construction materials, and production materials. Import of necessities of life is also increasing gradually.

As shown in Table 6-3 and Fig. 6-2, the volume of imported cargo exhibits large change according to months, while the volume of exportation cargo does not show larger change per month.

b. Number of vessels entered the port

Corresponding to the increased amount of cargo handled in the port, the number of vessels that enter the port is also increasing, the number exceeding 2,600 vessels today. 35% of the whole vessels, that is about 900 vessels, are ocean-going ships that enter the port. As the base of circulation of products and materials corresponding to the development of the North Sumatra, and also as the base of foreign trade, the importance of this port will surely go up, and tendency for large-sized vessels and increase in the number of vessels will be expected in future. (Table 6-4, Fig. 6-3)

c. Types of vessels that enter the port, and average volume of material loaded

The vessel type and average load of cargo per one vessel in 1972 are, as shown in Table 6-5 and Fig. 6-4. Average vessel type of ocean-going ships is 8000D/W whose everage load of cargo is 1,400 tons, while the average vessel type of domestic transportation ships is 1500D/W and the cargo loaded is 620 tons, and vessel type of local transportation is 24D/W and the cargo loaded is 180 tons.

The ships for domestic transportation and local transportation are loaded with considerable volume of cargo compared to their vessel types, while the ocean going vessels have comparatively small load capacity. This is because this port has no large quay suitable for such larger ships. It is clear that the vessel size will be enlarged further accompanying development of international trade in future and that the economy of the North Sumatra will also develop rapidly. It is therefore necessary to re-form the present inefficient transportation pattern, and to construct port facilities suitable for larger sized ships.

d. Utilization of mooring facilities

The mooring facilities in the new harbour Udjung Baru section are utilized by each ship company as shown in Fig. 6-5, and the utilization situation of each company in 1972 is shown in Table 6-6.

For comparison of utilization degree of the mooring facilities, it is convenient to calculate cargo per unit length of the quay (one meter). The volume of cargo handled per unit quay length is shown in Fig. 6-6, which is obtained by simply dividing the volume of cargo (general sundries) handled by the total extension of the existing quay. As shown in the graph, it doubled for the last seven years from 1966 to 1972, reaching the present level of 934ton/m.

Fig. 6-7 shows comparison of the volume of cargo handled per unit quay length (the volume of cargo handled per one meter of this quay is concerted into the volume of cargo handled per one meter of large sized

quay) between major ports in the world and Belawan port. As shown in this graph, the frequency of quay utilization of this port is extremely high, almost overcrawded. The standard volume of cargo to be handled in this quay is about 1,300,000 tons as shown in Table 6-7. The volume of cargo handled actually in this port quay being 1,800,000 tons, the quay can be considered as overloaded with cargo.

If suitable means should not be taken to restore and expand the port and to smoothen circulation of goods through the port, it may become large hindrance against rapid development of the economy of North Sumatra in near future.

(2) Benefits of rehabilitation of new harbour

By stabilization of the slope plane by means of bank protection structure to the opposite shore protion in new harbour section, increased deep dredging of basin may become possible, and the following benefits may be obtained.

(a) *Entrance of larger ships*

By dredging the basin to the depth of -10.5m, the existing quay wall restore its original function as a large sixed quay, and entrance of larger ships of up to 20,000D/W class will be possible.

(b) Increase in capacity for cargo handling

If large ships are able to enter the port, the standard capacity of cargo handling will be increased, resulting in an increase of capacity by more than 300,000 tons per year.
(Table 6-8).

(c) Acceleration of industrialization

A large scale quay wall enable parge volume transportation and establishment of large scale plants, and accelerate industrialization of hinterland area that depends on sea communication, as well as facilities employment of large scale development projects for the inland area.

Table 6-1 Volume of cargo handled in this port

Year	Foreign trade			Domestic trade			Petroleum (Ship-in)	Total
	Export	Import	Total	Domestic export	Domestic import	Total		
1966	488	185	673		175	175	329	1177
1967	459	265	724	23	162	185	358	1267
1968	537	356	893	36	141	177	448	1518
1969	521	410	931	24	200	224	405	1560
1970	524	317	841	28	155	183	454	1478
1971	618	490	1108	27	226	253	493	1854
1972	698	652	1350	100	278	378	351	2079

Table 6-2 Foreign trade cargo items (1970 - 1972)

(Unit: ton)

Product name	Export (1970)	(1971)	(1972)	Product name	Import (1970)	(1971)	(1972)
Latex	87	52	61	Rice	41	46	79
Rubber	182	188	220	Sugar	12	12	-
Palm oil	105	226	242	Wheat	19	31	6
Coconut sead	57	51	51	Textile	1	1	3
	20	2		Cotton	-	1	2
Coffee	9	10	9	Steel	3	3	112(-)
Tea	7	8	11	Cement	38	109	162
Tobacco	3	2	3	Asphalt	3	17	10
Copra	10	-	31	Materials for facilities	24	26	
Copra chip	-	10		Canned food	-	-	8
Gambier	2	3		Paper	6	3	3
Rasin	2	3		Medicine	-	1	38
Spice	2	3	3	Fertilizer	25	82	147
	10	17	22	Colored oil	4	2	4
Grain	3	-	20(x)	Salt			12
Others	26	34	28	Machinery	-	1	30
				Can	24	42	
				Car	2	1	6
				Others	115	112	30
Total	524	618	701	Total	317	490	652

(x) Including beans.

(-) Including materials for facilities, galvanized iron, and zinc.

Table 6-3 Change in general cargo handling volume per month (1969 - 1971)

Month	1969				1971			
	Export	Import	Domestic export	Domestic import	Export	Import	Domestic export	Domestic import
1	44	28	1	53	45	29	1	65
2	48	31	1	56	47	65	2	51
3	37	19	2	52	52	68	2	66
4	41	21	1	46	47	27	2	50
5	33	36	3	58	48	34	2	52
6	43	36	2	38	50	37	3	83
7	47	33	2	45	46	50	3	70
8	52	39	2	39	59	43	2	71
9	45	38	2	53	47	31	3	59
10	48	38	2	58	56	47	2	54
11	41	49	3	57	54	33	2	54
12	41	42	3	49	67	27	2	54
Total	521	410	24	605	618	490	27	719

Table 6-4 Change in the number of vessels entered the port

Year	Oceangoing	Interinsular Local	Oil Tanker	Sailing Vessels	Ferry	Total
1966	491	1044	46	151		1732
1967	641	1417	40	291		2389
1968	852	1613	46	104		2615
1969	774	1677	68	189		2708
1970	741	1623	91	270	81	2806
1971	846	1234	104	180	182	2546
1972	891	1327	107	106	179	2610

Table 6-5 No. of vessels entered and the volume of cargo (1972)

Classfication of Vessels	Vessels entered			Volume of cargo (t)			(E)/(A)
	(A) No. of vessels	(B) D/W	(B)/(A)	(C) Foreign trade	(D) Domestic trade	(E) Total	
Oceangoing	567	4,672,033	8,240	797,165	60	797,225	1,406
Interinsular	322	1,988,092	1,504	486,314	328,683	814,997	616
Local	1,327	76,713	235	40,103	18,702	58,805	180
Others	347	607,797	1,752	16,773	391,878	408,651	1,178
Total	2,563	7,344,635	2,866	1,340,355	739,323	2,079,678	811

Note 1. "Others" are mostly tankers for petroleum.

Table 6-6 Utilization of port by ship companies (1972)

Name of ship company	Vessels entered the port		Volume of cargo (kg)						
	No. of vessels	D/W	Import	Export	Sub-total	Domestic import	Domestic export	Sub-total	Total
A SAMUDERA									
1 PN. DJAKARTA LLOYD	198	1,734,566	105,458,513	153,247,620	258,706,133			—	258,706,133
2 PT. TRIKORA LLOYD	71	742,820	38,111,057	85,278,064	123,390,121	—	—	—	123,390,121
3 PT. GESURI LLOYD	163	8,8,526	51,570,960	73,720,184	125,291,144	—	—	—	125,291,144
4 PT. SAMUDERA INDONESIA	135	1,376,122	120,522,044	168,255,658	288,777,702	46,335	13,725	60,060	288,837,762
B NUSANTTRA									
1 PT. ASTRI LINES	170	219,807	92,127,208	11,880,873	104,008,081	54,023,931	9,890,032	63,913,963	167,922,044
2 PT. PERI TIS LINES	235	153,432	11,573,886	24,489,836	36,063,722	27,007,549	18,906,722	45,914,271	81,977,992
3 PT. DELI MADJU	280	80,316	40,730,874	17,963,299	58,694,173	16,993,899	4,803,376	21,797,275	80,491,448
4 PT. I. O. L.	111	526,828	17,256,155	67,716,333	84,972,488	13,520,287	8,541,166	22,061,453	107,033,941
5 PT. G. M. S.	—	—	—	—	—	—	—	—	—
6 PT. PEPANA	74	23,720	—	—	—	11,115,483	3,679,850	14,795,333	14,795,333
7 PN. PELNI	162	338,031	56,463,313	10,234,841	66,598,154	14,695,267	5,321,519	20,016,786	86,614,840
8 PT. EJA	60	66,400	590,758	101,700	692,458	48,798,396	3,977,519	52,775,916	53,468,374
9 PT. SRIWIDJAJA RAJA LINES	27	47,424	—	—	—	22,349,857	22,170,992	44,520,849	44,520,849
10PT. MERATUS	14	29,582	—	—	—	22,633,776	828,971	23,462,747	23,462,747
11PT. BAHARI	9	17,942	9,647,606	400,000	10,047,606	443,240	1,129,707	1,572,947	11,620,553
12PT. SAMUDERA JAYA	3	7,566	--	1,303,000	1,303,000	2,016,500	1,500,000	3,516,500	4,819,500
13PT. B. A. G.	177	477,044	63,104,352	60,729,990	123,834,342	13,130,495	1,204,000	14,334,495	138,168,837
C LOKAL									
1 PT. RENTJONG SEGRA	78	39,872	22,384,147	8,773,622	31,157,769	651,113	—	651,113	31,808,882
2 PT. BINTANG LAUT	127	17,950	1,512,265	4,289,811	5,802,076	3,768,755	2,291,516	6,060,271	11,862,347
3 PT. KUDA LAUT	44	6,882	2,211,158	822,795	3,033,953	717,829	1,687,047	2,404,876	5,438,829
4 PT. KESTURI LINES	49	8,222	46,750	10,000	56,750	3,536,167	4,896,309	8,432,476	8,489,226
5 PT. PANTJA EINA	10	675	—	—	—	180,935	396,255	587,190	587,190
6 PT. BINA DAYA SIXAWAN	9	1,125	24,074	28,775	52,894	237,117	108,848	345,965	398,814
7 PT. SEA TRAIN KODJA	8	1,947	—	—	—	—	200,000	200,000	200,000
8 PT. PEL INDO LINES	2	40	—	—	—	20,000	-	20,000	20,000
D KHUSUS									
1 PN. PERTAMINA PERKAPALAN	334	578,897	16,675,361	97,234	16,772,595	353,865,764	18,785,185	372,650,949	389,423,544
2 PN. GARAM	13	28,900	—	—	—	24,227,500	—	24,227,500	24,227,500
REKAPITULASI									
A SAMUDERA	567	4,672,033	316,663,574	480,501,526	797,165,100	46,335	13,725	60,060	797,225,160
B NUSANTARA	1322	1,988,092	291,494,152	194,819,872	486,314,024	246,728,680	81,953,854	328,682,534	814,996,558
C LOCAL	327	76,713	26,178,392	13,925,003	40,103,395	9,121,916	9,579,975	18,701,891	58,805,286
D KHUSUS	347	607,797	16,675,361	97,234	16,772,595	378,093,264	13,785,185	391,878,449	408,651,044

Table 6-7 Standard handling capacity of existing facilities (for general cargo)

Name of facilities	Depth of water(m)	Extension (m)	Capacity (ton/m)	Standard capacity
Interinsular Quay	-4.0~-5.0	250	400	100,000
Ocean Quay	-6.50	1000	800	800,000
New Harbour Quay	-5.50	600	650	390,000
Total	-4.0~-6.50	1850		1,290,000

Table 6-8 Increase in cargo handling capacity of New harbour quay

	Depth of water(m)	Extension (m)	Capacity (ton/m)	Standard capacity
Present	-5.50	600	650	390,000
After rehabilitation	-10.50	600	1200	720,000

Fig. 6-1 Change in the volume of cargo handled in port

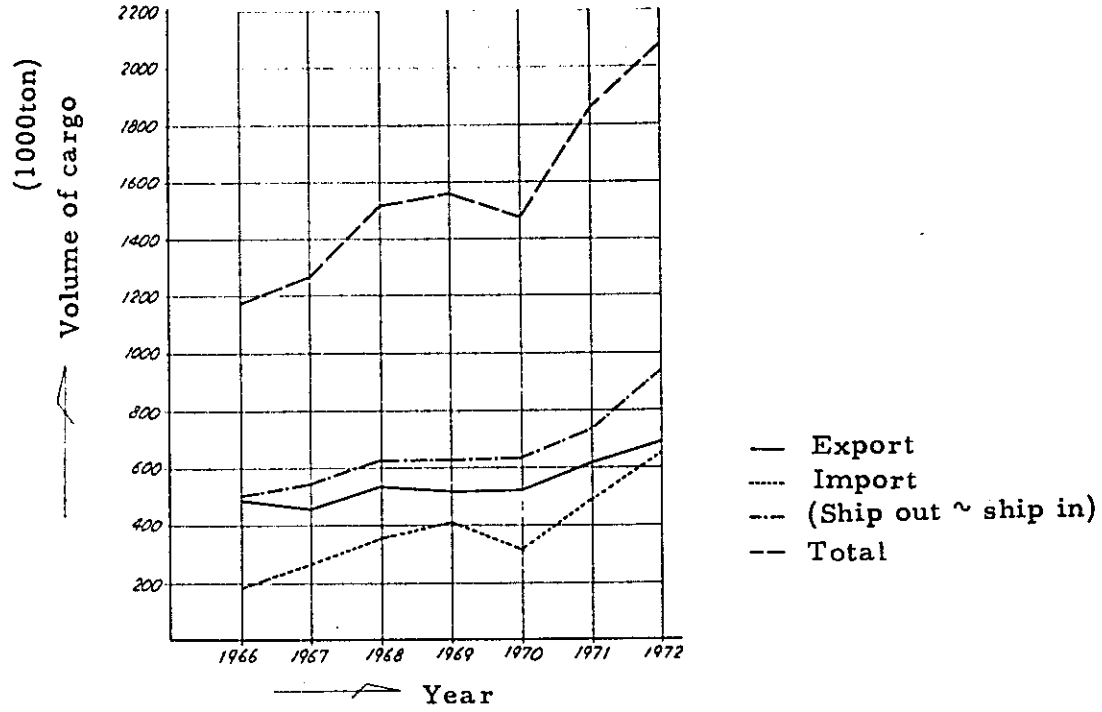


Fig. 6-2 Monthly change in the volume of cargo handled in port

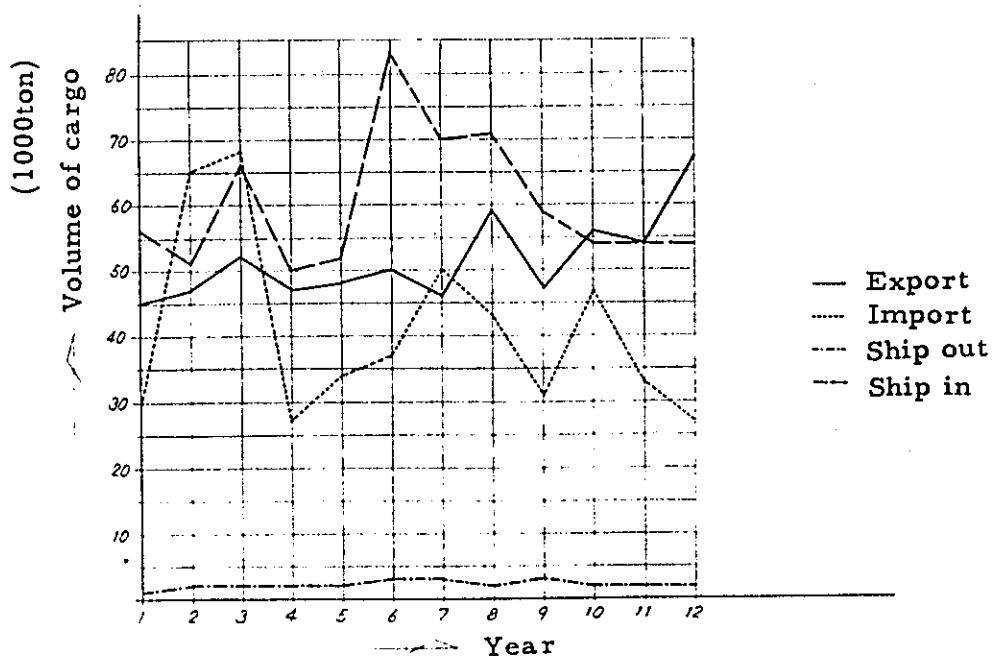


Fig. 6-3 Change in the number of vessels entered the port

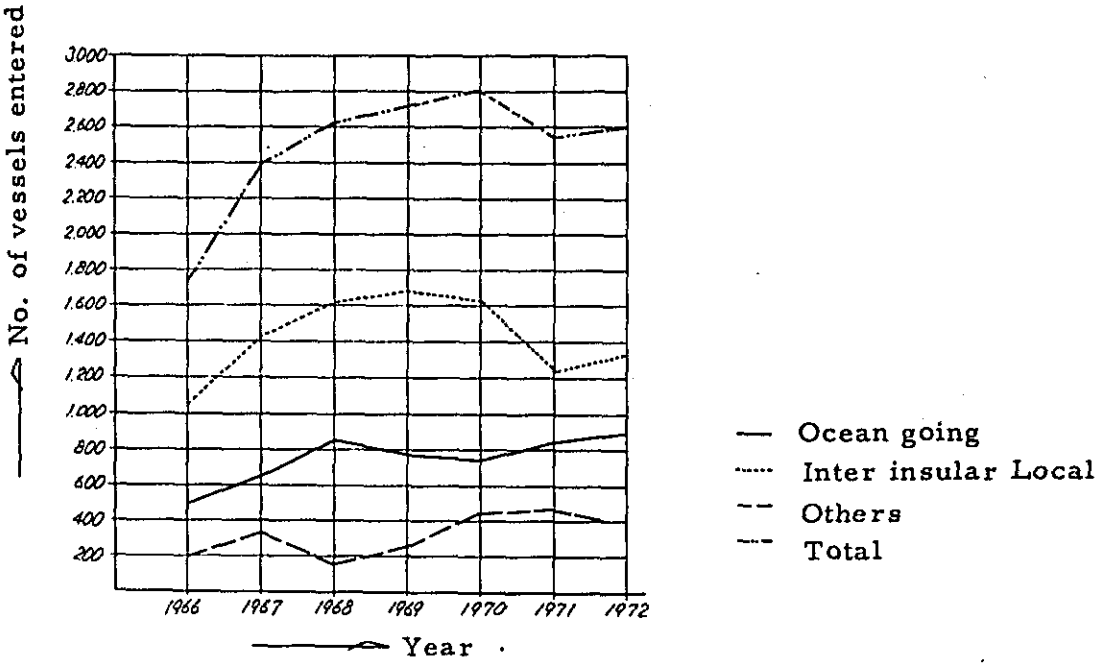


Fig. 6-4 Average dead weight tonnage and average volume of cargo

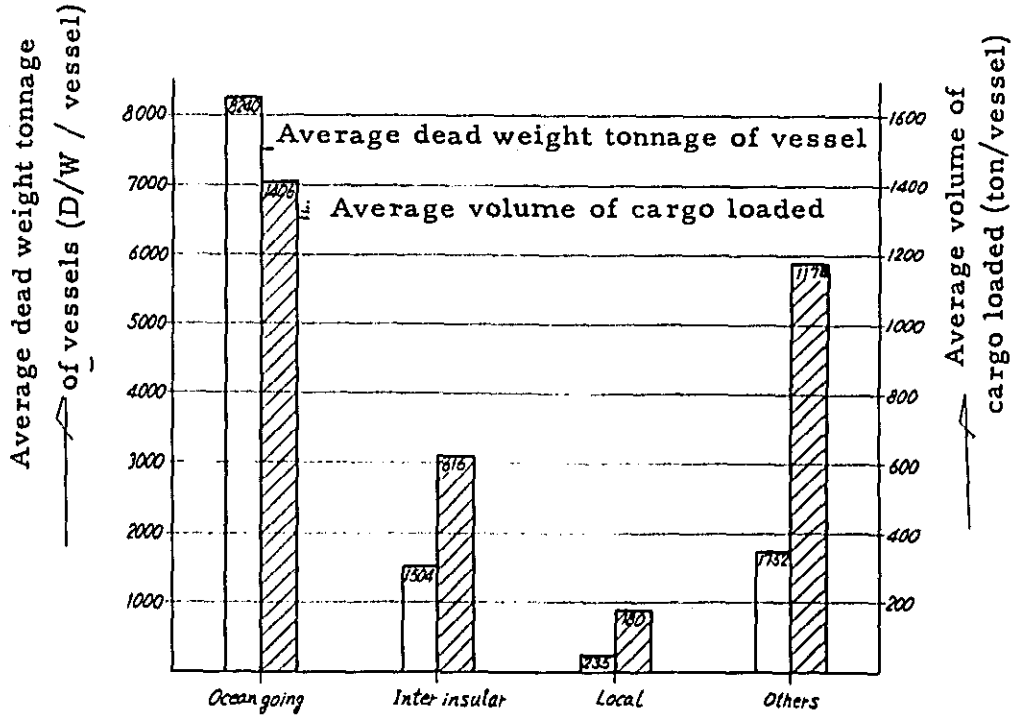
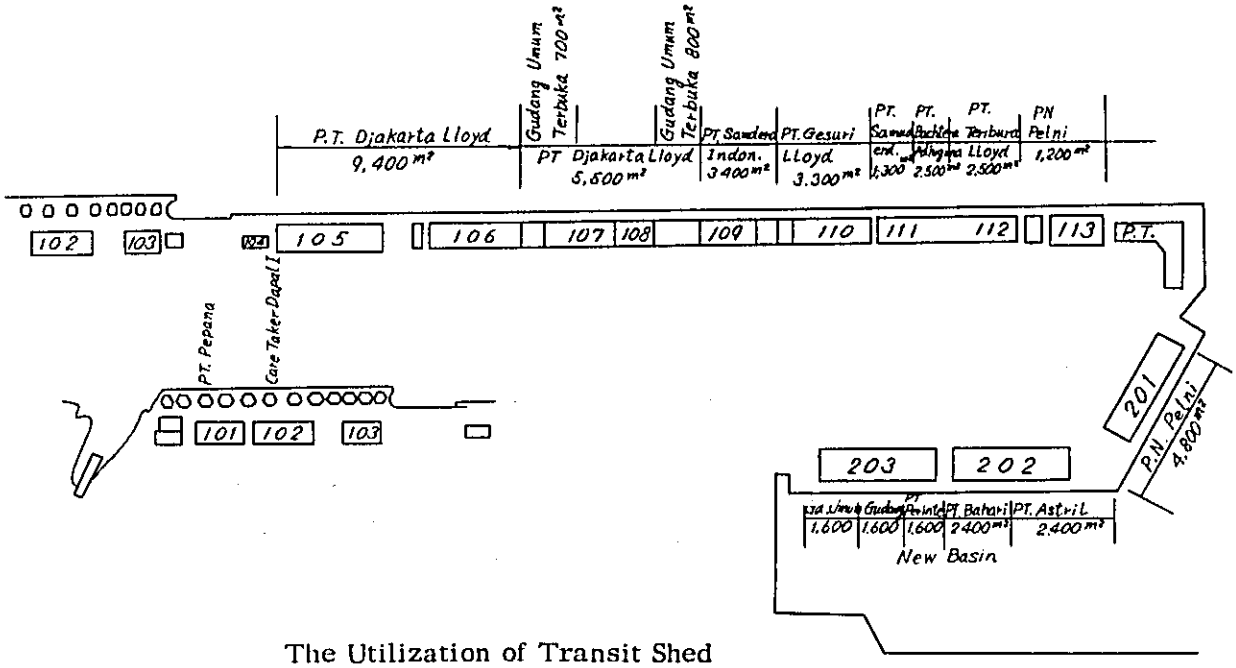


Fig. 6-5 Utilization of quay wall port of Belawan



The Utilization of Transit Shed
At Port of Belawan.

Transit Shed No.	T. S. Area (m^2)	Name of Company
006	1,590	P. T. Deli Maju
007-008	2,050	Care Taker Dapel I
101	2,200	P. T. Pepana
102	3,200	Care Taker Dapel I
105, 106	9,400	P. N. Jakarta Lloyd
107 (OK)	700	Gudang Umum Terbuka
107-108	5,500	P. N. Jakarta Lloyd
108 (OK)	800	Gudang Umum Terbuka
109	3,400	P. T. Samudera Indonesia
110	3,300	P. T. Gesuri Lloyd
111 A	1,300	P. T. Samudera Indonesia
111 B	2,500	P. T. Bachtera Adhiguna
112	2,500	P. T. Trikora Lloyd
113	4,700	P. N. Pelni
201	4,800	P. N. Pelni
1/2 202	2,400	P. T. Astri Lines
1/2 202	2,400	P. T. Bahari
1/3 203	1,600	P. T. Perintis
1/3 203	1,600	Gudang Umum
1/3 203	1,600	Gudang Umum (Prioritas I. O. L.)
Total	57,540 m^2	

Fig. 6-6 Cargo handling volume per 1 meter of quay

(Belawan port)

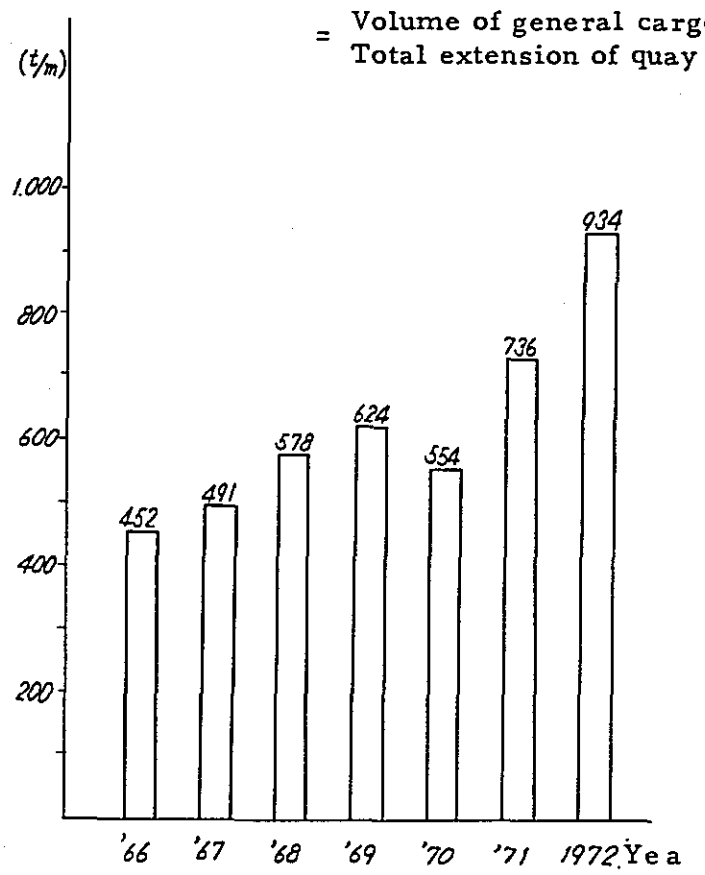
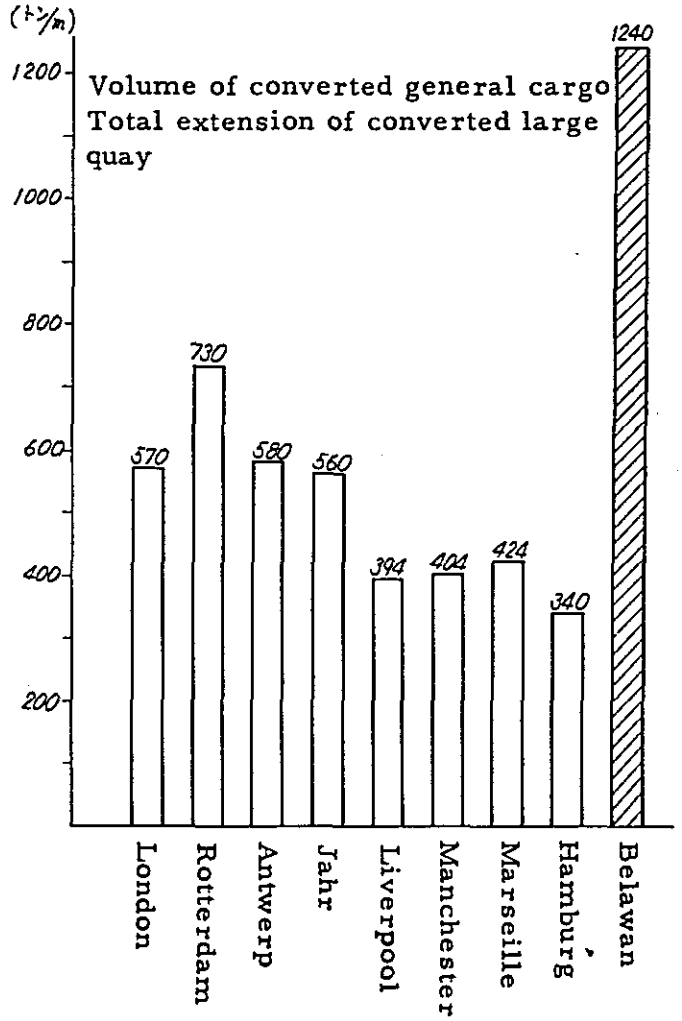


Fig. 6-7 Cargo handling volume per 1 meter of quay

(major ports in the world)



SUPPLEMENT

1. Progress to conclusion of Indonesia Yen Credit
2. Calculation of head required for water supply
3. New harbour sounding map.

1. *Progress to conclusion of Indonesia Yen Credit project*

IGGI conference: (Inter Governmental Group for Indonesia)

Australia

Belgium

Canada

France

West Germany

Italy

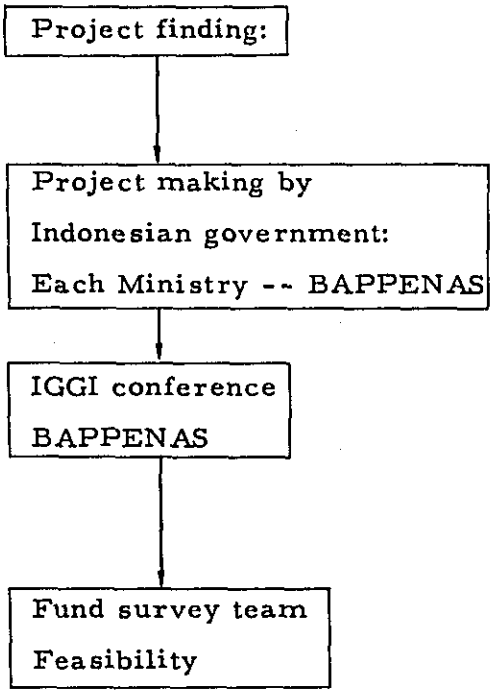
Japan

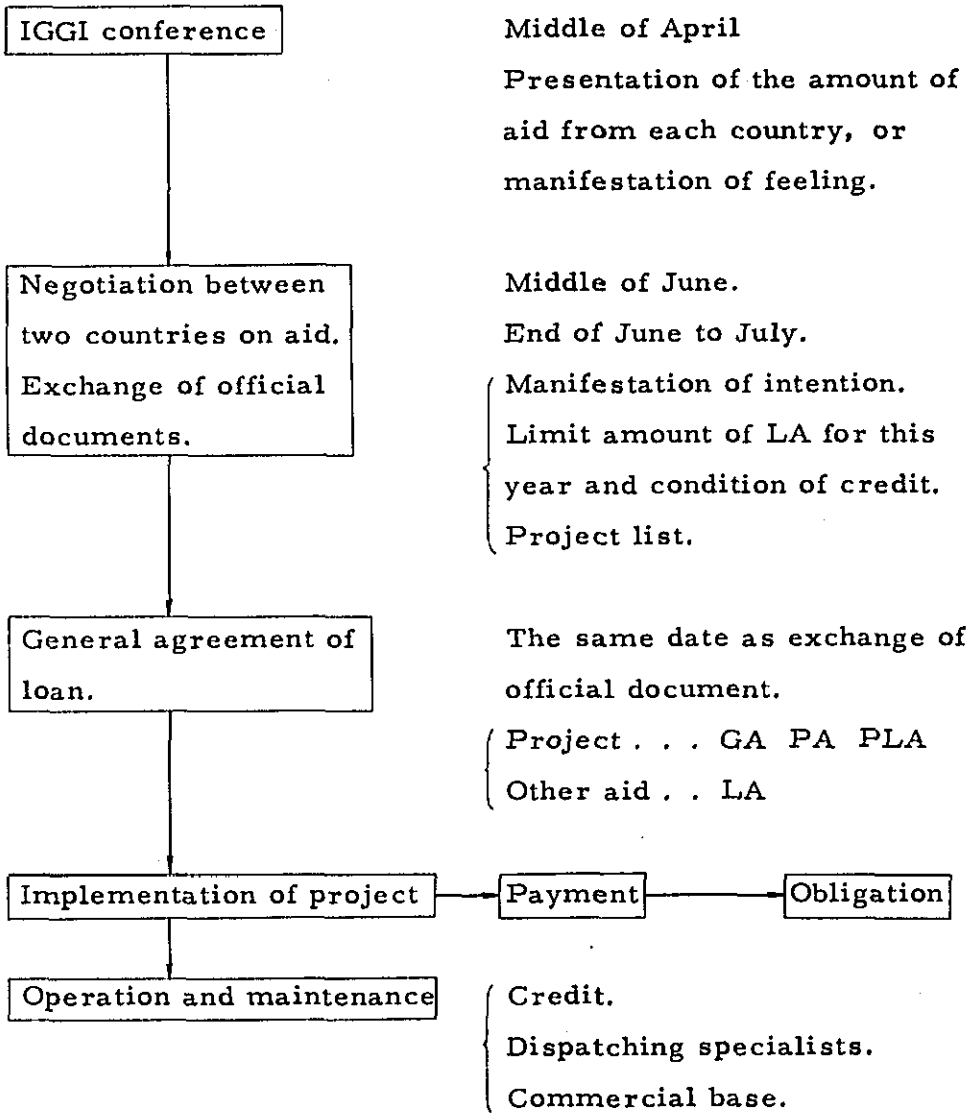
Netherland

U. K.

U. S. A.

New Zealand





2. Calculation of head required for water supply

Water for ships and plants is supplied under sufficient water pressure obtained by means of elevated tank and pump.

The necessary volume of water is:

Water supply for ships	$120m^3/h$
Water supply for plant	$40m^3/h$
Water supply for office	$45m^3/h$
TOTAL	$205m^3/h$

The water head required for water supply of $205m^3/h \times 8$ hours = $1,640m^3$/day can be calculated as in the following. In this case, the pipe network diagram of quay section should be omitted in consideration. If the pipe route for water supply is

1 - 2 - 3 - 4 - 6 - 7

1 - 2 - 3 - 4 - 5 - 7,

(a) Loss in 1-2-3 pipe line:

Flow rate $Q = 1,640m^3/h$

Diameter of pipe $D = 2,200m/m$

Length of pipe $l = 320m$

Loss $h = l\ I\ (I = 0.0021) = 320 \times 0.0021$

$= 0.67m$

(b) Loss in the pipe line 3-4:

Flow rate $Q = 1,640m^3/h$

Pipe diameter $D = 150m/m$

Pipe length $l = 110m$

Loss $h = l\ I\ (I = 0.0089) = 110 \times 0.0089$

$= 0.98m$

(c) Loss in the closed pipe line of 4-5-6

(c-1) Pipe line of 4-5-6

Flow rate $Q = 760m^3$/day (assumption)

Pipe diameter $D = 150m/m$

Pipe length $l = 650m$

Loss $h(c-1) = l\ I\ (I = 0.0021)$

$= 650 \times 0.0021 = 1.365m$

(c-2) Pipe line of 4-6

Flow rate $Q = 880m^3/h$ (assumption)

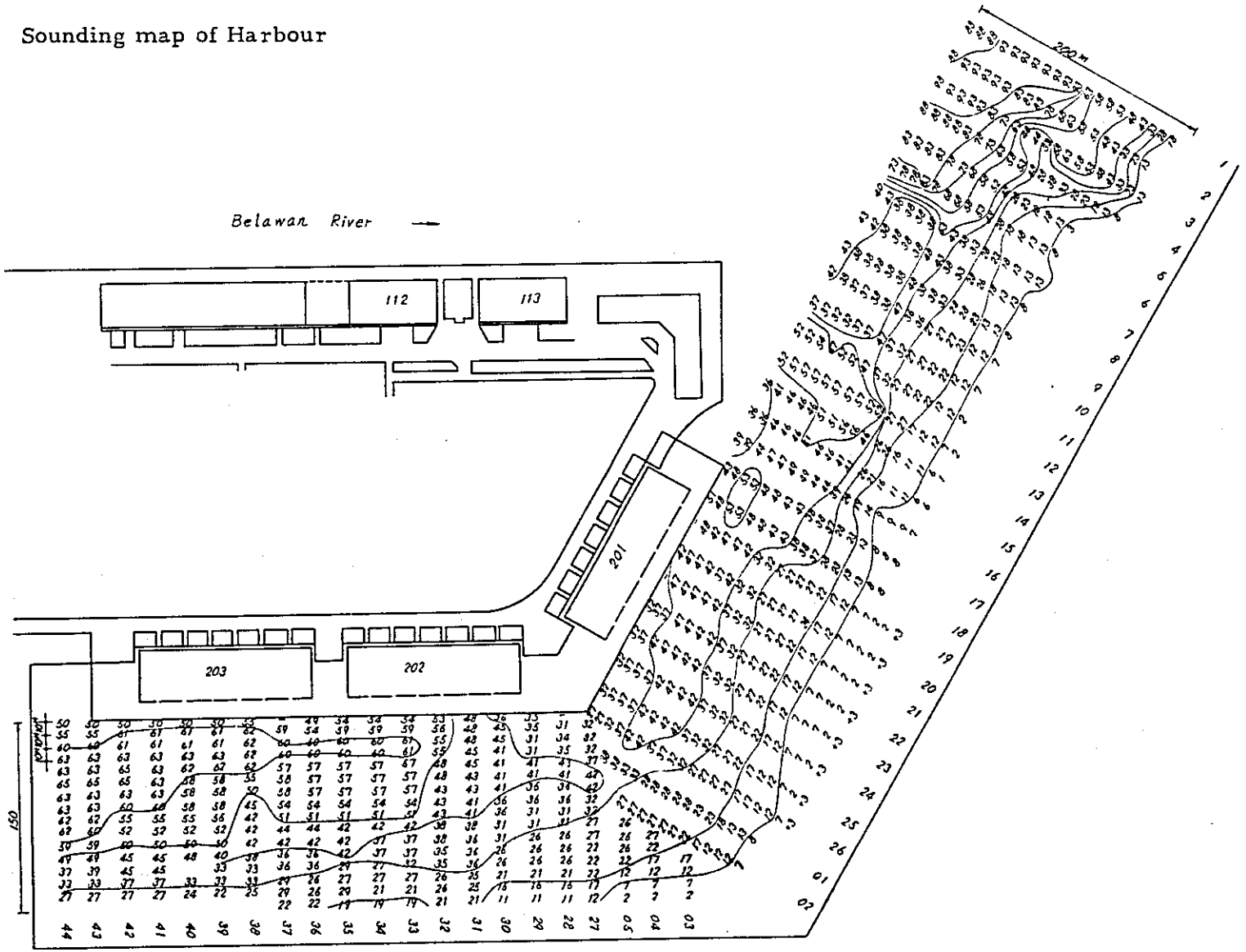
Pipe diameter $D = 150m/m$

Pipe length $l = 150m$

Loss $h(c-2) = l\ I\ (I = 0.0027)$

$= 510 \times 0.0027 = 1.377m$

3 Sounding map of Harbour



(d) Pipe line of 6-7

Flow rate Q = 1,640m^3/h

Pipe diameter D = 150m/m

Pipe length l = 500m

Loss h = 1 I (I = 0.0089)

= 500 x 0.0089 = 4.45m

The total loss head is:

H = 0.67 + 0.98 + 1,71 + 4.45 = 7.81 (1)

Head required for water supply to ships = 10.0m (2)

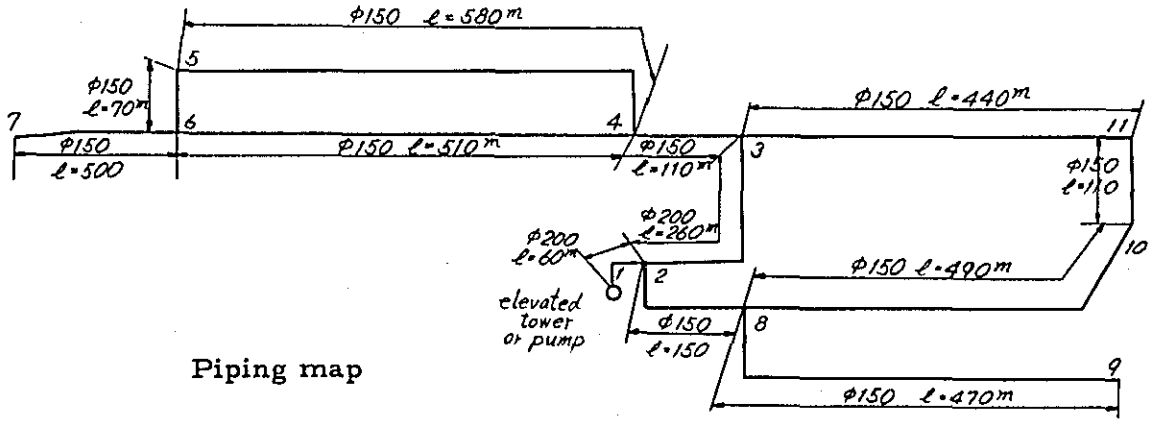
Head consumed in laying of pipe = 1.5m (3)

Head at outlet = 1.5m (4)

(1) + (2) + (3) + (4) = 20.81m

The height of 25m is the head necessary for supplying water for plant and ships (20.81 + other losses = 25m).

If water supply for residenses and others are to be included, the height of the elevated tower should be about 30m.



Piping map

SECTION III PRELIMINARY SURVEY ON BELAWAN EXPANSION PROJECT

1. Outline

As mentioned previously, the major purpose of this survey team was to establish the project for rehabilitation of Belawan port. In addition, a rough survey on the expansion project of Belawan port for development of North Sumatra was also included as one of the duties imposed on the team. However, it was almost impossible for the team comprising only two members to examine all the aspects in only 15 days, and therefore, least time was available for the preliminary survey on this subject. From this reason, the material and data obtained mainly through interviewing may be insufficient. We have to apologize herein for this point.

However, on the expansion project for Belawan port, Indonesian government and the state government of North Sumatra admitted its vital importance, and were already asking for survey team for establishment of the master plan of this project. We hope that, therefore, this chapter may be used as a guide by the future survey team.

The importance and potentiality of Belawan port and North Sumatra have been described in the foregoing sections, and in the report of OECF Port Survey Report on February 1972. Described in the followings are only summary on the subject.

(1) Because of suitability of climate and other natural features, caltivation of agricultural products such as rubber, palm oil, coffee, tobacco, and vegetables is quite popular in North Sumatra since the era of Dutch rule, and large amount of foreign currency is obtained through exportation of these products.

(2) Increase in the volume of the above products may be expected if development is performed properly due to suitability of climate and other natural features. Suitability of natural features means that except tropic area of coastal region, the land of North Sumatra is occupied in majority by highland region, several hundred meters high from sea level, and this

highland is not only suitable for cultivation of rubber, palm oil, tea, coffee, and tobacco, but also suitable for many types of vegetables. And, the undeveloped area is still large in North Sumatra.

(3) For these purpose, arrangement of road and railway network, maintenance of electricity and water, and rearrangement and expansion of port facilities are primarily necessary.

(4) If economic activities become vigorous by exportation of agricultural and forest products, demand for living commodities will necessarily increase. It is then become necessary to supply some portion of these commodities within the land.

(5) In the foregoing section, we reported that Belawan port is the second largest foreign trading port in obtaining foreign currency in Indonesia. Detailed analysis of this situation is as follows:

According to the statistics made by Indonesian government, yearly export of Indonesia amounted to 1 to 1. 1 billion US dollars in the year of 1969 and 1970, and 50 50 53% of which is obtained by exportation of agricultural and forest products, 37% is by petroleum, and remaining 13% is by other goods. The amount of exportation of agricultural and forest products from North Sumatra (mainly from Belawan port) at the same period is 140 hundred million US dollars per year. This record means that North Sumatra undertakes 14% in total amount of export from Indonesia, and 25% to 30% in total amount of agricultural and forest product exportation. Judging from its population ratio to whole country (6, 600, 000 to 120, 000, 000) and its area ratio (70, 000km^2), the income gain by North Sumatra is quite large, suggesting its extremely high potential in economic activities.

(6) If, in future, agricultural and forest products are increased, transportation networks are arranged, plants and factories are established, the ASAHAN project utilizing lake water of Toba lake (hydroelectric power generation of 600, 000KW and over, and alminium refining by this electricity) is promoted, power and water supply projects are implemented, and If development project of Belawan port as a circulation base and industrial port located at the connecting point between sea and land is implemented

successfully, then economic development of North Sumatra will be greatly accelerated. For realization of these projects, first of all necessary measures including expansion of Belawan port should be put into practice.

2. Field investigation of hinterland

The survey team made a small trip to the hinterland of Belawan port to investigate its actual conditions relating to the economic and social activities. The time allowed for the team was only one and half days, and the route was as shown in Fig. (3)-1.

The highway between cities is laid with asphalt, and provided with a width of two lanes, and some sections are provided with another two lanes width. Maintenance and repair of road is seemed to be carried out, and improvement work of road was noted on the route. In the inland district, the volume of traffic is not so large, while in the coastal city suburbs it is considerably larger, and trucks, buses, and passengercars, though of older models, were frequently seen. Especially, the city of Medan which is the capital of the state and the center of economic and political activities, was filled with an atmosphere of vigorous commercial activities. In the North Sumatra area, the traffic network is arranged around the city of Medan, and the road is sufficient to meet transportation requirement from the hinterland. Though the railway is still of the single line, the network is well arranged between cities located at theMarakka straight side. The railway is constructed to the city of Pem Siantar, the second largest city in this district next to Medan and located at the middle point of the North Sumatra area from Medan.

In the area from Medan to T. Tinggi and Pem. Siantar, there are many towns and villages along the highway, and scenes of rice producing agriculture depending mainly on paddy rice field are vissible along the road. There are also stepped rice field, as will be frequently seen in Japan, cut open the hills, and irrigation is seemed to be satisfactory. Vegitables and fruits at the shop front in a town are abundant both in kind and volume, but plants and factories are seldom seen on the route. The highlands from Pem Siantar to Toba lake, or from Pem Siantar to Berastigi are the production area of the primary

product characteristic for the tropical region, and there are plantations of coffee, palm oil, and rubber as far as the eye can reach. The highlands are also the place of production of highland vegitables, and these primary products are exported and shipped in large quantities from Belawan port. Along the highway, there are small scale of processing plants for shipping of these primary products, and the production and processing of primary products are seemed to form a major industry in the hinterland.

In other words, the hinterland has no important plants, except rice-producing agriculture, and the primary industry of rubber, palm oil, coffee, coconut, and tea. If the branch road except the main highway is arranged in future, it may by possible to expand the production area of these primary industry, and large increase in production volume may also be expected. Although located in the tropical region, the atmospheric temperature is not so high through the year due to its higher elevation, and the plants are quite different from those of coastal level area. In the level land, there are many broadleaf tropical trees, while in the area from Pem Siantar to Berastagi and around the lake to Toba, we can see many needle-leaved trees, just like in Shinano district in Japan. Many ups and downs are seen in this highlands, where summar resorts are found in several places. In the midst of the lake, there is an island whose area is similar to that of Awaji-island in Japan, and peculiar houses of the natives make up a sight-seeing spot. This area will be developed as the summer resort as well as tourist resort.

The level of life of the inhabitant of North Sumatra is considerably low compared to the city district such as Medan. However, their clothes are neat and clean, and some pupils clad in uniform. Footwear is generally slippers, but frequently shoes. From these observations, it can be said that the lifelevel of the inhabitant in North Sumatra is not so low as expected. It is reported that uneducated rate in Indonesia has considerably decreased recently, and the percentage of school attendance has greatly increased. Children's procession going to the school met on the road is sufficient to give us a strong impression of positive vitality of this country.

Traffic between Medan and Belawan is separated about 27km, and two

lane road is laid with asphalt. Houses, assembly plants for electrical appliances, cooling drink plant, tobacco plants, automobile parts plants are lined up along the road to Medan, and traffic is quite vigorous. Especially, the volume of traffic by cargo transportation trucks related to Belawan port is large, and the road is therefore considerably crowded, perhaps reaching a limit at present. The area around the road near Belawan is low swampy land, forming a jungle. It seems to us that, for the future development of Belawan port, the road connecting the port and its hinterland will cause the largest bottleneck effect if left as it is.

3. Investigation based on data and materials

Outline of North Sumatra which is the hinterland of Belawan port is as follows:

3-1 Population and area

Total population of North Sumatra state is 6,610,000 in 1971, and the area covers 70,787km^2, which is 3.72% in the whole country. The number of persona of foreign register is 170,000. As for composition of population, male is 3,330,000, and female is 3,280,000. The number of persons whose age is over 15 is 3,410,000, occupying 51% of the total population. The population increase rate is 2.44%.

Medan, the state capital of the North Sumatra, possesses a population of 634,000, the largest in the state, and Pem Siantar, the center city in the inland, possesses a population of 129,000, and other cities are all less than 100,000 in population. The total population of cities is 928,000, only 14% of the total population. The population density in the whole North Sumatra is 93 persons/km^2, while in the city area, it is more than 10,000 persons/km^2, forming an overcrowded condition. (Table 3-1-1, 3-1-2)

Table 3-1-1 Population and area of North Sumatra

	Population (x 1000)		Area (km^2)	Population density (Man/km^2)
	1971	1972		
City				
Medan	479	634	51.3	12,362
Pem Siantar	115	129	11.7	11,092
Bindjei	45	60	17.1	8,787
Sibulga	39	42	2.8	15,022
Tdj Balai	29	33	1.9	17,408
Teb Tinggi	26	30	3.5	8,787
Sub-total	733	928	88.3	10,510
District				
Deli Serdang	972	1432	4,824	297
Lamgkat	342	523	6,335	83
Karo	148	181	2,071	98
Simalungun	496	664	4,399	151
Asahan	409	587	4,629	122
Lab Batu	256	361	8,590	42
Tap Tengah	101	134	1,916	70
Tap Selatan	495	619	18,006	34
Tap Utara	560	622	11,240	55
Dairi	138	184	3,223	57
Nias	315	373	5,265	71
Sub-total	4232	5680	70,498	81
Total	4965	6610	70,787	93

Table 3-1-2 Composition of population of North Sumatra (1971)

	Age of 0 to 4		Age to 5 to 14		Age of 15 to 24		Age of 25 or over		Total
	Male	Female	Male	Female	Male	Female	Male	Female	
City									
Medan	50,800	49,557	89,348	87,118	69,656	68,276	110,728	108,709	634,192
Pem Siantar	10,940	10,091	18,951	18,154	14,847	14,198	20,842	21,200	129,223
Bindjei	5,188	4,920	9,041	8,619	5,959	5,711	10,381	10,123	59,942
Sibolga	3,461	3,536	6,217	5,773	4,620	4,225	7,288	7,091	42,211
Tdj Balai	2,638	2,455	4,735	4,687	3,035	3,203	6,039	6,184	33,076
Teb Tinggi	2,230	2,322	4,331	4,201	3,317	3,307	5,312	5,294	30,314
District									
Deli Serdang	130,855	133,615	226,661	214,171	120,155	119,399	249,702	237,125	1,431,633
Lang kat	47,109	49,959	82,867	77,552	42,869	40,960	95,069	86,827	523,212
Karo	15,602	15,765	26,447	24,795	14,284	14,687	33,353	36,383	181,316
Simalungun	62,232	62,972	104,735	99,836	51,486	51,940	114,405	116,368	663,974
Asahan	54,221	58,112	91,968	87,203	44,752	44,246	105,160	101,686	587,348
Lab Batu	33,428	35,352	57,578	52,060	27,583	27,374	66,565	60,936	360,876
Tap Tengah	12,466	12,653	20,156	19,104	10,566	10,549	24,097	24,539	134,130
Tap Selatan	57,535	61,600	97,201	92,318	46,733	47,280	106,890	109,876	619,433
Tap Utara	58,137	58,427	100,452	91,599	47,767	50,906	97,733	117,099	622,120
Dairi	18,854	19,221	28,764	26,448	14,085	14,155	30,849	31,768	184,144
Nias	31,155	31,247	56,431	49,466	33,508	33,151	69,890	67,803	372,651
Total	596,851	611,904	1,025,833	963,104	555,222	553,567	1,154,303	1,149,011	6,609,795

3-2 Trade

North Sumatra is the largest production zone of the primary products centering around the agricultural products, and the amount of trade is the second in the whole country. Especially, the amount of rubber and palm oil is the largest, and occupies 73% of the total volume of exported crago and 76% at the total amount of exportation. Other major products for export are tea, copper, and coffee. (Table 3-2-1)

The amount of export of the whole North Sumatra state is 138 x 10^6 US dollars, and the 96%, 133 x 10^6 US dollars, is exported from Belawan port. The foreign trading ports are Belawan port located near the Medan city, and Sibolga port which is located at the position 200km apart from Medan and is facing the Indian Ocean. Sibolga port is used mainly as a port for domestic trading, and therefore Belawan port is only the port developed for foreign trading.

The largest opposite countries is export is Japan, followed by U. S. A., Singapore, and Netherland, and these four countries occupies 63% of the total amount of export. (Table 3-2-2, 3-2-3)

3-3 Agriculture and forestry

The production volume and production site of major agricultural products in North Sumatra state are shown in Tables 3-3-1, 3-3-2, and 3-3-3. Table 3-3-4 shows a change in production volume and exportation volume of the major products. The agricultural products of this area occupies larger weight in the overall trade of Indonesia, and this area is the representative production area in the country of Indonesia. The product types are numerous, and well arranged plantations are commonly developed in this area. As for production volume, rubber, palm oil, and copla are occupying greatest share, and their acreage under cultivation is the largest. Most of the products are exported now, and the volume of production will increase further by land development in future.

Compared to abundabt agricultural resources, forest resources of this area are inferior to other regions, and production volume and export volume

are both comparatively small. (Table 3-3-5)

3-4 Industry

Present situation of the industry in North Sumatra is shown in Table 3-4-1.

The sum of the industrial production in 1971 amounts 43,651 x 10^6RP, and the number of enterprises having employees of more than 40,000 is around 9,000. Reflecting recent stabilization is economic environment, investment by enterprises is becoming vigorous. As for structure of industry, the light industry occupies 55%, and the fundamental industry is only less than 5%. Table 3-4-2 shows to major plants. The fundamental industry mentioned herein includex many assembly plants of final products of electrical and transportation machinery such as automobile, motor cycle, and radio receiver, and every production of consumer goods is the dominating pattern seen in every aspect of industry in North Sumatra. Growing up of industry for producer goods is the problem to be solved in future.

Table 3-4-3 shows the recent investment situation to industries by foreign capitals. Plants are mainly located in the city of Medan and its suburbs. According to the information obtained from the state government, considerable amount of investment by foreign capitals is expected in future.

3-5 Financial aspect

Table 3-5-1 shows the budget for 1971 year in North Sumatra state. The scale of budget is 9,247 x 10^6RP. Table 3-5-2 shows a change in national fund invested to North Sumatra. Reflecting the regional characteristics of this area, the investment to the plantation section is the largest, exceeding 50% of the total amount of investment in 1969 to 1972. Investment to industry section is increasing every year, and the number of investment objects is also larger. (Tables 3-5-1, 3-5-2)

Table 3-2-1 Actual record of export of major products

(Belawan port)

Sorts of Commodities	1969		1970		1971	
	ton	×1000US$	ton	×1000US$	ton	×1000US$
1. Rubber	222,394	63,964	219,967	74,331	226,650	66,423
2. Palm Kernel	42,032	4,260	45,141	5,400	52,912	5,393
3. Crude Palm Oil	131,745	22,772	162,850	34,883	219,632	46,979
4. Coffee	4,972	2,800	7,365	5,257	8,450	6,032
5. Tea	16,017	3,347	11,727	4,257	16,535	8,839
6. Cocoa Kernel	160	50	86	26	76	59
7. Copra chips	11,557	132	11,587	1,285	17,954	896
8. Wood	35,819	338	17,044	177	10,111	248
9. Vegetables	10,078	125	14,524	365	14,612	383
10. Pachouli Oil Leaves	260	254	235	337	500	834
11. Nutmeg/Oil	16	33	35	104	80	344
12. Kenanga Oil	1	3	2	4	—	—
13. Clove Leaves Oil	18	4	21	16	28	35
14. Shrimp	—	—	1,243	520	2,270	2,394
15. Fish	1,020	88	3	1	74	30
16. Leather	274	59	148	130	209	137
17. Resin(Gum Damar)	1,248	102	915	99	2,089	411
18. Turpentine	217	19	83	7	8	1
19. Benzoin	217	50	201	53	118	31
20. Gutta Djelutung	56	3	153	10	339	22
21. 〃 Djernang	8	1	3	0	17	2
22. 〃 Majang	—	—	2	0	17	3
23. Scrap Iron	2,775	34	4,543	45	7,527	74
24. Copper	2,594	8,370	1,784	5,144	2,237	8,036
25. Tobacco	106	54	—	—	75	35
26. Corn	6,076	61	7,002	94	13,131	657
27. Beans	70	2	1,355	20	1,112	22
28. Round Nuts	51	0	291	1	317	1
29. Bran	803	5	614	4	460	3
30. Manilafiber	—	—	48	14	—	—
31. Candle	—	—	75	1	—	—
32. Jute	—	—	2	1	—	—
33. Sisal Hemp	1,192	164	1,221	111	1,935	222
34. Nets	—	—	5	7	3	1
35. Other Commodities	1,134	76	1,453	98	2,245	133
Total	488,316	107,170	511,728	132,802	601,723	148,680

Source: Bank of Indonesia

Table 3-2-2 Volume of export from North Sumatra

Port	1968		1969		1970	
	1000 t	1000US$	1000 t	1000US$	1000 t	1000US$
Belawan	537.5	104,101	544.9	107,257	511.4	132,797
Sibolga	30.5 (6470m³)	6,481	22.5 (5270m³)	5,708	17.8 (6341m³)	5,485
Total	568.0 (6470m³)	110,582	577.2 (5270m³)	112,965	529.2 (6341m³)	138,282

Table 3-2-3 Volume of cargo exported and imported through Belawan port (1971)

(Unit: ton)

Name of country	Export	Import
Malaysia	28,115	22,720
Singapore	48,381	112,285
Thai	124	31,156
Japan	108,536	138,877
Hongkong	243	1,350
Pholippine	453	5,036
Korea	-	30,000
India	-	6,526
Netherland	102,489	41,638
Germany	71,359	48,015
Belgium	62,358	18,792
Poland	-	5,500
U.K.	16,206	3,327
U.S.A.	118,794	91,902
U.S.S.R.	12,349	17,684
France	16,638	4,725
Formosa	-	10,958
Australia	492	3,944
Denmark	1,248	156
Panama	16,544	-
Italy	1,116	-
Yugoslavia	219	-
Czechoslovakia	3,365	-
Kuwait	-	2,024
Total	609,030	598,616

Table 3-3-1 Production volume and production site for agricultural products in North Sumatra

Type	Unit	1965	1966	1967	1968	1969	1970
Wet rice field	ha	298,910	317,945	316,149	342,757	349,227	382,262
Paddy	ton	839,621	883,792	933,701	986,788	1,094,064	1,150,931
Dry rice field	ha	133,661	137,813	145,907	170,793	154,440	154,721
Paddy	ton	246,741	232,517	232,435	270,180	242,950	248,237
Cassave	ha	23,110	19,142	15,722	19,106	18,905	19,609
	ton	255,731	193,022	148,403	220,208	187,535	198,609
Cassave	ha	25,672	28,482	36,411	15,761	27,495	27,841
(Sweet Potatoes)	ton	241,733	160,857	214,856	181,998	170,593	173,841
Corn (Maize)	ha	23,618	37,134	15,640	29,189	21,068	19,477
	ton	30,139	62,596	19,418	41,752	29,527	29,463
Beans	ha	15,335	14,549	8,993	11,415	12,377	14,846
	ton	16,207	13,587	8,344	12,199	11,327	15,201
Vegetables &	ha	6,087	6,665	8,939	8,211	11,103	19,866
Fruits	ton	31,224	30,685	57,306	40,670	71,507	118,337

Note 1. "ha" in the Unit section means area of production site, and "ton" means production volume.

Table 3-3-2 The plantation of North Sumatra

No.	Kind of land	Plantation	Land of Production (ha)
1	Rubber	175	168,848
2	Green Coconut	30	79,450
3	Tea	6	9,829
4	Fiver	2	——
5	Chocolato	4	701
6	Coconut	7	1,687
7	Tobacco	23	4,700

Table 3-3-3 Land utilization of North Sumatra

(1970)

No.	Kind of land	Area ha (km^2)
1	Field for rice cultivation	381,162 (3,812)
2	Dry field for rice Plant	154,721 (1,547)
3	Public Plantation area	236,419 (2,364)
4	Public Coconut Plantation area	59,695 (597)
5	Public Coffee Plantation area	17,665 (177)
6	Public Incense Plantation area	14,100 (141)
7	Public Clove Plantation area	2,504 (25)
8	Nilam Plantation area	650 (7)
9	Sweet bark tree Plantation area	550 (6)
10	Forest area	3,078,423 (30,784)

Table 3-3-4 Production volume and export volume of major products of North Sumatra state

(Unit: Production volume and export volume: ton
Production site: ha)

Name of product	1966			1967			1968			1969			1970			Major importers
	Production volume	Export volume	Production site	Production volume	Export volume	Production site	Production volume	Export volume	Production site	Production volume	Export volume	Production site	Production volume	Export volume	Production site	
Corn	62,596	4,174	37,134	19,418	3,044	15,640	41,752	82	29,189	29,527	6,076	21,068	29,463	7,002	19,477	Singapore, Malaysia, Japan
Copra mixed	1,956	1,956					153	153								Singapore, Germany,
chips	6,256	6,256		8,283	8,283		7,541	7,641		11,557	11,557		11,587	11,587		Netherland
Nilam Oil	157	157		294	294		318	318		193	193		235	235		Europe, Singapore, Japan
Benzoin								269			296		*2,496	201	35,000	Singapore, Pakistan
Gutta Djelutung											56			153		India, Egypt, Singapore
Leather		9			9			23			27			148		Singapore, Hongkong, Japan
Roundnuts											51			291		Singapore
Rattan	1,057m³			3,020m³	55		2,945m³	135m³		1,399m³	52m³		2,088m³	353m³		Singapore, Japan
Wood	37,319			83,395			212,761	47,714		184,240	47,356		135,850	28,285		Singapore, Japan
Fish											1,020			1,246		Malaysia, Singapore, USA, Japan
Palm Kernel	29,653	29,653		40,438	40,438		39,201	39,201		42,032	42,032		45,141	45,141		Europe, Japan, USSR
Crude Palm Oil		174,921			141,285			169,972			181,450		*200,000	162,850		USA, Europe, China, Philippine
Tea				6,628	6,628		9,443	9,443		16,017	16,017		11,726	11,726		Europe, USA
Cassiavera		-			-			19			30		* 525			USA, Europe, Singapore
Deli-Tobacco		3,438			2,931			2,527			2,594			1,784		Netherland
Damar (Resin)	4			19				240			1,248			915		USA
Rubber	125,496	225,954		118,195	210,037		127,811	219,312		128,084	220,394			219,967		

Note (1) The asterisk (*) means yearly average production volume.

Table 3-3-5 Actual record of production of timber in North Sumatra (1971)

Type	Unit	Production volume
Premeval forest	m^3	129,000
Pine	m^3	18,541
Firewood	m^3	38,855
Post		38,055
Beam		7,674
Small timber		34,590
Cane	kg	1,600,000
Bark	kg	59,500
Rubber fluid		182,599
Sampan		610
Nibon Coconut	m^3	164,827

Table 3-4-1 Industries in North Sumatra (1971)

	Amount of capital invested (x 10^6RP)	No. of enterprises	No. of employees	Electric power (HP)	Production amount (x 10^6RP)
Light industry	34,774	1,196	12,779	38,234	23,978
Manual industry	3,068	7,208	15,554	40,801	4,574
Textile industry	2,598	179	6,626	6,980	4,894
Chemical industry	2,613	198	3,168	5,130	7,630
Basic industry	5,646	94	2,285	6,463	1,978
Total	48,513	8,875	40,412	97,682	43,651

Table 3-4-2 Major plants in North Sumatra

Division	Type	No. of plants
Basic industry	Assembly plant of automobile	3
	Assembly plant of motorcycle	4
	Assembly plant of radio receiver, television, tape-recorder	4
	Dry cell plant	2
	Storage battery plant	3
	Engine manufacturing plant	3
	Casting plant	3
	Iron and steel plant	1
Chemical industry	Paint plant	4
	Match manufacturing plant	3
	Cosmetic manufacturing plant	2
	Medicine manufacturing plant	1
	Drink water plant	7
	Benzine plant	3
Light industry	Tobacco plant	5
	Rubber processing plant	5
	Plastics processing plant	3
	Cake maker	1
	Leather processing plant	1
Food industry	Sirup manufacturing plant	4
	Salt, soy, and sauce plant	2
Textile industry	Textile plant	7

Table 3-4-3 Amount of investment by foreign capital to industries

(April 1969 to March 1972)

Industry type	Amount of investment	Location	Remarks
Manufacturer of zinc and iron sheet	(RP) 2,000,000	Medan	In operation
Cylinder manufacturer	2,080,000	Medan	Under construction
Food industry	1,300,000	P. Siantar	Under construction
Drink water manufacturer	2,000,000	Medan -- Belawan	Under construction

Table 3-5-1 · Budget of the state of North Sumatra (1971/1972)

(Unit: RP)

INCOME		EXPENDITURE	
1. Balance brought forward	262,784,182.5	1. Payment of debt	327,787,924.44
2. Subsidy	2,600,000,000	2. Advance of forgoing year	1,289,070,056
3. Direct tax	569,300,000	3. Personnel expenses	3,232,038,100
4. Indirect tax	5,489,540,000	4. Material purchasing fee	142,358,050
5. Miscellaneous	325,000,000	5. Development fund	1,263,163,255.75
		6. Expenditure of state government for branch office development	2,992,170,796.31
Total	9,246,588,182.5	Total	9,246,588,182.5

Table 3-5-2 Actual record of national capital investment to North Sumatra

(1969 to 1972)

(Unit: 10^6RP)

Division	1969		1970		1971		1972		Total	
	No. of object	Amount of investment (RP)	No. of object	Amount of investment (RP)	No. of object	Amount of investment (RP)	No. of object	Amount of investment (RP)	No. of object	Amount of investment (RP)
Industry	4	200	21	2,776	23	6,612	14	9,799	62	19,388
Plantation	5	1,424	17	22,919	4	912	3	4,472	29	29,728
Fisherproduction	1	274	-	-	-				1	274
Tourism			3	2,021	1	57			4	2,069
Health			1	100	-				1	100
Infrastructure			1	189	-				1	189
Forest					2	2,044			2	2,044
Communication & Transportation					1	73			1	73
Total	10	1,898	43	27,997	31	9,699	17	14,271	101	54,591

4. Interview with the Vice Governor of North Sumatra and the Chairman of Development Board for North Sumatra

On March 8th, through the arrangement of Japanese consulate in Medan, we made an interview with the vice governor of North Sumatra state, and then made another interview with Mr. Ir. M. Si Pahutar, the chairman of development board for North Sumatra (sent from the Ministry of Publicworks in Jakarta), on the expansion oroject of Belawan port and overall development plan of North Sumatra.

The vice governor said: North Sumatra is suitable especially for agriculture and forestry because of its earlier development in the era of Dutch rule, and production of rubber, palm oil, tea, cocoa, and other vegitables is quite popular, and these products are gaining the largest amount of foreign currency for Indonesia. On the other hand, the traffic condition in the inland region is inferior, and modern development is still falling behind Java island and others. It is, therefore, he said, important to increase production in future, and at the same to install and enrich the facilities such as installation of small scale plants and factories for maintaining necessities of life of the inhabitant. And, for this reason, he enphasized, the rehabilitation and expansion projects of Belawan port have the vital importance to the development of this area. We agreed with him, and explained that the motive power of the economic development in Japan was mainly due to the port-centered development system, and told him that Japanese government is largely interested in the expansion project of Belawan port. The vice governor strongly requested Japanese cooperation in the project, and promised that the state government will give whole hearted support and assistance to the survey team when it comes to Sumatra.

Following this interview, we made another interview with Mr. Ir. M. Sipahutar and his stuffs. He said that Indonesian government is considering to determine the second five-year plan for economic development that will be inaugulated on April of 1973, and for this purpose a committee is organized, with the leadership of the development board for North Sumatra, comprising civilian persons concerned, men of learning and experience such as university

professors, and governmental officials concerned. The major items in the draft, which is to be completed in April, are roughly as follows:

(1) Large scale establishment of industrial estate

(2) Fundamental improvement and increase of production of palm oil plantation, and

(3) Promotion of tourism

Establishment of the industrial estates in item (1), he said, aims not only at stabilized supply of necessities of life and industries in North Sumatra, but also at exportation of foreign countries as well as shipment to other regions in this country. For this purpose, an industrial site with the area of 800ha is planned at the northern portion between 27 km Medan and Belawan, which are to be connected with the industrial site by bypass highways. It is unnecessary to establish larger scale plants and factories, but those covering wide range of types of industry are more preferable. The master plan will be laid out soon, and foreign participation is expected. The existing small scale factories such as textile mase processing, latex automobile assembly, bicycle, rubber tire, rubber compound, oil, oil stripping, and other factories are all far from sarisfying the demand for the time being and in future.

As for inland traffic condition, the main highway of 800km managed by the country runs through the middle of the North Sumatra, and from this highway circle line road network, shortcircuited, and branched roads are constructed. These roads other than main highway is under the control of the state government. Road arrangement situation of North Sumatra is still insufficient, and in this field, too, foreign aid including Japan is desired. To the arrangement work of the road for about 300km between Medan and Kabarijiert, Japanese aid is almost determined.

North Sumatra presently requires the electricity of 30MW, and in near future 50MW will be necessary. In this sense, the completion of ASAHAN project is earnestly desired.

Water supply is obtained mainly by pumping up the underground water, and present capacity is only 300 liters/sec, and water supply of 900 liters/sec (3,300m^3/h) is now under consideration.

As for present situation of agriculture and forestry in North Sumatra, comparatively large scale state-operated plantations of rubber and palm oil are centered in the northern highland, and small scale private plantations are located in the southern portion. The urgent problem at present is that the plantation of palm oil, which is the second largest foreign money gainer in North Sumatra, has been aged, and the production volume is decreasing, and suitable promotion measures must be employed without delay. (Note: The life of rubber tree is about eight years, and two year old tree begins to produce crude rubber. The life of palm tree is about 25 to 30 years, and 7 to 8 year old tree begins to produce palm oil.)

The average yearly record of export of rubber in North Sumatra is 70,000,000 US dollars, and palm oil is 30,000,000 US dollars, and most part of these are exported through Belawan port. Explanation on state budget and foreign and domestic investment may be omitted here.

Through discussion on the relationship between development of North Sumatra and Belawan port, we found that the chairman and his stuffs have insufficient understanding on this subject. They considered that the industrial area and port can be separately established and managed without any connection between the two. We advised that the industrial area and port have a close relation of interdependence, and the types of industry and their standing points should be selected in relation to the port. And the factories and plants which require large volume of raw material through the port, and those that ship out and export quickly large volume of products through the port should be located adjacent to a port, and factories and plants that may employ road and railway transportation for their raw material and products may be located at a position apart from the port. We emphasized that some types of industry are profitable only after transportation costs are reduced by utilizing the port. The chairman and his stuffs understood this relationship, and when we told them that Japan is planning to dispatch survey team for making up of master plan for Belawan port expansion project (including industrial port project) in relation to North Sumatra development projects, the chairman welcomed wholeheatedly the plan, and said that the committee will assist

such survey team with all its energy. He hoped that such survey team will by all means include not only specialists of engineering of port, but also some specialists of economics.

5. Feasibility of expansion project of Belawan port as industrial and circulation port

5-1 Study on economic aspect

Sumatra island is abundant in agricultural and mineral resources, and most of which are exported to obtain largw amount of foreign currency. North Sumatra district is especially abundant in primary products such as rubber, palm oil, tobacco, coffee, tea, maise, and kasba, and Belawan port which is the shipping port of these products is one of the ports whose amount of exportation is the largest in Indonesia. On the other hand, North Sumatra district which possesses the largest population in the Sumatra island is insufficient in self-supply of foods, and commodities for life and industries must be either shipped in or imported over the sea route.

Indoneais is a country comprising thouthands of islands, and as mentioned in the foregoings, marine transportation has played an important role in circulation of materials and goods since old times. Belawan port has been prosperous from the beginning as a window for material circulation in North Sumatra district, and its importance will rapidly increase as the amount of exportation increases rapidly due to the development of agricultural products and arrangement of supply system. Necessity of industrialization for satisfying domestic demand originated from increased city area around Medan and improvement of the standard of living has been recognized since former times, and some joint-stock enterprises have been established. Since the existing plants are insufficient to satisfying rapidly arising demand, however, construction of industrial port in Belawan harbour and establishment of plants and factories are being planned. Fig. (3)-2 shows the location and arrangement of port facilities, and Table 5-1 is a list of plants to be established. Each industry can utilize the wateredge line for transporting its materials and products, and is able to enjoy advantages of coastal industry. Although

available area for direct hinterland of the port is only 80 to 90ha, but considerable space can be obtained between Belawan port and Medan city. In addition, the state government has a plan to cultivate land of 800ha and to establish industrial plants centered around the basic industry. This area is separated from Belawan port about 10km, and may be considered as a portion of coastal industrial zone.

The area of land suitable for industrial site is quite large, and transportation conditions can be improved by expanding Belawan port. Electricity can be obtained from the water of Toba lake, and a development plan for 600,000KW hydroelectric power plant is now under consideration. In this plan, 400,000KW is for alminium refining, 100,000KW for general use, and remaining 100,000KW for spare. The problem of water supply may also be resolved when water of Toba lake and other river are utilized.

Indonesian economy has already been overcome the period of inflation and stagnation, and along with stabilization in political situations, the economic policy has made steady headway, and begun steady development recently. In addition, needs for arrangement of infrastructure and development are arisen all over the country, and the development of North Sumatra district with abundant primary resources has a larger weight in attaining the five-year project for economic development. Corresponding to the economic development of this area with around the Medan city which is the center of political and economic activities in North Sumatra, requirement for arrangement of Belawan port will necessarily arise quite soon to make up the port as a circulation port as well as industrial port able to lead economic development. Now that the port facilities is already overloaded at present, the port expansion project should soon be established. In this connection, it is estimated that the cargo volume in 1979 will be 4,700,000tons, 2.4 times of that of 1972 year. (Table 5-2)

5-2 Study on technical aspect

As shown in Fig. (3)-2, most realistic expansion project for Belawan port is to construct new quay by digging at the southern portion of the New

harbour. Although this area forms a lower land, and is left without use, it is indespensable for the development of Belawan port as a modern port to construct new port facilities and utilize the hinter land of 80ha as tje cpastal industrial area.

The ground around Belawan is not firm, and according to the existing data, the layer from surface to -15m of depth is of soft muddy clay, and the next layer from -15m to -20m is of sand, and the layer below -20m is also soft muddy clay. Softness of ground may be known from the fact that though the quay of New harbour is of -10.5m, the depth is already reduced to -5.5m due to breakdown of slope surface of the lowland shore line. It is therefore necessary to conduct surveying operation by boring for correct understanding of the soil conditions. Anyhow, it may be necessary to conduct soil improvement work in installation of plants. In installation of port facilities, employment of new technique for improving soft ground may also be necessary. Together with the problem of water depth of the water route in the port, the problem of this soft ground may become one of the largest problems to be solved for development of Belawan port. (The soil data of the end section of this area is shown in Figs. (3)-3, and (3)-4.)

The sea route of 12km from Belawan port to Marakka straight sea route is dredged to a depth of -9m and width of 100m by Dutch aid in 1972 and 1973. Originally, the soil of this sea route is composed of silt which is liable to be burried by floating sand and breakdown of slope, and it is quite difficult to maintain the specified depth of water. And, large amount of dredging has been conducted for several ten years. At present, only ships of 10,000 to 15,000DWT are able to enter the port whose depth is not -8 to -9m (if tide difference is considered, the depth is -9 to -10m. If, in future, the size of ships is enlarged and it becomes necessary to maintain a depth of -10 to 13m, the volume to be dreged will greatly increase, and resultant increase in dredging costs will be tremendous. From these reasons, it may be necessary, together with dredging, to determine fundamental measures to reduce byrrying of the sea route.

5-3 Division of work with the surrounding ports

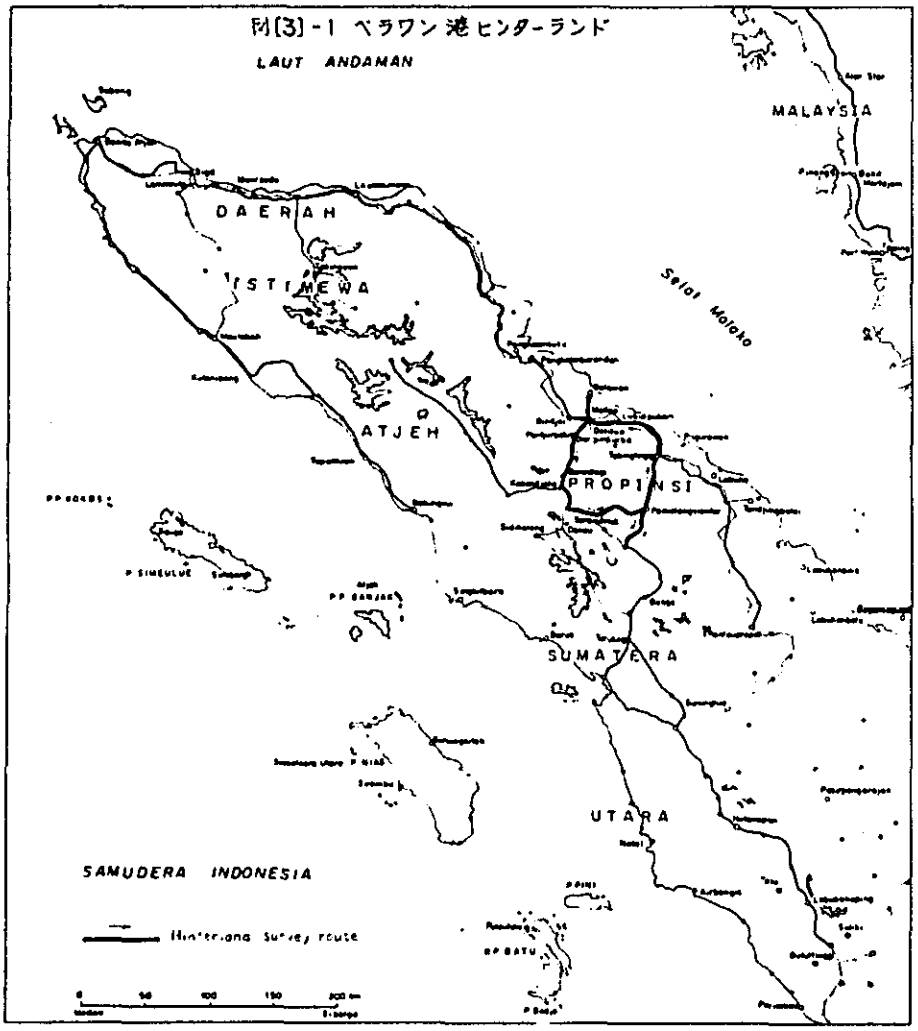
Major ports in North Summatra are Belawan port and Sibolga port in North Summatra, Ullelhue port in Atjeh, and Sabang port in Sabang. Sibolga port is located on the west coast of Sumatra island, 200km apart from Medan, and faces Indian Ocean. Uleelheue port is the outer port of Band Atjeh which is the capital of Atjeh state, and separated from Medan some 450km. Sabang port is the port in an island located at the north end of Sumatra island, and is used as a free port. Since Sabang port is adjacent to Belawan port, Penang port, and Singapore port which are all the international trading ports, importance as a free port is comparatively small. Besides, as it is located in an island, it lacks sufficient population and production capacity for supporting a port, and development potential is small.

Uleelheue port is backed up by only small economic power of Atjeh state, and economic connection between other districts is not so close, therefore, it may not be developed quickly in near future as a trading port, though its hinterland has abundant agricultural and foresty resources. As for the volume of cargo handled in 1969, export is 576 tons, and import is 5,000tons, while domestic shipping is 25,000tons. Major consumer activities and production activities are carried out between Banda Atjeh and Medan, and the cargo has begun to flow into Belawan port after arrangement of road. The port of Uleelheue may be positioned as a domestic trading port.

Sibolga port records 23,000 tons of exportation in 1969, and 18,000 tons in 1970, though uncomparably smaller than Belawan port, it has functions as a trading port. Present volume of domestic trading cargo handled in this port is about three times of foreign trading, and if road be improved in future, the weight as a domestic trading port will be increased, since the distance between Belawan port is comparatively small and use of Belawan port is more economical for foreign trading. From these reasons, the potential of Belawan port as a trading port is overwhelming in North Sumatra district, and therefore, it can be said that

consolidation of the functions of Belawan port will sertainly lead to higher efficiency in economic activities. (Fig.(3)-5)

Fig. (3) - 1 Hinterland of Belawan port



KETERANGAN TANDA' PADA PETA INDONESIA

Djika tidak diterangkan pada peta tanda' itu berarti:

- meréju suar
- gunung
- gunung berapi
- pelabuhan
- lapangan-terbang sipil
- tjandi
- gua
- tembusan
- djalan
- djalan sedang dibuat atau dalam rentjana
- djalan kereta api
- batas propinsi
- batas negara

Djumlah penduduk di-tempat² dengan tanda:

- kurang dari 20.000
- 20.000 – 100.000
- 100.000 – 500.000
- lebih dari 500.000

Nama kota dengan tanda:

- *** ibu kota propinsi / daerah swatantra tingkat I
- ** bekas ibu kota keresidenan
- * ibu kota kotapradja / kabupaten / daerah swatantra tingkat II

skala kira-kira 1 : 3.4 djuta

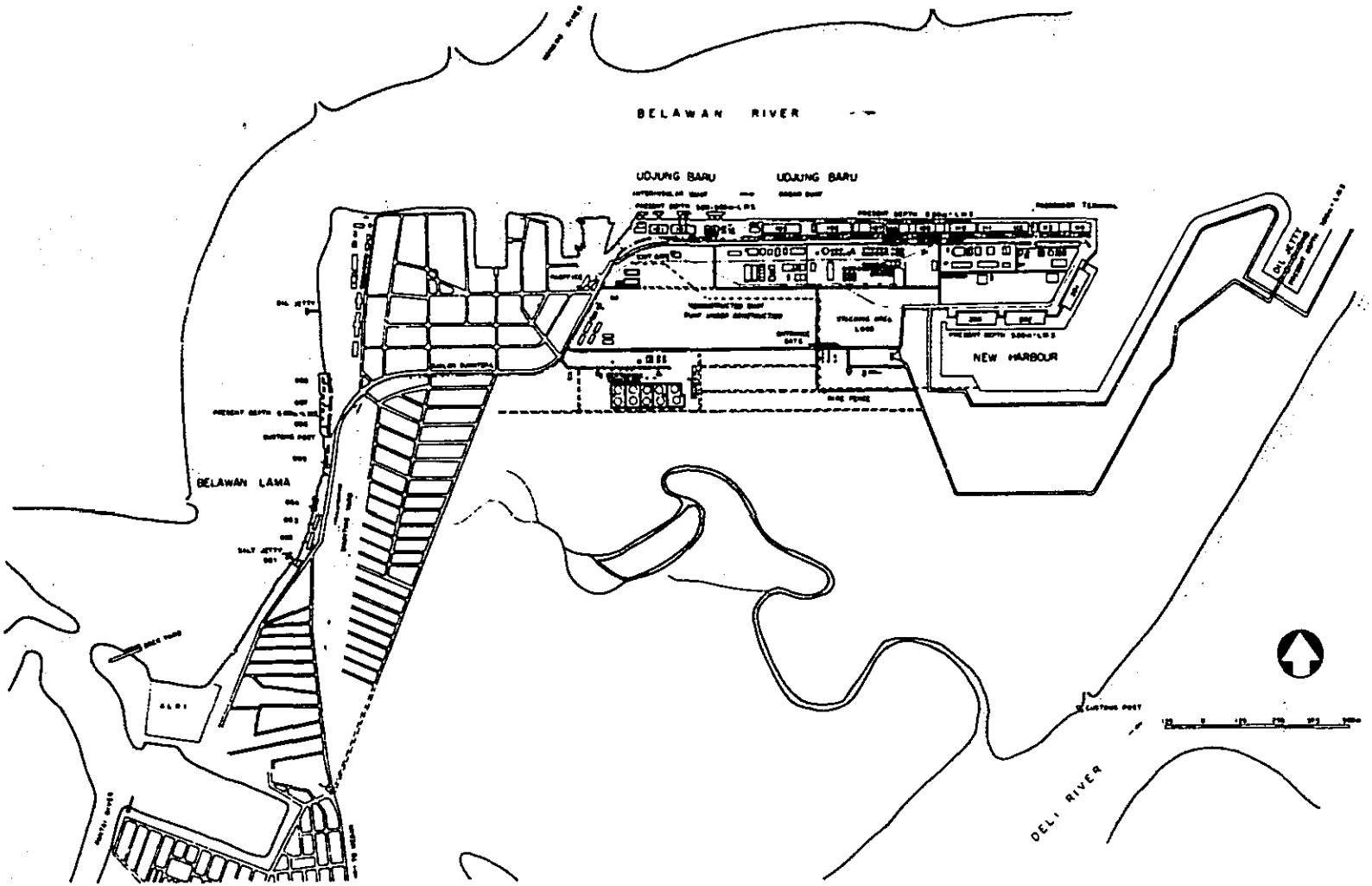


Fig. (3) - 2 Industrial port project for Belawan port

Fig. (3) - 3 Position of boring

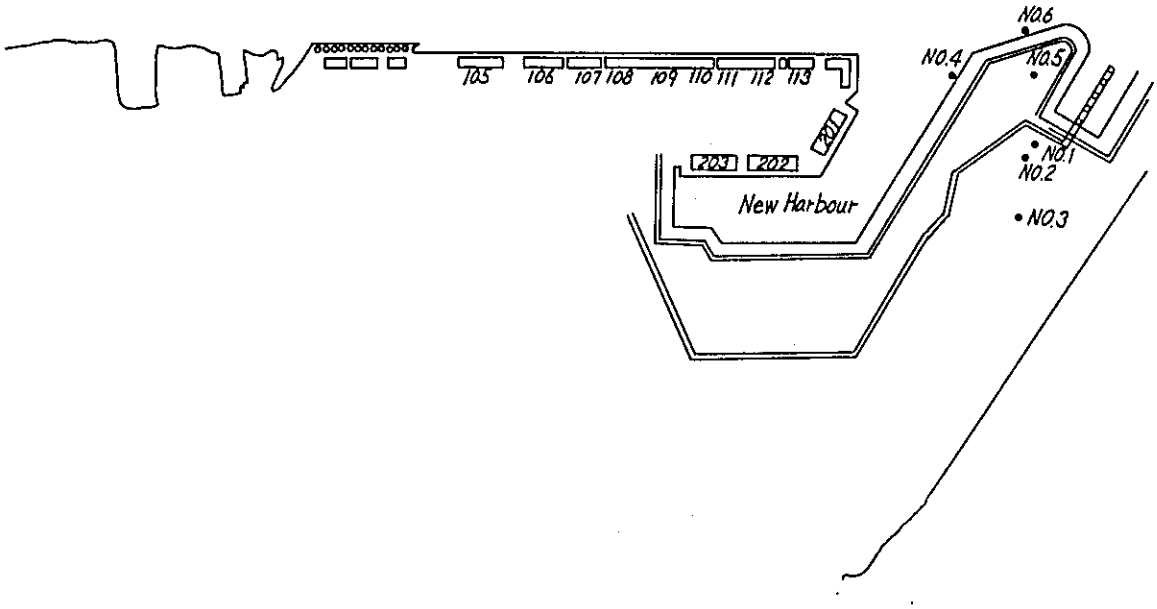


Fig. (3) - 4 Soil layer conditions

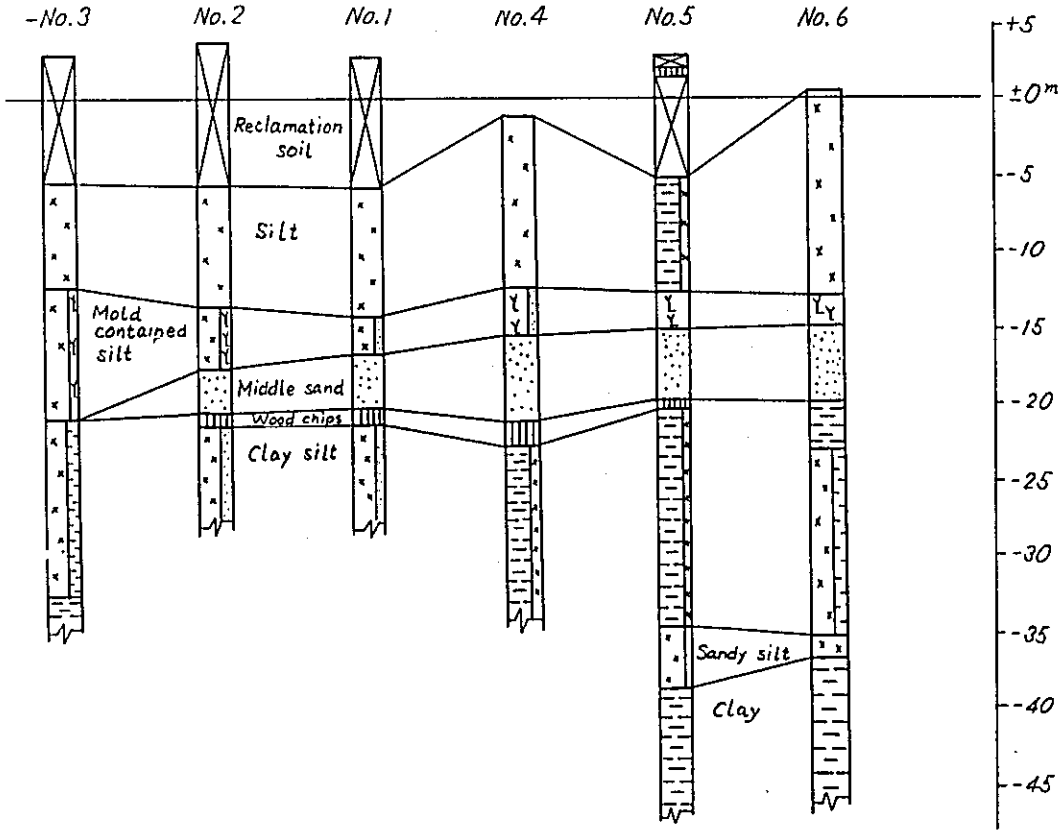


Fig. (3) - 5 Location of Belawan port

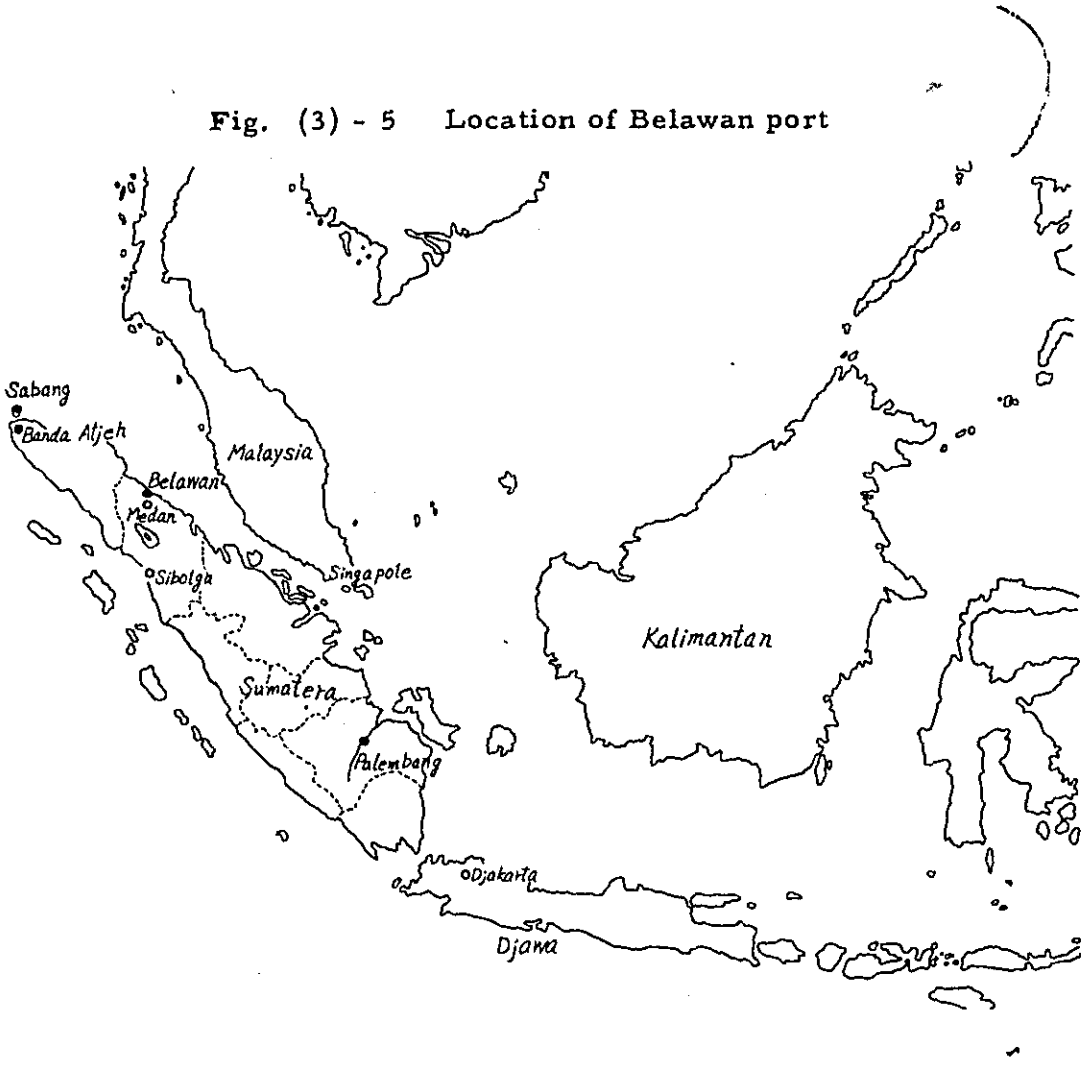


Table 5-1 Industries anticipated in coastal industrial zone

Type	Capacity (t/year)	Remarks
Cement plant	(1) 400,000	
	(2) 240,000	
Wood chip plant	840,000	
Chemical fertilizer plant	150,000 to 200,000	Circulation base for fertilizer imported separately.
Store base of palm oil	500,000	
Miscellaneous	350,000	Stock and distribution bases of metals, tobacco, coffee, and pinapple.

Table 5-2 Estimation on cargo handling volume of port (1979)

Division	Estimated cargo handling volume (ton/year)
1. Present increment in the volume of cargo (including petroleum)	2,000,000
2. Production from coastal plants	
Cement	640,000
Wood chips	840,000
Chemical fertilizer	200,000
Miscellaneous	500,000
Total	4,180,000

6. Conclusion of preliminary survey and recommendations

6-1 Conclusion

As mentioned in the foregoing section of feasibility of expansion project of Belawan port as an industrial and circulation port, the potentiality of North Sumatra in economic development, as viewed from the national standpoint of Indonesia, is extremely high, and especially, possible contribution of Belawan port to the economic development can be estimated highly. To promote positive development of economy in this district, it is necessary to increase production of agricultural products and to export them through Belawan port. It is also necessary, along with increased economic activities of this area, to establish production plants of necessities of life and industry and aosl to establish some basic industries for further improvement of the economy of this district.

Generally speaking, industrial activities depend on cheap and stable supply of electrical power, water, site, labour force, and materials, and on rapid and efficient means of transportation. In this district, requirements other than material are all satisfied, and the problems of transportation may also be satisfied if Belawan port is expanded for efficient shipping and road and railway network of the inland are further improved.

Therefore, for effective promotion of the North Sumatra economic development project, it can be said that expansion of Belawan port as a circulation port is not only indespensable but also the most urgent task to be accomplished. In this case, however, improvement of natural condition, especially soil condition, and maintenance of the depth of water for sea route must be conducted at the same time.

6-2 Recommendations

(1) Economic potential of North Sumatra is extremely high, and promotion of economic development project is urgent, and improvement and expansion of Belawan port are indispensable for this purpose. It is necessary, therefore, to quickly determine the master plans for

construction project of coastal industrial zone centering around Belawan port, and for arrangement and improvement of Belawan port as a circulation port. As Indonesia side is strongly requesting Japanese technical aid in determing these master plans, large scale survey team including specialists of economic development should be dispatched quickly within this year. Indonesian preparation to receive such survey team is already completed.

(2) The above master plans are to be included in the second five-year project for economic development of Indonesia and to be executed immediately. In execurion of these projects, therefore Japan should cooperate consistently from first to end, by offering economic aid with Yen-credit and the like, with a view of assisting from the rehabilitation project of Belawan port to its expansion project. This is also the strong request of the Ministry of Transportation and Communication of Indonesia.

(3) In dispatching survey team, it is necessary, before dispatching the survey team or at the same time of surveying, to conduct sufficient survey of soil conditions in the planned area, since the bearing power of the ground is insufficient and soil conditions are inferior due to the reason that the ground around Belawan comprises deposit layers of rivers.

When examining possibilities of entering of larger vessels than the present ones to Belawan port, sufficient consideration should be made on the relationship with maintaining of depth of water for the sea route outside the port.

(4) After determining the master plans, technical cooperation should be made in each stage of the project making, project execution, and design making, and consistent follow up of the project is important for promotion and realization of these plans.

APPENDIX

1. Rainfall in 1970 at North Sumatra
2. Rainfall in mm for everymonth and year at North Sumatra in 1970

1. Rainfall in 1970 at Nothern Sumatra

No.	Name of the station	The highest rainfall in mm within 24hours, a month of occurence (mm)	The absolute maximum of the rainfall in mm within 24hours with the month and year of occurrence	The average daily Rainfall (mm)
125	Tandem	135− 9	188−12−1907	1831/ 79=23.18
126	Medan Putri	131− 9	253−12−1907	2343/129=18.16
127e	Tandjung Purba	113−12	264− 9−1960	1909/ 72=26.51
127f	Sungai Putih	110− 7	135− 9−1459	2223/119=18.68
127h	Helvetia	95−12	309−11−1956	—
129	Bindjei	80− 9	177− 1−1931	—
129c	Sungai Musum	150−10	210− 1−1969	—
129d	Blankohan	135−12	198−12−1954	3911/145=26.97
130d	Tambuan	135− 1	207− 5−1961	2826/142=19.90
132d	Marijke	117− 6	226−11−1958	3212/111=28.94
133c	Bukit Lawang	113− 1	210− 5−1968	4132/161=25.66
140e	Sungai Birung	132−10	151−10−1959	—
140f	Rambutan	73−11	150−10−1959	—
140g	Bandar Negeri	107−11	147−12−1965	—
142	Lima Puluh	107− 7	138−10−1969	—
142a	Laras	80− 9	210− 1−1938	—
142b	Dolok Ilir	112− 9	200− 2−1951	2228/ 84=26.52
143b	Sidomanik	92−11	173−10−1963	1734/163=10.64
143c	Boh Djambi	145− 9	295− 2−1966	4258/156=27.29
143g	Aeknadua	58− 8	368− 7−1959	1979/130=15.22
143j	Dolok Sinumban	80− 6	183−10−1963	2102/119=17.66
143k	Sungai Mangkei	108− 3	130−10−1953	—
143L	Gunung Baju	93−10	125−12−1965	—
144	Balimbingan	105−10	249− 5−1956	—
144d	Tonduhau	130−10	177− 1−1957	3817/131=29.14
144g	Pagar Djawa	98− 3	180−12−1949	—
144h	Bangan	75−10	130− 9−1949	—
144i	Kasinder	110−11	190−10−1959	—
145	Kisaran	108−10	120−12−1891	1510/ 93=16.24
145a	Tindjauan	100−11	127− 9−1963	—
145b	Sei Dadap	92−11	120− 9−1950	1400/ 95=14.74
145c	Sungai Silan	60− 6	228− 3−1951	1360/ 84=16.19
145d	Bandar Pulan	109− 3	147− 5−1950	2765/109=25.37
146d	Bandar Slamet	105−10	260− 5−1957	2818/118=23.88
147	Hessa	57− 7	176− 1−1931	1822/ 93=19.59
147c	Pulau Maudi	134− 8	152− 5−1966	2261/ 68=33.25
148b	Perlabian	129− 3	140−12−1963	2421/128=18.91
149c	Pernaution	87−12	177−10−1933	2551/142=17.96
149e	Membang Muda	153−10	—	—

2. Rainfall in mm for every month and year at Northern Sumatra (1970)

No	Name of the station	The height of the station in meters (mean sealevel)	Jan	Feb	Apr	Mar	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
			(4)	(2)	(1)	(7)	(6)	(9)	(7)	(7)	(8)	(9)	(11)	(8)	(79)
125	Tandam	14	61	32	20	118	99	215	122	296	349	146	201	172	1831
			(7)	(3)	(5)	(10)	(9)	(5)	(7)	(14)	(16)	(20)	(15)	(18)	(129)
126	Medan Putri	20	95	41	66	171	86	148	63	330	285	391	397	270	2343
			(4)	(1)	(2)	(7)	(5)	(5)	(4)	(9)	(8)	(9)	(9)	(9)	(72)
127e	Tandjung Purba	60	77	10	15	128	56	85	114	300	185	429	253	257	1909
			(9)	(2)	(3)	(12)	(6)	(10)	(10)	(13)	(14)	(16)	(14)	(10)	(119)
127f	Sungai Putih	—	174	14	15	151	49	165	203	314	360	316	262	195	2223
			(5)	(4)	(3)	(7)	(4)	(4)	(4)	(—)	(10)	(12)	(14)	(12)	(—)
127h	Helvetia	—	45	32	14	98	23	55	25	—	166	152	210	309	—
			(2)	(2)	(1)	(4)	(9)	(9)	(8)	(—)	(12)	(17)	(14)	(9)	(—)
129	Bindjei	28	38	20	6	64	158	230	124	—	224	186	195	103	—
			(12)	(9)	(7)	(—)	(12)	(5)	(12)	(10)	(14)	(18)	(16)	(13)	(—)
129c	Sungai Musum	—	143	357	137	—	235	181	274	213	305	749	353	428	—
			(11)	(8)	(4)	(11)	(15)	(9)	(12)	(9)	(19)	(19)	(12)	(16)	(145)
129d	Blankohan	—	222	346	55	205	351	220	333	340	380	625	410	424	3911
			(13)	(9)	(3)	(11)	(9)	(7)	(10)	(7)	(21)	(17)	(22)	(13)	(142)
130d	Tbm bunan	—	296	299	87	145	177	134	159	74	450	360	401	244	2826
			(12)	(10)	(5)	(10)	(6)	(3)	(8)	(4)	(10)	(16)	(15)	(12)	(111)
132d	Marijke	—	403	242	131	203	183	164	230	191	353	393	358	361	3212
			(16)	(11)	(7)	(13)	(21)	(10)	(12)	(11)	(13)	(18)	(15)	(14)	(161)
133c	Bukit Lawang	—	312	426	170	217	381	258	308	188	454	601	372	445	4132
			(4)	(1)	(—)	(6)	(5)	(—)	(4)	(6)	(6)	(8)	(3)	(6)	(—)
140e	Sungai Birung	—	150	15	—	105	93	—	40	194	246	384	92	147	—
			(6)	(3)	(3)	(12)	(7)	(6)	(4)	(13)	(11)	(16)	(11)	(—)	(—)
140f	Rambutan	—	77	61	68	94	42	38	41	149	208	232	158	—	—
			(7)	(—)	(6)	(10)	(7)	(7)	(8)	(9)	(12)	(15)	(15)	(8)	(—)
140g	Bandar Negeri	—	140	—	80	178	111	101	211	121	315	333	386	50	—
			(7)	(2)	(5)	(9)	(—)	(—)	(7)	(11)	(—)	(11)	(10)	(7)	(—)
142	Lima Puluh	—	127	60	137	221	—	—	339	240	—	419	293	168	—
			(8)	(3)	(4)	(8)	(—)	(—)	(—)	(9)	(14)	(—)	(-)	(—)	(—)
142a	Laras	200	149	40	64	149	—	—	—	172	429	—	—	—	—
			(6)	(2)	(3)	(9)	(3)	(9)	(7)	(6)	(9)	(11)	(11)	(8)	(84)
142b	Dolok Ilir	125	67	18	68	161	62	343	163	170	392	250	329	205	2228
			(15)	(13)	(12)	(14)	(10)	(10)	(9)	(9)	(21)	(20)	(19)	(11)	(163)
143b	Sidomanik	1000	156	124	192	269	56	49	100	110	161	210	244	63	1734
			(14)	(3)	(7)	(9)	(10)	(16)	(11)	(19)	(16)	(18)	(20)	(13)	(156)
143c	Boh Djambi	170	351	95	55	192	207	643	426	388	683	499	514	205	4258
			(12)	(7)	(14)	(10)	(13)	(4)	(12)	(10)	(13)	(12)	(14)	(9)	(130)
143g	Aeknadua	1250	198	67	211	145	200	35	146	135	204	219	178	241	179
			(9)	(4)	(2)	(8)	(9)	(10)	(8)	(9)	(16)	(18)	(13)	(13)	(119)
143j	Dolok Sinumboh	—	56	20	14	111	90	205	254	124	379	347	294	208	2102
			(—)	(4)	(6)	(12)	(6)	(7)	(10)	(10)	(12)	(15)	(13)	(10)	(—)
143k	Sungai Mangkei	—	—	34	129	163	81	133	191	111	223	369	221	113	—
			(3)	(—)	(2)	(9)	(—)	(6)	(—)	(5)	(—)	(14)	(6)	(—)	(—)
143l	Gunung Baju	—	25	—	10	213	—	122	—	88	—	459	155	—	—

No	Name of the Station	The height of the station in meters (mean sea level)	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Doc	Total
			(10)	(—)	(—)	(10)	(8)	(—)	(—)	(—)	(14)	(16)	(13)	(8)	(—)
144	Balimbingau	155	225	—	—	167	107	—	—	—	378	472	499	161	—
			(9)	(5)	(6)	(12)	(8)	(11)	(11)	(14)	(11)	(16)	(16)	(12)	(131)
144d	Tonduhau	—	92	74	211	387	193	333	270	254	484	583	545	391	3817
			(7)	(5)	(6)	(11)	(6)	(—)	(9)	(10)	(—)	(—)	(—)	(—)	(—)
144g	Pagar Djawa	250	227	49	228	216	153	—	158	175	—	—	—	—	—
			(11)	(4)	(9)	(7)	(9)	(10)	(11)	(—)	(15)	(19)	(—)	(8)	(—)
144h	Bangun	—	142	110	122	105	175	321	218	—	358	433	—	177	—
			(11)	(8)	(11)	(11)	(6)	(—)	(10)	(10)	(15)	(12)	(14)	(10)	(—)
144i	Kasinder	—	235	430	363	330	293	—	254	265	734	602	975	519	—
			(7)	(3)	(3)	(13)	(9)	(5)	(7)	(5)	(12)	(15)	(9)	(5)	(93)
145	*Kisaran*	*10*	*53*	*16*	*26*	*128*	*96*	*80*	*108*	*91*	*142*	*387*	*266*	*117*	*1510*
			(9)	(4)	(4)	(—)	(—)	(—)	(6)	(7)	(12)	(19)	(11)	(7)	(—)
145a	Tindjauau	13	73	98	85	—	—	—	86	135	252	392	346	95	—
			(7)	(3)	(3)	(13)	(9)	(5)	(7)	(5)	(12)	(15)	(9)	(7)	(95)
145b	Sei Dadap	—	53	16	26	128	96	80	108	91	142	257	266	137	1400
			(5)	(4)	(3)	(11)	(6)	(6)	(5)	(6)	(10)	(12)	(7)	(9)	(84)
145c	Sungai Silau	—	48	19	24	179	89	116	76	47	115	323	115	209	1360
			(9)	(2)	(6)	(11)	(8)	(9)	(9)	(10)	(11)	(13)	(10)	(11)	(109)
145d	Bandar Pulau	—	136	10	178	217	167	308	214	208	358	343	423	203	2765
			(9)	(2)	(6)	(13)	(9)	(6)	(9)	(12)	(11)	(15)	(14)	(12)	(118)
146d	Bandar Slawet	—	207	16	80	352	140	212	229	235	303	433	364	247	2818
			(4)	(2)	(4)	(11)	(6)	(7)	(5)	(5)	(15)	(13)	(10)	(11)	(93)
147	*Hessa*	*20*	*100*	*39*	*74*	*161*	*138*	*174*	*101*	*127*	*260*	*353*	*145*	*150*	*1822*
			(4)	(2)	(4)	(4)	(7)	(6)	(3)	(8)	(6)	(9)	(7)	(8)	(68)
147c	Pulau Mandi	—	190	49	68	73	139	311	56	345	301	392	234	103	2261
			(8)	(5)	(4)	(16)	(12)	(10)	(8)	(8)	(13)	(21)	(15)	(18)	(128)
148b	Perlabian	—	204	61	188	186	160	173	94	78	285	399	344	249	2421
			(15)	(1)	(8)	(11)	(7)	(9)	(9)	(12)	(21)	(20)	(14)	(15)	(142)
149c	Pernantiau	37	155	1	75	110	120	96	159	180	326	543	459	327	2551
			(13)	(8)	(9)	(12)	(13)	(5)	(3)	(8)	(8)	(16)	(—)	(10)	(—)
149e	Membang Muda	—	121	92	97	279	314	281	52	304	163	551	—	218	—

(note)
( ) shows the number of raindays for every month and year.