### 8-5-4 Design of North Breakwater

The North Breakwater is of the same design conditions with the West Breakwater. For the comparison and examination of structural type, therefore, those examined for the West Breakwater were taken up. They are:

Steel pipe pile type,
Rubble mound sloping type, and
Coupled pile with steel sheet pile type.

### 8-5-5 Design of East Groin

For the purpose of preventing intrusion of waves and littoral drift due to east monsoon, the East Groin having an extension of 1,700 m is planned from the shoreline east of the Third Pier to the water area with a depth of about 3 m.

The 900 m section of the total extension from the head will be designed in a way to permit multiple use in future expansion of the port, while the remaining 800 m section will be in a necessary minimum for the prevention of littoral drift.

As a regards the structural type, the 900 m section will be designed with L-blocks having a crown height of +1.8 m upon the rubble mound and bamboo mattresses will be used for keeping the settlement to minimum, while the 800 m section will be designed in a simple structure of R.C. sheet piles driven in a single row for economy of the expense.

## 8-6 Wharf

### 8-6-1 General

The Short Term Development Program includes a -10.0 m foreign trade wharf with 6 berths, of which an extension of 495 m with 3 berths is planed under the Urgent Improvement Program.

The 50 m section between the existing -5.3 m wharf and the new -10.0 m wharf is designed as a transitional part.

The head of the first pier has to be sheathed with a temporary revetment until the wharf is constructed under the Short Term Development Program. Thus, the 60 m section connecting to it is designed as a transitional revetment in the Urgent Improvement Program.

However, the total extension of 3 berths with this 60 m section added measures 555 m (3@ 185 m) and is usable, as the -10 m wharf with 3 berth under the Short Term

Development Program. Thus, the 60 m section will be constructed in a similar structure to that of the -10.0 m wharf.

8-6-2 Design conditions

(1) The vessels to be accommodated are 10,000 D.W.T. class under the Urgent Improvement Program but of 15,000 D.W.T. under the Short Term Development Program.

Thus, the wharf is designed, from the beginning, for 15,000 D.W.T. vessels of the following dimensions:

| | |
|---|---|
| Length: | 165 m |
| Breadth: | 21.6 m |
| Depth: | 13.0 m, |
| Full-load draft: | 9.5 m and |
| Approaching velocity: | v = 15 cm/sec. |

(2) Design seismic coefficients are:

Horizontal coefficient Kh = 0.07, and
Vertical coefficient Kv = 0.

(3) Surcharge is separated for in normal condition and in an earthquake.

| | Normal | in an earthquake |
|---|---|---|
| Main structure of quay wall | | |
| uniform load | $q = 3.0\ t/m^2$ | $q' = 1.5\ t/m^2$ |
| Concentrated load | T-20 | |

(4) As form conditions,

| | |
|---|---|
| Wharf crown height: | + 2.20 m, and |
| Apron width: | 25.0 m |

(5) Soil conditions

1) Shearing strength of the cohesive soil of the existing ground is:
± 0.00 ~ -22.0 m, $Cu = 0.6\ t/m^2 + 0.14Z$ (Base ± 0.00),
Weight of unit volume in water, $\gamma_1 = 0.53\ t/m^2$.

2) For adhesion,
-10.0 m ~ -22.0 m $\bar{Ca} = 2.84\ t/m^2$,

| | |
|---|---|
| -22.0 m ~ -30.0 m | $\overline{Ca}$ = 5.92 t/m², |
| Deeper than -30.0 m | Cp = 8.0 t/m². |

(6) Design conditions of Transit Shed and Open Storage Area

1) Transit Shed

a) Floor load

| | |
|---|---|
| Normal condition | Average q = 2.0 t/m² is used as Uniform load for whole floor area of Transit Shed.<br>q = 3.0 t/m² is used as load in designing beams and girders. |
| In an earthquake | Average q' = 1.0 t/m² is used as Uniform load for whole floor.<br>q' = 1.5 t/m² is used as load in designing beams and girders. |

b) Dead load of shed

Same in both cases of normal time and earthquake at q = q' = 0.3 t/m².

2) Open Storage Area

The same surcharge as for the transit shed is assumed for the proposed open storage area 20.5 m wide immediately behind the relieving platform. The surcharge is uniformly distributed loads of q = 2.0 t/m² under normal conditions and q' = 1.0 t/m² at times of earthquake. Uniformly distributed loads of q = 1.5 t/m² ~ q = 2.0 t/m² are considered for the remaining part of the open storage area which is 69.5 m wide.

8-6-3 Proposal for the type of wharf

As described in the foregoing, the soil at the proposed site is considerably soft with Cu = 0.6 t/m² + 0.14Z to about -22.0 m, but it turns to a stiff cohesive soil beyond -22.0 m. At about -30.0 m, the cohesion Cu is about 8.0 t/m². The soil being soft in the layer from the surface to about -22.0 m, the wharf has to be designed in a structure capable of withstanding the circular failure.

As alternative types for such soft foundation, the following may be considered:

1) Gravity type with foundation improvement,
2) Steel sheet pile type or relieving platform type with foundation improvement, and

3) Relieving platform type wharf without foundation improvement.

However, the foundation improvement necessary for alternatives 1) and 2) above involves difficulties in (1) that the work will be of a large scale, (2) that a high level of accuracy is required of the work and (3) that an appropriate combination of materials is hardly possible so that full effect of improvement cannot be expected. Thus, the types requiring the foundation improvement were excluded from the final proposal.

Consequently, it was decided to employ the Relieving Platform Type supported by piles with the face of slope immediately below the wharf graded at 1:2 to withstand the circular failure and with no additional load (reclamation fill) on the original ground.

The transit sheds must be located at points 25.0 m immediately behind the wharves. All the external force acting on the sheds will be supported by the pile foundation.

The wharf was thus designed in a structure of relieving platform type with supporting piles as illustrated in Fig. 8-6, Fig. 8-7 and A-8. For the piles, two plans of steel pipe pile and prestressed concrete pile were prepared for comparison.

The comparison has disclosed that the prestressed concrete pile would not always be advantageous over the steel pipe pile because of the difficulties in handling, transport and driving due to its weight, trouble of treating the pile head and further in the aspect of economy.

The type selected for -10 m wharf is as shown in Fig. 8-6, Fig. 8-7.

An open storage area, 90 m wide by 150 m long, is planned for the space behind Berth III.

No problem is foreseeable if the proposed open storage area is to be used in a nomal way. However if it is planned to store substantial loads in the open storage area immediately behind the relieving platform, then some special works, such as, for example. a retaining wall or pile foundation, will have to be executed in that area.

Fig. 8-8 gives a standard cross section of the open storage area.

## 8-7 Maintenance Dredging and the Facilities for Navigation Aids

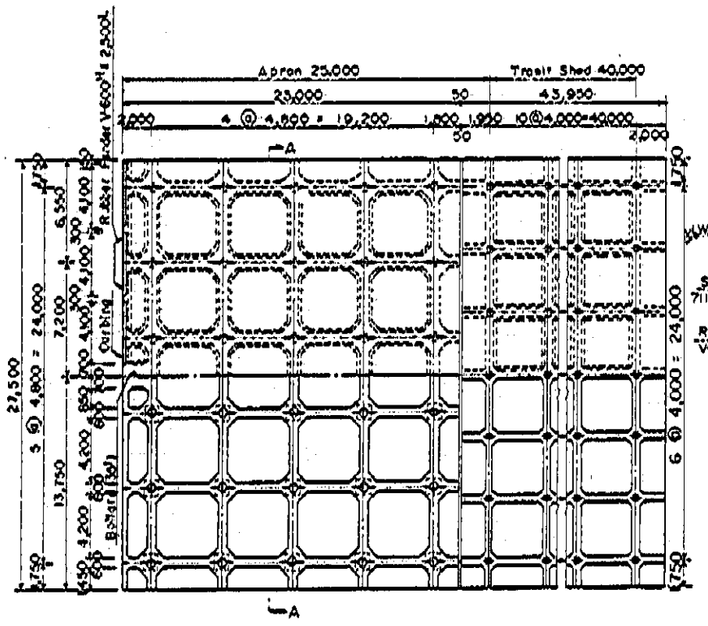
### 8-7-1 Maintenance Dreging

The channel made by dreging in the port of Semarang is 4 km long in total, and considered to be longer than usual channels. The area around this channel is shallow, and it

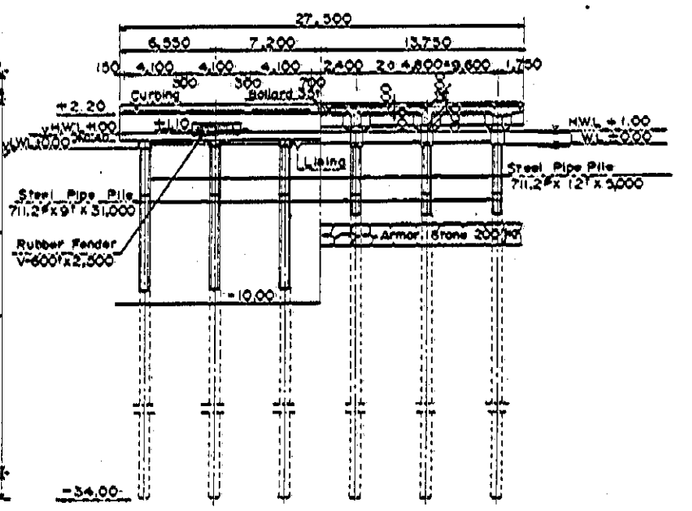
# Fig 8-6. -10.0m WHARF WITH TRANSIT SHED

( STEEL PIPE PILE )

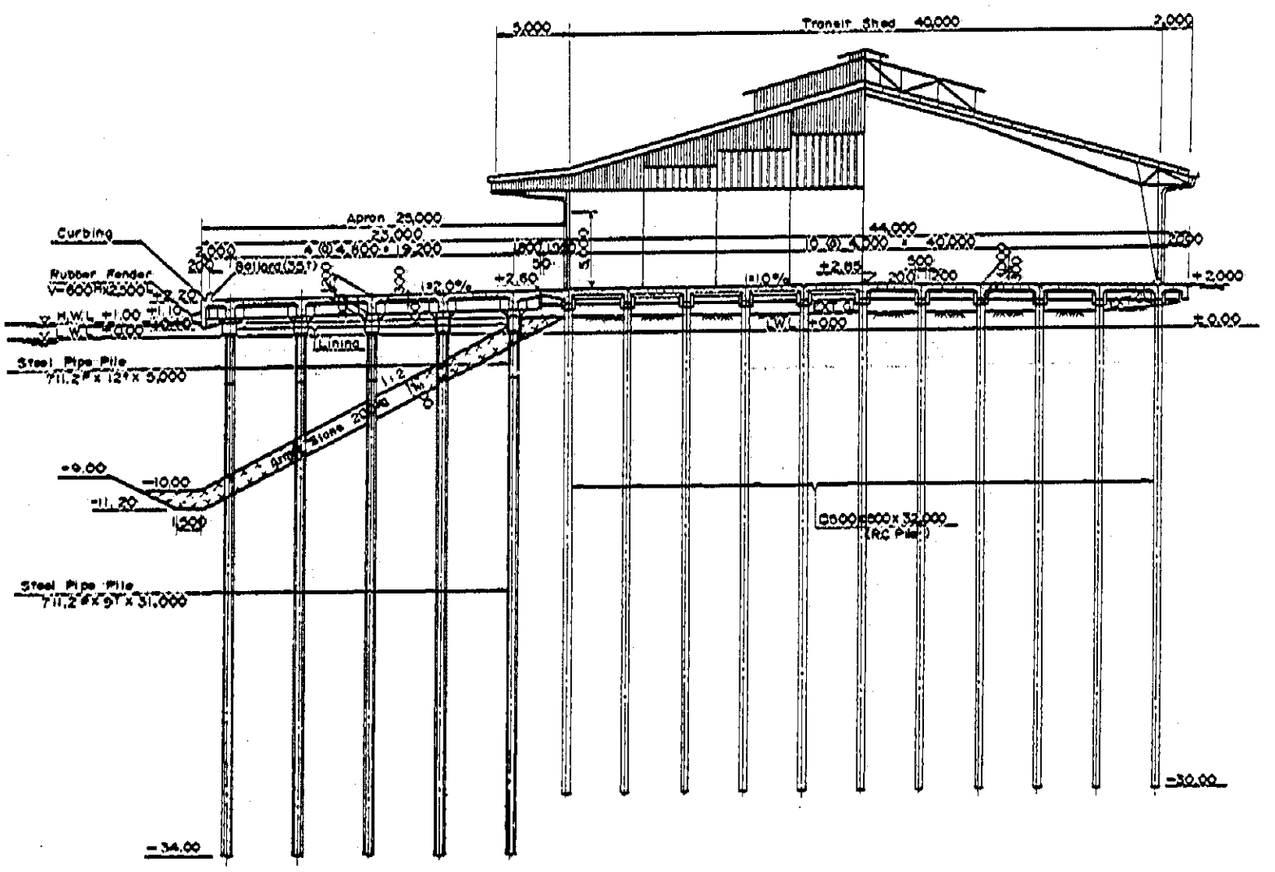
TYPICAL PLAN




FRONT VIEW SECTION A—A

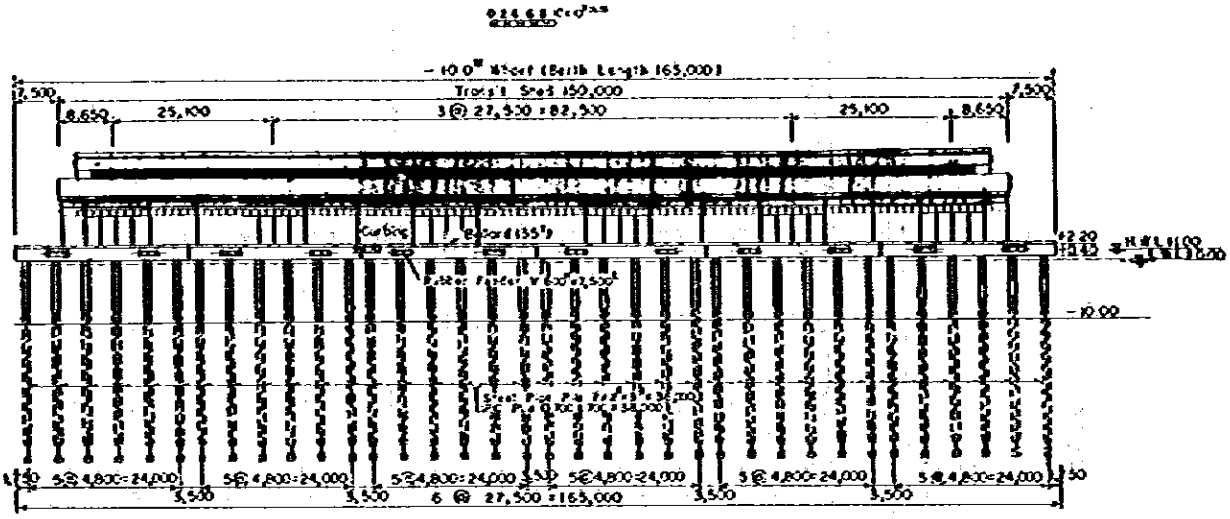



TYPICAL SECTION

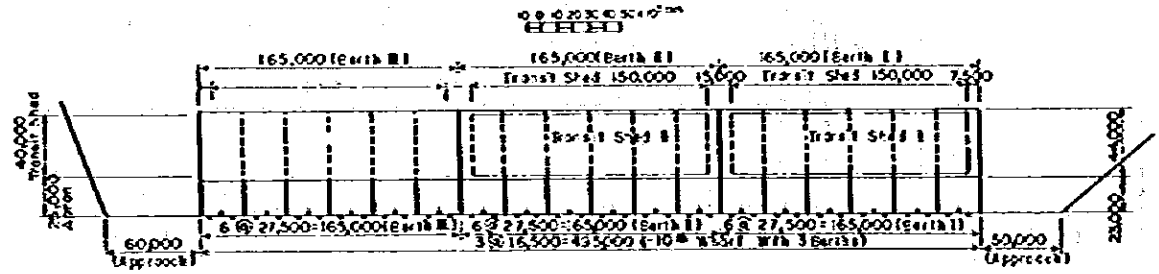


# Fig 8-7. -10.0[m] WHARF WITH TRANSIT SHED

## FRONT VIEW




## LAYOUT OF WHARF




## BERTH PLAN

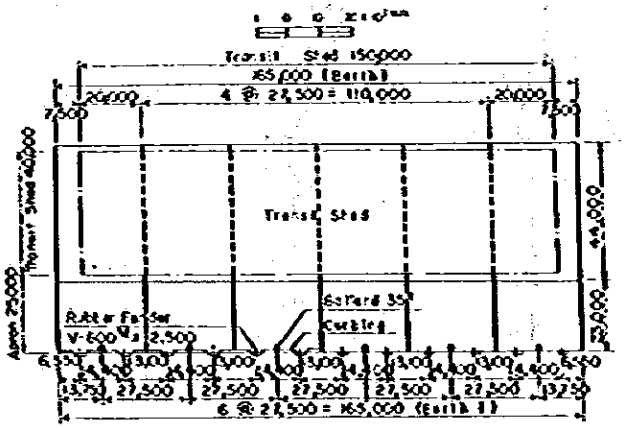
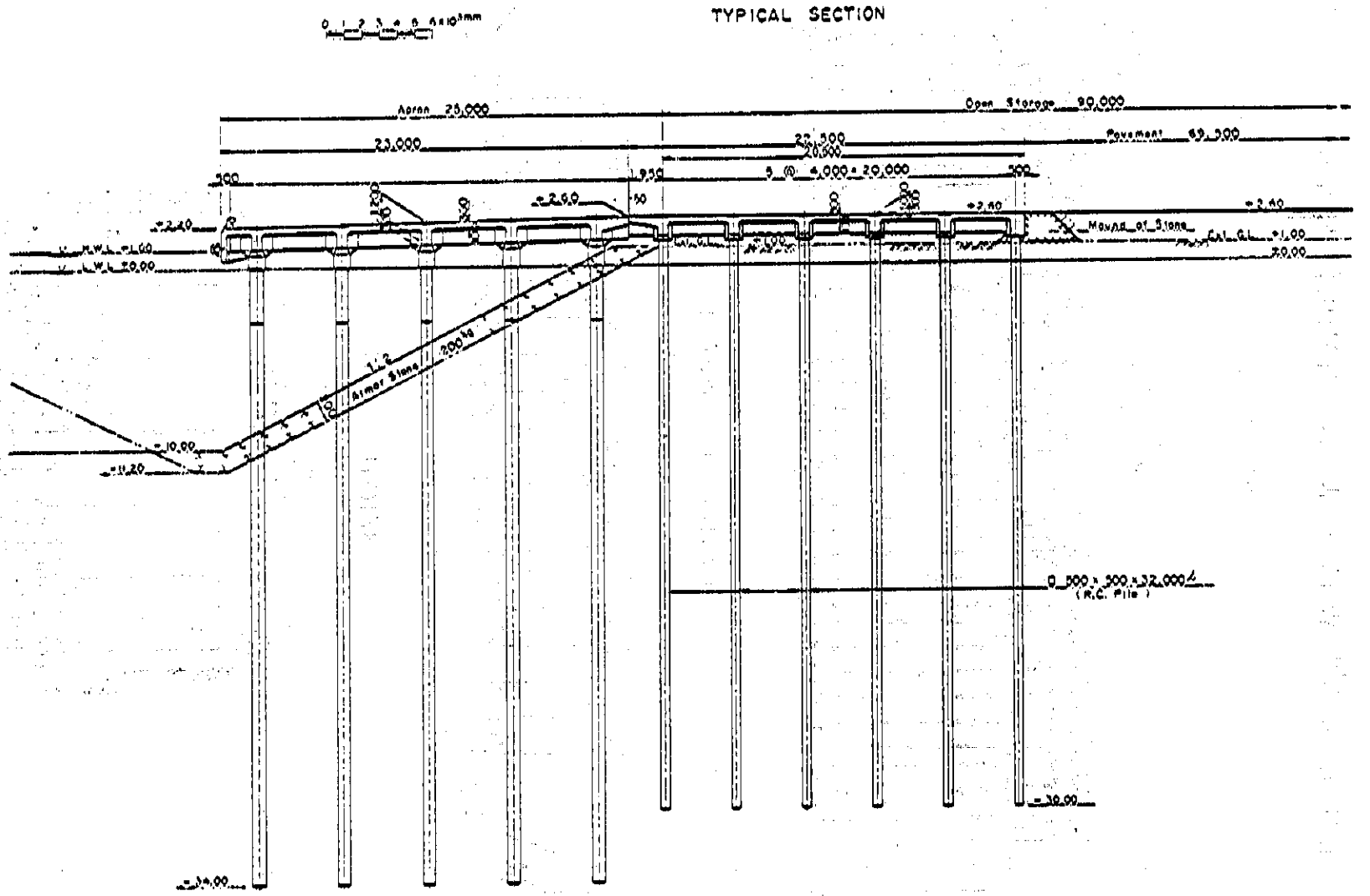


Fig. 8-8 – 10.0m WHARF WITH OPEN STORAGE



is always apprehended that the siltation easily occurs. The possible siltation in the channel means not only the blockade of the channel but also the functional paralysis of the whole port.

In order to prevent the threat of siltation, West and East Breakwater against the monsoon wave and tide that bring in siltation, are introduced in the Master Plan.

In planning the breakwater extension, it was made to cover 60% of the total length of the channel, considering the balance of construction cost and expense for maintainance dreding.

As the result, as indicated in 7-4, total siltation of 780-thousand $m^3$/year, 70% of which in the channel and 30% in the anchorage, was taken into consideration in the Short Term Development Program.

### 8-7-2 Facilities for Navigation Aids

Considering the 4 km long channel, low elevation of the top protecting structure of the breakwater and the limited dredging area (only anchorage area in the Short Term Development Program), we naturally obliged to think of facilities for navigation aids, in order to keep safety in the port.

As listed below, the navigation aids of most simple, easy to maintain, and most noticeable type are selected. The layout is shown in Fig. 8-9.

| | |
|---|---|
| Lighting Tower | 1 set |
| Light Beacon | 4 |
| Leading Buoy | 8 |
| Side Marker Buoy | 5 |
| Outer Marker | 2 |

The cost saving is designed by considering the efficient use of navigation aids in the Urgent Improvement Program to the same purpose in the Short Term Development Program as well.

## 8-8 Construction Work Schedule

Construction period of this plan is four years as shown in Fig. 8-10.

Fig. 8-9 Plan of Navigation Aid for Urgent Improvement Program

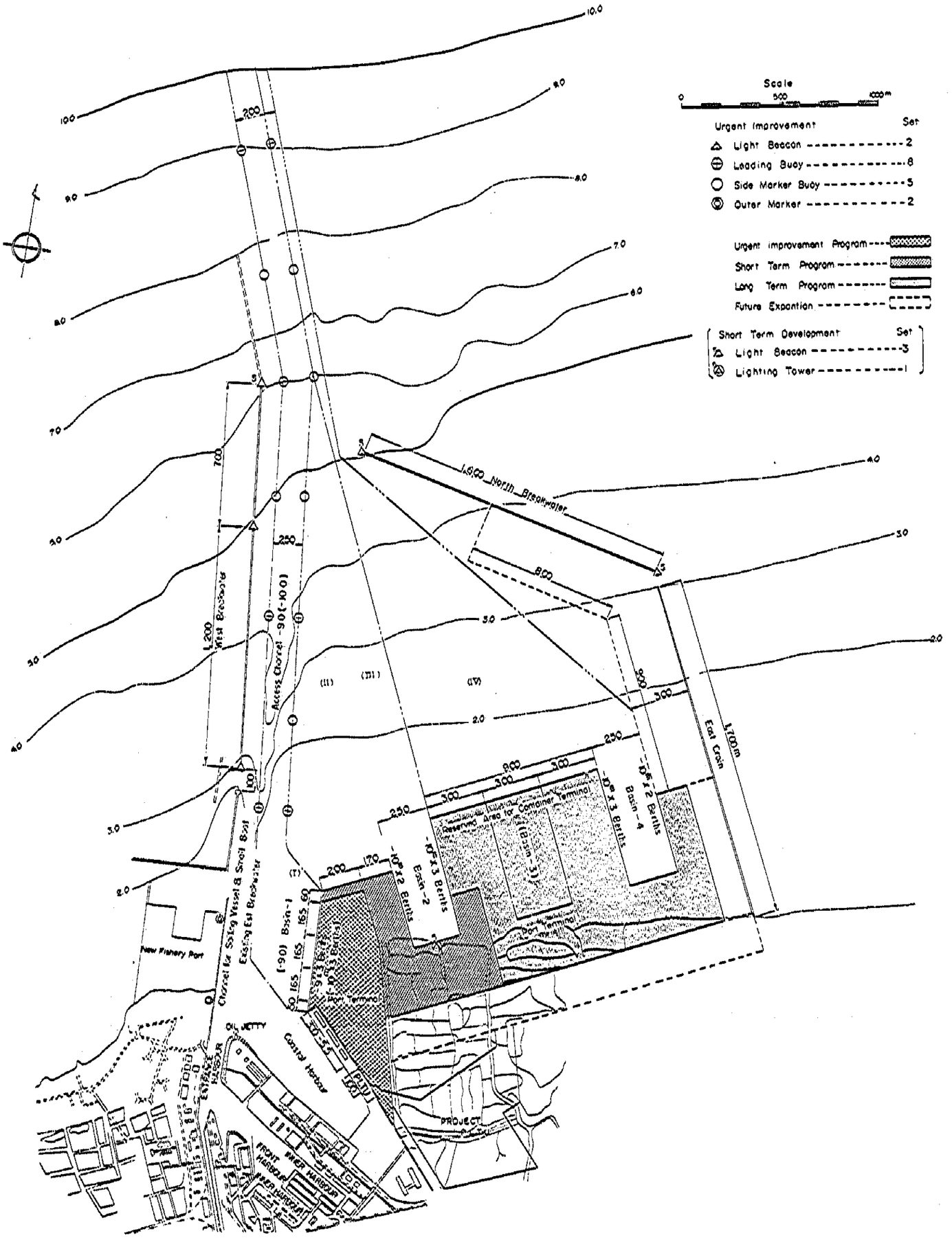
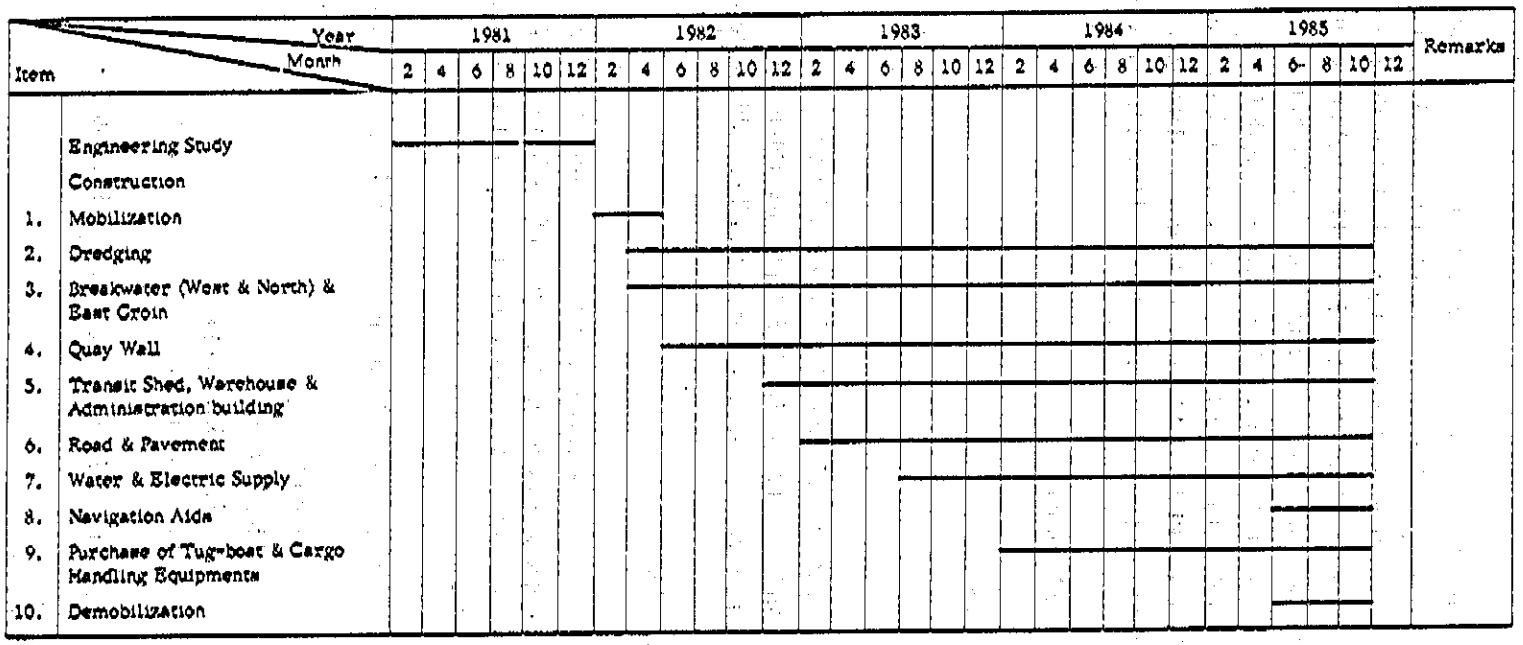


Fig. 8-10 Construction Schedule for Short Term Development Program




Note: 1) The construction of Breakwater and East Groin at PLAN A-1 will be executed in Urgent Improvement Program, and at PLAN A-2, the construction is assumed to be executed in Short Term Development Program as shown above.

## 8-9 Urgent Improvement Program

### 8-9-1 Planned Scale of Program

The objective of this Urgent Improvement Program is to provide cargo handling facilities to service vessels so that about 63% (440 thousand tons) of the projected 690 thousand tons of foreign trade in 1980 can be handled. For this purpose, three new berths for 10,000 D.W.T class vessels as shown in Fig. 8-11 should be considered in the plan. A water depth of -9 m will be sufficient for thse new berths, but due to the extremely poor sub-soil condition, a wharf structure of -10 m berthing depth has been envisaged. Based on the master plan provided, there are three alternative plan described, "A", "B" and "C". However, discussions of PLAN "A" only will be considered since there is not much difference among the three plans when referred to the Urgent Improvement Program.

### 8-9-2 Facilities to be Improved

#### (1) Harbour Facilities

1) Access Channel

The alignment of the approximately 4 km long access channel is as indicated in Figs. 7-3 and 7-4. The width and depth are 150 m and -9 m respectively. The volume to be dredged is approximately 5 million cubic meters.

2) Navigation Aids

Much as the much access channel will be almost 4 km long, and not much reference objects are visible, installation of navigation aids such as light beacons, leading buoys and marker buoys will be required to aid the safe navigation of vessels calling.

The number of navigation aid facilities required are as follows:

2-light beacons
8-leading buoys
5-side marker buoys
2-outer markers

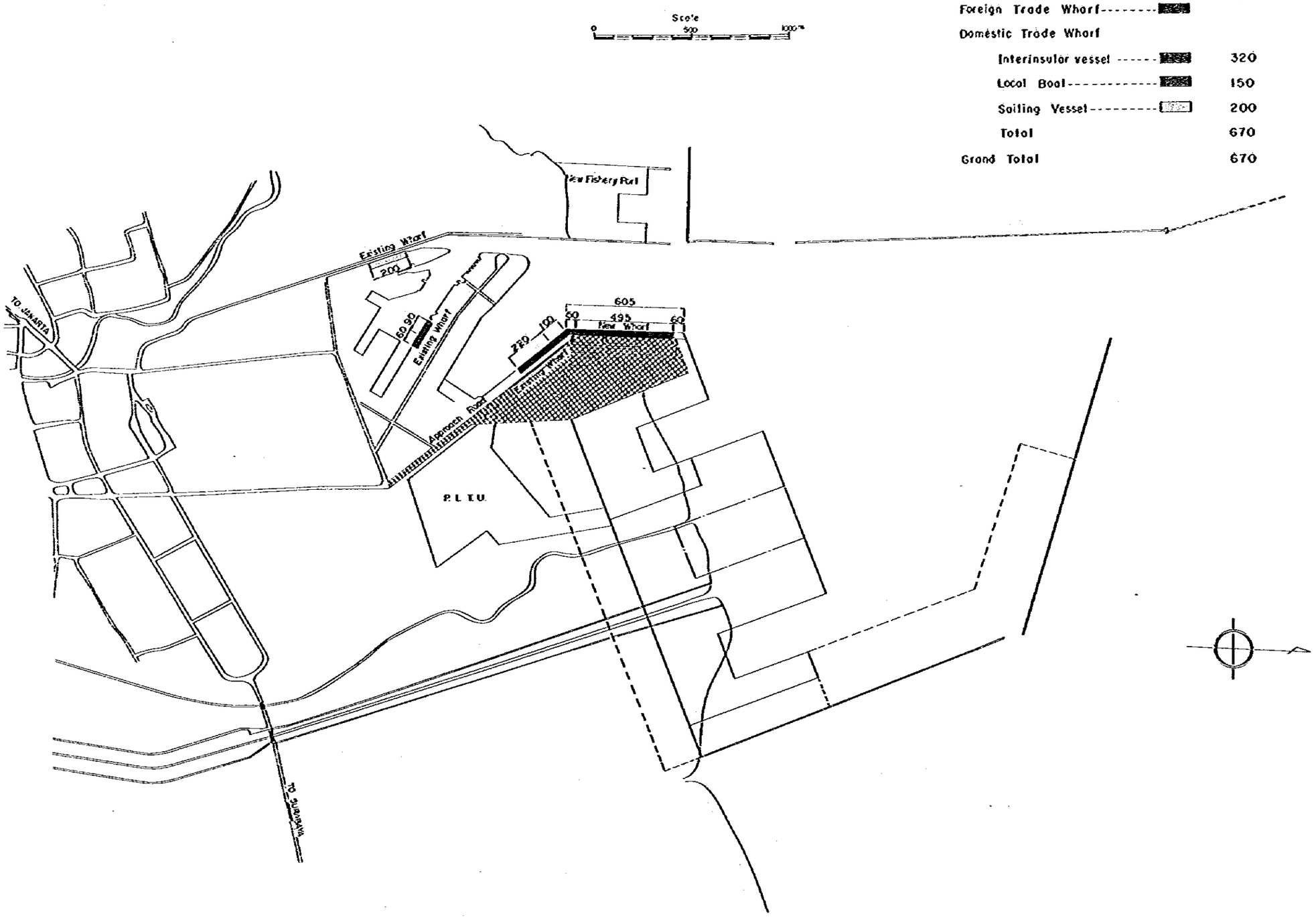
The locations of these facilities are shown in Fig. 8-9.

#### (2) Breakwaters and Groin

As shown in Figs. 7-3 and 7-4, in order to prevent the intrusion of invading waves and

Fig. 8-11 Wharf Plan of Urgent Improvement Program

| | Wharf Length(m) Existing Wharf | New Wharf |
|---|---|---|
| Foreign Trade Wharf | | 545 |
| Domestic Trade Wharf | | |
| Interinsular vessel | 320 | |
| Local Boat | 150 | |
| Sailing Vessel | 200 | |
| Total | 670 | |
| Grand Total | 670 | 545 |



currents and to reduce the siltation in the access channel and basin to a minimum, construction of the 1,900 m long West Breakwater, 1,600 m long North Breakwater and 1,700 m long East Groin are required. Considering, however the investment schedule, an alternative has been planned. This alternate deals PLAN-2 with the construction of a section of the West Breakwater, about 1,250 m in length during the Urgent Improvement Program and the construction of the North Breakwater and East Groin during the Short Term Development Program. The distance between the existing breakwater and the West Breakwater would be 100 m and this water area will be used as an approach entrance for small vessels. A 50 m long groin to be constructed at an oblique position from the West Breakwater is required to reduce the siltation in the access channel.

(3) Wharf Facilities

1) Wharf

A 25 m wide by 495 m long wharf of -10 m berthing depth will be constructed. Connection of this wharf to the existing 320 m long Coaster Harbour of -5.3 m berthing depth will be made by a 50 m long with pile supported approach. A temporary revetment of 150 m in length will be constructed normal to the head of the wharf and extension of the wharf by 60 m will be made to link the revetment to the wharf.

As for the usage plan, the wharf under study in the Urgent Improvement Program requires only a -9 m berthing depth. However, due to the poor sub-soil condition, a wharf structure of -10 m berthing depth has been envisaged.

2) Transit Sheds and Buildings

Two 150 m x 40 m transit sheds and one warehouse will be constructed behind the wharf. Approximately 700 $m^2$ of foreign trade wharf administration buildings and custom office are planned in the site.

3) Road and Open Storage Yard

Road and open storage yard are arranged as shown in Fig. 8-2 and a 25 m wide dock road and a 15 m wide branch roads are envisaged. Approximately 14,000 $m^2$ of open storage will be provided at the front end of the wharf.

4) Utilities

A water supply line and distribution system will be provided. The source of water

will be from deep wells to be located within the vicinity of the site as illustrated in Fig. 8-2. The source of electric power will be either from the existing electric power source in the port or from P.L.T.U. presently under construction. Bunkering oil is considered to be directly supplied from bunker barges to each vessel requring fuel oil.

5) Port Service Vessels

The number of the port service vessels required are as follows;

| | | |
|---|---|---|
| Tug Boat (800, 600 ps) | ..... | 2 vessels |
| Pilot Boat (100, 50 G.T.) | ..... | 2 " |
| Motor Boat | ..... | 1 vessel |

### 8-9-3 Construction Work Schedule

Construction period of this plan is two years as indicated in Fig. 8-12.

### 8-9-4 Construction Costs

#### (1) Condition of Cost Estimation

The estimations made herein are based on the following assumptions:

1) Exchange rate: U.S.$1.0 = Rp. 415 = ¥240.

2) The estimations are based on the costs of labour and materials as of August 1977. Allowance for future inflation were included.

3) All estimation does not include any import duties, tax and the like.

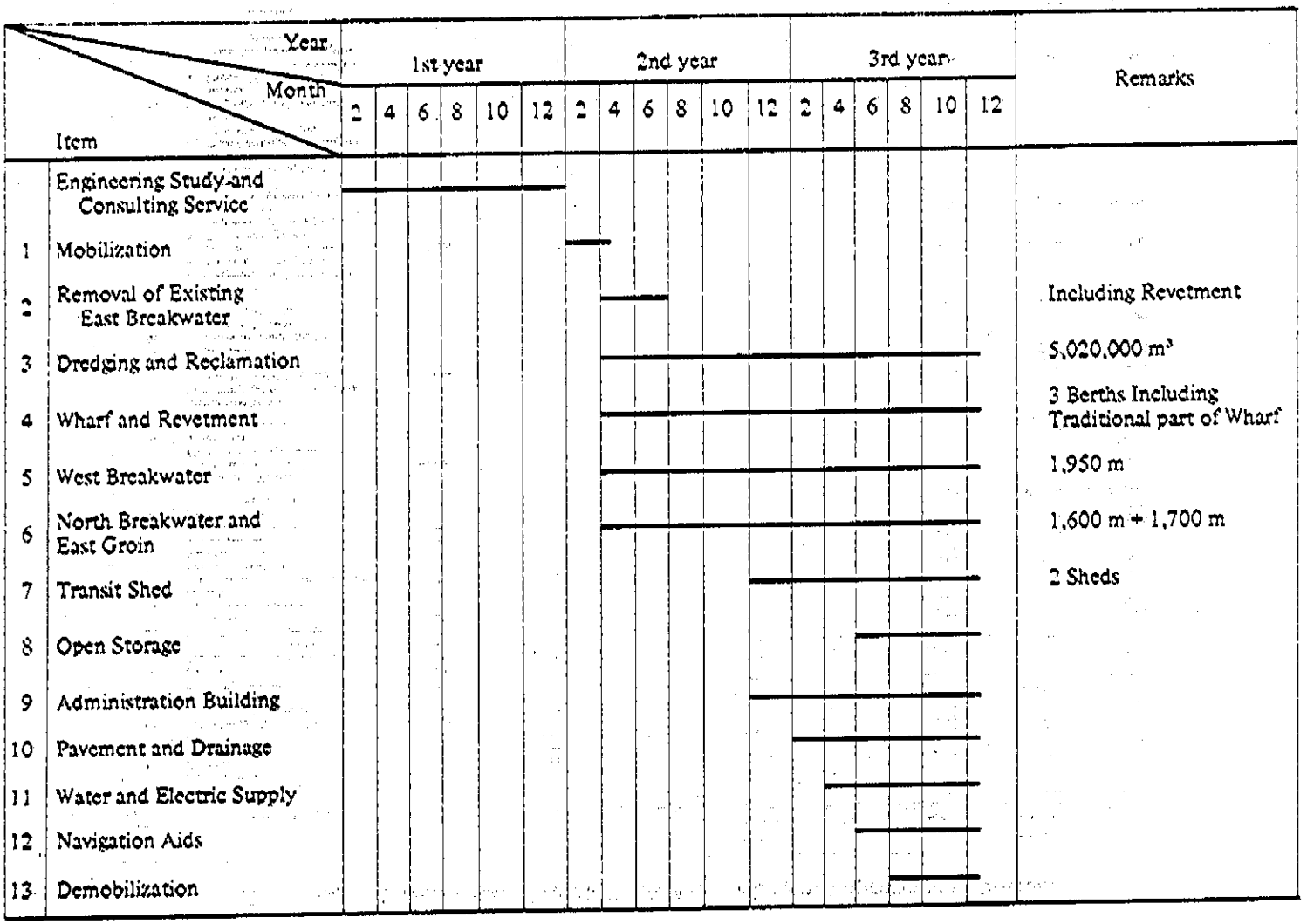
4) Local currency component included sales tax of 5 percent is included.

5) Construction cost of warehouse is included in the related project cost (see attached Chapter - 9).

#### (2) Construction Costs

Construction costs estimates are compiled in Table 8-3 and 8-4.

Fig. 8-12 Construction Schedule for Urgent Improvement Program



# Table 8-3 Construction Cost of PLAN A-1 for Urgent Improvement Program

| ITEM NO. | DESCRIPTION | UNIT | QUANTITY | RATE | | | AMOUNT | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | LOCAL CURRENCY U.S.$ | FOREIGN CURRENCY U.S.$ | TOTAL RATE U.S.$ | LOCAL CURRENCY U.S.$1,000 | FOREIGN CURRENCY U.S.$1,000 | TOTAL RATE U.S.$1,000 |
| 1. | Port Facilities | | | | | | | | |
| 1) | Dredging | m³ | 5,020,000 | 0.3 | 1.6 | 1.9 | 1,506 | 8,032 | 9,538 |
| 2) | Reclamation | " | 460,000 | 0.1 | 0.5 | 0.6 | 46 | 230 | 276 |
| 3) | -10 m Wharf | m | 495 | 4,900 | 7,600 | 12,500 | 2,426 | 3,762 | 6,188 |
| 4) | Transitional Part of Wharf | Sum | 1 | | | | 479 | 791 | 1,270 |
| 5) | Temporary Revetment | m | 150 | 410 | 2,140 | 2,550 | 62 | 321 | 383 |
| 6) | West Breakwater | " | 1,950 | 1,300 | 6,000 | 7,300 | 2,535 | 11,700 | 14,235 |
| 7) | North Breakwater | " | 1,600 | 1,300 | 6,000 | 7,300 | 2,080 | 9,600 | 11,680 |
| 8) | Flat Grain | Sum | 1 | | | | 1,385 | 737 | 2,122 |
| 9) | Transit Shed (Foundation) | m | 335 | 7,000 | 3,900 | 10,900 | 2,345 | 1,307 | 3,652 |
| 10) | " (Superstructure) | m² | 12,000 | 70 | 130 | 200 | 840 | 1,560 | 2,400 |
| 11) | Open Storage (Including Foundation) | Sum | 1 | | | | 872 | 371 | 1,243 |
| 12) | Pavement & Drainage | " | 1 | | | | 812 | - | 812 |
| 13) | Building | " | 1 | | | | 267 | - | 267 |
| 14) | Water Supply (Including Hydrant) | " | 1 | | | | 310 | 56 | 366 |
| 15) | Electric Power Supply | " | 1 | | | | 113 | 313 | 426 |
| 16) | Navigation Aids | " | 1 | | | | 35 | 307 | 342 |
| 17) | Miscellaneous | " | 1 | | | | 483 | 228 | 711 |
| 18) | Mobilize/Demobilize | " | 1 | | | | 385 | 935 | 1,320 |
| 19) | Sales Tax (5%) | | | | | | 849 | - | 849 |
| | Subtotal | | | | | | 17,830 | 40,250 | 58,080 |
| 2. | Port Service Vessels | | | | | | | | |
| 1) | Tug Boat (400,600 PS) | Vessel | 2 | | | | - | 1,650 | 1,650 |
| 2) | Pilot Boat (100,50 ton) | " | 2 | | | | - | 1,320 | 1,320 |
| 3) | Motor Boat | " | 1 | | | | - | 50 | 50 |
| | Subtotal | | | | | | - | 3,020 | 3,020 |
| 3. | Consulting Service | | | | | | | | |
| 1) | Soil Investigation, Topographic and Hydrographic Survey | Sum | 1 | | | | 200 | 280 | 480 |
| 2) | Engineering Study | " | 1 | | | | 170 | 1,230 | 1,400 |
| 3) | Supervision | " | 1 | | | | 130 | 1,070 | 1,200 |
| 4) | Engineering Study for Port Service Vessels | " | 1 | | | | - | 90 | 90 |
| | Subtotal | | | | | | 500 | 2,670 | 3,170 |
| 4. | Contingency | | | | | | | | |
| 1) | Contingency for Port Facilities | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 1.) | Sum | 1 | | | | 2,670 | 6,030 | 8,700 |
| | b. Price Contingency (Approx. 15% of above 1. plus a-1)=a.) | " | 1 | | | | 3,070 | 6,940 | 10,010 |
| 2) | Contingency for Port Service Vessels | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 2.) | " | 1 | | | | - | 450 | 450 |
| | b. Price Contingency (Approx. 15% of above 2. plus a-2)=a.) | " | 1 | | | | - | 520 | 520 |
| 3) | Contingency for Consulting Service | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 3.) | " | 1 | | | | 70 | 400 | 470 |
| | b. Price Contingency (Approx. 15% of above 3. plus a-3)=a.) | " | 1 | | | | 80 | 460 | 540 |
| | Subtotal | | | | | | 5,890 | 14,800 | 20,690 |
| | TOTAL | | | | | | 24,220 (28.5%) | 60,740 (71.5%) | 84,960 (100%) |

## Table 8-4 Construction Cost of PLAN A-2 for Urgent Improvement Program

| ITEM NO. | DESCRIPTION | UNIT | QUANTITY | RATE | | | AMOUNT | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | LOCAL CURRENCY U.S.$ | FOREIGN CURRENCY U.S.$ | TOTAL RATE U.S.$ | LOCAL CURRENCY U.S.$1,000 | FOREIGN CURRENCY U.S.$1,000 | TOTAL RATE U.S.$1,000 |
| 1. | Port Facilities | | | | | | | | |
| 1) | Dredging | m³ | 5,020,000 | 0.3 | 1.6 | 1.9 | 1,506 | 8,032 | 9,538 |
| 2) | Reclamation (Grading) | " | 460,000 | 0.1 | 0.5 | 0.6 | 46 | 230 | 276 |
| 3) | -10 m Wharf | m | 495 | 4,900 | 7,600 | 12,500 | 2,426 | 3,762 | 6,188 |
| 4) | Transitional Part of Wharf | Sum | 1 | | | | 479 | 791 | 1,270 |
| 5) | Temporary Revetment | m | 150 | 410 | 2,160 | 2,550 | 62 | 321 | 383 |
| 6) | West Breakwater | " | 1,250 | 1,300 | 6,000 | 7,300 | 1,625 | 7,500 | 9,125 |
| 7) | Transit Shed (Foundation) | " | 335 | 7,000 | 3,900 | 10,900 | 2,345 | 1,307 | 3,652 |
| 8) | " (Superstructure) | m² | 12,000 | 70 | 130 | 200 | 840 | 1,560 | 2,400 |
| 9) | Open Storage (including Foundation) | Sum | 1 | | | | 872 | 371 | 1,243 |
| 10) | Pavement & Drainage | " | 1 | | | | 812 | - | 812 |
| 11) | Building | " | 1 | | | | 267 | - | 267 |
| 12) | Water Supply (including Hydrant) | " | 1 | | | | 310 | 56 | 366 |
| 13) | Electric Power Supply | " | 1 | | | | 113 | 313 | 426 |
| 14) | Navigation Aids | " | 1 | | | | 35 | 307 | 342 |
| 15) | Miscellaneous | " | 1 | | | | 419 | 245 | 664 |
| 16) | Mobilize/Demobilize | " | 1 | | | | 385 | 935 | 1,320 |
| 17) | Sales Tax (5%) | " | 1 | | | | 628 | - | 628 |
| | Subtotal | | | | | | 13,170 | 25,730 | 38,900 |
| 2. | Port Service Vessels | | | | | | | | |
| 1) | Tug Boat (800,600 PS) | Vessel | 2 | | | | - | 1,650 | 1,650 |
| 2) | Pilot Boat (100,500 ton) | " | 2 | | | | - | 1,320 | 1,320 |
| 3) | Motor Boat | " | 1 | | | | - | 50 | 50 |
| | Subtotal | | | | | | - | 3,020 | 3,020 |
| 3. | Consulting Service | | | | | | | | |
| 1) | Soil Investigation, Topographic and Hydrographic survey | Sum | 1 | | | | 170 | 210 | 380 |
| 2) | Engineering Study | " | 1 | | | | 170 | 1,230 | 1,400 |
| 3) | Supervision | " | 1 | | | | 130 | 1,070 | 1,200 |
| 4) | Engineering Study for Port Service Vessels | " | 1 | | | | - | 90 | 90 |
| | Subtotal | | | | | | 470 | 2,600 | 3,070 |
| 4. | Contingency | | | | | | | | |
| 1) | Contingency for Port Facilities | | | | | | | | |
| | a. Physical Contingency (Approx. 13% of above 1.) | Sum | 1 | | | | 1,970 | 3,850 | 5,820 |
| | b. Price Contingency (Approx. 15% of above 1. plus 4-1)-a.) | " | 1 | | | | 2,270 | 4,430 | 6,700 |
| 2) | Contingency for Port Service Vessels | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 2.) | " | 1 | | | | - | 450 | 450 |
| | b. Price Contingency (Approx. 15% of above 2. plus 4-2)-a.) | " | 1 | | | | - | 520 | 520 |
| 3) | Contingency for Consulting Service | | | | | | | | |
| | a. physical Contingency (Approx. 15% of above 3.) | " | 1 | | | | 70 | 390 | 460 |
| | b. Price Contingency (Approx. 15% of above 3. plus 4-3)-a.) | " | 1 | | | | 80 | 440 | 520 |
| | Subtotal | | | | | | 4,390 | 10,080 | 14,470 |
| | TOTAL | | | | | | 17,030 (30.3%) | 41,430 (69.7%) | 59,460 (100%) |

## 8-10 Construction Costs

### 8-10-1 Condition of Cost Estimation

The estimations made herein are based on the following assumptions:

(1) Exchange reate: U.S.$1.0 = Rp. 415 = ¥240.

(2) The estimations are based on the costs of labour and materials as of August 1977. Allowance for future inflation were included.

(3) All estimation does not include any import duties, tax and the like.

(4) Local Currency component included sales tax of 5 percent is included.

(5) The construction cost for approach road is considered only for inside of port area, however, for out side it will be included in the related project.

(6) Construction cost of warehouse is included in the related project cost (see attached Chapter - 9).

### 8-10-2 Construction Costs

Construction costs estimates are compiled in Table 8-5~8-8.

## Table 8-5 Construction Cost of PLAN A-1 at High Projection for Short Term Development Program

| ITEM NO. | DESCRIPTION | UNIT | QUANTITY | RATE | | | AMOUNT | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | LOCAL CURRENCY U.S.$ | FOREIGN CURRENCY U.S.$ | TOTAL RATE U.S.$ | LOCAL CURRENCY U.S.$1,000 | FOREIGN CURRENCY U.S.$1,000 | TOTAL RATE U.S.$1,000 |
| 1. | Port Facilities | | | | | | | | |
| 1) | Dredging | m³ | 9,170,000 | 0.3 | 1.6 | 1.9 | 2,751 | 14,672 | 17,423 |
| 2) | Reclamation (Grading) | " | 490,000 | 0.1 | 0.5 | 0.6 | 49 | 245 | 294 |
| 3) | -10 m Wharf | m | 450 | 4,900 | 7,600 | 12,500 | 4,165 | 6,460 | 10,625 |
| 4) | Service Vessels Wharf | " | 320 | 4,900 | 7,600 | 12,500 | 1,568 | 2,432 | 4,000 |
| 5) | Temporary Revetment | " | 80 | 410 | 2,140 | 2,550 | 33 | 171 | 204 |
| 6) | Transit Sheds (Foundation) | " | 450 | 7,000 | 3,900 | 10,900 | 3,150 | 1,755 | 4,905 |
| 7) | " (Superstructure) | m² | 16,800 | 70 | 130 | 200 | 1,176 | 2,184 | 3,360 |
| 8) | Approach Road | m | 1,050 | 760 | - | 760 | 800 | - | 800 |
| 9) | Pavement & Drainage | Sum | 1 | | | | 1,994 | - | 1,994 |
| 10) | Building | " | 1 | | | | 292 | - | 292 |
| 11) | Water Supply (including Hydrant) | " | 1 | | | | 413 | 86 | 499 |
| 12) | Electric Power Supply | " | 1 | | | | 167 | 468 | 635 |
| 13) | Navigation Aids | " | 1 | | | | 35 | 33 | 68 |
| 14) | Cargo Handling Equipment | " | 1 | | | | - | 1,034 | 1,034 |
| 15) | Miscellaneous | " | 1 | | | | 402 | 521 | 923 |
| 16) | Mobilize/Demobilize | " | 1 | | | | 561 | 1,309 | 1,870 |
| 17) | Sales Tax (5%) | " | 1 | | | | 878 | - | 878 |
| | Sub-total | | | | | | 16,440 | 31,370 | 49,810 |
| 2. | Port Service Vessels | | | | | | | | |
| 1) | Tug Boat (800,600 PS) | Vessel | 2 | | | | - | 1,650 | 1,650 |
| 2) | Pilot Boat (100 ton) | " | 1 | | | | - | 770 | 770 |
| 3) | Motor Boat | " | 2 | | | | - | 110 | 110 |
| | Sub-total | | | | | | - | 2,530 | 2,530 |
| 3. | Consulting Service | | | | | | | | |
| 1) | Soil Investigation, Topographic and Hydrographic Survey | Sum | 1 | | | | 170 | 210 | 380 |
| 2) | Engineering Study | " | 1 | | | | 135 | 1,035 | 1,170 |
| 3) | Supervision | " | 1 | | | | 165 | 1,265 | 1,430 |
| 4) | Engineering Study for Port Service Vessels | " | 1 | | | | - | 70 | 70 |
| | | | 1 | | | | 470 | 2,580 | 3,050 |
| 4. | Contingency | | | | | | | | |
| 1) | Contingency for Port Facilities | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 1.) | Sum | 1 | | | | 2,760 | 4,700 | 7,460 |
| | b. Price Contingency (Approx. 40% of above 1. plus 4-1)-a.) | " | 1 | | | | 8,480 | 14,420 | 22,900 |
| 2) | Contingency for Port Service Vessels | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 2.) | " | 1 | | | | - | 370 | 370 |
| | b. Price Contingency (Approx. 40% of above 2. plus 4-2)-a.) | " | 1 | | | | - | 1,160 | 1,160 |
| 3) | Contingency for Consulting Service | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 3.) | " | 1 | | | | 70 | 380 | 450 |
| | b. Price Contingency (Approx. 40% of above 3. plus 4-3)-a.) | " | 1 | | | | 220 | 1,180 | 1,400 |
| | Sub-total | | | | | | 11,530 | 22,210 | 33,740 |
| | TOTAL | | | | | | 30,440 (34.2%) | 58,690 (65.8%) | 89,130 (100%) |

## Table 8-6 Construction Cost of PLAN A-1 at Low Projection for Short Term Development Program

| ITEM NO. | DESCRIPTION | UNIT | QUANTITY | RATE | | | AMOUNT | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | LOCAL CURRENCY U.S.$ | FOREIGN CURRENCY U.S.$ | TOTAL RATE U.S.$ | LOCAL CURRENCY U.S.$1,000 | FOREIGN CURRENCY U.S.$1,000 | TOTAL RATE U.S.$1,000 |
| 1. | Port Facilities | | | | | | | | |
| 1) | Dredging | $m^3$ | 9,170,000 | 0.3 | 1.6 | 1.9 | 2,751 | 14,672 | 17,423 |
| 2) | Reclamation (Grading) | " | 320,000 | 0.1 | 0.5 | 0.6 | 32 | 160 | 192 |
| 3) | -10 m Wharf | $m^2$ | 400 | 4,900 | 7,600 | 12,500 | 1,960 | 3,040 | 5,000 |
| 4) | Service Vessels Wharf | " | 320 | 4,900 | 7,600 | 12,500 | 1,568 | 2,432 | 4,000 |
| 5) | Temperary Revetment | " | 70 | 410 | 2,140 | 2,550 | 29 | 150 | 179 |
| 6) | Transit Sheds (Foundation) | $m^2$ | 300 | 7,000 | 3,900 | 10,900 | 2,100 | 1,170 | 3,270 |
| 7) | " (Superstructure) | $m^2$ | 11,200 | 70 | 130 | 200 | 784 | 1,456 | 2,240 |
| 8) | Approach Road | m | 1,050 | 760 | - | 760 | 800 | - | 800 |
| 9) | Pavement & Drainage | Sum | 1 | | | | 1,197 | - | 1,197 |
| 10) | Building | " | 1 | | | | 292 | - | 292 |
| 11) | Water Supply (including Hydrant) | " | 1 | | | | 323 | 77 | 400 |
| 12) | Electric Power Supply | " | 1 | | | | 43 | 486 | 529 |
| 13) | Navigation Aids | " | 1 | | | | 23 | 33 | 56 |
| 14) | Cargo Handling Equipment | " | 1 | | | | - | 1,034 | 1,034 |
| 15) | Miscellaneous | " | 1 | | | | 443 | 480 | 923 |
| 16) | Mobilize/demobilize | " | 1 | | | | 550 | 1,320 | 1,870 |
| 17) | Sales Tax (5%) | " | 1 | | | | 645 | - | 645 |
| | Sub-total | | | | | | 13,540 | 26,510 | 40,050 |
| 2. | Port Service Vessels | | | | | | | | |
| 1) | Tug Boat (800,600 p.s.) | Vessel | 2 | | | | - | 1,650 | 1,650 |
| 2) | Pilot Boat (100 ton) | " | 1 | | | | - | 770 | 770 |
| 3) | Motor Boat | " | 2 | | | | - | 110 | 110 |
| | Sub-total | | | | | | - | 2,530 | 2,530 |
| 3. | Consulting Service | | | | | | | | |
| 1) | Soil Investigation, Topographic and Hydrographic Survey | Sum | 1 | | | | 170 | 210 | 380 |
| 2) | Engineering Study | " | 1 | | | | 135 | 1,035 | 1,170 |
| 3) | Supervision | " | 1 | | | | 165 | 1,265 | 1,430 |
| 4) | Engineering Study for Port Service Vessles | " | 1 | | | | - | 70 | 70 |
| | Sub-total | | | | | | 470 | 2,590 | 3,060 |
| 4. | Contingency | | | | | | | | |
| 1) | Contingency for Port Facilities | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 1.) | Sum | 1 | | | | 2,030 | 3,970 | 6,000 |
| | b. Price Contingency (Approx. 40% of above 1. plus (4-1)+1.) | " | 1 | | | | 6,220 | 12,190 | 18,410 |
| 2) | Contingency for Port Service Vessels | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 2.) | " | 1 | | | | - | 370 | 370 |
| | b. Price Contingency (Approx. 40% of above 2. plus 4-2)+a.) | " | 1 | | | | - | 1,160 | 1,160 |
| 3) | Contingency for Consulting Service | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 3.) | " | 1 | | | | 70 | 380 | 450 |
| | b. Price Constingency (Approx. 40% of above 3. plus 4-3)+a.) | " | 1 | | | | 220 | 1,180 | 1,400 |
| | Sub-total | | | | | | 8,540 | 19,240 | 27,780 |
| | TOTAL | | | | | | 22,550 (30.7%) | 50,870 (69.3%) | 73,420 (100%) |

## Table 8-7 Construction Cost of PLAN A-2 at High Projection for Short Term Development Program

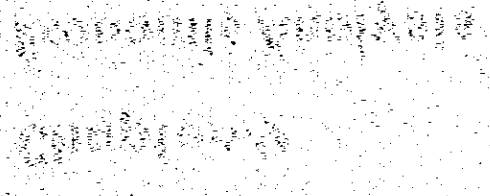
| ITEM NO. | DESCRIPTION | UNIT | QUANTITY | RATE | | | AMOUNT | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | LOCAL CURRENCY U.S.$ | FOREIGN CURRENCY U.S.$ | TOTAL RATE U.S.$ | LOCAL CURRENCY U.S.$1,000 | FOREIGN CURRENCY U.S.$1,000 | TOTAL RATE U.S.$1,000 |
| 1. | Port Facilities | | | | | | | | |
| 1) | Dredging | m³ | 9,170,000 | 0.3 | 1.6 | 1.9 | 2,751 | 14,672 | 17,423 |
| 2) | Reclamation (Grading) | " | 490,000 | 0.1 | 0.5 | 0.6 | 49 | 245 | 294 |
| 3) | -10-m Wharf | m | 450 | 4,900 | 7,600 | 12,500 | 4,165 | 6,460 | 10,625 |
| 4) | Service Vessels Wharf | " | 320 | 4,900 | 7,400 | 12,300 | 1,568 | 2,432 | 4,000 |
| 5) | Temporary Revetment | " | 80 | 410 | 2,140 | 2,550 | 33 | 171 | 204 |
| 6) | West Breakwater | " | 700 | 1,300 | 6,000 | 7,300 | 910 | 4,200 | 5,110 |
| 7) | North Breakwater | " | 1,600 | 1,300 | 6,000 | 7,300 | 2,080 | 9,600 | 11,680 |
| 8) | Rest Grids | Sum | 1 | | | | 1,385 | 737 | 2,122 |
| 9) | Transit Sheds (Foundation) | m² | 450 | 7,000 | 3,900 | 10,900 | 3,150 | 1,755 | 4,905 |
| 10) | " (Superstructure) | m² | 16,800 | 70 | 130 | 200 | 1,176 | 2,184 | 3,360 |
| 11) | Approach Road | m | 1,050 | 760 | - | 760 | 800 | - | 800 |
| 12) | Pavement & Drainage | Sum | 1 | | | | 1,998 | - | 1,998 |
| 13) | Building | " | 1 | | | | 292 | - | 292 |
| 14) | Water Supply (including Hydrant) | " | 1 | | | | 413 | 86 | 499 |
| 15) | Electric Power Supply | " | 1 | | | | 167 | 468 | 635 |
| 16) | Navigation Aids | " | 1 | | | | 44 | 72 | 116 |
| 17) | Cargo Handling Equipment | " | 1 | | | | - | 1,034 | 1,034 |
| 18) | Miscellaneous | " | 1 | | | | 440 | 484 | 924 |
| 19) | Mobilize/Demobilize | " | 1 | | | | 550 | 1,320 | 1,870 |
| 20) | Sales Tax (5%) | " | 1 | | | | 1,099 | - | 1,099 |
| | Subtotal | | | | | | 23,070 | 45,920 | 68,990 |
| 2. | Port Service Vessels | | | | | | | | |
| 1) | Tug Boat (800,600 p.s.) | Vessel | 2 | | | | - | 1,650 | 1,650 |
| 2) | Pilot Boat (100 ton) | " | 1 | | | | - | 770 | 770 |
| 3) | Motor Boat | " | 2 | | | | - | 110 | 110 |
| | Subtotal | | | | | | - | 2,530 | 2,530 |
| 3. | Consulting Service | | | | | | | | |
| 1) | Soil Investigation, Topographic and Hydrographic Survey | Sum | 1 | | | | 200 | 280 | 480 |
| 2) | Engineering Study | " | 1 | | | | 135 | 1,035 | 1,170 |
| 3) | Supervision | " | 1 | | | | 165 | 1,265 | 1,430 |
| 4) | Engineering Study for Port Service Vessels | " | 1 | | | | - | 70 | 70 |
| | Subtotal | | | | | | 500 | 2,650 | 3,150 |
| 4. | Contingency | | | | | | | | |
| 1) | Contingency for Port Facilities | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 1.) | Sum | 1 | | | | 3,460 | 6,880 | 10,340 |
| | b. Price Contingency (Approx. 40% of above 1, plus 4-1)-a.) | " | 1 | | | | 10,610 | 21,120 | 31,730 |
| 2) | Contingency for Port Service Vessels | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 2.) | " | 1 | | | | - | 370 | 370 |
| | b. Price Contingency (Approx. 40% of above 2, plus 4-2)-a.) | | 1 | | | | - | 1,160 | 1,160 |
| 3) | Contingency for Consulting Service | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 3.) | " | 1 | | | | 70 | 390 | 460 |
| | b. Price Contingency (Approx. 40% of above 3, plus 4-3)-a.) | " | 1 | | | | 230 | 1,200 | 1,430 |
| | Subtotal | | | | | | 14,370 | 31,120 | 45,490 |
| | TOTAL | | | | | | 37,940 | 82,220 | 120,160 |
| | | | | | | | (31.6%) | (68.4%) | (100%) |

## Table 8-8 Construction Cost of PLAN A-2 at Low Projection for Short Term Development Program

| ITEM NO. | DESCRIPTION | UNIT | QUANTITY | RATE | | | AMOUNT | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | LOCAL CURRENCY U.S.$ | FOREIGN CURRENCY U.S.$ | TOTAL RATE U.S.$ | LOCAL CURRENCY U.S.$1,000 | FOREIGN CURRENCY U.S.$1,000 | TOTAL RATE U.S.$1,000 |
| 1. | Port Facilities | | | | | | | | |
| 1) | Dredging | m³ | 9,170,000 | 0.3 | 1.6 | 1.9 | 2,751 | 14,672 | 17,423 |
| 2) | Reclamation (Grading) | " | 320,000 | 0.1 | 0.5 | 0.6 | 32 | 160 | 192 |
| 3) | -10 m Wharf | m | 400 | 4,900 | 7,600 | 12,500 | 1,960 | 3,040 | 5,000 |
| 4) | Service Vessels Wharf | " | 320 | 4,900 | 7,600 | 12,500 | 1,568 | 2,432 | 4,000 |
| 5) | Temporary Revetment | " | 70 | 410 | 2,140 | 2,550 | 29 | 150 | 179 |
| 6) | West Breakwater | " | 700 | 1,300 | 6,000 | 7,300 | 910 | 4,200 | 5,110 |
| 7) | North Breakwater | " | 1,600 | 1,300 | 6,000 | 7,300 | 2,080 | 9,600 | 11,680 |
| 8) | East Groin | Sum | 1 | - | - | - | 1,385 | 737 | 2,122 |
| 9) | Transit Sheds (Foundation) | m | 300 | 7,000 | 3,900 | 10,900 | 2,100 | 1,170 | 3,270 |
| 10) | " (Superstructure) | m² | 11,200 | 70 | 130 | 200 | 784 | 1,456 | 2,240 |
| 11) | Approach Road | m | 1,050 | 760 | - | 760 | 800 | - | 800 |
| 12) | Pavement & Drainage | Sum | 1 | | | | 1,197 | - | 1,197 |
| 13) | Building | " | 1 | | | | 292 | - | 292 |
| 14) | Water Supply (including Hydrant) | " | 1 | | | | 323 | 77 | 400 |
| 15) | Electric Power Supply | " | 1 | | | | 43 | 486 | 529 |
| 16) | Navigation Aids | " | 1 | | | | 32 | 72 | 104 |
| 17) | Cargo Handling Equipment | " | 1 | | | | - | 1,034 | 1,034 |
| 18) | Miscellaneous | " | | | | | 440 | 484 | 924 |
| 19) | Mobilize/Demobilize | " | | | | | 550 | 1,320 | 1,870 |
| 20) | Sales Tax (5%) | " | | | | | 864 | - | 864 |
| | Sub-total | | | | | | 18,140 | 41,090 | 59,230 |
| 2. | Port Service Vessels | | | | | | | | |
| 1) | Tug Boat (400,600 p.s.) | Vessel | 2 | | | | - | 1,650 | 1,650 |
| 2) | Pilot Boat (100 ton) | " | 1 | | | | - | 770 | 770 |
| 3) | Motor Boat | " | 2 | | | | - | 110 | 110 |
| | Sub-total | | | | | | - | 2,530 | 2,530 |
| 3. | Consulting Service | | | | | | | | |
| 1) | Soil Investigation, Topographic and Hydrographic Survey | Sum | 1 | | | | 200 | 280 | 480 |
| 2) | Engineering Study | " | 1 | | | | 135 | 1,035 | 1,170 |
| 3) | Supervision | " | 1 | | | | 165 | 1,265 | 1,430 |
| 4) | Engineering Study for Port Service Vessels | " | 1 | | | | - | 70 | 70 |
| | Sub-total | | | | | | 500 | 2,650 | 3,150 |
| 4. | Contingency | | | | | | | | |
| 1) | Contingency for Port Facilities | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 1.) | Sum | 1 | | | | 2,720 | 6,160 | 8,880 |
| | b. Price Contingency (Approx. 40% of above 1. plus 4-1)-a.) | " | 1 | | | | 8,340 | 18,900 | 27,240 |
| 2) | Contingency for Port Service Vessels | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 2.) | " | 1 | | | | - | 370 | 370 |
| | b. Price Contingency (Approx. 40% of above 2. plus 4-2)-a.) | | 1 | | | | - | 1,160 | 1,160 |
| 3) | Contingency for Consulting Service | | | | | | | | |
| | a. Physical Contingency (Approx. 15% of above 3.) | " | 1 | | | | 70 | 390 | 460 |
| | b. Price Contingency (Approx. 40% of above 3. plus 4-3)-a.) | " | 1 | | | | 230 | 1,200 | 1,430 |
| | Subtotal | | | | | | 11,360 | 28,180 | 39,540 |
| | TOTAL | | | | | | 30,000 (28.7%) | 74,450 (71.3%) | 104,450 (100%) |

# Chapter-9

# Economic Analysis



# CHAPTER 9
# ECONOMIC ANALYSIS

## 9-1 General

As was observed in Chapters 5 and 6, it is believed that the advantages to Central Java of constructing a full scale foreign trade port in Semarang enabling large ocean going vessels to berth at any time are unfathomable as its economic development is the most retarded in the island of Java. In other worlds, as the access channel and wherves in this port are not equipped to handle large ocean going vessels in their current state, vessels exceeding 1,500 D.W.T have no alternative but to moor at offshore anchorage and carry out offshore cargo handling utilizing lighters.

As ocean going vessels exceeding 2,000 D.W.T consituted 85% of the vessels entered the port of Semarang in 1976, it is evident that practically almost all of the ocean going vessels were forced to carry out offshore cargo handling. Since the development of the port of Semarang would eliminate this type of inefficient cargo handling, extra costs involved in cargo handling by lighters will be saved. Also, as cargo handling will not be influenced by the weather or by delays in the availability of lighters, economy in operational costs may be realized as idle days at the anchorage will be reduced. This is the first direct benefit.

However, as may be noted from the trends in cargo volume transported by different means in Central Java, dependence on road transportation is continuing to increase and had reached 67% as of 1974. Also, as may be surmised by the fact that cargo handling in the ports of Tanjung Priok and Surabaya has reached 5 to 10 times that in the port of Semarang, the large volume of cargo is being transported over land to Central Java via these two ports as a result of the undeveloped state of the port of Semarang. Therefore, great benefits may be anticipated with the development of the port of Semarang as substantial savings in land transportation costs will be possible if the foreign trade cargo can be loaded and unloaded directly at the port of Semarang. That is, it will be possible to shorten the overland transportation distance to the service area by approximately 460 km by loading and unloading cargo at the port of Semarang. This is the second direct benefit.

Although the foregoing two benefits were numerically presented here, as we will explain later, the indirect benefits realized with the development of the port of Semarang will be boundless. In assessing the analytical results here, we believe it is of extreme importance that this point be taken into consideration.

## 9-2 Preconditions of Analysis

(1) In estimating the effect of development of the port of Semarang, how to set the second

best plan will involve much room of controversy. But, here, as the second best case, that which the development of the service area assumed in Chapter 6 is carried out without development of this port is taken up with the assumption that the exit and entry of foreign trade cargos will be made through the two ports of Tg. Priok and Surabaya.

Accordingly, the benefit of the development will be calculated upon the difference in the cost of cargo transportation.

(2) Under the present condition of the port of Semarang, the domestic trade wharf has still an allowance, while by improving the foreign trade wharf, the domestic trade wharf presently used by the lighters becomes usable for the origianlly intended purpose, so that with respect to the domestic trade wharf, there will be no need of improvement until about 1995 even if the handling cargos should increase at a rate compatible with the high projection. From the foregoing, it was decided that the analysis of the effect of development of the port would be made upon the improvement of the terminal for foreign trade only.

For the high projection under the Long Term Development Program, the construction cost required for improvement of the domestic trade wharf is included in the expense.

(3) Analysis of the effect of development will be made of the respective cases of Urgent Improvement Program (1979~1980), Short Term Development Program (1979 ~1985), and Long Term Development Program (1979~2000), and the period of 30 years counted from the year of start of the investment will be subjected to analysis, the subsequenty years being covered by the residual value.
The development effect of the Urgent Development Program represents the case where it is assumed that the development investment is made during the period of 1979 to 1980 but not at all in and after 1981, and that for the Short Term Development Program represents the case where it is assumed that the investment is made during the period of 1979 to 1985 but not at all in and after 1986.

(4) With respect to the flow of foreign trade cargos for the service area of the port of Semarang, it was assumed, with due consideration of the present condition of the offshore cargo handling being carried out at this port, that the foreign trade cargos could be classified into those that would come in and go out of the port in the form of offshore handling even if the foreign trade wharf were improved (that is, marine transport-oriented cargos) and those that would be land transported to the service area via the port of Tg. Priok or Surabaya in the absence of improvement of the foreign trade wharf (that is, land transport-oriented cargos).

Here, classified under the land transport-oriented cargos are the industrial products in

the case of export and the industrial materials, machines, industrial products and 1/2 of construction materials in the case of import. Classified under the marine transport-oriented cargos are the whole cargos except the land transport-oriented cargos stated above and are comprised of bulk cargos such as fertilizers and rice and agricultural, forestry and fishery products.

According to this classification, the cargo volum of each category of the classification at the respective target years can be calculated with ease from Fig. A-6-4, as shown in Table 9-1.

Table 9-1 Estimation of Land Transport-Oriented and Marine Transport-Oriented Cargos

(Unit: 1,000 tons)

| Year | Foreign Trade Cargos | | Land Transport-Oriented Cargos | | Marine Transport-Oriented Cargos | |
|---|---|---|---|---|---|---|
| | L.P. | H.P. | L.P. | H.P. | L.P. | H.P. |
| 1980 | 650 | 690 | 350 | 380 | 300 | 310 |
| 1985 | 780 | 870 | 430 | 510 | 350 | 360 |
| 2000 | 1,960 | 3,000 | 1,270 | 2,110 | 690 | 890 |

Note: 1) Definitions of the high projection (H.P.) and low projection (L.P.) are the same to those in 6-4-2 at 1).

2) Oils handled at PERTAMINA are not included.

## 9-3 Calculation of Costs and Benefits

### (1) Benefit accruing from change of offshore to quayside cargo handling

Now assuming that 495,000 tons of cargos will be shifted from the offshore to quayside cargo handling by virtue of 3 berths of -9 m wharf to be provided under the Urgent Improvement Program, its annual benefits are calculated as shown in Table 9-2. As seen from the table, what is largest among the benefits obtainable by quayside cargo handling is the economy of expense due to dissolution of the lighter cargo handling, and all of the expenses required for cargo loading and unloading between the ship and the lighters and lighter transport between the offshore anchorage and the wharf in the harbour are saved entirely, resulting in an annual benefit of about 2,300,000 U.S. dollars. Next largest is the saving of the expense of demurrage of the ship. As there is no loss of time for waiting due to the lighter service being unavailable on account of strong wind and waves on the sea, a benefit of about 1,900,000 U.S. dollars is obtainable a year. Conversely, there are extra costs to be incurred by quayside cargo handling. They are mooring charges and pilotage rates incident to incoming of large vessels. But, the loss dus to such extra costs is very slight against the benefit to be

obtained.

Upon balance of the benefit and loss stated above, there is obtained a benefit of about 4,100,000 U.S. dollars a year so that when the volume of cargos handled at the three berths is assumed to be 495,000 tons, the benefit per ton of cargo is 8.37 U.S. dollars. While the foregoing benefit is conducive directly to the shipping companies and consignors, it is reflected in reduction of the commodity prices and contributes finally to the benefit of the area.

As elements not calculated in the table, there are damage to and loss of cargos, but these are accountable in the benefit from the quayside cargo handling. The benefit of the quayside cargo handling is thus considered to be actually greater than that enumerated in the table.

Table 9-2 Benefits Over One Year Period by Changing Offshore to Quayside Cargo Handling

(Unit: US$)

| Type of Costs | Benefits |
|---|---|
| Port Dues on Ship | 0 |
| Berthing | - 38,390 |
| Lighterage | 1,898,600 |
| Mooring and Demooring | - 13,290 |
| Pilotage | - 9,360 |
| Stevedooring | 435,770 |
| Reduction in Demurrage | 1,870,000 |
| Total | 4,143,330 |
| Per ton of cargo | 8.37 |

Note: The (–) symbol denotes increases in costs due to wharf cargo handling.

(2) Benefit of handling the cargos via the ports of Tg. Priok and Surabaya directly at the port of Semarang

While the benefit calculation was made of the foreign trade cargos, it was thought so far as the foregoing three ports were concerned, there was no difference in the marine transport cost between the foreign port of delivery or shipment and the respective Indonesian ports facing the Java Sea. Also, it was assumed that there was no difference in the port dues between said Indonesian ports. Thus, it was thought that the benefit of handling the cargos directly at the port of Semarang would be represented by the

economy in the cost of land transportation from the port of Tg. Priok or Surabaya to the service area of the port of Semarang.

Now, looking the volume of foreign trade cargos at the port of Tg. Priok and that at the port of Surabaya, they are approximately at a ratio of 2:1. Then, assuming that the volumes of foreign trade cargos coming into the going out of the service area of the port of Semarang via both ports are of the same ratio and further simply that the volume of incoming and outgoing cargos by district in the service area of the port of Semarang is produced in proportion to GDP of the respective districts, the road transport distance from both ports to the service area of the port of Semarang is calculated as 551 km average. In the same way, the road transport distance from the port of Semarang to its service area is calculated as 92 km average. Thus the difference is 459 km.

With the cost of truck transport per ton kilometer taken as 20 rupiahs, the difference in the road transport cost is calculated as 22.12 U.S. dollars per ton of cargo. This was taken as representing the benefit per ton of cargo through direct import and export.

In counting the benefit, there is a problem of how to treat the costs of construction and maintenance of the port facilities of the ports of Tg. Priok and Surabaya and those of the roads.

These costs are reduced to zero if the export and import are made through the port of Semarang directly so that they can be counted in the benefit. However, the former was omitted in that the port facilities of the ports of Tg. Priok and Surabaya would be large enough in the capacity to give an allowance, while the latter was thought to be included in the 20 rupiahs of the transport cost per ton kilometer.

As a means of land transport, the railroad may be available in addition to the road, but the share of the railroad in the cargo transport within the area of Central Java is only 8% presently, and there is no prospect of the share increasing sharply in the near future. Thus, all of the land transport was assumed to be of the road for the sake of calculation.

(3) Operation costs and repair and maintenace costs

Using the present port of Semarang as a reference, operation costs and repair and maintenance costs were set at 1.51 U.S. dollars per ton of cargo that the foreign trade facilities to be newly developed will be capable of handling. As the port of Semarang will be capable of carrying out operations with much greater efficiency as compared to the present if the port is developed in future, we will consider that the renewal costs for the miscellaneous small facilities will be included in the operation costs as it is

## Table 9-3(1) Calculation of Economic Cost

(Unit: 1,000 U.S. $)

| Phase | Projection of Cargo Increase | Alternative Plan | Financial Cost | Taxes | Shadow Price | Economic Cost |
|---|---|---|---|---|---|---|
| Urgent Improvement Program (1970 – 1980) | L.P., H.P. | A-1 | 73,690 | 980 | 3,340 | 69,570 |
| | " | A-2 | 51,720 | 720 | 2,240 | 48,760 |
| Short Term Development Program (1981 – 1985) | L.P. | A-1 | 63,670 | 1,010 | 2,860 | 59,800 |
| | " | A-2 | 85,840 | 1,260 | 3,970 | 80,610 |
| | H.P. | A-1 | 52,450 | 740 | 2,300 | 49,410 |
| | " | A-2 | 74,630 | 990 | 3,400 | 70,230 |
| Long Term Development Program (1986 - 2000) | L.P. | A-1, A-2 | 107,250 | 1,920 | 4,850 | 100,450 |
| | H.P. | A-1, A-2 | 76,590 | 1,260 | 3,350 | 71,980 |

## Table 9-3(2) Calculation of Economic Cost of Related Projects

(Unit: 1,000 U.S. $)

| Phase | Projection of Cargo Increase | Alternative Plan | Financial Cost | Taxes | Shadow Price | Economic Cost |
|---|---|---|---|---|---|---|
| Urgent Improvement Program (1970 – 1980) | L.P., H.P. | A-1 | 1,900 | 80 | 90 | 1,730 |
| | " | A-2 | 1,900 | 80 | 90 | 1,730 |
| Short Term Development Program (1981 – 1985) | L.P. | A-1 | 5,690 | 250 | 270 | 5,170 |
| | " | A-2 | 5,690 | 250 | 270 | 5,170 |
| | H.P. | A-1 | 5,170 | 230 | 250 | 4,690 |
| | " | A-2 | 5,170 | 230 | 250 | 4,690 |
| Long Term Development Program (1986 – 2000) | L.P. | A-1, A-2 | 29,920 | 1,370 | 1,440 | 27,110 |
| | H.P. | A-1, A-2 | 12,350 | 560 | 600 | 11,220 |

Note: The costs of the related projects include the following
Urgent Improvement Program — Warehouse
Short Term Development Program — Warehouse and approach road (rest side)
Long Term Development Program — Warehouse, approach road (rest side), relocation of the East Banjir Canal and improvement of the domestic trade wharf

anticipated that these costs will be considerably reduced. Also, with reference to maintenance dredging of the Access Channel, 1,140,000 $m^3$ will be dredged annually prior to completion of the North Breakwater and East Groins and 870,000 $m^3$ dredged annually after completion with dredging costs set at 200 Rp./$m^3$.

(4) Shadow prices and taxes

The purposes of the shadow price computation are to properly evaluate the foreign currency exchange rates, wages of unskilled labours and cost of capital in the national point of view.

In this analysis, however, only a shadow wage rate of 0.5 will be applied. Also, in relation to taxes, the total amount of the sales tax was deleted from the costs.

If the economic costs are computed by carrying out the foregoing operations in this analysis, it will be as shown in Table 9-3 (1) ~ (2).

(5) Cost of related projects

To the costs in the economic analysis were added the costs of the related projects, viz. warehouses, approach roads, relocation of the canal and improvement of the domestic trade wharves (see Table A-9-1 (1) ~ (5)).

9-4 Evaluation of the Result of Analysis

For the Urgent, Short Term and Long Term Programs, the result of analysis is shown in terms of the internal rate of return (I.R.R.) in Table 9-4. The cost/benefit tables of the programs are shown in Tables A-9-2 (1) through A-9-2 (8).

Table 9-4 List of Internal Rate of Return

(Unit: %)

| Phase | Low Projection | | High Projection | |
|---|---|---|---|---|
| | PLAN A-1 | PLAN A-2 | PLAN A-1 | PLAN A-2 |
| Urgent Improvement Program | 10.6 | 15.0 | 10.7 | 15.2 |
| Short Term Development Program | 10.5 | – | 11.9 | 12.6 |
| Long Term Development Program | – | – | 12.8 | – |

From the result of analysis in Table 9-4, the following may be said.

(1) The internal rate of return is increasing in the order of Urgent Improvement Program, Short Term Development Program and Long Term Development Program. This is due to a large amount of prerequisite investment made to the facilities such as breakwater, groin and channel which do not contribute directly to the cargo handling and thus shows that the project should be executed steadily upon a long ranging point of view. The internal rate of return of the project on the long ranging point of view is expected to be 12.8% so that the project is a reasonable one.

(2) Increase in the volume of cargo handling may go along the low projection, but the decline of the internal rate of return is very slight in that the investment after the Short Term Development Program can be adjusted to the trend of increase of the cargo volume. Therefore, the investment to the Urgent Improvement Program may be performed as scheduled.

(3) In the present project, the physical contingency to the cost is estimated at 15%. Here, against the case where the work cost should increase due to unexpected factors, the effect upon the cost/benefit of the project was examined by a sensitivity test.

As the result, it was found that should the cost increase by 10% in the case of high projection for Alternative Plan A-1 of the Urgent Improvement Program, the internal rate of return shown in Table 9-5 would decrease from 10.7% to 9.4% and that upon a similar test of the case of high projection for Alternative Plan A-1 of the Short Term Development Program, the internal rate of return would decline from 11.9% to 10.7%.

## 9-5 Effects of the Development of the Project

Although the direct benefits of the results of the development of this project are as previously explained, it is not too much to say that the true aim of this project is more a far reaching indirect effects. That is, by rationalizing goods distribution and thus reducing transportation costs, general consumer goods can be supplied at low cost to the service area. In addition to improving the livelihood of the people, it will also have great effect on industry, particularly on the manufacturing industry, as it will increase their competitive strength by reducing transportation costs of materials and goods and thus promote establishment of new industries.

Now, when we observe the areas around both Jakarta and Surabaya, which are existing developed areas, already showing signs of overcongestion, we believe the area around the city of Semarang, which is blessed with abundant labour, and market, will be an attractive new world for the industries. What is believed to be especially important in relation to

industrial promotion is its lure to the coastal industry, which will be able to utilize the convenience of transportation of the new port of Semarang. This plan has already been included in PELITA II and, though it is indeed an appropriate plan, vigorous promotion of an industrial area construction plan at time of port development will be strongly desired.

The coastal industry, which should be the key industry, will have far reaching effect in promoting related industries so it is most effective in promoting economic development in the entire service area.

On the other hand, in relation to the port itself, high hopes are placed on the effects this growth will have on the city of Semarang. That is, it will promote the distribution and processing industry, information industry, and the sales industry supplementing the commercial port and improve the city functions of the city of Semarang. It will also improve the central control functions of the city of Semarang in relation to production activities, administrative activities, and cultural activities throughout the service area and thus result in further contributing to the growth of the city of Semarang.

The advantages of the city of Semarang being connected to the north and south with the cultural city of Yogyakarta in the historic island of Java and the fact that it is closely linked by marine transportation to Kalimantan and Sulawesi facing the Java Sea, which are areas expected to grow in future.

# Chapter-10
# Financial Analysis

# CHAPTER 10
# FINANCIAL ANALYSES

## 10-1 General

Where an investment is made to the development project of a port, the criteria for evaluation of the financial soundness of the project are not always defined clearly, but the profitability and fund schedule as an enterprise are obviously the important standards for the evaluation. These are relatively easily represented by numerical figures so that these are used extensively as the objective standards for evaluation of the development projects.

Of course, the standards for evaluation of the financial soundness are variable depending on the character and scale of the development projects. But, it is nevertheless important to determine a long term investment schedule, establish accounting procedures and, at the same time, examine the project from a financial aspect including such factors as the expense of operation, capacity for refund the loan, fund raising method and setting of dues.

However, in a long term project, specific figures are apt to change so that it will be required for calculation to set various assumptions.

The financial analysis of the port of Semarang had the calculation made upon the following presuppositions for evaluation of the financial soundness.

(1) For furtherance of the independency of port administration, a self-paying accounting system based on the cost principle would be taken for the port of Semarang. In other words, the dues were maintained at a level that would permit to cover the operating expense, refund of the loan and daily operational fund.

(2) The development investment fund would be financed by the interest-free development fund of the Indonesian Government and loans from the overseas.

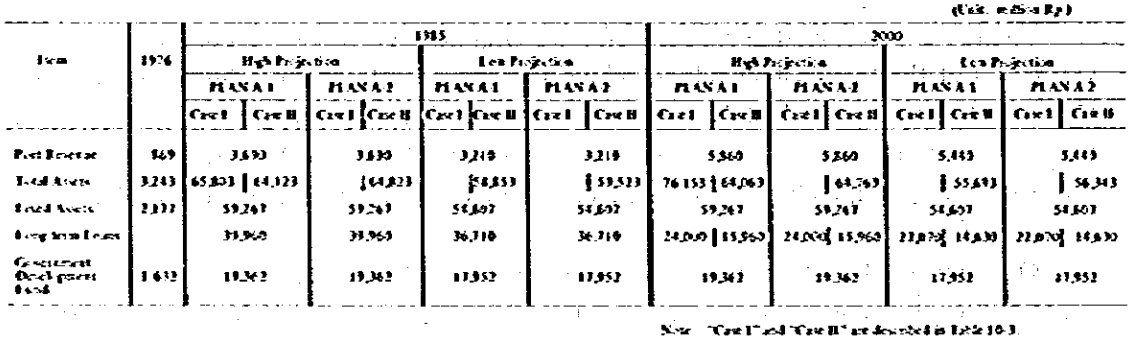
(3) The expense for maintenance dredging of the access channel and basins of the port of Semarang was assumed to be covered by the subsidiary of the Indonesian Government and was not at all counted in the expense in the fund schedule.

(4) The financial analysis here was intended only for the Urgent and Short Term Development Programs integrally. The designed period of investment was thus seven years of from 1979 to 1985.

(5) The 1976 prices were taken as basic prices, and the unit of calculation was one million Rp..

As the result of calculation according to the foregoing, the aspect as an administrative target of the finance of the port of Semarang is represented in Table 10-1.

Table 10-1 Financial Status in the Target Years



10-2 Long-Term Loans and Fixed Assets

The development plan of the port of Semarang is of a very great scale equivalent nearly to construction of a new port. Accordingly, the interest on the loan and depreciation of the fixed assets are of great burden and are influencing the balance greatly. While the development investment of the port of Semarang is financed by the development fund of the Central Government and the long-term loan. In the equipment investment of a profit-making industry, it is said that the self-fund should comprise a proportion of at least 30%. It is a tremendous investment for development and improvement of the infrastracture. Further, considering comprehensively the amounts of money used out of the government development funds appropriated for development of the other major ports (such as Tg. Priok and Surabaya), the proportion of the Central Government development fund to the long term loan in the case of the port of Semarang was assumed to be 30:70 as shown in Table 10-2.

Table 10-2 Proportion of Long-Term Loan in the Investment

(unit: million Rp.)

| Item | High Projection | Low Projection |
|---|---|---|
| Investment (A) | 57,090 | 52,430 |
| Central Government Development Fund | 17,130 | 15,720 |
| Long-term Loans (B) | 39,960 | 36,710 |
| B/A | 70% | 70% |

For the conditions of long-term loan, those of the Asian Development Bank, etc. were taken as reference in Case I, while those in Japan in the recent years in Case II, and for the respective cases, sensitivity analyses were made (see Table 10-3, appended Tables 10-12(1) ~ 10-12(4)).

Table 10-3 Assumed Loans Conditions

| Item | Case I | Case II |
|---|---|---|
| Interest Rate | 2.0% per annum | 3.0% per annum |
| Unredeemed Term | 10 years | 10 years |
| Repayment Term | 30 years | 20 years |
| Total Term | 40 years | 30 years |

Depreciation of the fixed assets was calculated according to the fixed amount method with the last years specified by the Indonesian Government taken for the respective facilities as shown in Table 10-4 and the amounts of depreciation thus calculated of the facilities summed up. The depreciation, net fixed asset balance and fixed asset balance in the respective case are shown in Tables 10-13(1) ~ 10-13(4).

Table 10-4 Depreciation Rates and Last Years

| Items | Depreciation Rates | Last Years |
|---|---|---|
| Quay | 0.02 | 50 |
| Breakwater | 0.02 | 50 |
| Transit Shed | 0.10 | 10 |
| Open Storage | 0.02 | 50 |
| Warehouse | 0.03 | 33 |
| Road | 0.01 | 100 |
| Office building | 0.03 | 33 |
| Water Supply | 0.04 | 25 |
| Power Supply | 0.03 | 33 |
| Navigation Aids | 0.04 | 25 |
| Cargo Handling Equipment | 0.05 | 20 |
| Vessel | 0.05 | 20 |
| Others | 0.02 | 50 |

Source: Directorate General of Sea Communications

## 10-3 Revenues and Expenditure

### 10-3-1 Method of Estimation

The revenue was calculated of the following six items according to the current system of classification of the port of Semarang.

(1) Harbour dues: Calculated by estimating the numbers of calling vessels by type and size for the respective years and summing up in consideration of the tariffs.

(2) Quay dues: Calculated by summing up the numbers of berthing vessels by type and size estimated in (1) above in consideration of the mooring dues, unmoring dues, etc..

(3) Facility rental: Calculated by summing up the values obtainable from the past records.

(4) Pilotage dues: Calculated by summing up in consideration of the numbers of calling vessels by type and the tariffs in the respective years.

(5) Land rental: Total amount of land rentals estimated upon the past records.

(6) Support revenues: Total amount of such revenues estimated upon the past records.

The expenditure was calculated according to the following classifications.

(1) Personnel expense: The required number of personnel in the respective years was estimated upon the actual value in 1976. The per capita expense was assumed to increase at a rate of 5 percent yearly after 1976 and was calculated by summing up.

(2) Interest payable: Assuming that the investment would be made equally in each year of the two years of the Urgent Improvement Program or five years of the Short Term Development Program, the interests payable and the amount of return in the respective years were calculated for the respective cases (reference appended Table 10-12(1) through (4)).

(3) Administrative expense: Calculated with the actual values of the rate of operation expense of the port of Tg. Priok, etc. taken into consideration.

(4) Depreciation: Calculated by summing up the amounts of depreciation commensurate with the investments for the last year by type of work (Tables 10-13 (1) ~ 10-13 (4)).

The net profit after depreciation was calculated with 30.25% paid into the Central

Government Development Fund as in the case of the other government enterprises and the remaining reserved internally. The basis of calculation is

(Net profit after depreciation 100% – Tax fund equivalent 45%) x 55%
= 30.25%

### 10-3-2 Level of Unit Charges

Upon calculation of the revenues enough to maintain the self-supporting of the port of Semarang in the target years, the unit charges would have to be increased as shown in Table 10-5. In the case of the port of Semarang, the investment is of a great scale nearly equal to that of a new port, resulting in increasing burden of the interest and depreciation, as stated in the foregoing. Now taking the years of 1976 and 1985, the unit charges in 1985 are increasing by about 2.0 times average over those in 1976. It was assumed that the level of the unit charges from 1986 to 2000 would be maintained the same level as 1985. In raising the tariff in the years from 1979 to 1985, a method of raising at the same rate every year was adopted.

Table 10-5 Unit Charge and Revenue in 1976 and 1985

| Item | 1976 | | | 1985 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | High Projection | | | Low Projection | | |
| | Unit Charge Rp/ton | Volume of Cargo Thousand tons | Revenue Million Rp | Unit Charge Rp/ton | Volume of Cargo Thousand tons | Revenue Million Rp | Unit Charge Rp/ton | Volume of Cargo Thousand tons | Revenue Million Rp |
| | (1) | (1) | (1) | (1.1) | (2.1) | (2.4) | (1.1) | (1.9) | (2.1) |
| Harbour Dues | 82 | 8.4 | 66 | 92 | 1,330 | 165 | 92 | 1,530 | 143 |
| | (1) | (1) | (1) | (2.9) | (2.1) | (4.2) | (2.9) | (1.9) | (5.4) |
| Quay Dues | 218 | 8.4 | 176 | 630 | 1,330 | 1,090 | 630 | 1,530 | 950 |
| | (1) | (1) | (1) | (1.9) | (2.1) | (4.0) | (1.8) | (1.9) | (3.4) |
| Facility Dues | 359 | 8.4 | 322 | 740 | 1,330 | 1,290 | 720 | 1,530 | 1,359 |
| | (1) | (1) | (1) | (4.1) | (2.1) | (8.9) | (4.1) | (1.9) | (7.8) |
| Pilotage Dues | 65 | 8.4 | 33 | 190 | 1,330 | 330 | 180 | 1,530 | 290 |
| | | | (1) | | | (1.7) | | | (1.7) |
| Land Rental | | | 19 | | | 150 | | | 150 |
| | | | (1) | | | (3.7) | | | (3.7) |
| Support Revenues | | | 179 | | | 670 | | | 585 |
| | (1) | | (1) | (2.9) | (2.1) | (4.2) | (2.9) | (1.9) | (3.7) |
| Total | 1,015 | | 859 | 2,130 | 1,330 | 3,430 | 2,110 | 1,530 | 3,210 |

Note: ( ) denotes a trend ratio.

Where a large investment is made in a relatively short period as in the case of the port of Semarang, the interest on loan and depreciation are normally of great burden, and the means to resolve such problem are, first, reduction of the expenditure and, second, increase of the tariff, and it is required to balance the incomings and outgoings through such means.

Table 10-6 shows the status of balances under the respective cases of the port of Semarang (see Tables 10-14 (1) ~ 10-14 (5)).

Table 10-6 Status of Balances

(Unit: million Rp)

| | Case | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 2000 | 1978-1985 | 1986-2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Revenue | H.P. PLAN A-1 & A-2 | 1,020 | 1,190 | 1,450 | 1,830 | 2,350 | 2,570 | 3,020 | 3,690 | 5,850 | 18,690 | 80,820 |
| | L.P. PLAN A-1 & A-2 | 950 | 1,130 | 1,360 | 1,650 | 1,950 | 2,290 | 2,720 | 3,210 | 5,440 | 17,080 | 66,840 |
| Net Profit after Depreciation | H.P. PLAN A-1 Case I | 102 | - 70 | - 420 | - 530 | - 650 | - 320 | - 170 | 190 | 950 | - 9,510 | 14,690 |
| | H.P. PLAN A-1 Case II | 102 | - 130 | - 580 | - 750 | - 720 | - 630 | - 510 | - 190 | 950 | - 3,250 | 11,290 |
| | H.P. PLAN A-2 Case II | 102 | - 20 | - 370 | - 420 | - 440 | - 630 | - 330 | - 150 | 970 | - 1,900 | 11,250 |
| | L.P. PLAN A-1 Case II | 92 | - 140 | - 610 | - 850 | - 740 | - 650 | - 430 | - 290 | 960 | - 3,490 | 6,870 |
| | L.P. PLAN A-2 Case II | 92 | - 40 | - 330 | - 650 | - 650 | - 650 | - 390 | - 250 | 930 | - 2,370 | 6,370 |
| Interest on Loans | H.P. PLAN A-1 Case I | | 110 | 320 | 470 | 540 | 610 | 690 | 760 | 650 | 3,500 | 9,930 |
| | H.P. PLAN A-1 Case II | | 165 | 450 | 700 | 810 | 920 | 1,030 | 1,140 | 650 | 5,240 | 13,320 |
| | H.P. PLAN A-2 Case II | | 110 | 340 | 530 | 650 | 830 | 930 | 1,030 | 650 | 4,540 | 13,320 |
| | L.P. PLAN A-1 Case II | | 160 | 450 | 690 | 780 | 870 | 960 | 1,060 | 630 | 5,000 | 12,870 |
| | L.P. PLAN A-2 Case II | | 110 | 340 | 520 | 650 | 760 | 910 | 1,040 | 610 | 4,330 | 12,210 |
| Depreciation | H.P. PLAN A-1 | 128 | 300 | 630 | 850 | 960 | 1,080 | 1,190 | 1,300 | 900 | 6,650 | 16,970 |
| | H.P. PLAN A-2 | 128 | 250 | 630 | 690 | 840 | 980 | 1,130 | 1,250 | 910 | 6,040 | 16,310 |
| | L.P. PLAN A-1 | 128 | 300 | 630 | 840 | 950 | 1,000 | 1,080 | 1,170 | 810 | 6,320 | 14,260 |
| | L.P. PLAN A-2 | 128 | 250 | 690 | 690 | 790 | 910 | 1,030 | 1,150 | 810 | 5,670 | 14,320 |

## 10-4 D.C.F. Internal Rate of Return

In order to evaluate the investment effect in the self-supporting accounting system of the port of Semarang, the total amount of profit before depreciation before interest payment up to 2008 was taken against the total amount of investment up to 1985 to calculate the rate of return. The formula for calculation of the D.C.F. internal rate of return is

D.C.F. (Discounted Cash Flow) Internal Rate of Return

$$= \frac{\text{Profit before Depreciation before Interest (Cash in Flow)}}{\text{Investment (Cash Out Flow)}}$$

The period of calculation of the D.C.F. internal rate of return was taken as 30 years after start of the investment.

The D.C.F. internal rate of return thus calculated are shown in Table 10-7 (see appended Tables 10-15 (1) ~ 10-15 (5)).

Table 10-7 D.C.F. Internal Rate of Return

(unit: %)

| Item | High Projection | Low Projection |
|---|---|---|
| PLAN A-1 | 3.3 | 2.9 |
| PLAN A-2 | 3.4 | 3.0 |

Except the case of Low Projection, PLAN A-1, the D.C.F. internal rate of return is greater than three percent, and it may be taken as a reasonable figure from the viewpoint of investment to infrastructures.

## 10-5 Balance Sheet at End of Year

From the Table of the status of balances of the port of Semarang, a balance sheet was prepared as shown in Table 10-8, and upon the balance sheet, a source & application of fund was calculated as shown in Table 10-9 (see appended Tables 10-16 (1) ~ 10-16 (5)).

Table 10-8 Balance Sheet at End of Year

(Unit: million Rp.)

| Item | Case | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1990 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Net Current Assets | H.P. PLAN A-1 Case I | 2,046 | 2,276 | 2,456 | 2,816 | 3,326 | 4,086 | 5,106 | 6,536 | 12,826 | 16,856 |
| | H.P. PLAN A-1 Case II | 2,046 | 2,226 | 2,276 | 2,376 | 2,616 | 3,066 | 3,746 | 4,856 | 7,776 | 4,756 |
| | H.P. PLAN A-2 Case II | 2,056 | 2,276 | 2,456 | 2,336 | 3,136 | 3,656 | 4,426 | 5,556 | 8,776 | 5,496 |
| | L.P. PLAN A-1 Case II | 2,036 | 2,196 | 2,216 | 2,256 | 2,436 | 2,776 | 3,366 | 4,246 | 5,646 | 1,086 |
| | L.P. PLAN A-2 Case II | 2,036 | 2,246 | 2,436 | 2,636 | 2,926 | 3,376 | 4,016 | 4,916 | 6,336 | 1,736 |
| Other Reserves and Provisions | H.P. PLAN A-1 Case I | 842 | 372 | 352 | -168 | -618 | -938 | -1,168 | -978 | 1,142 | 9,262 |
| | H.P. PLAN A-1 Case II | 842 | 722 | 182 | -608 | -1,328 | -1,958 | -2,418 | -2,658 | -1,858 | 5,212 |
| | H.P. PLAN A-2 Case II | 842 | 822 | 522 | 102 | -338 | -768 | -1,158 | -1,308 | -548 | 6,522 |
| | L.P. PLAN A-1 Case II | 832 | 692 | 82 | -768 | -1,458 | -2,118 | -2,608 | -2,898 | -3,218 | 1,262 |
| | L.P. PLAN A-2 Case II | 832 | 792 | 462 | 2 | -478 | -938 | -1,328 | -1,578 | -1,838 | 3,002 |
| Long-term Loans | H.P. PLAN A-1 Case I | | 10,330 | 21,460 | 25,160 | 28,860 | 32,560 | 36,260 | 39,960 | 37,300 | 24,000 |
| | H.P. PLAN A-1 Case II | | 10,330 | 21,460 | 25,160 | 28,860 | 32,560 | 36,260 | 39,960 | 35,960 | 15,960 |
| | H.P. PLAN A-2 Case II | | 7,505 | 15,010 | 20,000 | 24,990 | 29,980 | 34,970 | 39,960 | 35,960 | 15,960 |
| | L.P. PLAN A-1 Case II | | 10,330 | 21,460 | 24,510 | 27,560 | 30,610 | 33,660 | 36,710 | 33,030 | 14,630 |
| | L.P. PLAN A-2 Case II | | 7,505 | 15,010 | 19,350 | 23,690 | 28,030 | 32,370 | 36,710 | 33,030 | 14,630 |
| Total Assets | H.P. PLAN A-1 Case I | 4,223 | 19,783 | 35,923 | 43,839 | 46,735 | 52,781 | 59,687 | 65,803 | 71,393 | 76,153 |
| | H.P. PLAN A-1 Case II | 4,223 | 19,333 | 35,113 | 40,399 | 46,025 | 51,761 | 57,727 | 64,323 | 63,043 | 64,063 |
| | H.P. PLAN A-2 Case II | 4,223 | 15,183 | 26,103 | 33,459 | 41,025 | 45,701 | 56,547 | 64,823 | 67,743 | 54,763 |
| | L.P. PLAN A-1 Case II | 4,213 | 19,703 | 35,653 | 39,447 | 43,981 | 48,675 | 53,619 | 58,853 | 60,233 | 55,693 |
| | L.P. PLAN A-2 Case II | 4,213 | 15,353 | 26,043 | 32,447 | 38,551 | 45,595 | 52,029 | 59,523 | 60,943 | 56,343 |

Table 10-9 Source & Application of Funds

(Unit: million Rp.)

| Item | Case | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1990 | 2000 | 1976~1985 | 1986~2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Profit before Depreciation | H.P. PLAN A-1 Case I | 330 | 330 | 210 | 330 | 510 | 760 | 1,020 | 1,030 | 2,040 | 3,880 | 5,375 | 30,760 |
| | H.P. PLAN A-1 Case II | 330 | 180 | 50 | 130 | 240 | 450 | 680 | 1,310 | 1,710 | 3,880 | 3,435 | 27,360 |
| | H.P. PLAN A-2 Case II | 330 | 230 | 180 | 270 | 630 | 550 | 740 | 1,330 | 1,710 | 3,890 | 4,135 | 27,360 |
| | L.P. PLAN A-1 Case II | 320 | 160 | 20 | 60 | 160 | 340 | 530 | 850 | 2,350 | 1,370 | 2,925 | 21,830 |
| | L.P. PLAN A-2 Case II | 320 | 210 | 160 | 210 | 310 | 450 | 640 | 900 | 1,370 | 1,330 | 3,495 | 21,090 |
| Repayment of Long-term Loans | H.P. PLAN A-1 & PLAN A-2 Case I | | | | | | | | | 1,330 | 1,330 | | 15,960 |
| | H.P. PLAN A-1 & PLAN A-2 Case II | | | | | | | | | 2,000 | 2,000 | | 24,000 |
| | L.P. PLAN A-1 & PLAN A-2 Case I | | | | | | | | | 1,230 | 1,230 | | 14,640 |
| | L.P. PLAN A-1 & PLAN A-2 Case II | | | | | | | | | 1,845 | 1,845 | | 22,080 |
| Repayment to Government | H.P. PLAN A-1 Case I | 30 | - | - | - | - | - | - | 60 | 270 | 300 | 150 | 4,650 |
| | H.P. PLAN A-1 Case II | 30 | - | - | - | - | - | - | - | 150 | 300 | 30 | 3,420 |
| | H.P. PLAN A-2 Case II | 30 | - | - | - | - | - | - | - | 150 | 300 | 30 | 3,420 |
| | L.P. PLAN A-1 Case II | 30 | - | - | - | - | - | - | - | 50 | 300 | 30 | 2,220 |
| | L.P. PLAN A-2 Case II | 30 | - | - | - | - | - | - | - | 50 | 300 | 30 | 2,220 |
| Increase/Decrease of Net Current Assets | H.P. PLAN A-1 Case I | 500 | 230 | 210 | 330 | 510 | 760 | 1,020 | 1,430 | | | 5,345 | 11,350 |
| | H.P. PLAN A-1 Case II | 500 | 180 | 50 | 130 | 240 | 450 | 680 | 1,310 | | | 3,265 | - 60 |
| | H.P. PLAN A-2 Case II | 500 | 230 | 180 | 270 | 630 | 550 | 740 | 1,330 | | | 4,965 | - 60 |
| | L.P. PLAN A-1 Case II | 490 | 160 | 20 | 60 | 160 | 340 | 590 | 850 | | | 3,655 | -3,150 |
| | L.P. PLAN A-2 Case II | 490 | 210 | 160 | 210 | 310 | 450 | 640 | 900 | | | 4,325 | -3,180 |

Additionally, the operating ratio and return on net fixed assets were calculated according to the following formulas (see Tables 10-10 and 10-11).

$$\text{Operating Ratio} = \frac{\text{Operating Expenditure}}{\text{Operating Revenue}} \times 100$$

Return on Net Fixed Assets

$$= \frac{\text{Profit after Depreciation before Payment of Interest}}{\text{Net Fixed Assets at End of Year}} \times 100$$

From the balance sheets etc., the following may be concluded.

With increasing depreciation, the operating ratio and the return on net fixed assets are in the orders of 80~100 percent and less than one percent respectively and can hardly be said to be good. However, from 1986 when the depreciation begins to decrease, the rates will be improved gradually to the level of the operating ratio at 70 percent and the return on the net fixed assets at 4 percent in 2000.

Table 10-10 Operating Ratio

(Unit: %)

| Case | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1990 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H.P. PLAN A-1 | 92.3 | 92.3 | 90.0 | 96.6 | 106.8 | 102.8 | 95.8 | 88.7 | 82.8 | 74.3 | 67.5 | 75.1 |
| H.P. PLAN A-2 | 92.3 | 92.3 | 90.0 | 92.4 | 97.3 | 93.9 | 90.2 | 84.8 | 80.8 | 73.7 | 67.5 | 75.3 |
| L.P. PLAN A-1 | 92.3 | 92.2 | 90.6 | 98.2 | 109.6 | 106.7 | 98.0 | 90.8 | 82.7 | 76.0 | 70.7 | 75.0 |
| L.P. PLAN A-2 | 92.3 | 92.2 | 90.6 | 93.8 | 99.3 | 96.4 | 91.3 | 86.9 | 80.9 | 75.4 | 70.7 | 75.0 |

Table 10-11 Return on Net Fixed Assets

(Unit: %)

| Case | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1990 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H.P. PLAN A-1 | 5.22 | 6.23 | 9.92 | 0.25 | -0.33 | -0.14 | 0.23 | 0.66 | 1.09 | 1.83 | 3.57 | 4.09 |
| H.P. PLAN A-2 | 5.22 | 6.23 | 9.92 | 0.78 | 0.18 | 0.39 | 0.61 | 0.96 | 1.24 | 1.85 | 3.52 | 3.99 |
| L.P. PLAN A-1 | 5.22 | 6.23 | 8.95 | 0.12 | -0.42 | -0.32 | 0.11 | 0.51 | 1.06 | 1.62 | 2.73 | 4.09 |
| L.P. PLAN A-2 | 5.22 | 6.23 | 8.95 | 0.61 | 0.05 | 0.22 | 0.52 | 0.79 | 1.21 | 1.64 | 2.69 | 4.02 |

As a conclusion, the foregoing cases are not much different, in any case, financial viability is observed.

## Table 10-12(1) Long-term Loan Schedule (High Projection PLAN A-1)

(Unit: million Rp)

| Year | Investment | | | Case – I | | | Case – II | | |
|---|---|---|---|---|---|---|---|---|---|
| | Development Fund | Long-term Loans | Total | Loans Repayment Amount | Loans Balance at End | Loans Interest | Loans Repayment Amount | Loans Balance at End | Loans Interest |
| 1979 | 4,600 | 10,730 | 15,330 | | 10,730 | 110 | | 10,730 | 160 |
| 1980 | 4,600 | 10,730 | 15,330 | | 21,460 | 320 | | 21,460 | 430 |
| 1981 | 1,586 | 3,700 | 5,286 | | 25,160 | 470 | | 25,160 | 700 |
| 1982 | 1,586 | 3,700 | 5,286 | | 28,860 | 540 | | 28,860 | 810 |
| 1983 | 1,586 | 3,700 | 5,286 | | 32,560 | 610 | | 32,560 | 930 |
| 1984 | 1,586 | 3,700 | 5,286 | | 36,260 | 690 | | 36,260 | 1,030 |
| 1985 | 1,586 | 3,700 | 5,286 | | 39,960 | 760 | | 39,960 | 1,150 |
| 1986 | | | | | 39,960 | 800 | | 39,960 | 1,200 |
| 1987 | | | | | 39,960 | 800 | | 39,960 | 1,200 |
| 1988 | | | | | 39,960 | 800 | | 39,960 | 1,200 |
| 1989 | | | | 1,330 | 38,630 | 770 | 2,000 | 37,960 | 1,140 |
| 1990 | | | | 1,330 | 37,300 | 750 | 2,000 | 35,960 | 1,080 |
| 1991 | | | | 1,330 | 35,970 | 720 | 2,000 | 33,960 | 1,020 |
| 1992 | | | | 1,330 | 34,640 | 690 | 2,000 | 31,960 | 960 |
| 1993 | | | | 1,330 | 33,310 | 670 | 2,000 | 29,960 | 900 |
| 1994 | | | | 1,330 | 31,980 | 640 | 2,000 | 27,960 | 840 |
| 1995 | | | | 1,330 | 30,650 | 610 | 2,000 | 25,960 | 780 |
| 1996 | | | | 1,330 | 29,320 | 590 | 2,000 | 23,960 | 720 |
| 1997 | | | | 1,330 | 27,990 | 560 | 2,000 | 21,960 | 660 |
| 1998 | | | | 1,330 | 26,660 | 530 | 2,000 | 19,960 | 600 |
| 1999 | | | | 1,330 | 25,330 | 510 | 2,000 | 17,960 | 540 |
| 2000 | | | | 1,330 | 24,000 | 480 | 2,000 | 15,960 | 480 |
| Total | 17,130 | 39,960 | 57,090 | 15,960 | | 13,420 | 24,000 | | 18,560 |

## Table 10-12(2) Long-term Schedule (High Projection PLAN A-2)

(Unit: million Rp)

| Year | Investment | | | Case – I | | | Case – II | | |
|---|---|---|---|---|---|---|---|---|---|
| | Development Fund | Long-term Loans | Total | Loans Repayment Amount | Loans Balance at End | Loans Interest | Loans Repayment Amount | Loans Balance at End | Loans Interest |
| 1979 | 3,225 | 7,505 | 10,730 | | 7,505 | 80 | | 7,505 | 110 |
| 1980 | 3,225 | 7,505 | 10,730 | | 15,010 | 230 | | 15,010 | 340 |
| 1981 | 2,136 | 4,990 | 7,126 | | 20,000 | 350 | | 20,000 | 530 |
| 1982 | 2,136 | 4,990 | 7,126 | | 24,990 | 450 | | 24,990 | 650 |
| 1983 | 2,136 | 4,990 | 7,126 | | 29,980 | 550 | | 29,980 | 830 |
| 1984 | 2,136 | 4,990 | 7,126 | | 34,970 | 650 | | 34,970 | 970 |
| 1985 | 2,136 | 4,990 | 7,126 | | 39,960 | 750 | | 39,960 | 1,120 |
| 1986 | | | | | 39,960 | 800 | | 39,960 | 1,200 |
| 1987 | | | | | 39,960 | 800 | | 39,960 | 1,200 |
| 1988 | | | | | 39,960 | 800 | | 39,960 | 1,200 |
| 1989 | | | | 1,330 | 38,630 | 770 | 2,000 | 37,960 | 1,140 |
| 1990 | | | | 1,330 | 37,300 | 750 | 2,000 | 35,960 | 1,080 |
| 1991 | | | | 1,330 | 35,970 | 720 | 2,000 | 33,960 | 1,020 |
| 1992 | | | | 1,330 | 34,640 | 690 | 2,000 | 31,960 | 960 |
| 1993 | | | | 1,330 | 33,310 | 670 | 2,000 | 29,960 | 900 |
| 1994 | | | | 1,330 | 31,980 | 640 | 2,000 | 27,960 | 840 |
| 1995 | | | | 1,330 | 30,650 | 610 | 2,000 | 25,960 | 780 |
| 1996 | | | | 1,330 | 29,320 | 590 | 2,000 | 23,960 | 720 |
| 1997 | | | | 1,330 | 27,990 | 560 | 2,000 | 21,960 | 660 |
| 1998 | | | | 1,330 | 26,660 | 530 | 2,000 | 19,960 | 600 |
| 1999 | | | | 1,330 | 25,330 | 510 | 2,000 | 17,960 | 540 |
| 2000 | | | | 1,330 | 24,000 | 480 | 2,000 | 15,960 | 480 |
| Total | 17,130 | 39,960 | 57,090 | 15,960 | | 12,550 | 24,000 | | 17,560 |

## Table 10-12(3) Long Term Loan Schedule (Low Projection PLAN A-1)

(Unit: million Rp)

| Year | Investment | | | Case – I | | | Case – II | | |
|---|---|---|---|---|---|---|---|---|---|
| | Development Fund | Long term Loans | Total | Loans Repayment Amount | Loans Balance at End | Loans Interest | Loans Repayment Amount | Loans Balance at End | Loans Interest |
| 1979 | 4,600 | 10,730 | 15,330 | | 10,730 | 110 | | 10,730 | 160 |
| 1980 | 4,600 | 10,730 | 15,330 | | 21,460 | 320 | | 21,460 | 480 |
| 1981 | 1,304 | 3,050 | 4,354 | | 24,510 | 460 | | 24,510 | 690 |
| 1982 | 1,304 | 3,050 | 4,354 | | 27,560 | 520 | | 27,560 | 780 |
| 1983 | 1,304 | 3,050 | 4,354 | | 30,610 | 580 | | 30,610 | 870 |
| 1984 | 1,304 | 3,050 | 4,354 | | 33,660 | 640 | | 33,660 | 960 |
| 1985 | 1,304 | 3,050 | 4,354 | | 36,710 | 700 | | 36,710 | 1,060 |
| 1986 | | | | | 36,710 | 730 | | 36,710 | 1,100 |
| 1987 | | | | | 36,710 | 730 | | 36,710 | 1,100 |
| 1988 | | | | | 36,710 | 730 | | 36,710 | 1,100 |
| 1989 | | | | 1,220 | 35,490 | 710 | 1,840 | 34,870 | 1,050 |
| 1990 | | | | 1,220 | 34,270 | 690 | 1,840 | 33,030 | 990 |
| 1991 | | | | 1,220 | 33,050 | 660 | 1,840 | 31,190 | 940 |
| 1992 | | | | 1,220 | 31,830 | 640 | 1,840 | 29,350 | 880 |
| 1993 | | | | 1,220 | 30,610 | 610 | 1,840 | 27,510 | 830 |
| 1994 | | | | 1,220 | 29,390 | 590 | 1,840 | 25,670 | 770 |
| 1995 | | | | 1,220 | 28,170 | 560 | 1,840 | 23,830 | 710 |
| 1996 | | | | 1,220 | 26,950 | 540 | 1,840 | 21,990 | 660 |
| 1997 | | | | 1,220 | 25,730 | 510 | 1,840 | 20,150 | 600 |
| 1998 | | | | 1,220 | 24,510 | 490 | 1,840 | 18,310 | 550 |
| 1999 | | | | 1,220 | 23,290 | 470 | 1,840 | 16,470 | 490 |
| 2000 | | | | 1,220 | 22,070 | 440 | 1,840 | 14,630 | 440 |
| Total | 15,720 | 36,710 | 52,430 | 14,640 | | 12,430 | 22,080 | | 17,170 |

## Table 10-12(4) Long-term Loan Schedule (Low Projection PLAN A-2)

(Unit: million Rp)

| Year | Investment | | | Case – I | | | Case – II | | |
|---|---|---|---|---|---|---|---|---|---|
| | Development Fund | Long term Loans | Total | Loans Repayment Amount | Loans Balance at End | Loans Interest | Loans Repayment Amount | Loans Balance at End | Loans Interest |
| 1979 | 3,225 | 7,505 | 10,730 | | 7,505 | 80 | | 7,505 | 110 |
| 1980 | 3,225 | 7,505 | 10,730 | | 15,010 | 230 | | 15,010 | 340 |
| 1981 | 1,854 | 4,340 | 6,194 | | 19,350 | 340 | | 19,350 | 520 |
| 1982 | 1,854 | 4,340 | 6,194 | | 23,690 | 430 | | 23,690 | 650 |
| 1983 | 1,854 | 4,340 | 6,194 | | 28,030 | 530 | | 28,030 | 760 |
| 1984 | 1,854 | 4,340 | 6,194 | | 32,370 | 600 | | 32,370 | 910 |
| 1985 | 1,854 | 4,340 | 6,194 | | 36,710 | 690 | | 36,710 | 1,040 |
| 1986 | | | | | 36,710 | 730 | | 36,710 | 1,100 |
| 1987 | | | | | 36,710 | 730 | | 36,710 | 1,100 |
| 1988 | | | | | 36,710 | 730 | | 36,710 | 1,100 |
| 1989 | | | | 1,200 | 35,490 | 710 | 1,840 | 34,870 | 1,050 |
| 1990 | | | | 1,200 | 34,270 | 690 | 1,840 | 33,030 | 990 |
| 1991 | | | | 1,200 | 33,050 | 660 | 1,840 | 31,190 | 940 |
| 1992 | | | | 1,200 | 31,830 | 640 | 1,840 | 29,350 | 880 |
| 1993 | | | | 1,200 | 30,610 | 610 | 1,840 | 27,510 | 830 |
| 1994 | | | | 1,200 | 29,390 | 590 | 1,840 | 25,670 | 770 |
| 1995 | | | | 1,200 | 28,170 | 560 | 1,840 | 23,830 | 710 |
| 1996 | | | | 1,200 | 26,950 | 540 | 1,840 | 21,990 | 660 |
| 1997 | | | | 1,200 | 25,730 | 510 | 1,840 | 20,150 | 600 |
| 1998 | | | | 1,200 | 24,510 | 490 | 1,840 | 18,310 | 550 |
| 1999 | | | | 1,200 | 23,290 | 470 | 1,840 | 16,470 | 490 |
| 2000 | | | | 1,200 | 22,070 | 440 | 1,840 | 14,630 | 440 |
| Total | 15,720 | 36,710 | 52,430 | 14,640 | | 11,990 | 22,080 | | 16,540 |

Table 10-13(1) Fixed Assets Schedule (High Projection PLAN A-1)

(Unit: million Rp.)

| Year | Additional Fixed Assets to be Depreciated | Depreciation | Net Fixed Assets to be Depreciated at End | Additional Land | Net Fixed Assets at End | Fixed Assets at End |
|---|---|---|---|---|---|---|
| (1975) | | | (972) | | (1,412) | (2,177) |
| 1976 | | 128 | 844 | | 1,284 | 2,177 |
| 1977 | | 128 | 716 | | 1,156 | 2,177 |
| 1978 | | 128 | 588 | | 1,028 | 2,177 |
| 1979 | 12,680 | 300 | 12,968 | 2,650 | 16,058 | 17,507 |
| 1980 | 12,680 | 630 | 25,018 | 2,650 | 30,758 | 32,837 |
| 1981 | 3,366 | 850 | 27,534 | 1,920 | 35,194 | 38,023 |
| 1982 | 3,366 | 960 | 29,940 | 1,920 | 39,520 | 43,409 |
| 1983 | 3,366 | 1,080 | 32,226 | 1,920 | 43,726 | 48,695 |
| 1984 | 3,366 | 1,190 | 34,402 | 1,920 | 47,822 | 53,981 |
| 1985 | 3,366 | 1,300 | 36,468 | 1,920 | 51,808 | 59,267 |
| 1986-2000 | | 16,070 | 20,398 | | 35,738 | 59,267 |

Table 10-13(2) Fixed Assets Schedule (High Projection PLAN A-2)

(Unit: million Rp.)

| Year | Additional Fixed Assets to be Depreciated | Depreciation | Net Fixed Assets to be Depreciated at End | Additional Land | Net Fixed Assets at End | Fixed Assets at End |
|---|---|---|---|---|---|---|
| (1975) | | | (972) | | (1,412) | (2,177) |
| 1976 | | 128 | 844 | | 1,284 | 2,177 |
| 1977 | | 128 | 716 | | 1,156 | 2,177 |
| 1978 | | 128 | 588 | | 1,028 | 2,177 |
| 1979 | 7,980 | 250 | 8,318 | 2,750 | 11,508 | 12,907 |
| 1980 | 7,980 | 490 | 15,808 | 2,750 | 21,748 | 23,637 |
| 1981 | 5,266 | 690 | 20,384 | 1,860 | 28,184 | 30,763 |
| 1982 | 5,266 | 840 | 24,810 | 1,860 | 34,470 | 37,889 |
| 1983 | 5,266 | 950 | 29,096 | 1,860 | 40,616 | 45,015 |
| 1984 | 5,266 | 1,130 | 33,232 | 1,860 | 46,612 | 52,141 |
| 1985 | 5,266 | 1,280 | 37,218 | 1,860 | 52,458 | 59,267 |
| 1986-2000 | | 16,110 | 21,108 | | 36,348 | 59,267 |

Table 10-13(3) Fixed Assets Schedule (Low Projection PLAN A-1)

(Unit: million Rp.)

| Year | Additional Fiexed Assets to be Depreciated | Depreciation | Net Fiexed Assets to be Depreciated at End | Additional Land | Net Fixed Assets at End | Fixed Assets at End |
|---|---|---|---|---|---|---|
| (1975) | | | (972) | | (1,412) | (2,177) |
| 1976 | | 128 | 844 | | 1,284 | 2,177 |
| 1977 | | 128 | 716 | | 1,156 | 2,177 |
| 1978 | | 128 | 588 | | 1,028 | 2,177 |
| 1979 | 12,680 | 300 | 12,968 | 2,650 | 16,058 | 17,507 |
| 1980 | 12,680 | 630 | 25,018 | 2,650 | 30,758 | 32,837 |
| 1981 | 2,404 | 840 | 26,582 | 1,950 | 34,272 | 37,191 |
| 1982 | 2,404 | 920 | 28,066 | 1,950 | 37,706 | 41,545 |
| 1983 | 2,404 | 1,000 | 29,470 | 1,950 | 41,060 | 45,899 |
| 1984 | 2,404 | 1,080 | 30,794 | 1,950 | 44,334 | 50,253 |
| 1985 | 2,404 | 1,170 | 32,028 | 1,950 | 47,518 | 54,607 |
| 1986-2000 | | 14,260 | 17,768 | | 33,258 | 54,607 |

Table 10-13(4) Fixed Assets Schedule (Low Projection PLAN A-2)

(Unit: million Rp.)

| Year | Additional Fiexed Assets to be Depreciated | Depreciation | Net Fiexed Assets to be Depreciated at End | Additional Land | Net Fixed Assets at End | Fixed Assets at End |
|---|---|---|---|---|---|---|
| (1975) | | | (972) | | (1,412) | (2,177) |
| 1976 | | 128 | 844 | | 1,284 | 2,177 |
| 1977 | | 128 | 716 | | 1,156 | 2,177 |
| 1978 | | 128 | 588 | | 1,028 | 2,177 |
| 1979 | 7,980 | 250 | 8,318 | 2,750 | 11,508 | 12,907 |
| 1980 | 7,980 | 490 | 15,808 | 2,750 | 21,748 | 23,637 |
| 1981 | 4,324 | 670 | 19,462 | 1,870 | 27,272 | 29,831 |
| 1982 | 4,324 | 790 | 22,996 | 1,870 | 32,676 | 36,025 |
| 1983 | 4,324 | 910 | 26,410 | 1,870 | 37,960 | 42,219 |
| 1984 | 4,324 | 1,030 | 29,704 | 1,870 | 43,124 | 48,413 |
| 1985 | 4,324 | 1,150 | 32,878 | 1,870 | 48,168 | 54,607 |
| 1986-2000 | | 14,320 | 18,558 | | 33,848 | 54,607 |

## Table 10-14(1) Statement of Revenue & Expenditure (High Projection PLAN A-1 Case I)

(Unit: million Rp)

| Item | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 2000 | 1976-1985 | 1986-2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Revenue | | | | | | | | | | | | | |
| Harbour Dues | 66 | 70 | 70 | 90 | 70 | 90 | 100 | 120 | 140 | 160 | 250 | 976 | 3,450 |
| Quay Dues | 176 | 190 | 220 | 270 | 390 | 510 | 630 | 750 | 850 | 1,090 | 1,730 | 5,696 | 23,240 |
| Facility Rental | 322 | 350 | 380 | 440 | 530 | 620 | 730 | 860 | 1,040 | 1,290 | 2,050 | 6,582 | 28,020 |
| Pilotage Dues | 37 | 45 | 50 | 60 | 100 | 160 | 190 | 230 | 270 | 330 | 520 | 1,451 | 7,370 |
| Land Rental | 89 | 90 | 90 | 90 | 90 | 90 | 110 | 130 | 140 | 150 | 240 | 1,059 | 3,240 |
| Support Revenue | 179 | 190 | 210 | 240 | 280 | 330 | 400 | 470 | 550 | 670 | 1,070 | 3,519 | 14,650 |
| Total | 869 | 930 | 1,020 | 1,190 | 1,460 | 1,800 | 2,350 | 2,570 | 3,020 | 3,690 | 5,860 | 18,699 | 80,420 |
| Expenditure | | | | | | | | | | | | | |
| Official Cost | 211 | 240 | 270 | 310 | 350 | 430 | 460 | 530 | 610 | 700 | 2,320 | 4,541 | 23,570 |
| Administration Cost | 463 | 490 | 520 | 540 | 580 | 600 | 640 | 670 | 700 | 740 | 1,180 | 5,943 | 16,170 |
| Interest on Loans | | | | 110 | 320 | 470 | 540 | 610 | 690 | 760 | 450 | 3,500 | 9,920 |
| Total | 674 | 730 | 790 | 960 | 1,250 | 1,470 | 1,640 | 1,810 | 2,000 | 2,200 | 3,950 | 13,524 | 49,660 |
| Profit before Depreciation | 195 | 200 | 230 | 230 | 210 | 330 | 510 | 760 | 1,020 | 1,490 | 1,850 | 5,175 | 30,760 |
| Less Depreciation | 128 | 128 | 128 | 300 | 630 | 850 | 960 | 1,660 | 2,330 | 2,300 | 900 | 6,654 | 16,070 |
| Net Profit after Depreciation | 67 | 72 | 102 | -70 | -420 | -520 | -450 | -330 | -170 | 190 | 950 | -1,519 | 14,690 |
| Less payment to Government Development Reserve | 20 | 20 | 30 | - | - | - | - | - | - | 60 | 300 | 130 | 4,450 |
| Net Profit to Port | 47 | 52 | 72 | -70 | -420 | -520 | -450 | -330 | -170 | 130 | 650 | -1,649 | 10,240 |
| Accumulated Net Profit to Port from 1976 | 47 | 99 | 171 | 101 | -319 | -839 | -1,289 | -1,619 | -1,789 | -1,649 | 8,591 | -1,649 | 8,591 |

## Table 10-14(2) Statement of Revenue & Expenditure (High Projection PLAN A-1 Case II)

(Unit: million Rp)

| Item | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 2000 | 1976-1985 | 1986-2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Revenue | | | | | | | | | | | | | |
| Harbour Dues | 66 | 70 | 70 | 90 | 70 | 90 | 100 | 120 | 140 | 160 | 250 | 976 | 3,450 |
| Quay Dues | 176 | 190 | 220 | 270 | 390 | 510 | 630 | 750 | 850 | 1,090 | 1,730 | 5,696 | 23,240 |
| Facility Rental | 322 | 350 | 380 | 440 | 530 | 620 | 730 | 860 | 1,040 | 1,290 | 2,050 | 6,582 | 28,020 |
| Pilotage Dues | 37 | 45 | 50 | 60 | 100 | 160 | 190 | 230 | 270 | 330 | 520 | 1,451 | 7,370 |
| Land Rental | 89 | 90 | 90 | 90 | 90 | 90 | 110 | 130 | 140 | 150 | 240 | 1,059 | 3,240 |
| Support Revenue | 179 | 190 | 210 | 240 | 280 | 330 | 400 | 470 | 550 | 670 | 1,070 | 3,519 | 14,650 |
| Total | 869 | 930 | 1,020 | 1,190 | 1,460 | 1,800 | 2,350 | 2,570 | 3,020 | 3,690 | 5,860 | 18,699 | 80,420 |
| Expenditure | | | | | | | | | | | | | |
| Official Cost | 211 | 240 | 270 | 310 | 350 | 430 | 460 | 530 | 610 | 700 | 2,320 | 4,541 | 23,570 |
| Administration Cost | 463 | 490 | 520 | 540 | 580 | 600 | 640 | 670 | 700 | 740 | 1,180 | 5,943 | 16,170 |
| Interest on Loans | | | | 150 | 480 | 700 | 810 | 930 | 1,030 | 1,110 | 450 | 5,240 | 33,320 |
| Total | 674 | 730 | 790 | 1,010 | 1,410 | 1,730 | 1,910 | 2,130 | 2,340 | 2,540 | 3,950 | 15,254 | 73,060 |
| Profit before Depreciation | 195 | 200 | 230 | 180 | 50 | 100 | 240 | 450 | 680 | 1,150 | 1,850 | 3,435 | 27,360 |
| Less Depreciation | 128 | 128 | 128 | 300 | 630 | 850 | 960 | 1,660 | 2,330 | 2,300 | 900 | 6,654 | 16,070 |
| Net Profit after Depreciation | 67 | 72 | 102 | -120 | -580 | -750 | -720 | -630 | -510 | -190 | 950 | -3,219 | 11,290 |
| Less Payment to Government Development Reserve | 20 | 20 | 30 | - | - | - | - | - | - | - | 300 | 70 | 3,420 |
| Net Profit to Port | 47 | 52 | 72 | -120 | -580 | -750 | -720 | -630 | -510 | -190 | 650 | -3,329 | 7,870 |
| Accumulated Net Profit to Port from 1976 | 47 | 99 | 171 | 51 | -529 | -1,279 | -1,999 | -2,629 | -3,139 | -3,329 | 4,541 | -3,329 | 4,541 |

## Table 10-14(3) Statement of Revenue & Expenditure (High Projection PLAN A-2 Case II)

(Unit: million Rp)

| Item | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 2000 | 1976~1985 | 1986~2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Revenue | | | | | | | | | | | | | |
| Harbour Dues | 66 | 70 | 70 | 90 | 70 | 90 | 100 | 120 | 140 | 160 | 250 | 976 | 3,460 |
| Quay Dues | 176 | 190 | 220 | 270 | 390 | 510 | 630 | 750 | 880 | 1,090 | 1,330 | 5,096 | 23,740 |
| Facility Rental | 322 | 350 | 380 | 440 | 530 | 620 | 730 | 880 | 1,040 | 1,290 | 2,650 | 6,582 | 28,120 |
| Pilotage Dues | 37 | 40 | 50 | 60 | 100 | 160 | 190 | 230 | 270 | 330 | 520 | 1,467 | 5,370 |
| Land Rental | 89 | 90 | 90 | 90 | 90 | 90 | 110 | 120 | 140 | 150 | 240 | 1,059 | 3,290 |
| Support Revenue | 179 | 190 | 210 | 240 | 280 | 330 | 400 | 470 | 550 | 670 | 1,070 | 3,519 | 14,650 |
| Total | 869 | 930 | 1,020 | 1,190 | 1,460 | 1,800 | 2,150 | 2,570 | 3,020 | 3,690 | 5,850 | 18,693 | 80,420 |
| Expenditure | | | | | | | | | | | | | |
| Official Cost | 211 | 240 | 270 | 310 | 350 | 400 | 460 | 530 | 610 | 700 | 2,320 | 4,081 | 23,590 |
| Administration Cost | 463 | 490 | 520 | 560 | 580 | 650 | 640 | 670 | 700 | 740 | 1,180 | 5,943 | 16,870 |
| Interest on Loans | | | | 110 | 340 | 530 | 650 | 820 | 970 | 1,170 | 450 | 4,540 | 13,320 |
| Total | 674 | 730 | 790 | 960 | 1,270 | 1,580 | 1,750 | 2,020 | 2,280 | 2,560 | 3,950 | 14,564 | 53,060 |
| Profit before Depreciation | 195 | 200 | 230 | 230 | 190 | 220 | 400 | 550 | 740 | 1,130 | 1,880 | 4,135 | 27,360 |
| Less Depreciation | 128 | 128 | 128 | 250 | 490 | 690 | 840 | 980 | 1,330 | 1,280 | 910 | 6,044 | 16,110 |
| Net Profit after Depreciation | 67 | 72 | 102 | -20 | -300 | -420 | -440 | -430 | -590 | -150 | 970 | -1,909 | 11,250 |
| Less Payment to Government Development Reserve | 20 | 20 | 30 | - | - | - | - | - | - | - | 290 | 70 | 3,420 |
| Net Profit to Port | 47 | 52 | 72 | -20 | -300 | -420 | -440 | -430 | -590 | -150 | 680 | -1,979 | 7,830 |
| Accumulated Net Profit to Port from 1976 | 47 | 99 | 171 | 151 | -149 | -569 | -1,009 | -1,439 | -1,829 | -1,979 | 5,851 | -1,979 | 5,851 |

## Table 10-14(4) Statement of Revenue & Expenditure (Low Projection PLAN A-1 Case II)

(Unit: million Rp)

| Item | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 2000 | 1976~1985 | 1986~2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Revenue | | | | | | | | | | | | | |
| Harbour Dues | 66 | 70 | 70 | 80 | 70 | 80 | 90 | 100 | 120 | 140 | 240 | 856 | 2,920 |
| Quay Dues | 176 | 190 | 210 | 260 | 350 | 450 | 560 | 660 | 790 | 950 | 1,610 | 4,656 | 19,780 |
| Facility Rental | 322 | 340 | 360 | 420 | 490 | 570 | 670 | 790 | 930 | 1,100 | 1,870 | 5,992 | 22,540 |
| Pilotage Dues | 37 | 40 | 50 | 50 | 100 | 150 | 170 | 200 | 240 | 290 | 490 | 1,327 | 6,030 |
| Land Rental | 89 | 90 | 90 | 90 | 90 | 90 | 110 | 120 | 140 | 150 | 250 | 1,059 | 3,190 |
| Support Revenue | 179 | 190 | 200 | 230 | 260 | 300 | 360 | 430 | 500 | 580 | 950 | 3,219 | 12,870 |
| Total | 869 | 920 | 980 | 1,130 | 1,360 | 1,650 | 1,960 | 2,290 | 2,720 | 3,210 | 5,410 | 17,689 | 65,840 |
| Expenditure | | | | | | | | | | | | | |
| Official Cost | 211 | 240 | 260 | 290 | 330 | 370 | 420 | 470 | 540 | 630 | 2,170 | 3,351 | 20,030 |
| Administration Cost | 463 | 480 | 500 | 530 | 530 | 550 | 580 | 610 | 630 | 650 | 1,130 | 5,513 | 13,560 |
| Interest on Loans | | | | 160 | 480 | 690 | 760 | 870 | 960 | 1,060 | 420 | 5,600 | 12,170 |
| Total | 674 | 720 | 760 | 980 | 1,340 | 1,610 | 1,760 | 1,950 | 2,130 | 2,330 | 3,720 | 14,464 | 45,760 |
| Profit before Depreciation | 195 | 200 | 220 | 150 | 20 | 40 | 180 | 340 | 590 | 880 | 1,690 | 2,225 | 20,080 |
| Less Depreciation | 128 | 128 | 128 | 330 | 630 | 840 | 920 | 1,000 | 1,680 | 1,370 | 810 | 6,324 | 14,260 |
| Net Profit after Depreciation | 67 | 72 | 92 | -180 | -610 | -800 | -740 | -660 | -490 | -290 | 880 | -3,099 | 5,820 |
| Less Payment to Government Development Reserve | 20 | 20 | 30 | - | - | - | - | - | - | - | 290 | 70 | 3,210 |
| Net Profit to Port | 47 | 52 | 62 | -180 | -610 | -800 | -740 | -660 | -490 | -290 | 590 | -3,169 | 2,610 |
| Accumulated Net Profit to Port from 1976 | 47 | 99 | 161 | -19 | -583 | -1,383 | -2,123 | -2,783 | -3,273 | -3,563 | -973 | -3,563 | -973 |

## Table 10-14(5) Statement of Revenue & Expenditure (Low Projection PLAN A-2 Case II)

(Unit: million Rp)

| Item | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 2000 | 1976~1985 | 1986~2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Revenue | | | | | | | | | | | | | |
| Harbour Dues | 66 | 79 | 79 | 89 | 79 | 89 | 99 | 109 | 120 | 143 | 243 | 856 | 2,929 |
| Quay Dues | 176 | 190 | 210 | 260 | 350 | 460 | 560 | 660 | 790 | 950 | 1,610 | 4,606 | 19,760 |
| Facility Rental | 322 | 343 | 369 | 420 | 490 | 570 | 670 | 790 | 930 | 1,100 | 1,870 | 5,992 | 22,543 |
| Pilotage Dues | 37 | 43 | 50 | 50 | 100 | 150 | 170 | 200 | 240 | 290 | 490 | 1,327 | 6,030 |
| Land Rental | 89 | 90 | 90 | 90 | 90 | 90 | 110 | 120 | 140 | 150 | 250 | 1,059 | 3,190 |
| Support Revenue | 179 | 193 | 200 | 230 | 260 | 300 | 360 | 430 | 500 | 580 | 980 | 3,219 | 17,870 |
| Total | 869 | 920 | 993 | 1,139 | 1,369 | 1,659 | 1,969 | 2,299 | 2,729 | 3,213 | 5,443 | 17,059 | 66,843 |
| Expenditure | | | | | | | | | | | | | |
| Official Cost | 211 | 243 | 269 | 290 | 330 | 370 | 420 | 470 | 543 | 630 | 2,170 | 3,753 | 20,000 |
| Administration Cost | 463 | 483 | 530 | 579 | 550 | 550 | 580 | 610 | 630 | 656 | 1,100 | 5,513 | 13,543 |
| Interest on Loans | | | | 110 | 349 | 529 | 650 | 769 | 919 | 1,043 | 443 | 4,330 | 11,210 |
| Total | 674 | 726 | 769 | 979 | 1,229 | 1,449 | 1,650 | 1,849 | 2,089 | 2,329 | 3,713 | 13,596 | 45,250 |
| Profit before Depreciation | 195 | 230 | 220 | 210 | 169 | 219 | 319 | 450 | 649 | 900 | 1,730 | 3,455 | 21,099 |
| Less Depreciation | 128 | 178 | 128 | 250 | 490 | 670 | 790 | 910 | 1,030 | 1,350 | 810 | 5,676 | 14,320 |
| Net Profit after Depreciation | 67 | 72 | 92 | -43 | -330 | -450 | -453 | -460 | -390 | -250 | 920 | -2,219 | 6,770 |
| Less Payment to Government Development Reserve | 20 | 20 | 30 | - | - | - | - | - | - | - | 280 | 70 | 2,890 |
| Net Profit to Port | 47 | 52 | 62 | -43 | -330 | -450 | -453 | -460 | -390 | -250 | 640 | -2,249 | 4,580 |
| Accumulated Net Profit to Port from 1976 | 47 | 99 | 161 | 331 | -209 | -649 | -1,143 | -1,659 | -1,999 | -2,249 | 1,851 | -2,249 | 2,331 |

Table 10-15(1) D.C.F. Internal Rate of Return (High Projection PLAN A-1)

(Unit: million Rp.)

| Year | | Cash Out Flow | Cash In Flow | Discounted Value (3.3%) | |
|---|---|---|---|---|---|
| | | | | Cash Out Flow | Cash In Flow |
| 1 | 1979 | 15,330 | 340 | 15,330 | 340 |
| 2 | 1980 | 15,330 | 530 | 14,840 | 513 |
| 3 | 1981 | 5,286 | 800 | 4,954 | 750 |
| 4 | 1982 | 5,286 | 1,050 | 4,795 | 953 |
| 5 | 1983 | 5,286 | 1,370 | 4,642 | 1,203 |
| 6 | 1984 | 5,286 | 1,710 | 4,494 | 1,454 |
| 7 | 1985 | 5,286 | 2,250 | 4,350 | 1,852 |
| 8 | 1986 | | 2,400 | | 1,912 |
| 9 | 1987 | | 2,560 | | 1,974 |
| 10 | 1988 | | 2,630 | | 1,964 |
| 11 | 1989 | | 2,720 | | 1,966 |
| 12 | 1990 | | 2,790 | | 1,952 |
| 13 | 1991 | | 2,880 | | 1,951 |
| 14 | 1992 | | 2,970 | | 1,947 |
| 15 | 1993 | | 3,030 | | 1,923 |
| 16 | 1994 | | 2,950 | | 1,813 |
| 17 | 1995 | | 2,870 | | 1,707 |
| 18 | 1996 | | 2,780 | | 1,601 |
| 19 | 1997 | | 2,680 | | 1,494 |
| 20 | 1998 | | 2,580 | | 1,392 |
| 21 | 1999 | | 2,480 | | 1,296 |
| 22 | 2000 | | 2,360 | | 1,193 |
| 23 | 2001 | | 2,360 | | 1,155 |
| 24 | 2002 | | 2,360 | | 1,118 |
| 25 | 2003 | | 2,360 | | 1,083 |
| 26 | 2004 | | 2,360 | | 1,048 |
| 27 | 2005 | | 2,360 | | 1,015 |
| 28 | 2006 | | 2,360 | | 982 |
| 29 | 2007 | | 2,360 | | 951 |
| 30 | 2008 | | 2,360 | | 920 |
| Residual Value | | | 29,850 | | 11,642 |
| Total | | 57,090 | 97,460 | 53,405 | 53,064 |

D.C.F.R.R. = 3.3 %

Table 10-15(2) D.C.F. Internal Rate of Return (High Projection PLAN A-2)

(Unit: million Rp.)

| Year | | Cash Out Flow | Cash In Flow | Discounted Value (3.4%) | |
|---|---|---|---|---|---|
| | | | | Cash Out Flow | Cash In Flow |
| 1 | 1979 | 10,730 | 340 | 10,730 | 340 |
| 2 | 1980 | 10,730 | 530 | 10,377 | 513 |
| 3 | 1981 | 7,126 | 800 | 6,665 | 748 |
| 4 | 1982 | 7,126 | 1,050 | 6,446 | 950 |
| 5 | 1983 | 7,126 | 1,370 | 6,042 | 1,162 |
| 6 | 1984 | 7,126 | 1,710 | 6,029 | 1,447 |
| 7 | 1985 | 7,126 | 2,250 | 5,831 | 1,841 |
| 8 | 1986 | | 2,400 | | 1,899 |
| 9 | 1987 | | 2,560 | | 1,959 |
| 10 | 1988 | | 2,630 | | 1,947 |
| 11 | 1989 | | 2,720 | | 1,947 |
| 12 | 1990 | | 2,790 | | 1,931 |
| 13 | 1991 | | 2,880 | | 1,928 |
| 14 | 1992 | | 2,970 | | 1,923 |
| 15 | 1993 | | 3,030 | | 1,897 |
| 16 | 1994 | | 2,950 | | 1,787 |
| 17 | 1995 | | 2,870 | | 1,681 |
| 18 | 1996 | | 2,780 | | 1,575 |
| 19 | 1997 | | 2,680 | | 1,468 |
| 20 | 1998 | | 2,580 | | 1,367 |
| 21 | 1999 | | 2,480 | | 1,271 |
| 22 | 2000 | | 2,360 | | 1,169 |
| 23 | 2001 | | 2,360 | | 1,131 |
| 24 | 2002 | | 2,360 | | 1,094 |
| 25 | 2003 | | 2,360 | | 1,058 |
| 26 | 2004 | | 2,360 | | 1,023 |
| 27 | 2005 | | 2,360 | | 989 |
| 28 | 2006 | | 2,360 | | 957 |
| 29 | 2007 | | 2,360 | | 925 |
| 30 | 2008 | | 2,360 | | 895 |
| Residual Value | | | 30,440 | | 11,543 |
| Total | | 57,090 | 98,050 | 52,120 | 52,365 |

D.C.F.R.R. = 3.4 %

Table 10-15(3) D.C.F. Internal Rate of Return (Low Projection plan A-1)

(Unit: million Rp.)

| Year | | Cash Out Flow | Cash In Flow | Discounted Value (2.9%) | |
|---|---|---|---|---|---|
| | | | | Cash Out Flow | Cash In Flow |
| 1 | 1979 | 15,300 | 320 | 15,330 | 320 |
| 2 | 1980 | 15,330 | 500 | 14,898 | 486 |
| 3 | 1981 | 4,354 | 730 | 4,112 | 689 |
| 4 | 1982 | 4,354 | 960 | 3,996 | 881 |
| 5 | 1983 | 4,354 | 1,210 | 3,884 | 1,079 |
| 6 | 1984 | 4,354 | 1,550 | 3,774 | 1,344 |
| 7 | 1985 | 4,354 | 1,940 | 3,668 | 1,634 |
| 8 | 1986 | | 2,040 | | 1,670 |
| 9 | 1987 | | 2,060 | | 1,639 |
| 10 | 1988 | | 2,100 | | 1,624 |
| 11 | 1989 | | 2,130 | | 1,600 |
| 12 | 1990 | | 2,160 | | 1,577 |
| 13 | 1991 | | 2,210 | | 1,568 |
| 14 | 1992 | | 2,220 | | 1,531 |
| 15 | 1993 | | 2,270 | | 1,521 |
| 16 | 1994 | | 2,290 | | 1,491 |
| 17 | 1995 | | 2,310 | | 1,462 |
| 18 | 1996 | | 2,340 | | 1,439 |
| 19 | 1997 | | 2,360 | | 1,411 |
| 20 | 1998 | | 2,370 | | 1,377 |
| 21 | 1999 | | 2,270 | | 1,281 |
| 22 | 2000 | | 2,170 | | 1,191 |
| 23 | 2001 | | 2,170 | | 1,157 |
| 24 | 2002 | | 2,170 | | 1,124 |
| 25 | 2003 | | 2,170 | | 1,093 |
| 26 | 2004 | | 2,170 | | 1,062 |
| 27 | 2005 | | 2,170 | | 1,032 |
| 28 | 2006 | | 2,170 | | 1,051 |
| 29 | 2007 | | 2,170 | | 975 |
| 30 | 2008 | | 2,170 | | 947 |
| Residual Value | | | 28,140 | | 12,282 |
| Total | | 52,430 | 86,010 | 49,662 | 49,532 |

D.C.F.R.R. = 2.9 %

Table 10-15(4) D.C.F. Internal Rate of Return (Low Projection PLAN A-2)

(Unit: million Rp.)

| Year | | Cash Out Flow | Cash In Flow | Discounted Value (3.0%) | |
|---|---|---|---|---|---|
| | | | | Cash Out Flow | Cash In Flow |
| 1 | 1979 | 10,730 | 320 | 10,730 | 320 |
| 2 | 1980 | 10,730 | 500 | 10,417 | 485 |
| 3 | 1981 | 6,194 | 730 | 5,838 | 688 |
| 4 | 1982 | 6,194 | 960 | 5,568 | 879 |
| 5 | 1983 | 6,194 | 1,210 | 5,503 | 1,075 |
| 6 | 1984 | 6,194 | 1,550 | 5,343 | 1,337 |
| 7 | 1985 | 6,194 | 1,940 | 5,187 | 1,625 |
| 8 | 1986 | | 2,040 | | 1,659 |
| 9 | 1987 | | 2,060 | | 1,626 |
| 10 | 1988 | | 2,100 | | 1,609 |
| 11 | 1989 | | 2,130 | | 1,585 |
| 12 | 1990 | | 2,160 | | 1,560 |
| 13 | 1991 | | 2,210 | | 1,550 |
| 14 | 1992 | | 2,220 | | 1,512 |
| 15 | 1993 | | 2,270 | | 1,501 |
| 16 | 1994 | | 2,290 | | 1,470 |
| 17 | 1995 | | 2,310 | | 1,440 |
| 18 | 1996 | | 2,340 | | 1,416 |
| 19 | 1997 | | 2,360 | | 1,386 |
| 20 | 1998 | | 2,370 | | 1,351 |
| 21 | 1999 | | 2,270 | | 1,257 |
| 22 | 2000 | | 2,170 | | 1,166 |
| 23 | 2001 | | 2,170 | | 1,133 |
| 24 | 2002 | | 2,170 | | 1,100 |
| 25 | 2003 | | 2,170 | | 1,067 |
| 26 | 2004 | | 2,170 | | 1,036 |
| 27 | 2005 | | 2,170 | | 1,006 |
| 28 | 2006 | | 2,170 | | 977 |
| 29 | 2007 | | 2,170 | | 948 |
| 30 | 2008 | | 2,170 | | 921 |
| Residual Value | | | 28,680 | | 12,170 |
| Total | | 52,430 | 86,550 | 48,586 | 48,855 |

D.C.F.R.R. = 3.0 %

## Table 10-16(1) Source & Application of Funds (High Projection PLAN A-1 Case I)

(Unit: million Rp)

| | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1976~1985 | 1986~2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source of Funds (A) | | | | | | | | | | | | |
| Profit before Depreciation | 195 | 200 | 230 | 230 | 210 | 330 | 510 | 765 | 1,020 | 1,493 | 5,335 | 39,369 |
| Proceeds from Long-term Loans | | | | 10,330 | 10,330 | 3,300 | 3,300 | 3,300 | 3,300 | 3,300 | 39,969 | |
| Government Development Funds | 300 | 300 | 300 | 4,650 | 4,650 | 1,586 | 1,586 | 1,586 | 1,586 | 1,586 | 18,830 | |
| Total | 495 | 500 | 530 | 15,569 | 15,593 | 5,216 | 5,396 | 6,565 | 6,906 | 6,378 | 63,265 | 39,369 |
| Application of Funds (B) | | | | | | | | | | | | |
| Cost of Fixed Assets Addition | | | | 15,330 | 15,330 | 5,256 | 5,256 | 5,256 | 5,256 | 5,256 | 57,090 | |
| Repayment of Long-term Loans | | | | | | | | | | | | 15,369 |
| Payment to Government | 20 | 20 | 30 | - | - | - | - | - | - | 65 | 130 | 4,450 |
| Total | 20 | 20 | 30 | 15,330 | 15,330 | 5,256 | 5,256 | 5,256 | 5,256 | 5,321 | 57,220 | 20,819 |
| Increase/Decrease (+/-) of Net Current Assets (C = A - B) | 475 | 480 | 500 | 239 | 263 | 330 | 510 | 765 | 1,020 | 1,493 | 5,045 | 18,550 |
| Net Current Assets at Beginning of Year (D) | 591 | 1,066 | 1,546 | 2,046 | 2,276 | 2,556 | 2,816 | 3,326 | 4,066 | 5,376 | 591 | 6,536 |
| Net Current Assets at End of Year (C + D) | 1,066 | 1,546 | 2,046 | 2,276 | 2,556 | 2,816 | 3,326 | 4,066 | 5,376 | 6,536 | 6,536 | 18,536 |

## Table 10-16(2) Source & Application of Funds (High Projection PLAN A-1 Case II)

(Unit: million Rp)

| | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1976~1985 | 1986~2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source of Funds (A) | | | | | | | | | | | | |
| Profit before Depreciation | 155 | 200 | 230 | 183 | 59 | 130 | 243 | 458 | 683 | 1,318 | 3,835 | 27,369 |
| Proceeds from Long-term Loans | | | | 10,330 | 10,330 | 3,300 | 3,300 | 3,300 | 3,300 | 3,300 | 39,969 | |
| Government Development Funds | 300 | 300 | 300 | 4,650 | 4,650 | 1,586 | 1,586 | 1,586 | 1,586 | 1,586 | 18,830 | |
| Total | 455 | 500 | 530 | 15,519 | 15,383 | 5,386 | 5,529 | 5,338 | 5,968 | 6,206 | 61,975 | 27,369 |
| Application of Funds (B) | | | | | | | | | | | | |
| Cost of Fixed Assets Addition | | | | 15,330 | 15,330 | 5,256 | 5,256 | 5,256 | 5,256 | 5,256 | 57,090 | |
| Repayment of Long-term Loans | | | | | | | | | | | | 24,000 |
| Payment to Government | 20 | 20 | 30 | - | - | - | - | - | - | - | 70 | 3,450 |
| Total | 20 | 20 | 30 | 15,330 | 15,330 | 5,256 | 5,256 | 5,256 | 5,256 | 5,256 | 57,160 | 27,450 |
| Increase/Decrease (+/-) of Net Current Assets (C = A - B) | 435 | 480 | 500 | 189 | 53 | 130 | 243 | 450 | 683 | 1,318 | 4,265 | -81 |
| Net Current Assets at Beginning of Year (D) | 591 | 1,066 | 1,546 | 2,046 | 2,276 | 2,556 | 2,816 | 3,066 | 3,516 | 4,266 | 591 | 4,856 |
| Net Current Assets at End of Year (C + D) | 1,066 | 1,546 | 2,046 | 2,276 | 2,276 | 2,556 | 2,816 | 3,066 | 3,516 | 4,856 | 4,856 | 4,775 |

## Table 10-16(3) Source & Application of Funds (High Projection PLAN A-2 Case II)

(Unit: million Rp)

| | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1976~1985 | 1986~2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source of Funds (A) | | | | | | | | | | | | |
| Profit before Depreciation | 195 | 200 | 230 | 230 | 190 | 270 | 430 | 550 | 743 | 1,130 | 4,135 | 27,360 |
| Proceeds from Long-term Loans | | | | 7,505 | 7,505 | 4,990 | 4,990 | 4,990 | 4,990 | 4,990 | 39,960 | |
| Governmental Development Funds | 300 | 300 | 300 | 3,225 | 3,225 | 2,336 | 2,336 | 2,336 | 2,336 | 2,336 | 18,030 | |
| Total | 495 | 500 | 530 | 10,960 | 10,920 | 7,596 | 7,756 | 7,876 | 7,856 | 8,256 | 62,135 | 27,360 |
| Application of Funds (B) | | | | | | | | | | | | |
| Cost of Fixed Assets Additions | | | | 10,330 | 10,330 | 7,326 | 7,326 | 7,326 | 7,326 | 7,326 | 57,093 | |
| Repayment of Long-term Loans | | | | | | | | | | | | 20,000 |
| Payment to Government | 20 | 20 | 30 | – | – | – | – | – | – | – | 70 | 3,420 |
| Total | 20 | 20 | 30 | 10,330 | 10,330 | 7,326 | 7,326 | 7,326 | 7,326 | 7,326 | 57,169 | 27,420 |
| Increase/Decrease (-) of Net Current Assets (C = A - B) | 475 | 480 | 500 | 630 | 590 | 270 | 430 | 550 | 743 | 1,130 | 4,965 | -60 |
| Net Current Assets at Beginning of Year (D) | 591 | 1,066 | 1,546 | 2,046 | 2,676 | 3,266 | 3,536 | 3,966 | 4,516 | 5,256 | 591 | 5,556 |
| Net Current Assets at End of Year (C + D) | 1,066 | 1,546 | 2,046 | 2,676 | 3,266 | 3,536 | 3,966 | 4,516 | 5,256 | 5,556 | 5,556 | 5,496 |

## Table 10-16(4) Source & Application of Funds (Low Porjection PLAN A-1 Case II)

(Unit: million Rp)

| | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1976~1985 | 1986~2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source of Funds (A) | | | | | | | | | | | | |
| Profit before Depreciation | 195 | 200 | 220 | 150 | 20 | 45 | 150 | 340 | 590 | 880 | 2,875 | 21,830 |
| Proceeds from Long-term Loans | | | | 10,730 | 10,230 | 3,650 | 3,650 | 3,650 | 3,650 | 3,650 | 36,710 | |
| Government Development Funds | 300 | 300 | 300 | 4,650 | 4,650 | 1,304 | 1,304 | 1,304 | 1,304 | 1,304 | 16,820 | |
| Total | 495 | 500 | 520 | 15,530 | 15,350 | 4,994 | 5,104 | 5,294 | 5,544 | 5,834 | 56,355 | 21,830 |
| Application of Funds (B) | | | | | | | | | | | | |
| Cost of Fixed Assets Additions | | | | 15,330 | 15,330 | 4,354 | 4,354 | 4,354 | 4,354 | 4,354 | 52,430 | |
| Repayment of Long-term Loans | | | | | | | | | | | | 22,580 |
| Payment to Government | 20 | 20 | 30 | – | – | – | – | – | – | – | 70 | 2,210 |
| Total | 20 | 20 | 30 | 15,330 | 15,330 | 4,354 | 4,354 | 4,354 | 4,354 | 4,354 | 52,500 | 24,790 |
| Increase/Decrease (-) of Net Current Assets (C = A - B) | 475 | 480 | 490 | 200 | 20 | 640 | 750 | 940 | 1,190 | 1,480 | 3,855 | -2,960 |
| Net Current Assets at Beginning of Year (D) | 591 | 1,066 | 1,546 | 2,036 | 2,236 | 2,256 | 2,896 | 3,646 | 4,586 | 5,776 | 591 | 4,246 |
| Net Current Assets at End of Year (C + D) | 1,066 | 1,546 | 2,036 | 2,236 | 2,256 | 2,896 | 3,646 | 4,586 | 5,776 | 7,256 | 4,246 | 1,286 |

## Table 10-16(5) Source & Application of Funds (Low Projection PLAN A-2 Case II)

(Unit: million Pp)

| | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1976-1985 | 1986-2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source of Funds (A) | | | | | | | | | | | | |
| Profit before Depreciation | 135 | 200 | 220 | 310 | 160 | 210 | 310 | 450 | 640 | 900 | 3,435 | 21,090 |
| Proceeds from Long term Loans | | | | 7,505 | 7,505 | 4,343 | 4,343 | 4,343 | 4,343 | 4,343 | 36,719 | |
| Government Development Funds | 300 | 300 | 300 | 3,225 | 3,225 | 1,854 | 1,854 | 1,854 | 1,854 | 1,854 | 16,826 | |
| Total | 435 | 500 | 520 | 10,949 | 10,890 | 6,454 | 6,504 | 6,644 | 6,834 | 7,094 | 56,825 | 21,090 |
| Application of Funds (B) | | | | | | | | | | | | |
| Cost of Fixed Assets Additions | | | | 10,230 | 10,230 | 6,394 | 6,394 | 6,394 | 6,394 | 6,394 | 52,430 | |
| Repayment of Long term Loans | | | | | | | | | | | | 22,080 |
| Payment to Government | 30 | 30 | 30 | - | - | - | - | - | - | - | 90 | 2,190 |
| Total | 30 | 30 | 30 | 10,230 | 10,230 | 6,394 | 6,394 | 6,394 | 6,394 | 6,394 | 52,500 | 24,270 |
| Increase/Decrease (-) of Net Current Assets (C = A - B) | 405 | 450 | 490 | 710 | 660 | 710 | 310 | 450 | 640 | 900 | 4,325 | -3,180 |
| Net Current Assets at Beginning of Year (D) | 591 | 1,006 | 1,546 | 2,036 | 2,746 | 3,406 | 4,116 | 4,426 | 4,876 | 5,516 | 591 | 4,916 |
| Net Current Assets at End of Year (C + D) | 1,006 | 1,546 | 2,036 | 2,746 | 3,406 | 4,116 | 4,426 | 4,876 | 5,516 | 6,416 | 4,916 | 1,736 |

## Table 10-17(1) Balance Sheet at End of Year (High Projection PLAN A-1 Case I)

(Unit: million Pp)

| | (1975) | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1990 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assets | | | | | | | | | | | | | |
| Fixed Assets | 2,377 | 2,377 | 2,377 | 2,377 | 17,507 | 33,837 | 38,923 | 43,429 | 49,695 | 53,581 | 59,267 | 59,267 | 59,267 |
| (Contained land) | (443) | (443) | (443) | (443) | (3,093) | (5,783) | (7,660) | (9,560) | (11,530) | (13,020) | (15,340) | (15,340) | (15,340) |
| Net Current Assets Total | 591 | 1,006 | 1,546 | 2,036 | 2,746 | 3,406 | 4,116 | 4,426 | 4,876 | 5,516 | 6,416 | 12,326 | 16,856 |
| Total | 2,768 | 3,243 | 3,723 | 4,213 | 19,783 | 35,323 | 40,839 | 46,335 | 52,781 | 59,687 | 65,803 | 71,393 | 76,353 |
| Liabilities | | | | | | | | | | | | | |
| Other Reserves and Provisions | 671 | 718 | 770 | 842 | 772 | 352 | -168 | 618 | -938 | -1,108 | -978 | 3,142 | 9,262 |
| Long term Loans | | | | | 10,230 | 21,460 | 25,160 | 28,860 | 32,560 | 36,260 | 39,960 | 37,320 | 24,000 |
| Government Development Fund | 1,332 | 1,632 | 1,932 | 2,232 | 6,832 | 11,432 | 13,818 | 16,654 | 16,190 | 17,176 | 19,362 | 19,362 | 19,362 |
| Accumulated Depreciation on Fixed Assets | 765 | 893 | 1,021 | 1,149 | 1,449 | 2,079 | 2,829 | 3,889 | 4,963 | 6,159 | 7,459 | 13,569 | 23,529 |
| Total | 2,768 | 3,243 | 3,723 | 4,213 | 19,783 | 35,323 | 40,839 | 46,335 | 52,781 | 59,687 | 65,803 | 71,393 | 76,153 |

## Table 10-17(2) Balance Sheet at End of Year (High Projection PLAN A-1 Case II)

(Unit: million Rp)

| | (1975) | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1990 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assets | | | | | | | | | | | | | |
| Fixed Assets | 2,377 | 2,377 | 2,377 | 2,377 | 12,502 | 27,837 | 38,023 | 43,439 | 48,695 | 53,581 | 59,267 | 59,267 | 59,267 |
| (Contained fund) | (445) | (445) | (445) | (445) | (3,090) | (5,240) | (7,650) | (9,560) | (11,500) | (13,420) | (15,340) | (15,340) | (15,340) |
| Net Current Assets Total | 391 | 1,066 | 1,546 | 2,046 | 2,276 | 2,276 | 2,376 | 2,616 | 3,066 | 3,746 | 4,856 | 7,276 | 6,296 |
| Total | 2,768 | 3,243 | 3,723 | 4,223 | 19,333 | 35,313 | 43,399 | 46,925 | 51,261 | 57,327 | 64,123 | 67,043 | 64,563 |
| Liabilities | | | | | | | | | | | | | |
| Other Reserves and Provisions | 671 | 718 | 770 | 842 | 722 | 542 | -658 | -3,378 | -3,958 | -2,458 | -2,658 | -1,868 | 5,212 |
| Long-term Loans | | | | | 13,930 | 21,459 | 25,169 | 28,869 | 32,569 | 36,260 | 39,960 | 35,960 | 15,960 |
| Government Development Fund | 1,332 | 1,832 | 1,932 | 2,232 | 6,832 | 11,032 | 13,818 | 14,604 | 16,390 | 17,276 | 19,362 | 19,362 | 19,362 |
| Accumulated Depreciation on Fixed Assets | 765 | 893 | 1,021 | 1,149 | 1,449 | 2,829 | 2,829 | 3,849 | 4,969 | 6,359 | 7,459 | 13,589 | 23,529 |
| Total | 2,768 | 3,243 | 3,723 | 4,223 | 19,333 | 35,313 | 43,399 | 46,925 | 51,261 | 57,327 | 64,123 | 67,043 | 64,563 |

## Table 10-17(3) Balance Sheet at End of Year (High Projection PLAN A-2 Case II)

(Unit: million Rp)

| | (1975) | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1990 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assets | | | | | | | | | | | | | |
| Fixed Assets | 2,377 | 2,377 | 2,377 | 2,377 | 12,502 | 23,837 | 30,763 | 37,839 | 45,015 | 52,141 | 59,267 | 59,267 | 59,267 |
| (Contained fund) | (445) | (445) | (445) | (445) | (3,190) | (5,540) | (7,850) | (9,650) | (11,550) | (13,380) | (15,240) | (15,240) | (15,240) |
| Net Current Assets Total | 391 | 1,066 | 3,556 | 2,046 | 2,276 | 2,456 | 2,336 | 3,336 | 3,636 | 4,476 | 5,556 | 8,476 | 5,496 |
| Total | 2,768 | 3,243 | 3,723 | 4,223 | 15,183 | 26,193 | 33,439 | 41,935 | 48,701 | 56,567 | 64,823 | 67,743 | 64,763 |
| Liabilities | | | | | | | | | | | | | |
| Other Reserves and Provisions | 671 | 718 | 770 | 842 | 822 | 522 | 592 | -338 | -768 | -1,358 | -1,308 | -548 | 6,512 |
| Long-term Loans | | | | | 3,565 | 15,810 | 20,000 | 24,990 | 29,863 | 34,979 | 39,960 | 35,960 | 15,960 |
| Government Development Fund | 1,332 | 1,832 | 1,932 | 2,232 | 5,451 | 8,642 | 10,818 | 13,554 | 15,090 | 17,276 | 19,362 | 19,362 | 19,362 |
| Accumulated Depreciation on fixed Assets | 765 | 893 | 1,021 | 1,149 | 3,399 | 3,883 | 2,579 | 3,619 | 4,339 | 5,329 | 6,829 | 12,969 | 22,929 |
| Total | 2,768 | 3,243 | 3,723 | 4,223 | 15,183 | 26,193 | 33,439 | 41,935 | 48,701 | 56,567 | 64,823 | 67,743 | 64,763 |

## Table 10-17(4) Balance Sheet at End of Year (Low Projection PLAN A-1 Case II)

(Unit: million Rp)

| | (1975) | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1990 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assets | | | | | | | | | | | | | |
| Fixed Assets | 2,377 | 2,377 | 2,377 | 2,377 | 17,507 | 32,837 | 37,351 | 41,565 | 45,879 | 50,253 | 54,607 | 54,607 | 54,607 |
| (Cost of land) | (445) | (445) | (445) | (445) | (3,090) | (5,740) | (7,690) | (9,640) | (11,590) | (13,540) | (15,490) | (15,490) | (15,490) |
| Net Current Assets Total | 391 | 1,066 | 1,546 | 2,036 | 2,196 | 2,216 | 2,256 | 2,436 | 2,716 | 3,366 | 4,245 | 5,606 | 1,656 |
| Total | 2,768 | 3,243 | 3,723 | 4,213 | 19,703 | 35,053 | 39,447 | 43,951 | 48,635 | 53,619 | 58,853 | 60,273 | 55,693 |
| Liabilities | | | | | | | | | | | | | |
| Other Reserves and Provisions | 671 | 718 | 770 | 832 | 692 | 82 | -318 | -1,458 | -2,318 | -2,658 | -2,858 | -3,218 | 1,762 |
| Long term Loans | | | | | 10,730 | 21,450 | 24,510 | 27,569 | 30,630 | 33,690 | 36,710 | 33,830 | 14,630 |
| Government Development Fund | 1,332 | 1,832 | 1,932 | 2,232 | 6,832 | 11,432 | 12,236 | 14,043 | 15,344 | 16,648 | 17,952 | 17,952 | 17,952 |
| Accumulated Depreciation on Fixed Assets | 765 | 893 | 1,021 | 1,149 | 1,449 | 2,079 | 2,919 | 3,839 | 4,839 | 5,919 | 7,069 | 12,509 | 21,349 |
| Total | 2,768 | 3,243 | 3,723 | 4,213 | 19,703 | 35,053 | 39,447 | 43,951 | 48,635 | 53,619 | 58,853 | 60,273 | 55,693 |

## Table 10-17(5) Balance Sheet at End of Year (Low Projection PLAN A-2 Case II)

(Unit: million Rp)

| | (1975) | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1990 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assets | | | | | | | | | | | | | |
| Fixed Assets | 2,377 | 2,377 | 2,377 | 2,377 | 12,907 | 23,637 | 29,831 | 36,025 | 42,219 | 48,413 | 54,607 | 54,607 | 54,607 |
| (Cost of land) | (445) | (445) | (445) | (445) | (3,190) | (5,940) | (7,840) | (9,740) | (11,590) | (13,490) | (15,290) | (15,290) | (15,290) |
| Net Current Assets Total | 391 | 1,066 | 1,545 | 2,036 | 2,245 | 2,436 | 2,616 | 2,936 | 3,376 | 4,816 | 4,916 | 6,336 | 1,336 |
| Total | 2,768 | 3,243 | 3,723 | 4,213 | 15,353 | 26,643 | 32,447 | 38,961 | 45,595 | 52,429 | 59,523 | 60,943 | 56,343 |
| Liabilities | | | | | | | | | | | | | |
| Other Reserves and Provisions | 671 | 718 | 770 | 832 | 292 | 452 | 2 | 478 | 938 | -1,328 | -1,578 | -1,858 | 3,002 |
| Long term Loans | | | | | 7,505 | 15,010 | 19,350 | 23,690 | 28,030 | 32,370 | 36,710 | 33,830 | 14,630 |
| Government Development Fund | 1,332 | 1,832 | 1,932 | 2,232 | 5,432 | 8,632 | 10,536 | 12,390 | 14,244 | 16,098 | 17,952 | 17,952 | 17,952 |
| Accumulated Depreciation on Fixed Assets | 765 | 893 | 1,021 | 1,149 | 1,399 | 1,839 | 2,559 | 3,343 | 4,259 | 5,289 | 6,439 | 11,859 | 20,759 |
| Total | 2,768 | 3,243 | 3,723 | 4,213 | 15,353 | 26,643 | 32,447 | 38,951 | 45,595 | 52,429 | 59,523 | 63,543 | 56,343 |

# Chapter-11

# Port Administration and Operation

# CHAPTER 11
# PORT ADMINISTRATION AND OPERATION

## 11-1 General

This Chapter is intended to examine and evaluate the administration and operation of the port of Semarang which is the objective port of the present survey for presentation of some necessary recommendations.

The port of Semarang is positioned as an important port in Central Java, yet it has no access channel of adequate depth and width for the ocean going vessels to come in and is retarded in improvement of the deep sea wharves so that it has so far failed to function properly as a major foreign trade port.

However, as the development of the port of Semarang progresses hereafter, it will have an increasing port influence along with progress of the economic activities in the service area and develop into a foreign trade port worthy of the name.

For more effective use of the port and maintaining the effects at the highest level, careful consideration is required for administration and operation of the port, and modernization of the procedures of administration and operation is also important. On the other hand, there may arise difficulties that have not been seen in the administration and operation of the port of Semarang.

To enhance the effects of development of the port of Semarang, reasonable and efficient port administration and operation are indispensable, and it is required to energetically tackle the problems that may intervene.

## 11-2 Present Condition of Port Operation

The port of Semarang is, like the other ports of Indonesia, a national port planned, improved, administered and operated directly by the Central Government. The operation of the port of Semarang forming a part of the wide range sea communication administration is subject to control and coordination of the Directorate General of District Sea Communication (KANWIL HUBLA) located in Surabaya and is assumed by the Semarang Port Administration.

The wharves, breakwaters and other basic facilities of the port of Semarang are administered and operated directly by the Port Administration, while the sheds and warehouses are used upon lease to Indonesian shipping companies which perform various roles of shipping agents, stevedores, terminal operators and shipowners.

The foreign trade cargoes of the port of Semarang are dependent on the offshore cargo handling by means of the lighters, but the lighters and tugboats used in such service are all owned by the shipping companies. As of April 1977, the lighters in service in the port of Semarang number 88 with a total loading capacity of about 8,700 tons. The tugboats number 23 developing a total capacity of about 4,000 h.p.

The foreign trade cargos carried in by the lighters are discharged on land along the wharves of Inner Harbour having an average water depth of 2.5 m and the Coaster Harbour with a depth of 5.5 m and are sorted. The domestic trade cargoes of offshore loading/unloading are sometimes allowed to enter the Kali Baru Canal, discharged on both banks and carried directly to the service area by means of trucks.

Presently, there are provided 17 warehouses (total floor area of 33,000 $m^2$) in the first row and 3 warehouses (total floor area of 11,000 $m^2$) in the second row in the back of the wharves, but they are not in use upon clear classification for the so-called sheds to be used for collection and distribution, classification, sorting, inspection and temporary storage of cargos and for the warehouses to be used for storage of cargos over a long period of time.

For loading and unloading at the wharves, the derrick crane on the vessel alongside the wharf is used in one case, while the mobile crane or crawler crane used in the other. For loading to or unloading from the lighters, it is customary to use the mobile crane and manpower jointly or manpower alone.

The port labourers working in the port of Semarang are provided by the Badan Usaha Karya, and the shipping companies use them under direction of the Port Administration. They are classified in the following three, viz.

Permanent labour,
Registered pool labour, and
Casual labour,

and the registered pool labour assumes the principal role for cargo handling.

The skilled labourers are hired directly by the shipping company or its agent which rates them as permanent labour to junior or middle management personnel and gives them the positions of supervisors, tally clerks and watchmen.

About 50 percent of the registered pool labour works for about 20 days average a month, while the casual labour works only for about 10 days a month.

For the cargo handling in the anchorage, two gangs, each gang consisting of 15 persons, are used, one gang assuming the works on board the ships and the other on the lighter normally.

The standard gang formation at the wharf is;

– Where mechanical equipment such as forklift is not used;

1 gang of 15 personnel formation, and 3 gangs working, one in the lighter and the other two on the apron of the wharf; or

– Where mechanical equipment such as forklift is used;

The number of personnel of one gang is reduced normally to about 2/3 of that for use of the mechanical equipment.

For supervision, tallying and watchman service for the respective gangs, two permenent labourers are assigned.

At present, the port of Semarang is shortcoming in the wharf illumination facilities so that no cargo handling is carried out at night. Thus, the daily average of the working hours throughout the year is less than 10 hours.

## 11-3 Present Condition of Port Administration System

The administration and operation of the port of Semarang are placed, as in the other major ports, under the direct control of the Central Government, and the Port Administration (ADPEL) assumes the responsibility. That is, the Directorate General of Sea Communications in the Department of Communications and Tourism of the Central Government controls the port administration in general of the country to promote the sea communications and port development in line with the policies on sea communications. In Fig. 11-1 and 11-2 are shown the organization of the Department of Communications and Tourism and that of the Directorate General of Sea Communications respectively.

To insure nationwide harmony of the port as well as shipping administration and for realization of smooth execution of such administration, the water area of the whole country of Indonesia is divided into 9 districts, and a Directorate General of District Sea Communications (KANWIL HUBLA) is installed in each of the central cities of such districts. The organization of the Directorate General of Distric Sea Communications is illustrated in Fig. 11-3.

The areas of jurisdiction of these Directorate Generals of District Sea Communications are as shown below, and the Semarang Port Administration is placed under the control of S.R. IV located in Surabaya.

Fig. 11-1 The Organization Chart of the Department of Communications and Turism

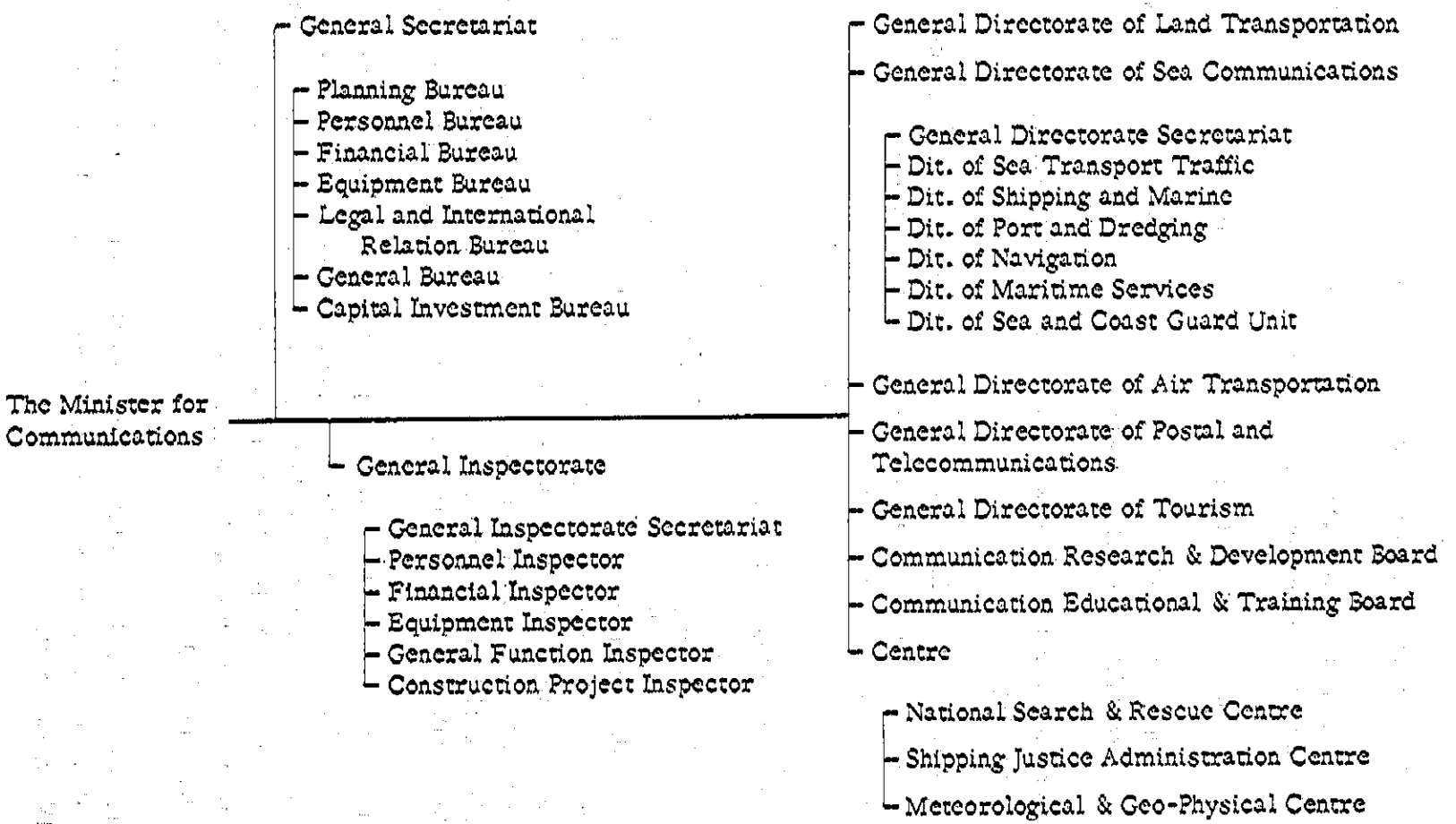


Fig. 11-2 The Organization Chart of the Directorate General of Sea Communications

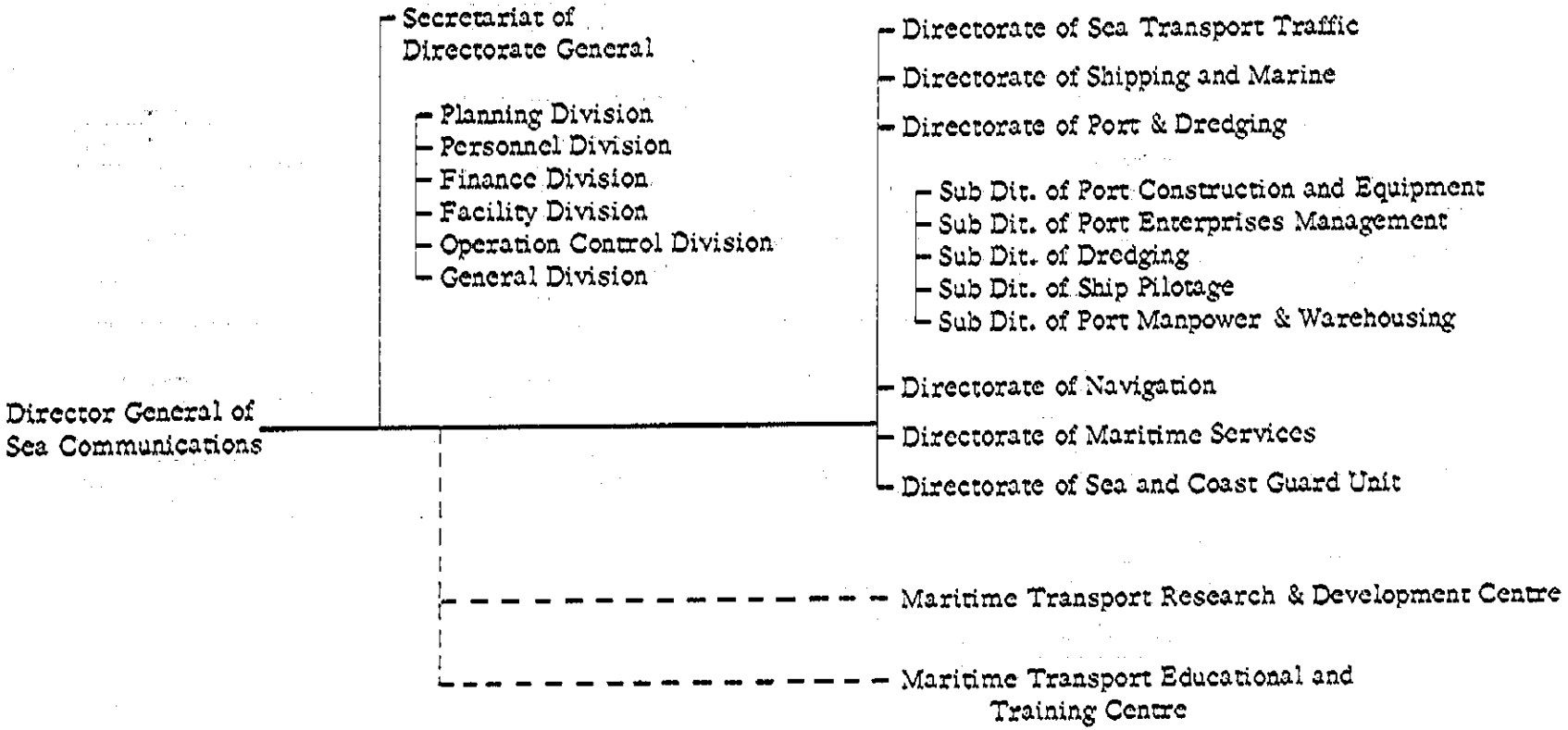
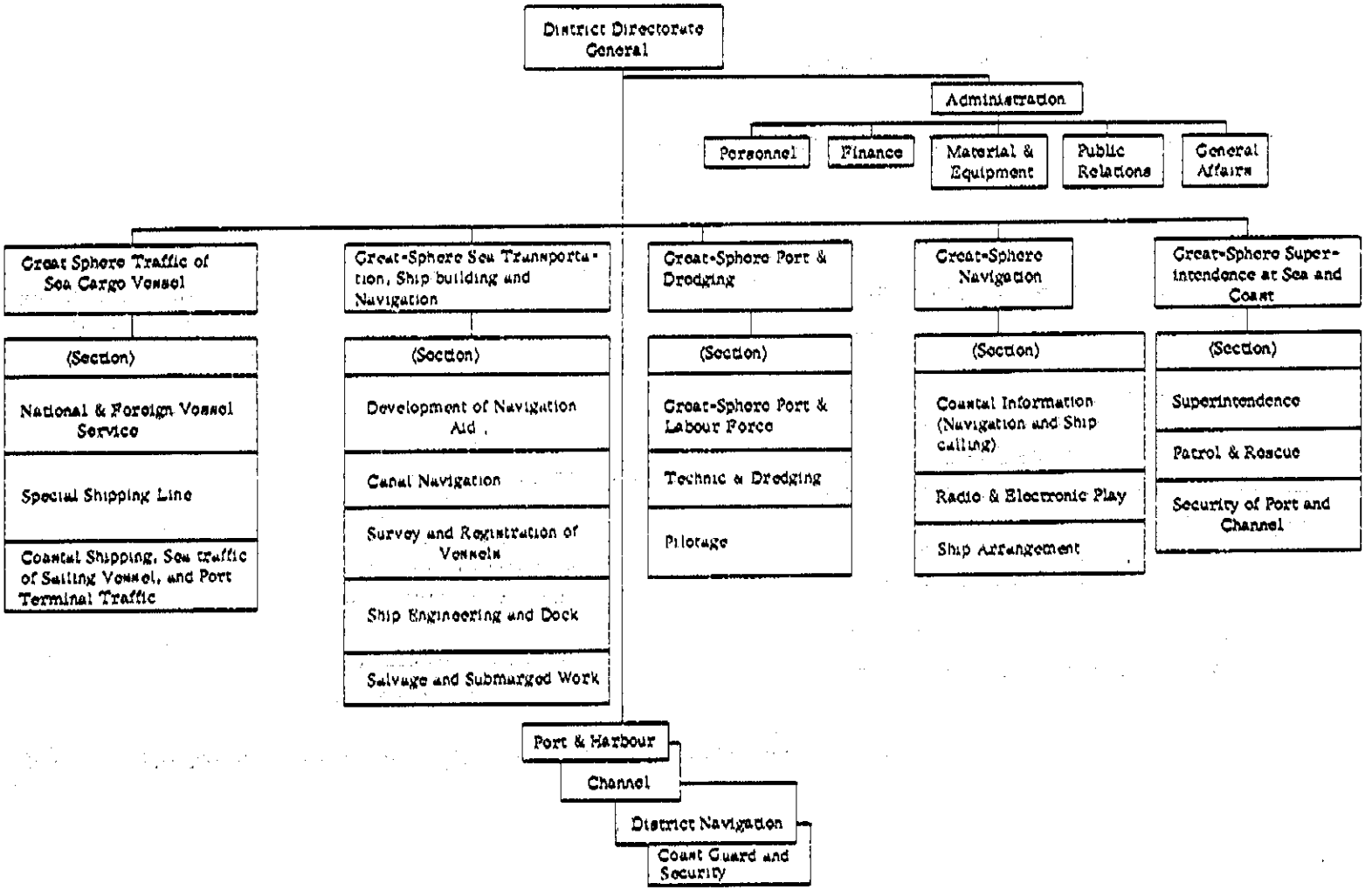


Fig. 11-3 Organization Chart of the Directorate General of District Sea Communications



S.R. 1 BELAWAN: Aceh, North Sumatra
S.R. 2 DUMAI: West Sumatra, Riau
S.R. 3 TG. PRIOK (Jakarta): Jambi, South Sumatra, Bengkulu, Lampung, West Kalimantan, West Java, Jakarta Special District
S.R. 4 TG. PERAK (Surabaya): Central Java, Yogya, East Java, Bali, West Nusa Tenggara, East Nusa Tenggara
S.R. 5 BANJARMASIN: South-east Kalimantan, Central Kalimantan
S.R. 6 UJUNG PANDANG: South Sulawesi, South-east Sulawesi
S.R. 7 BITUNG: North Sulawesi, Central Sulawesi
S.R. 8 AMBON: Maluku
S.R. 9 JAYA PURA: West Irian

These Directorate Generals of District Sea Communications were installed in 1977 in place of the old District Commanders (KEDAPEL) to meet the requirement for broader range of administration of the sea communications. For reference, the organization of the old District Commander (KEDAPEL) is shown in Fig. 11-5.

Fig. 11-4 is shown the organization chart of the Semarang Port Administration.

Normally, the Port Administration of the respective ports assumes the following tasks:
(1) Allocation of berths, supervision of entrance and clearance of vessels;
(2) Supervision and co-ordination of port operations, loading and unloading of cargo, port labour, and port equipment;
(3) Provision and control of port engineering work and maintenance and co-ordination with port operations;
(4) Dredging operation;
(5) Pilotage and ship/shore communications;
(6) Administration in regard to all port activities;
(7) Preparation of port statistics;
(8) Preparation and control of financial statements, budgets, and cost accounts;
(9) Preparation and collection of port dues and charges; and
(10) Security of the port area.

## 11-4 Problems Arising Out of Administration and Operation of the port of Semarang

### 11-4-1 Problems occurring presently

The major wharves in the port are used not only for cargo handling under the lighter system but as mooring facilities of the lighters. This results in impeding the port functions.

That is,

Fig. 11-4 Organization Chart of Semarang Port Administration

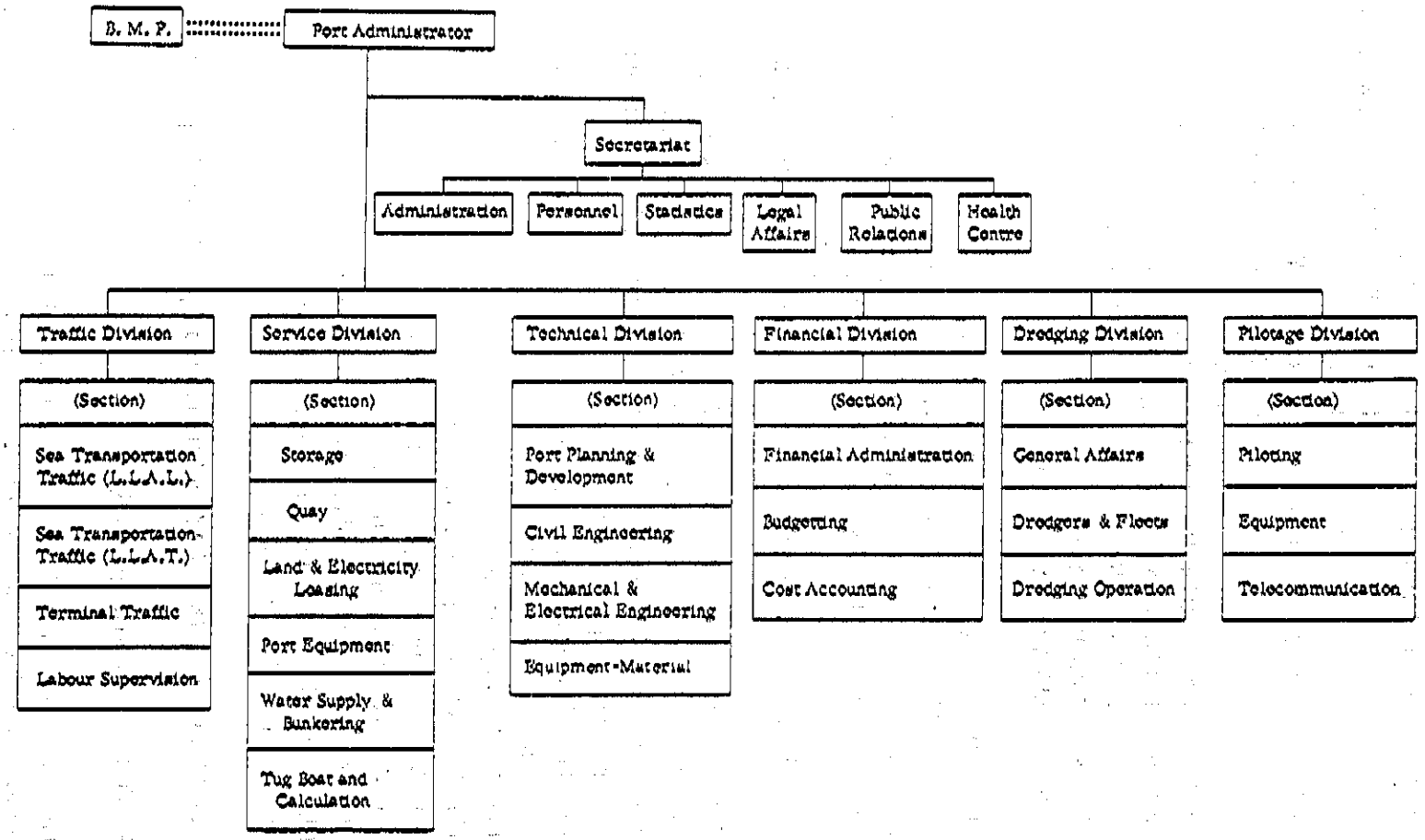
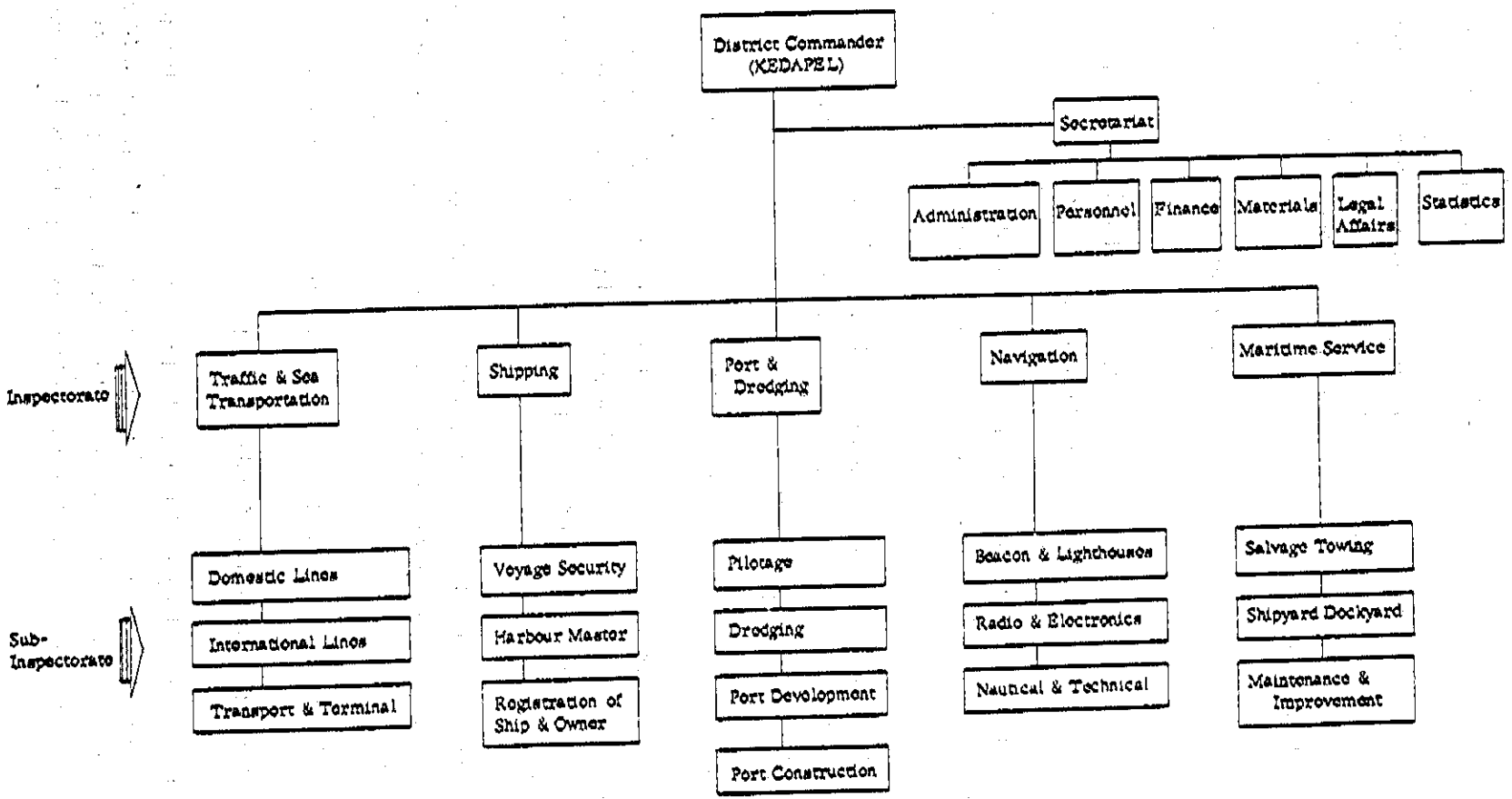


Fig. 11-5 Organization Chart of District Commander (KEDAPEL)



(1) With a number of idle lighters moored in the inner harbour, the sheds or warehouses in the neighborhood may be vacant, but their effective use is hardly expectable; and

(2) The sheds and warehouses are not used appropriately according to the kind or quantity of cargo and are used separately by the respective shipping companies to which they are leased so that a variety of cargos are mixed or piled up to the ceiling inhibiting their effective use.

As the problems arising from offshore handling of cargos of ocean going vessels and large coasters,

(1) In a stormy weather or, more specifically, at the time of west monsoon, the cargo handling is particularly difficult, resulting in a state of demurrage.

(2) It takes time to dispatch the custom and quarantine officers to the ocean going vessels anchoring about 4.5 km in the offing, tending to complicate the clearance procedures and delay the cargo handling.

(3) While the lighters are organized and dispatched according to the quantity of cargos, it takes time for the lighters to reach the anchorage to make it difficult to handle the cargos effectively and efficiently.

Some problems are also occurring in the port terminal. For example,

(1) Where strict distinction should be made between the use of the warehouses that are designed for storage of cargos over a long period of time and that of the sheds, they are used one for the other and vice versa probably because of small lots due to the lighter system.

(2) Since there is only one bonded shed available and no plan contemplated for installation of a bonded area or shed for the respective wharves, handling of the bonded cargos is in disorder.

(3) The warehouses are generally obsolete and not adequate for long storage of cargos.

### 11-4-2 Problems that may occur after development

When the cargo handling at wharf is enabled for the ocean going vessels as the result of development of the port of Semarang, the problems occurring incident to offshore loading and unloading due to the lighter system will be resolved one after another On the other hand, changes in the situation due to incoming of large ocean going vessels will produce new problems.

(1) The ocean going vessels load and unload the cargo at wharves in the port.

(2) The foreign and domestic trade piers are clearly distinguished from one another for use.

(3) There is an increasing use of mechanical force for cargo handling at the foreign trade wharves.

(4) There will be no more offshore loading and unloading under the lighter system

(5) There will be an increasing number of ocean going vessels coming into the port to increase the cargo traffic through the port.

(6) An access channel extending for more than 4.5 km is provided. As the result, maintenance of the access channel including control of the navigation will be required.

With such changes in the situation, the following matters will be required urgently in the aspect of port administration and operation.

(1) Rationalization of the entrance and departure procedures in order to cope with the increasing incoming vessels.

(2) Adequate berth allocation to enhance the investment effect to maximum and for economic use of the port.

(3) Modernization of the control of incoming and outgoing vessels including control of the navigation in the access channel.

(4) Rationalization of the administrative and operative works in the bonded areas and warehouses, and expediting the custom clearance services.

(5) Wharf control intended for reasonable and effective use of the sheds and warehouses.

(6) Maintenance of the port functions satisfactorily to meet the economic progress in the service area, this being an essential condition for the port administration and operation.

(7) Training of the port labourers to adapt themselves to modernization of cargo handling through introduction of cargo handling machines with consideration for qualitative improvement of port labourers and conversion to and absorption in the other industries of the surplus labour force.

(8) Harmony of the sea transport capacity and the port cargo handling capacity in order

for the port functions to be exhibited to the maximum, and alignment thereto off the capacity of railway, road and other land transport means connecting the port to the service area.

## 11-5 Recommendation

With progress of the development of the port of Semarang, the port will have its character as a foreign trade port intensified and be positioned as a major port worthy of the name in Central Java. In general, any port participating in the international trade is not only related to, and in support of, the economic activities in its service area but comes to play an important role in the development of the national economy.

The Department of Communications taking care of the nationwide control and coordination of the port administration and the Directorate General of Sea Communications assuming the port planning, construction, administration and operation should have an adequate interest in the increasing importance through development of the port of Semarang and give considerations to the following matters:

(1) The development must be carried out as scheduled according to the master plan; and

(2) It is required to review the organization of the Semarang Port Administration and reinforce it drastically.

That is, for smooth execution of the administration and operation of the port of Semarang which is growing into a foreign trade port. it is required to improve and expand the system of the Port Administration into one suitable for a major foreign trade port after the port administration and operation system of the port of Tg. Priok or Surabaya.

### Improvement of the Organization and System of Port Administration

Now comparing the present organization for administration of the port of Semarang with that of a major foreign trade ports such as Tg. Priok or Surabaya composition of the Divisions and Sections is substantially the same, but there are some points requiring immediate study in the assignment of personnel, distribution of the works and share of the responsibility, and there should be an adequate personnel plan conforming to the work load

In the following will be described the Divisions to be given the priority tentatively for expansion and reinforcement.

### (1) Expansion and Reinforcement of Technical Division

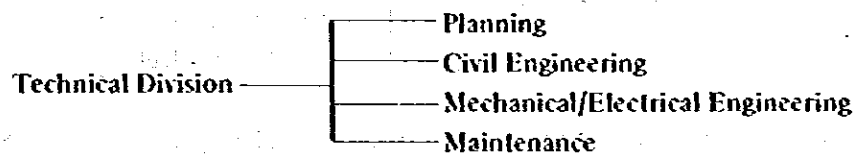
The development project site of the port of Semarang is of soft ground with poor sub-

soil condition, and a high level of technical capacity is required for construction of the port structures. On the other hand, the development project must be carried out without closing the port of Semarang for only a day but rather utilizing the port positively. For such purpose, ingenuity is required of the execution methods, and the project must be carried out under a minute schedule of execution. Additionally, the development is an Urgent Improvement Program to be started immediately and completed in two years during which a -10 m wharves with three berths and East and West Breakwaters in a length of about 5.2 km must be constructed. Thus, the design and execution involve a variety of works and a very great work load.

Therefore, it is not too much to say that the first stage of the Semarang Port development is dependent on how this immediate project is carried out adequately and as scheduled. While it is of course required to increase the personnel of Technical Division drastically, it is also important to strive for qualitative improvement of the personnel through training, etc.

For the time being, the Technical Division will be the substantially responsible body for promotion of the Semarang Port development. The techniques concerned extend over many fields, yet these diverse fields must be coordinated with one another for execution of the works. To clearly define the scope of responsibility for the assigned duties, it is desirable to rearrange the work assignments as given below. The tasks assigned to the Technical Division should be divided largely into four types, viz. Planning, Civil Engineering, Mechanical/Electrical Engineering and Maintenance for each of which a section is to be provided.

The construction works accompanying the port development are carried out over a very wide area on the sea as well as on land, and the work sites are usually remote from the office of the Port Administration. A field office as a detachment of the Technical Division should be provided at an appropriate place near the work site to insure supervision of the work at the site.




(2) Installation of Maintenance Dredging Division

The Access Channel of a length of 4.5 km to the port of Semarang is subject to siltation by the littoral drift, and the basins in the port by the sediments discharged out of the rivers flowing into the port.

In formulating the development project, consideration was given to the layout of the breakwaters and groins so that the inflow of littoral drift, etc. to the access channel would be prevented. But, it is really very difficult to prevent them completely by the breakwaters, etc., and such a scheme is greatly uneconomical. Further, the problem of sediments discharged out of the rivers is hardly resolved unless the river courses are changed.

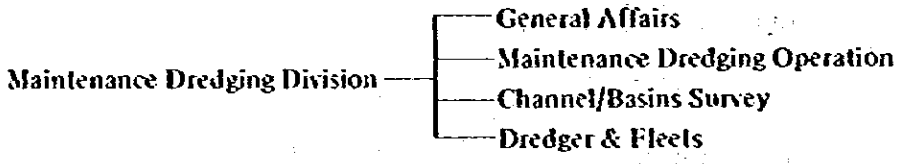
Thus, it was planned that the prevention of siltation of the access channel and basins of the port of Semarang would be dependent basically on the arrayed breakwaters and groins but that the excess siltation would be removed by maintenance dredging to keep the required water depth.

In order for the maintenance dredging to be performed adequately, it is required to execute the following works precisely:

a) Grasping the condition of siltation by periodic sounding surveys;
b) Formulation of an effective and economic plan of maintenance dredging upon the results of surveys;
c) Execution of the maintenance dredging; and
d) Provision, improvement and maintenance of the navigation aids facilities.

The Maintenance Dredging Division should be installed as soon as possible after completion of the -9 m Access Channel and the Urgent Improvement Program in that the works are different and relatively independent from those of the other divisions and are constant and of considerable load throughout the year.

The works of the reorganized Maintenance Dredging Division are set forth in the following.




(3) Rearrangement of the Allocation of Services and Expansion of the System of the Service Division

In a port placed under the competitive principle, if its service is not good or of poorer quality than those of the other ports, the port will have no more vessels calling but have its power declined and be deserted lastly. In maintaining and improving the port functions, important is the role played by the Service Division, and its responsibility is great.

The services to be performed by the Service Division are normally varying with the facilities to be utilized by the users so that it will be important to rearrange the services according to the type and organize the section accordingly for convenience of the users.

The services may be rearranged according to the type as shown below.

a. Services for use of the transit shed, warehouse and open storage:

1) Allocation of transit shed and warehouse;
2) Adjustment of space utilization;
3) Control of input and output;
4) Keeping in order, cleaning and maintenance of facilities; and
5) Collection of charges.

b. Services for use of wharf:

1) Mooring service;
2) Maintenance of aprons, fenders, etc.;
3) Incidental services to use of wharf; and
4) Collection of dues.

c. Water/electricity supply and bunkering services;

1) Water supply service;
2) Electricity supply service;
3) Bunker service; and
4) Collection of charges

d. Land leasing services:

1) Services pertaining to land leasing;
2) Repair and maintenance services; and
3) Collection of lease charges.

e. Port equipment services:

1) Offer for use of cargo handling equipment;
2) Repair and maintenance of cargo handling equipment; and
3) Collection of charges.

f. Dock road services:

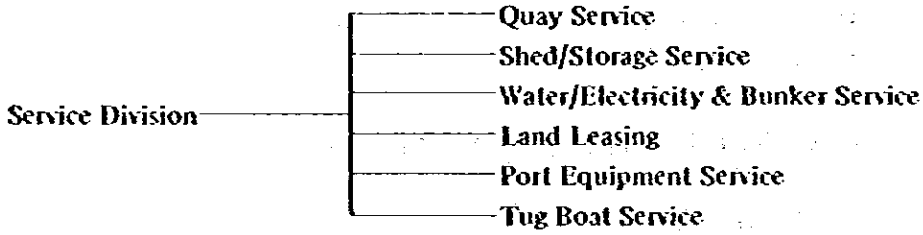
1) Maintenance of truck terminal:
2) Maintenance of dock road;
3) Dock road traffic control; and
4) Maintenance of road signs, gates and other related facilities of the dock road.

g. Tugboat services:

1) Offer for use of tugboats;
2) Maintenance of tugboats; and
3) Collection of charges.

It is desirable for performing the foregoing services to organize the sections of the Service Division as given below and assign the personnel to the respective sections in consideration of the workload.

The works of the reorganized Port Service Division are set forth in the following.




Installation of Permanent Committee and Liaison Conference Concerning Port Development

In a port which is newly developed or has reached a certain level of scale and is in activity, the port activity comes to have a close relation not only with the economic activity of the city to which the port belongs but with the economic activities of the service area.

In a newly developed port, the port improvement must always be carried out in alignment with the development plan of the city to which it belongs and the regional development plan of the service area. Thus, for the Administrator of such port, it is required to have a channel which permits him to grasp the opinions concerning the development of the city to which the port belongs or the desires or requests of the utilizers concerning the administration and operation correctly and promptly.

On the other hand, the port has generally an important role as a junction of sea and land transports. Thus, the port development should not be limited to matching to the development projects in the vicinity only but have the capacity of railway, road and other

land transport means tuned to the sea transport. Then, the Port Administrator should have his thought not limited to the sea transport and wharf traffic only but extended always to the port administration in a broader system of transport and traffic. This is why a Permanent Committee is required which is designed to consult with the organizations concerned.

It is also important to have an opportunity where it is enabled to hear candid opinions of, and discuss with, the responsible persons of the Local Government and Regional Planning Agency.

As specific measures for such purpose, it will be adequate to provide a permanent committee composed of the chiefs of the local offices of the central government agencies and professors and other men of knowledge and experience including the Governor and Mayor and also a development liaison conference with participation of the field development officers of the organizations concerned with the development and have such conference periodically.

Evasion of Confusion Due to Change of the Port Cargo Handling Method

The first step of development of the port of Semarang is to change the conventional offsore loading and unloading for the ocean going vessels to the cargo handling at wharf. By this, some more than 80 lighters will be out of use, and qualitative conversion of the port labourers working in the unloading from the lighters is required. Incidentally, the medium and small tugboats used for towing the lighters will scarcely be used.

On the other hand, once the cargo handling at wharf is started, the cargo handling on the aprons is urged so that the works in the sheds are important. The forklifts and other cargo handling machines may be introduced, yet systematic and stable supply of port labourers will still be a requisite.

The lighters and smaller tugboats owned by the shipping companies or their agents can find use in the other ports than the port of Semarang so that it is important to guide the owners administratively for distribution of the lighters, etc. If the lighters and tugboats are relocated to the other ports in a smooth manner, illegal occupation of the basins in the port by the lighters or unnecessary stimulation to the labourers can be avoided.

The cargo handling on the aprons must emerge from the conventional system relying solely on the manpower into joint work of handling machinery and manpower for improvement of the handling capacity. It is important to provide satisfactory training for qualitative improvement of the labourers. Introduction of the cargo handling machines should not be made in haste but stepwise with ample time allowed to cope with the qualitative improvement and progress in job conversion of the labourers. Careless

introduction of the mechanical force into the port cargo handling may result in generation of a large number of unemployed persons and induce social unrest so that particular care must be exerted.

Adequate Execution of Terminal Operation

Where the cargoes to be exported domestically or to the foreign countries are handled at the wharf, it is necessary to collect, classify, sort and arrange them in the sheds so that the cargo loading can be started as soon as the ship arrives. The cargos imported domestically or from foreign countries are likewise classified, sorted, arranged, inspected and stored temporarily in the sheds or the imported goods, they will have to be stored temporarily in the bonded warehouse and receive inspection for customs clearance in addition to the ordinary classification, sorting and arrangement.

For the port to be used effectively, the sheds and warehouses must be clearly distinguished from one another and their functions defined strictly for operation.

Use of the open storage and warehouses must be governed by certain administrative criteria. The cargos must not be left and allowed to stand on the aprons or dock road for long hours nor kept in the vacant lots other than the specified open storage or truck terminal.

With respect to the sheds, the most preferable principle for flow of the cargos is to reduce the number of links of cargo unloading as much as possible and also the distance of handling carriage of cargos or possibly to zero. Thus, the form of direct loading and unloading between the ship and the land transport means is ideal. Actually, however, the collection and distribution of goods are not adapted for such system, and here presence of sheds becomes important for sorting, inspection and other works.

# Chapter-12

# Environmental Assessment

# CHAPTER 12
# ENVIRONMENTAL ASSESSMENT

## 12-1 General

If men's environment is exerted by men through their developing activities, the nature will be generally modified. In order to avoid destruction of the nature by change of nature exerted by men, actual conditions of natural environment must be correctly grasped, and functions of each element forming the environment and interactions of such elements must be understood properly. This is a prerequisite for men's development activities.

The surrounding environment of the port of Semarang will undergo change as the result of execution of its long-term plan. Such change will be caused not only directly by improvement and extension of the port itself but naturally by indirect influence of changes made in hinterland including the city of Semarang in the course of development and progress by the project.

The direct influence of the former can be forecasted to a certain extent during the planning stage but influence of the latter will be very difficult to define.

The development of the port of Semarang will trigger both regional and industrial development and a great amount of benefit to the development of local economy will be created, but there will be increasing possibility of water pollution by oil and air pollution with increasing port utilization and by industrial activities of the factories. Thus, every possible measure should be taken to eliminate such problems in advance at the stage of the planning. However, it should be fully noted that environmental pollutions which might be caused in the process of regional development and industrial development would be wholly prevented by proper consideration and planning in advance including some investment required, and also that while benefits are obtained from such development and promotion of local economy, prevention of environmental pollutions is executed with required investment.

To stop the regional development simply because of possibility of pollution is ridiculous.

## 12-2 Air Pollution

Air pollution is caused by industrial activities which involve emission of sulfurous acid gas from thermal power plants and various factories, and traffic activities which involve emission of nitrogen oxides from automobiles.

Dust which might be emitted during transport of materials in factories and cargo-handling at port or soot from burning will occasionally create some pollution problems.

Gases and fine solid or liquid particles substantially may not be precipitated readily due to air movement but some other particles will precipitate very rapidly so that the influences caused by these materials to nearby environment and human life are widely varying.

Transport and dispersion of polluted materials are affected mainly by wind. Here the mean wind velocity as moving current and turbulence as dispersion coefficient are the important factors.

As explained in Chapter 4, annual occurrence of wind is represented by W and N winds in the northwest monsoon season and E wind in the southeast monsoon season. Thus, in these seasons, the leeward side of a polluted area which is in the E and S directions or in the W direction is subject to pollution.

When the wind velocity exceeds a certain limit, say, 5 m/sec, very clear daily alternation due to sea and land breezes will result as stated before. That is, sea breeze from the north during the day and land breeze from the south at night are clearly distinguished.

Depending upon the time zone of activities of the pollution source, the leeward polluted area will be drastically switched.

Therefore, instead of trying to review the location of factories to prevent air pollution resulting from emission of smoke and soot, it is rather desirable to locate the facilities for transport of raw materials, products and semi-products required for production activities at the factories to the coastal region for their vital usage of port functions to reduce transport costs and production costs. Then, a part of saving in cost should be utilized for investment to facilities such designed for example for absorption of sulfurous acid gas and after-burning of smake for preventing pollution.

Since turbulence of wind increase as the mean wind velocity increases, the extent of an area at the leeward side of a pollution source where polluted materials are dispersed will change within a day. Land facilities to be built such as transit sheds and warehouses will increase surface roughness resulting in greater turbulence of air current and acceleration of the dispersion.

Odor presently caused by crowded fishing boats within the port can be considerably reduced by moving the fishing port to outside of the port in future, properly processing bilge ejected from fishing boats, constructing waste storing facilities for marine product

processing, burning of used fish boxes, preventing secondary pollution due to smoke, and taking other necessary measures.

## 12-3 Water Pollution

Sea water near the port area will be polluted by oil from sailing or anchored vessels, chemicals or medicines ejected during port cargo handling, waste or garbages flowing into city river and sewer and finally into the port, agricultural waste such as agricultural chemicals and fertilizers, industrial waste from factories, water mixed with muddy sediment during port dredging, and other various organic and inorganic materials.

These materials float on water surface, drift in water for a long period of time or are dissolved, or rapidly precipitate and accumulate on the bottom of sea.

The polluted materials are moved by tidal current or flow of river water and dispersed by turbulence of waves, winds or currents. The current in the port in future will be moved by tide and governed by incoming and outgoing motion of water through the port entrance for a distance of about 1 km inside of the port from the tip of the breakwater along the access channel which is a distance of movement of water particle during one tide. Since the river water flows as thin layer on the surface of sea water even at the time of a river flood, it is effective to eject the floated objects to outside of the port. Effect of wind is also limited only to the surface of the water.

Flow of water in other area in the port is very slow but it moves steadily with a longer period of time. But dispersion of polluted materials caused by wind can hardly be expected.

The polluted materials carried to outside of the port are relatively quickly moved over a long distance by the tidal current (maximum velocity is about 1 kt) regularly making round trip once or twice a day along the breakwater or coastal line.

Providing a properly narrow port entrance width in the port planning for the future will be effective for reducing siltation of the access channel, because of preventing the entry of suspended sediment from outside of the port. It is inappropriate to expect the improvement of water quality in the port to the movement of sea water by widening the port entrance. Instead, strong administrative port control must be enforced to prohibit the vessels from discharging oil or bilge within the port.

## 12-4 Thermal Pollution

Thermal power stations or large-scale manufacturing plants use cooling water and discharge warm water into sea water. In the tropical region, temperature of sea water is basically high so that a greater amount of sea water must be used in such plants.

Temperature rise of sea water will give influence to ecological system along the coast, and a large amount of seaweed, planktons and bacteria will actively absorb the organic substances discharged near the port and grow up rapidly resulting in a red tide. This will also give certain changes to submarine biological system.

Intake of cooling water and discharge of warm water being made presently near the Coaster Harbour must be re-examined in future when the power generating capacity is increased. Effects of such warm water onto the circulating water for cooling the engines of vessels must also be reviewed in order to maintain a certain degree of consistency in the port planning.

## 12-5 Other Pollutions

Forecasting of future pollution is very difficult. However, problems of organic substances produced by food processing industry, muddy organic waste by paper manufacturing plants, ground settlement caused by frequent uses of wells by textile industry, noise and vibration by lumber and metal processing industries will be anticipated. Each industry has a possibility of creating specific pollution peculiar to the industry.

As a link of regional development plan of the zoning and pollution control regulations in the urban planning, all necessary measures should be provided in advance.

# Appendix

# CHAPTER-3 PRESENT SITUATION OF THE PORT OF SEMARANG

## (1) Port Facilities

## Table A-3-1 Mooring Facilities of the Port of Semarang in 1977

| Name | Present Water Depth (m) | Width of Apron m | Length of Facilities (m) | Facility Condition | Utility | Type of Structure | Remarks |
|---|---|---|---|---|---|---|---|
| Coaster Harbour | -4.0 - -4.2 | 14.5<br>15.0 | 320 | Good, slight degree of siltation | Small size of Ocean Going Vessels, Interinsular Vessels and large scale lighters | Relieving platform-type wharf | (1) |
| Inner Harbour, Dalam-II | | | | | | | |
| North Side (1) | -3.0 - -3.4 | 140.20 | 300 | Fairly good | Lighters and Local boats | Gravity quay wall by Caisson | (2) |
| North Side (2) | -2.0 | 16 | 79 | Not so good | Lighters and Local boats | Gravity quay wall by Caisson | (3) |
| South Side | -2.8 | 10 | 310 | Good | Lighters and Local boats | Gravity quay wall by Caisson | (4) |
| East Side | -1.9 | 15.6 | 65 | Good | Lighers only | Gravity type quay wall by Caisson | (5) |
| Front Wharf | -0.5 | 20.0 | 120 | Good, slight degree of siltation | Small boats | Gravity type quay wall by Caisson | (6) |
| Inner Harbour, Dalam-I | | | | | | | |
| North Side | -1.7 - -1.8 | 16.0 | 170 | Good | Lighters and Local boats | Gravity quay wall by Caisson | (7) |
| East Side | -1.5 - -1.7 | 10.0 | 55 | Good | Lighters and Local boats | Gravity quay wall by concrete block | (8) |
| South Side | -1.5 - -1.7 | 10.0 | 285 | Good | Lighters and Local boats | Gravity quay wall by Caisson | (9) |
| Kali Baru | | | | | | | |
| East Side | -2.0 | | 1,085 | Fairly good | Sailing vessels and lighters | Concrete block type | (10) |
| West Side | -2.0 | | 1,360 | Fairly good | Sailing vessels and Local boats | Concrete block type | (11) |
| Naval Harbour | -2.0 - -4.0 | | 241 | Usable good | Military ships and patrol boats | Concrete block type, partly wooden jetty | (12) |
| Other mooring facilities | -2.0 | | 25 | Usable but not so good | Official use only | Wooden jetty | |

Note: 1) Only the mooring facilities presently in use and being usable are listed.
2) The mooring facilities of the Oil Terminal PLTU Wharf, and the exclusive facilities of the lumber mill are excluded.
3) The length of quay wall and present water depth are according to the result of the field survey conducted in September 1977.
4) The number in parentheses described in remarks of table shows the location of each port facilities in Fig. A-3-1 as contrast number.

Table A-3-2 Basins Area of the Port of Semarang in 1977

| Name of Basin | Present Depth in average | Basin Area | Remarks |
|---|---|---|---|
| | m | ha | |
| Coaster Harbour Basin | 4.2 | 28.6 | used by smaller interinsular vessels and lighters. |
| Entrance Harbour Basin | 4.0 | 8.1 | connected with the access channel; Shipyard on the west coast, and siltated in flood season. |
| Front Harbour Basin | 3.5 | 7.0 | used by lighters and local boats |
| Naval Harbour Basin | 2.0 | 0.5 | mooring and maintenance of Navy Patrol boats |
| Inner Harbour Dalam-I | 3.3 | 1.3 | used by lighters and Local boats |
| Inner Harbour Dalam-II | 3.6 | 2.2 | used by lighters and Local boats |
| Kali Baru Basin | 3.0 | 3.3 | depth varying in flood; used by sailing vessels and Local boats |
| Total | | 51.0 | |

Fig. A-3-1 Location of Port Facilities

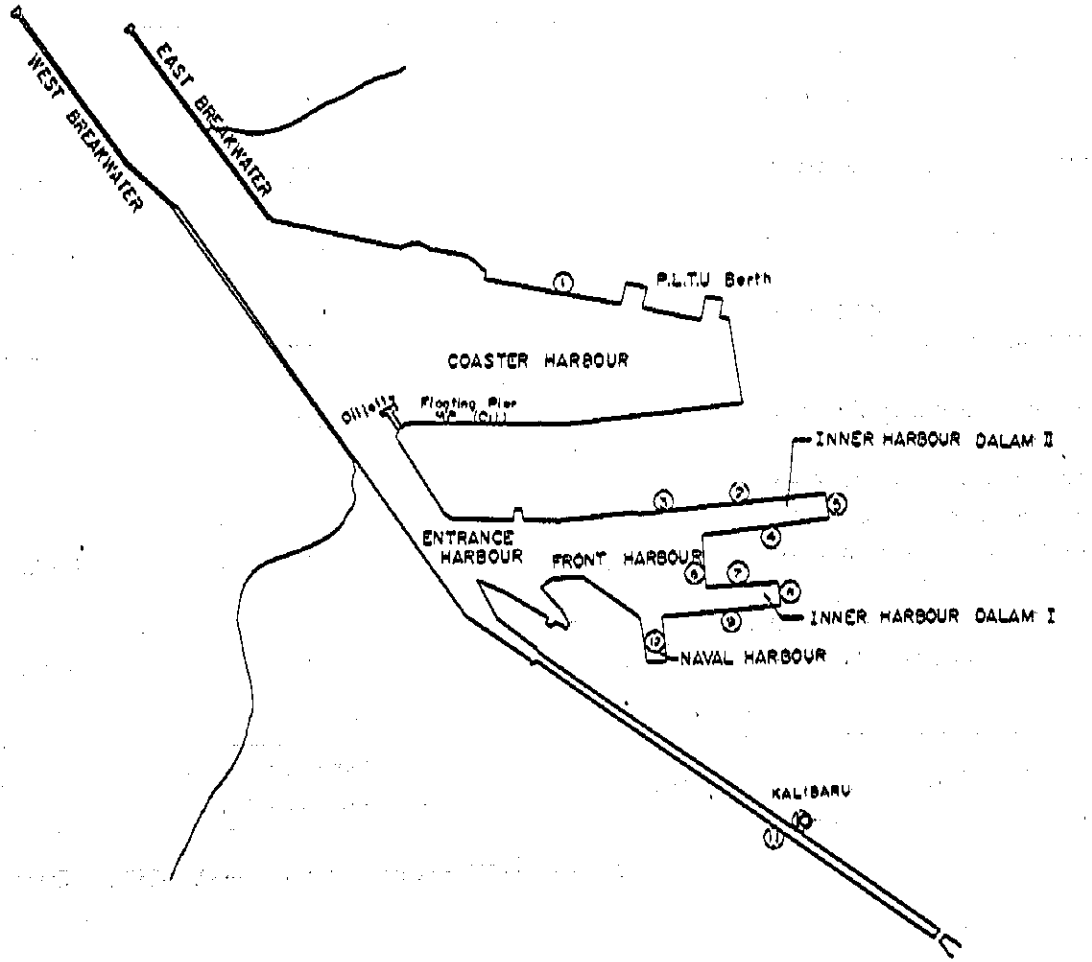


Fig. A-3-2 Channel & Breakwater

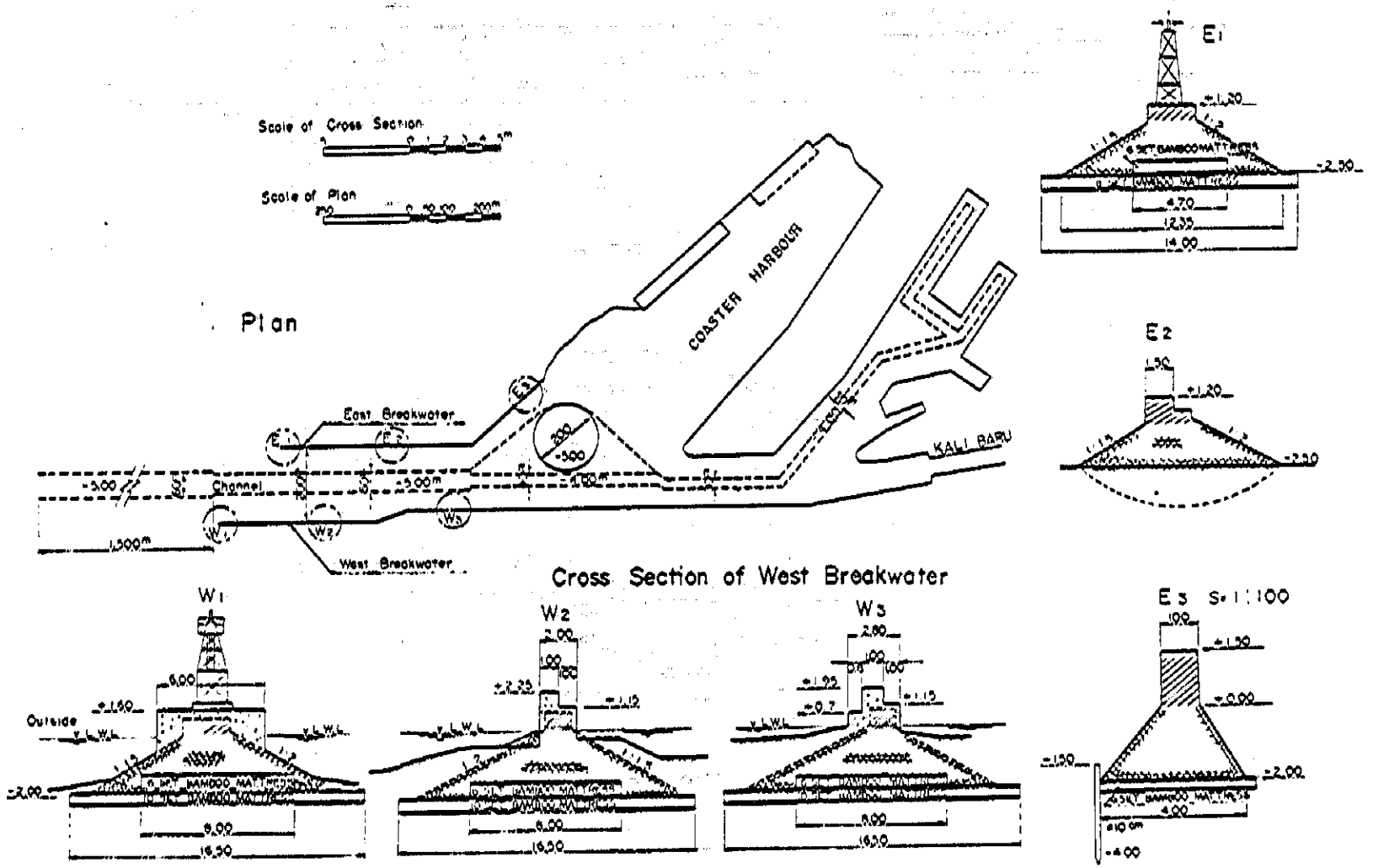
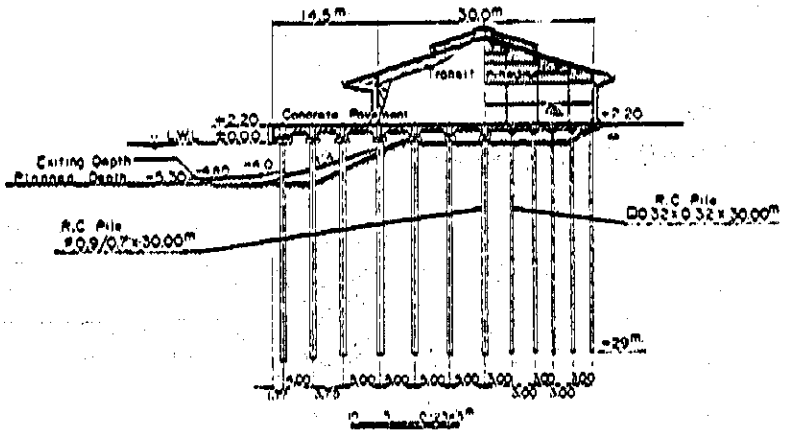


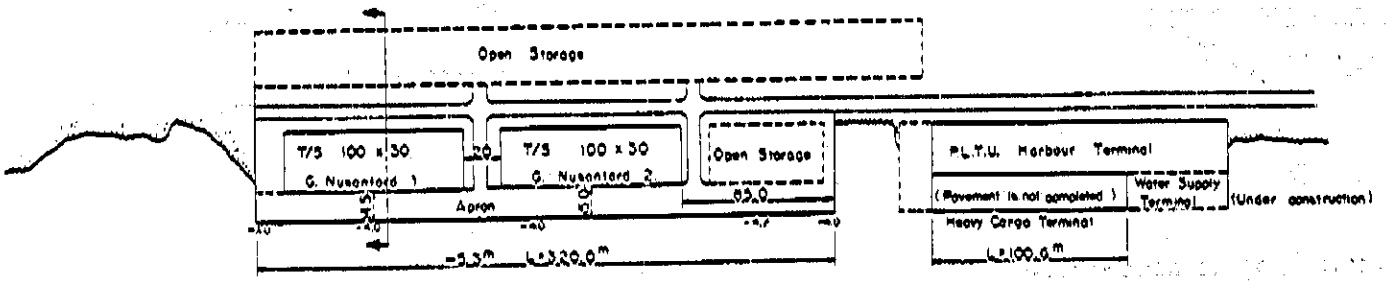
Fig. A-3-3 Existing Port Facilities (1)

COASTER HARBOUR

CROSS SECTION

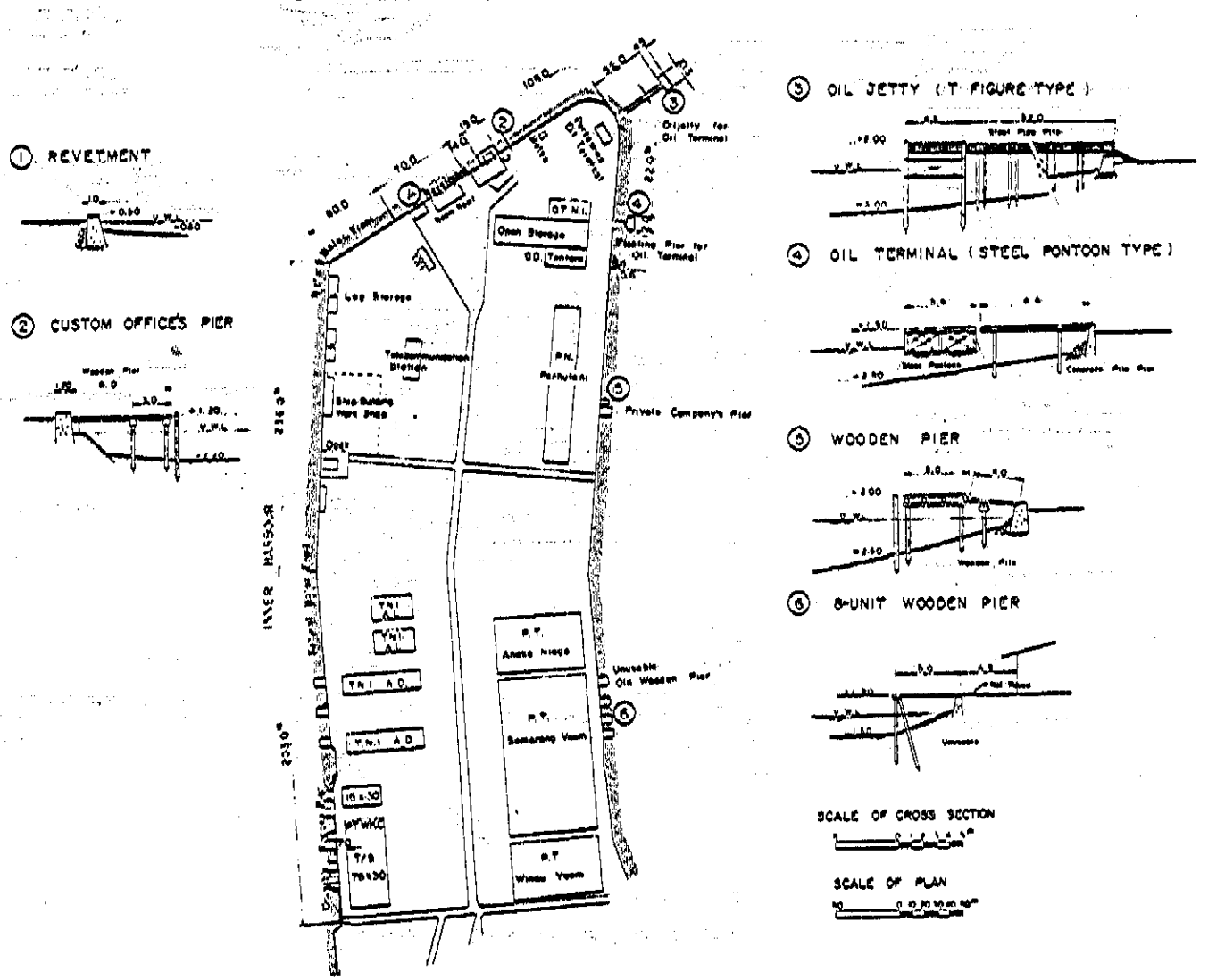



PLAN




COASTER HARBOUR

## Fig. A-3-4 Existing Port Facilities (2)



## Fig. A-3-5 Existing Port Facilities (3)

INNER HARBOUR DALAM I & II

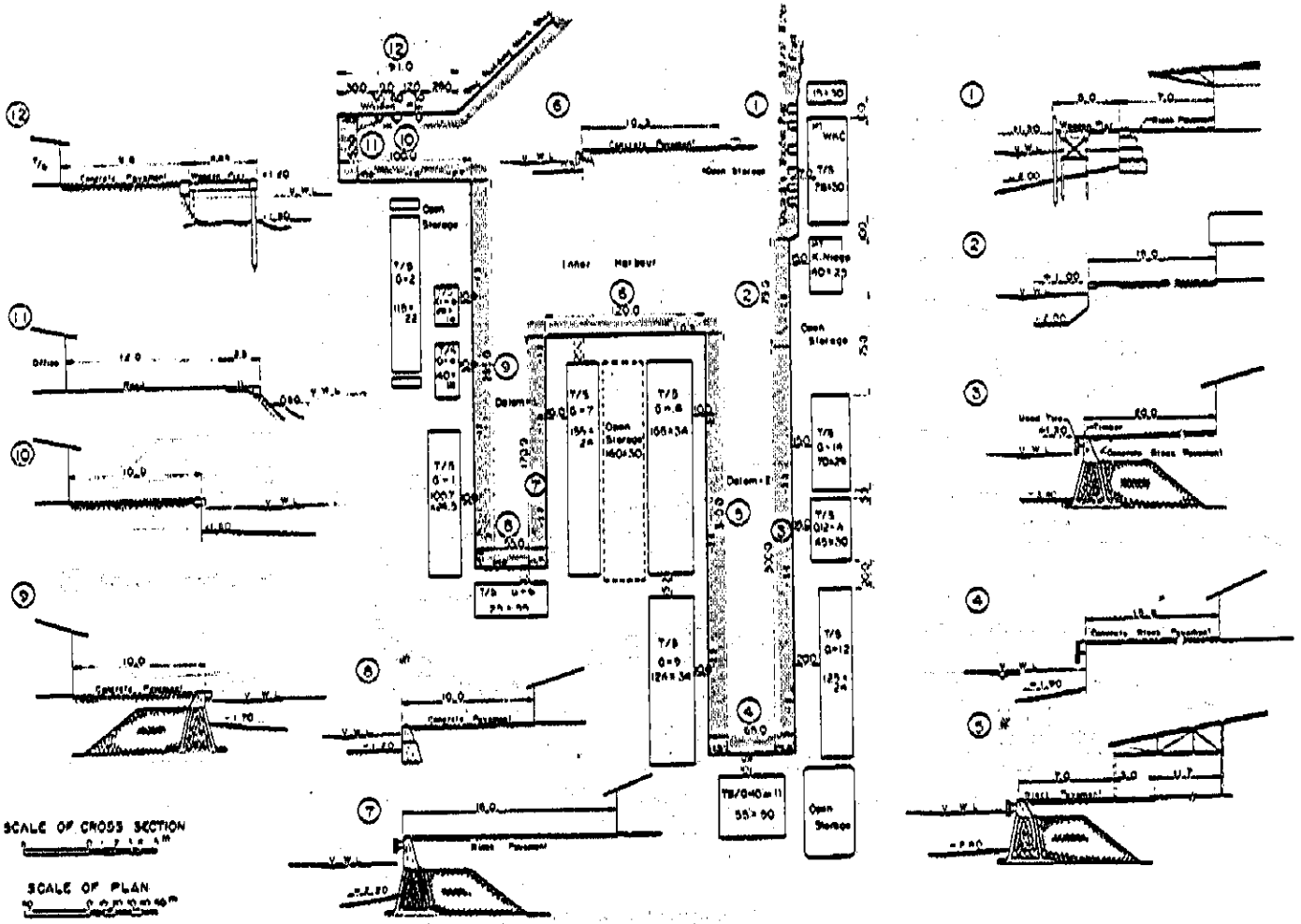


Table A-3-3 List of Transit Sheds, Wharehouses and Open Storages in the Port of Semarang

| Name of Shed | Location | Scale | | | Capacity | Built in |
|---|---|---|---|---|---|---|
| | | Length | Width | Area | | |
| | | m | m | $m^2$ | $ton/m^2$ | |
| Transit Shed No. I | Inner Harbour | 100 | 24 | 2,400 | 2.5 | 1946 |
| Transit Shed No. II | Inner Harbour | 125 | 24 | 3,000 | 2.5 | 1917 |
| Transit Shed No. 8 | Inner Harbour | 25 | 17 | 425 | 2.0 | 1921 |
| Transit Shed No. VI | Inner Harbour | 55 | 24 | 1,320 | 2.0 | 1918 |
| Transit Shed No. VII | Inner Harbour | 180 | 24 | 4,320 | 3.0 | 1947 |
| Transit Shed No. VIII | Inner Harbour | 155 | 24 | 3,720 | 3.5 | 1976 |
| (Plus Open Storage) | | (155) | (10) | (1,550) | | |
| Transit Shed No. IX | Inner Harbour | 125 | 24 | 3,000 | 3.0 | 1919 |
| (Plus Open Storage) | | (50) | (10) | (500) | | |
| Transit Shed No. XI | Inner Harbour | 40 | 55 | 2,200 | 3.5 | 1949 |
| Transit Shed No. XII | Inner Harbour | 125 | 24 | 3,000 | 3.0 | 1954 |
| Transit Shed No. XIIA | Inner Harbour | 45 | 28 | 1,260 | 3.5 | 1956 |
| Transit Shed No. XIV | Inner Harbour | 70 | 28 | 1,960 | 3.0 | 1963 |
| Transit Shed Coaster No. I | Coaster Harbour | 100 | 30 | 3,000 | 3.5 | 1969 |
| Transit Shed Coaster No. II | Coaster Harbour | 100 | 30 | 3,000 | 3.5 | 1970 |
| Sub Total | | | | 32,605 | | |
| Special Warehouse for Tobacco Leaf | Inner Harbour | 20 | 55 | 1,100 | 3.5 | 1949 |
| Special Warehouse for Tobacco Leaf | Inner Harbour | 40 | 17 | 680 | 2.0 | 1921 |
| Sub Total | | | | 1,780 | | |
| Warehouse for Dangerous Cargo | N. Pardi St. | 40 | 20 | 800 | 3.0 | 1975 |
| Open Storage K.B.T | East Kalibaru | 20 | 7 | 140 | 3.0 | 1976 |
| Total for Transit Shed/Warehouse | | | | 33,185 | | |
| Total for Open Storage | | | | 2,190 | | |

Source : ADPEL of Semarang

(2) Transit Sheds and Warehouses

In the port of Semarang, there are transit sheds arranged in the back of the wharves and, in the back of the transit sheds, there are warehouses including storages of special products for use for storage and sorting of port cargos.

Present situation of the facilities are shown in Tables A-3-3 and A-3-4.

The transit sheds constructed recently are generally of the standard type of iron frame with slates. They are of a scale of 100 m x 30 m each and are designed largely a capacity of 3.5 tons per sq. m. Except some facilities constructed recently, they are generally timeworn with the lapse of about 60 years but stand well for use at present.

The greater part of the old transit sheds in the Inner Harbour are of wooden frame with slates. Their eaves project over the apron of the landing wharf for convenience of the work of cargo handling in the rainy season.

Recently, improvement of the open storage has been done by removing the obsolete wharehouses in the wharves and by leveling the open space. In 1975, the improvement was made at two sites totalling to 12,400 $m^2$, and in 1976 at three sites totalling to 7,200 $m^2$. These open storages are designed with a capacity of 2.5 tons per sq. m to 3.5 tons per sq. m except one with a capacity of 1.5 tons per sq. m.

(3) Cranes and Fork-lift Trucks

In the port of Semarang, the cargo handling comprises that at quaywall for the interinsular vessels and other coastal small boats, unloading of import goods from the lighters loaded offshore and loading of export goods onto the lighters, and is carried out by ship crane, crawler crane and mobile crane. Handling to the sheds or warehouses is performed by manpower, fork-lift truck and truck, and there are instances of some unloaded cargos being carried directly from the wharves to the customers by means of trucks. Numbers of mobile cranes and fork-lift trucks by owner in the port of Semarang are shown in Table A-3-5.

(4) Togboats and Lighters

The port of Semarang is shortcoming in the water depth of the channel and the basin in the harbour so that the cargo transport in loading/unloading between the vessels at anchor in the offshore anchorage and the wharves is carried out by lighters towed by a tugboat. As shown in Table A-3-6, the tugboats belonging to the port of Semarang and in the service presently number 23 with a total horsepower of 4,025 (or 175 horsepowers per boat), and the barges number 88 with an average capacity of 100 tons.

## Table A-3-4 List of Open Storages in the Port of Semarang

| Name of Open Storage | Location | Area | Capacity | Year Built |
|---|---|---|---|---|
| | | $m^2$ | tons/$m^2$ | |
| Open Storage I | Coaster Harbour | 8,900 | 3.5 | 1975 |
| Open Storage II | Coaster Harbour | 3,500 | 3.5 | 1975 |
| Open Storage III | Inner Harbour | 3,000 | 1.5 | 1976/77 |
| Open Storage IV | Inner Harbour | 2,400 | 2.5 | 1976/77 |
| Open Storage V | Inner Harbour | 1,600 | 2.5 | 1976/77 |
| Open Storage VI | Inner Harbour | 1,200 | 3.0 | – |
| Open Storage VII | Inner Harbour | 400 | 2.5 | – |
| Open Storage VIII | Inner Harbour | 1,200 | 3.0 | – |
| Total | | 22,400 | | |

Source : ADPEL of Semarang

## Table A-3-5 List of Cranes and Fork-lift Trucks in the Port of Semarang

| Kind | Capacity | Ownership | | | Total | Remarks |
|---|---|---|---|---|---|---|
| | | ADPEL | Unit Terminal | Private | | |
| Mobile Crane | 18t | 1 | | | 1 | |
| | 15 | 2 | | | 2 | |
| | 13 | 1 | | | 1 | |
| | 10 | | | 1 | 1 | Private owner P.T. Samodera Indonesia |
| | 6 | 5 | | 2 | 7 | Private owner P.T. Jakarta Lloyd |
| | 5 | | | 1 | 1 | Private owner Gesuri Lloyd |
| | 3 | 2 | | | 2 | |
| Total | | 11 | | 4 | 15 | |
| Fork-lift Truck | 15t | 1 | | | 1 | |
| | 10 | 1 | | | 1 | |
| | 7.5 | 2 | | | 2 | |
| | 5 | 3 | | | 3 | |
| | 3.5 | 1 | | | 1 | |
| | 3 | 4 | | | 4 | |
| | 2.5 | 3 | 2 | 5 | 10 | |
| | 2 | | | 1 | 1 | |
| | 1.5 | | | 1 | 1 | |
| Total | | 15 | 2 | 7 | 24 | |

Source : ADPEL of Semarang

Table A-3-6 List of Tugboats and Lighters in the port Semarang

| Owner | Tugboat | | Lighter | |
|---|---|---|---|---|
| | Total Capacity | No. of Tagboats | Total Capacity | No. of Lighters |
| | HP | | ton | |
| P.T. Jakarta Lloyd | 1,100 | 10 | 1,850 | 27 |
| P.T. Samodra Ind. | 685 | 4 | 2,200 | 18 |
| P.N. Pelni | 550 | 2 | 960 | 11 |
| P.T. Tritora Lloyd | 350 | 2 | 1,050 | 8 |
| P.T. Gesuri Lloyd | 240 | 2 | 600 | 8 |
| P.T. Berkah Bintang Samudra | 1,100 | 3 | 2,050 | 16 |
| Total | 4,025 | 23 | 8,710 | 88 |
| Average Capacity | 175 | | 99 | |

Source : ADPEL of Semarang

(5) Dredgers

The port of Semarang has an extension of a little longer than one kilometer of channel which is not sheltered by the breakwater. It has also the direct flow of the water of Semarang River and Banjir Canal into the basin in the harbour. The channel and basin are thus subject to siltation due to littoral drift and flowed-in soil so that maintenance dredging is carried out in order to recover and maintain the functions. But, if the channel is more deepened, it is apprehended that it may receive more severe siltation. Thus, at present, only the maintenance dredging is made of the sheltered portion of the channel to the water depth of three meters which is the depth at the northern end of the West Breakwater. Siltation due to flowed-in soil tinto the harbour from the river and canal is particularly intense in the rainy flood season, but the inflow is nearly constant, and its removal is dependent on the maintenance dredging. The annual mud quantity removed in maintenance dredging is about 400,000 cubic-meters as shown in Table A-3-7, and the maintenance dredging is carried out under direct control and operation (by the government personnel and government owned vessels) by dredgers as shown in Table A-3-3. The dredgers are obsolete, 60 years having elapsed since the construction, and are apt to fail. However, the result of maintenance dredging in 1976 is over the target value as shown in Table A-3-9.

(6) Dock Road and Dock Railway Sidings

The dock roads in the land of the port have an extension of 9 km including Classes 2 and 3 roads and are used for input and output of the cargo flow. These roads generally have a width of 6 - 7 m with at least two lanes and are asphalt pavements. They are arranged to connect the sheds and warehouses which have been improved successively

Table A-3-7 Annual Maintenance Dredging Volume in the Port of Semarang (1965 ~ 1970)

| Year | Maintenance Dredging Volume x1,000 $m^3$ |
|---|---|
| 1965 / 1966 | 37 |
| 1966 / 1967 | 31 |
| 1967 / 1968 | 407 |
| 1968 / 1969 | 164 |
| 1969 / 1970 | 391 |
| 1970 / 1971 | 401 |

Source: "Report on Economic Survey and Master Plan Semarang Seaport" Gadjah Mada University

Table A-3-8 List of Dredgers belonging to Port Administration of Semarang

| Kind | Name | Year Built | Remarks |
|---|---|---|---|
| Bucket Dredger | Sanempaka | 1917 | Two 75$m^3$ - Barges<br>One 120HP - Tugboat |
| Bucket Dredger | Toromi | 1916 | Two 25$m^3$ - Barges<br>One 120HP - Tugboat |

Source : ADPEL of Semarang

Table A-3-9 Actual Maintenance Dredging Volume in the Port of Semarang in 1976/1977

| Location | Target x 1,000 $m^3$ | Actual x 1,000 $m^3$ | Achievement Rate % |
|---|---|---|---|
| Channel | 190 | 273 | 144 |
| Basin | 110 | 87 | 79 |
| Total | 300 | 360 | 120 |

Source : ADPEL of Semarang

over a long period of time so that the arrangement is not always reasonable and will have to be reexamined for further improvement. The dock roads are connected with a main local road through three gates of the port terminal. The local road runs through the urban area of Semarang including a densely built up area and, moreover level crossing with a railway. For that reason, the dock roads are not able to display their capacities. Such situation will have to be improved promptly.

Dock railway sidings are laid in the back of the sheds and warehouses of the wharves. The railway is of the narrow gauge, and diesel cars are used for the motive power car. In the port terminal a siding is laid to the respective wharves. It is laid close to the sheds and warehouses and is, therefore, convenient for loading and unloading of the cargos. However, the railway connecting the areas with one another is of single track on one hand, and the marshalling yard is not of adequate scale and arrangement on the other. Thus, difficulties are involved in composition of trains of freight cars, etc. so that the dock railway is unable to exhibit its capacity fully.

The transports by type of the inward and outward land transportation measure of the port of Semarang and their percentages, transports of inward/outward ratios by land transporation measure and the numbers of the transport vehicles and the inward/out ward ratios are shown in Table A-3-10 and A-3-11, respectively. The inward cargos

Table A-3-10 Cargo Flow and its Share by Land Transportation in the port of Semarang in 1976

| Classification | Cargo Flow (x 1,000 tons) | | | Percentage (%) | | |
|---|---|---|---|---|---|---|
| | Inward | Outward | Total | Inward | Outward | Total |
| Truck | 242 | 60 | 302 | 95.0 | 87.2 | 93.4 |
| Train | 13 | 9 | 22 | 5.0 | 12.8 | 6.6 |
| Total | 255 | 69 | 324 | 100 | 100 | 100 |

Source: ADPEL of Semarang

Table A-3-11 Share of Cargo Flow and Traffic Flow by Land Transportation in the Port of Semarang in 1976

(Unit : %)

| Classification | Cargo Flow | | | Number of Vehicles | | |
|---|---|---|---|---|---|---|
| | Inward | Outward | Total | Inward | Outward | Total |
| | | | | (60) | (15) | (75) |
| Truck | 80 | 20 | 100 | 80 | 20 | 100 |
| | | | | (1.3) | (0.9) | (2.2) |
| Train | 59 | 41 | 100 | 60 | 40 | 100 |

Source: ADPEL of Semarang

Note: ( ) indicates the actual number of vehicles (Unit: thousand vehicles)

are dependent on the trucks for 95%, and the outward cargos for 87%, and use of the dock railway is of a very low level. Classifying by the inward and outward cargos, the outward cargo accounts for 80% of the truck transport and for about 60% in the case of the railway.

(7) Water Supplying Facilities

Supply of water to ships and offices in the port of Semarang is made from four artesian wells owned by Port Administration. The capacity of these wells is about 500 tons per day. Water supply to ships at the offshore anchorage is made by a water boat which has a capacity of supplying 60 tons of water per trip.

When the incoming ships will increase hereafter, and the demand for water will increase, the present water supplying facilities will be unable to meet the requirement. Therefore, drastic improvement of such facilities is required along with improvement of the basic facilities of the port.

(8) Oil Supply Facilities

The port of Semarang has no oil supplying facility to ships and ships moored along the wharf have the oil fed from tank lorries. However, the ships anchoring in the offshore anchorage in the port of Semarang have the oil supplied at the other ports having the oil supplying facilities.

Illumination in the port of Semarang and supply of electricity to offices of the government organizations and private enterprises in the port are serviced directly by PLTU (National Electric Corporation), and there are no independent power generating facilities.

# CHAPTER-4 NATURAL CONDITION OF THE PORT SEMARANG

## (1) Meteorological and Oceanographical Conditions

Table A-4-1 Occurrence of Strong Wind

| Year | Direction / Month | N | NE | E | SE | S | SW | W | NW | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1976 | September | | 3 | 5 | 1 | | | 1 | 1 | 11 |
| | October | | | | 1 | | | | 1 | 2 |
| | November | | | | | | | | | 0 |
| | December | | | | | | | | | 0 |
| 1977 | January | | | | | | 8 | 40 | 6 | 54 |
| | February | 1 | | | | | 1 | 71 | 60 | 133 |
| | March | | | | | | | 31 | 39 | 70 |
| | April | | off record | | | | | | | - |
| | May | | | | | | | | | 0 |
| | June | | | | | | | | | 0 |
| | July | 1 | | 2 | | 1 | | | | 4 |
| | August | 3 | | 1 | | | | | | 4 |

(Wind velocity $\geq$ 10 m/sec.)

Table A-4-2. Daily Maximum Wind (1976 - 1977)

| Hr | Aug. | Sep. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 - 6 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 2 | - | 2 | 0 | 0 | 0 |
| 7 - 12 | 11 | 13 | 4 | 1 | 3 | 4 | 6 | 5 | - | 8 | 17 | 24 | 15 |
| 13 - 18 | 19 | 14 | 22 | 22 | 18 | 16 | 16 | 20 | - | 11 | 11 | 6 | 15 |
| 19 - 24 | 0 | 1 | 3 | 7 | 9 | 1 | 4 | 4 | - | 8 | 2 | 1 | 0 |

Table A-4-3. Monthly Rainfall (Semarang 1967 - 72)

| Month | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rainfall (mm) | 450 | 303 | 247 | 166 | 124 | 83 | 72 | 30 | 47 | 105 | 149 | 223 | 1999 |

Table A-4-4. Occurrence of High Wave

Tg. Priok Aug. 1976 to Jul. 1977
at 0, 3, 6, 9 and 12 o'clock

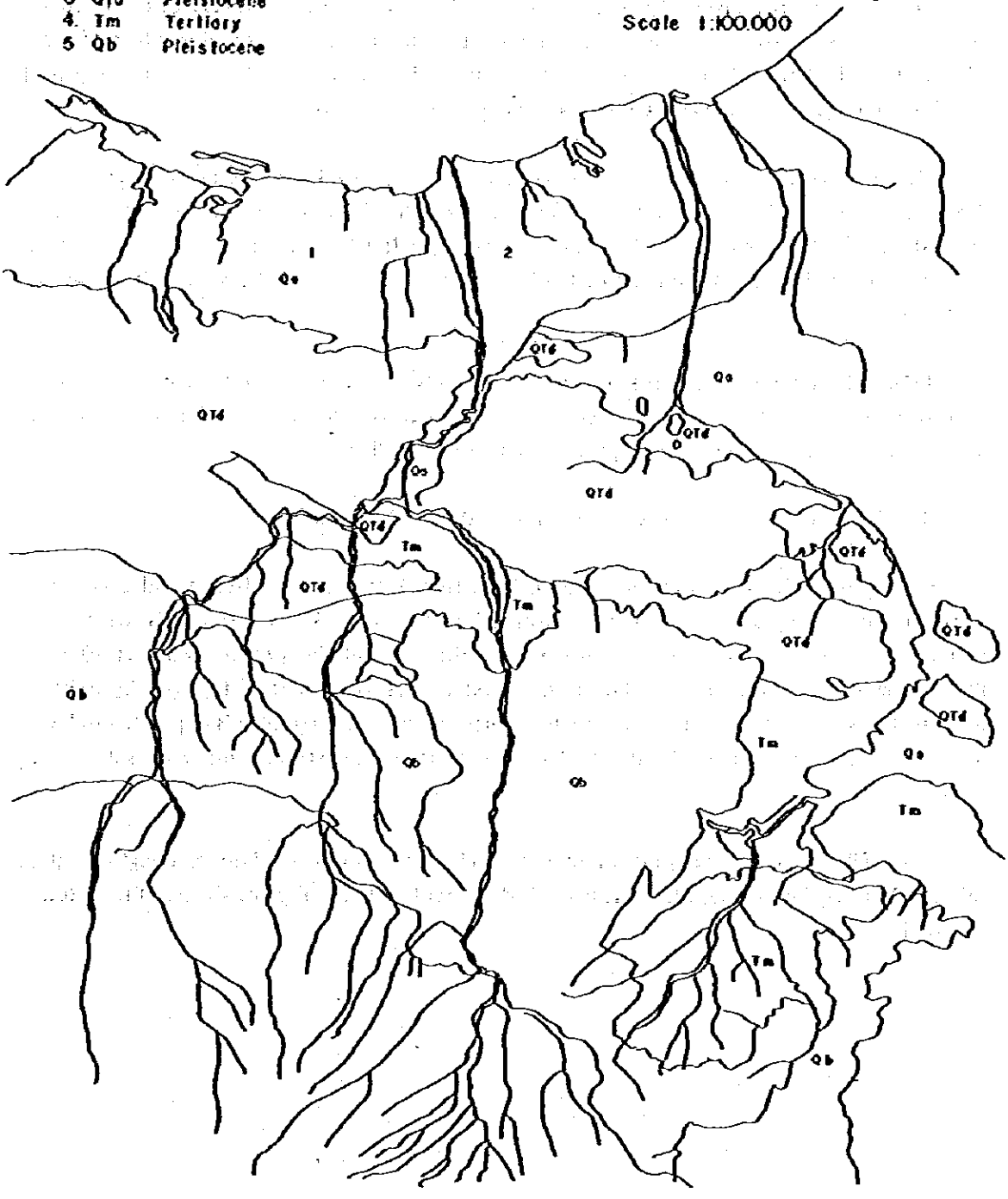
| Month | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Occurrence | 18 | 18 | 8 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 51 |

(Wave height $< 1.5$ m)

1 Qo Surface deposit
2. Volcanic product
3 QTd Pleistocene
4. Tm Tertiary
5 Qb Pleistocene

Fig. A-4-1. Geological Map around Semarang

Scale 1:100.000



Qa: This is an alluvial stratum consisting of sediments of coast, rivers and lakes. The coastal sediment mainly comprises clay and sand and its thickness is probably 50 m or thicker but not uniform.

The delta of the river of Semarang is a supply source of sand and clay of intermediate stratum. The sand stratum forms an aquifer stratum for fresh ground water. Most of wells deeper than 100 m made in the city of Semarang are located on this delta, and the depth of shallowest aquifer near the coast exceeds the depth of 80 meters.

The base of the alluvium along the river comprises 1 to 3 m thick layer of gravel and boulder covered by sand and silt. The boulder is a volcanic rock with about 1 m diameter consisting of hard, unweathered andesite containing less sandstone and limestone. Area where river was blocked by a fault or landslide is accompanied by the sediment of swamp and lake.

QTd: This stratum comprises tuffaceous sandstone, conglomerate, volcanic breccia and tuff. The sandstone contains feldspar but quartz is rare. The breccia is an alkaline volcanic rock but non-marine type containing fossil of mollusk.

This is successional lowest stratum covering the marine strata.

Qb: This comprises volcanic breccia, lava, tuff, tuffaceous sandstone and claystone. Lower portion is mostly covered with talus. The volcanic rock is considerably weathered indicating soil with color of reddish brown. The thickness of the stratum is about 50 m at the northeast and more than 200 m at the west reflecting a relief of topography existed prior to the sedimentation. Throughout the northern area, this stratum is deposited in level forming cliffs over marl or claystone of marine stratum Tm (stratum made by submarine sedimentation).

Tm: This is a marine stratum including claystone, marl, sandstone, conglomerate, volcanic breccia, limestone, etc. Claystone is dominant and partially consisting of limestone and marl.

Fig. A-4-2. Atmospheric Pressure and Wind

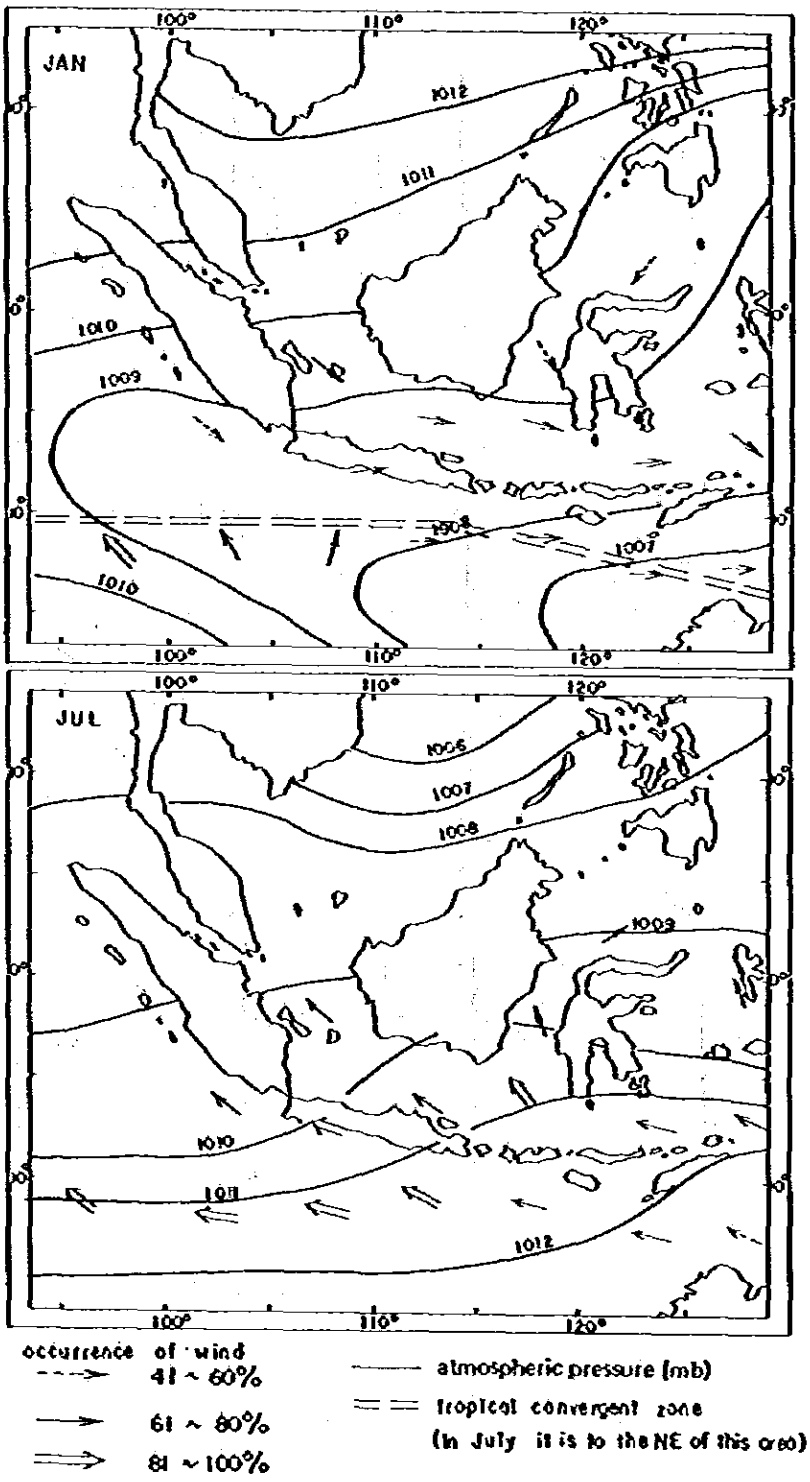


Fig. A-4-3. Wind Direction 1971 - 1974
(PORT OF SEMARANG)

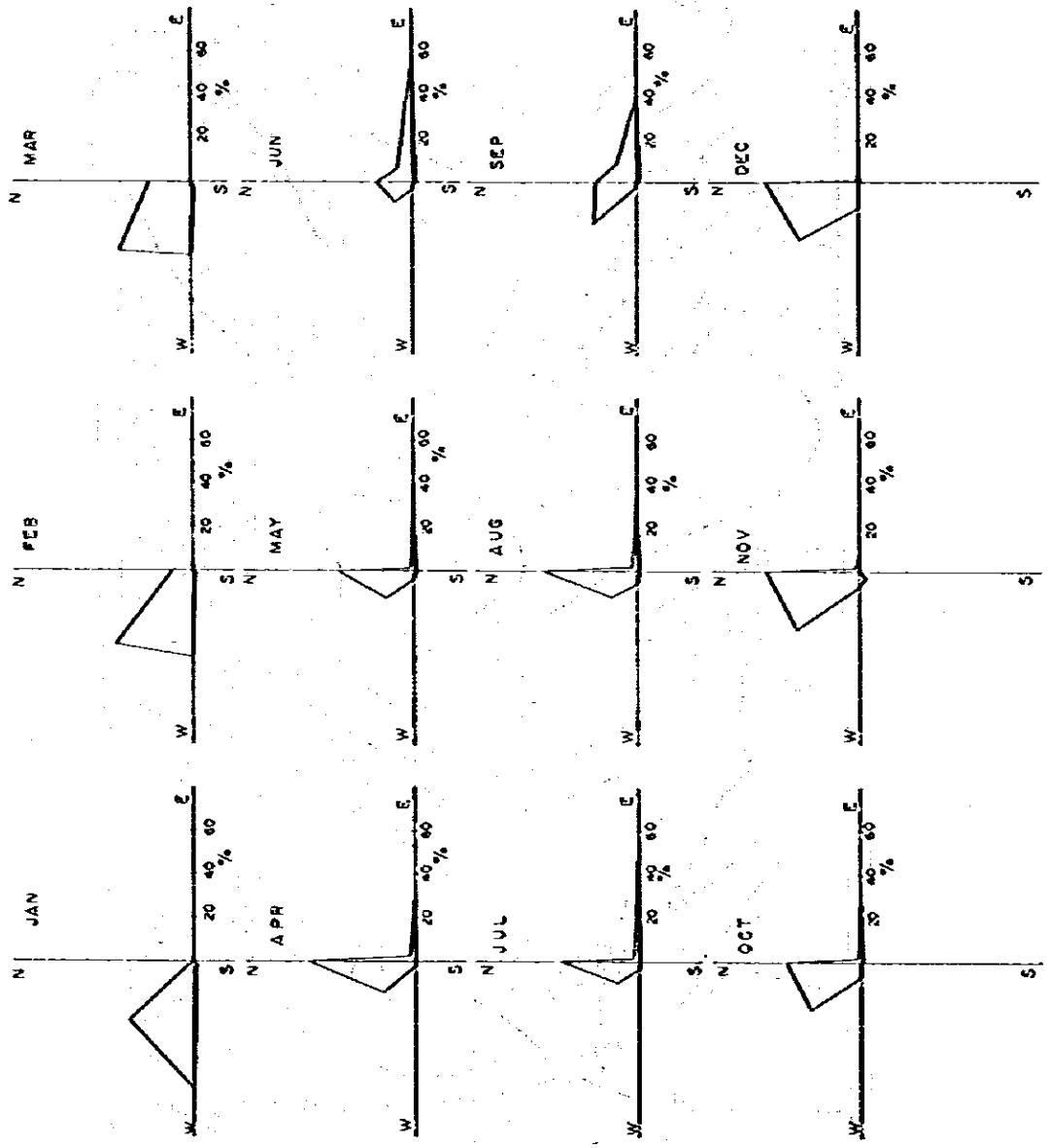


Fig. A-4-4. Wave Observed in the Center of Java Sea
(between 106 to 114°E and 4 to 7° S. 1976 and 1977)

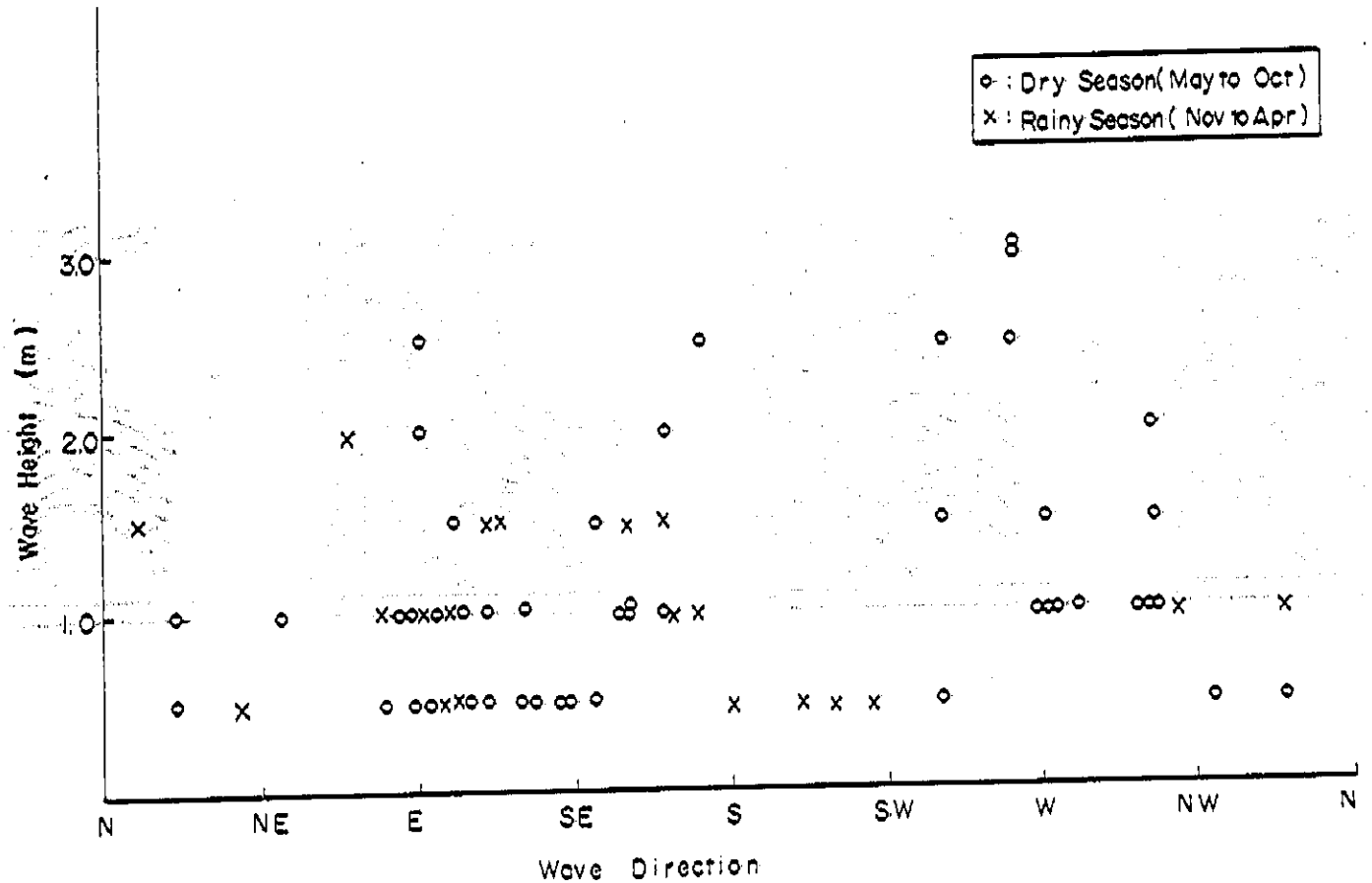
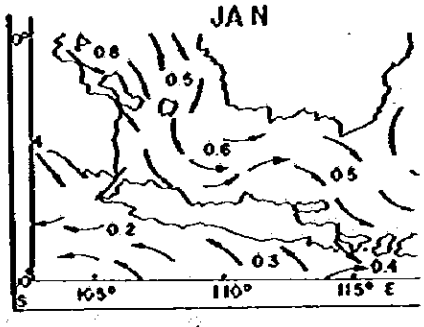
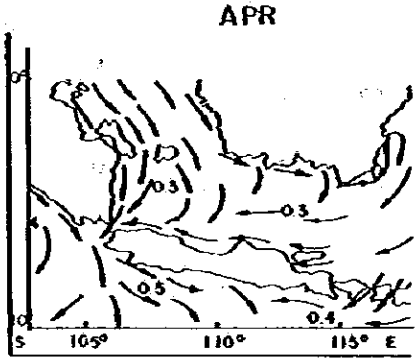


Fig. A-4-5. Ocean Current

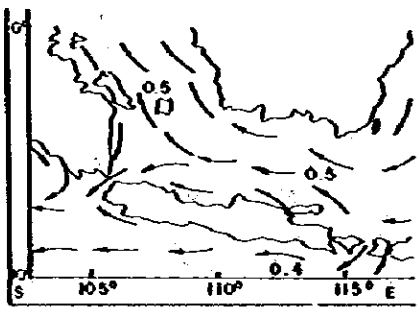
JAN (velocity in kt)




APR




JUL




OCT

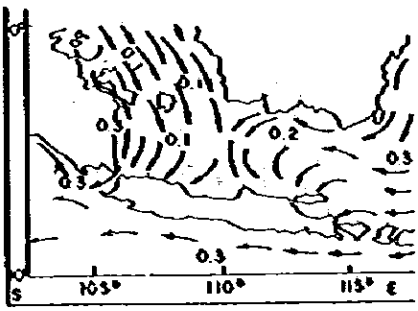


Fig. A-4-6. Correlation between Wind Velocity and Direction

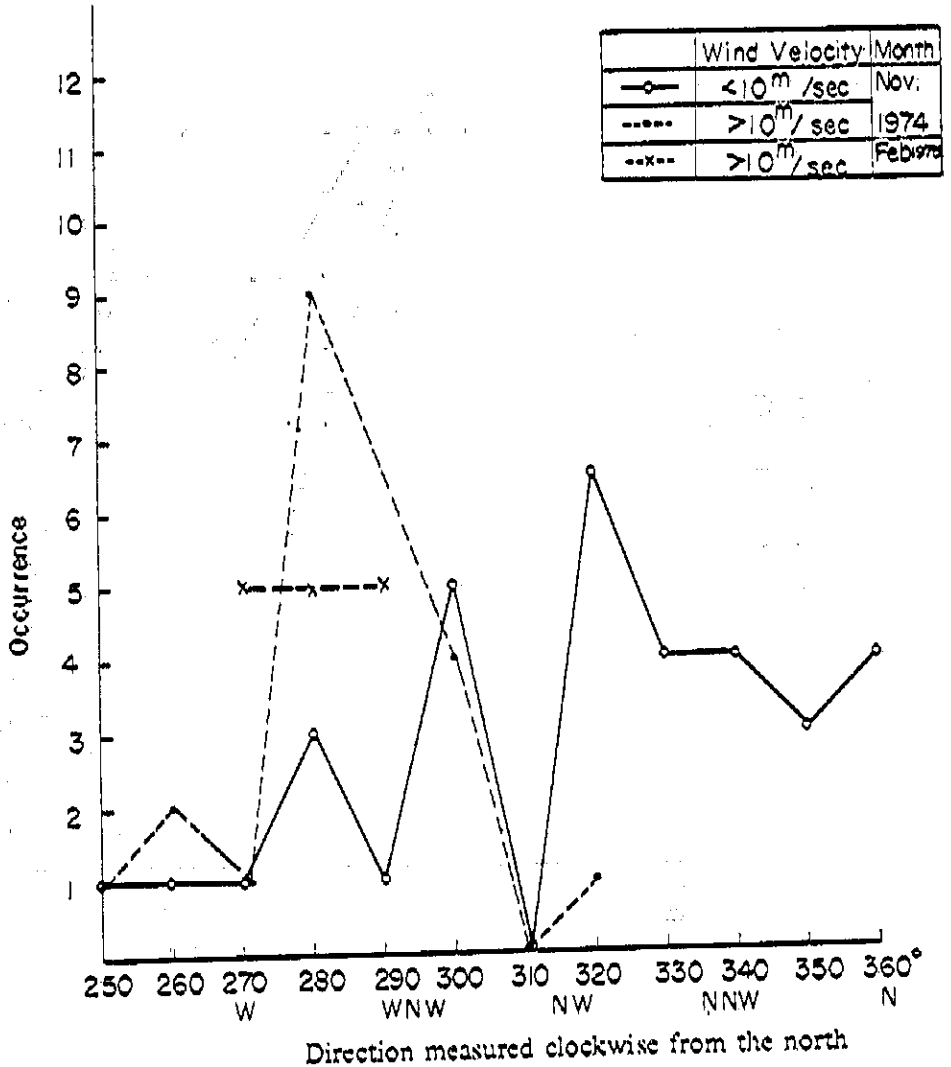


Fig. A-4-7. Relationship between Wave Height and Wind Velocity

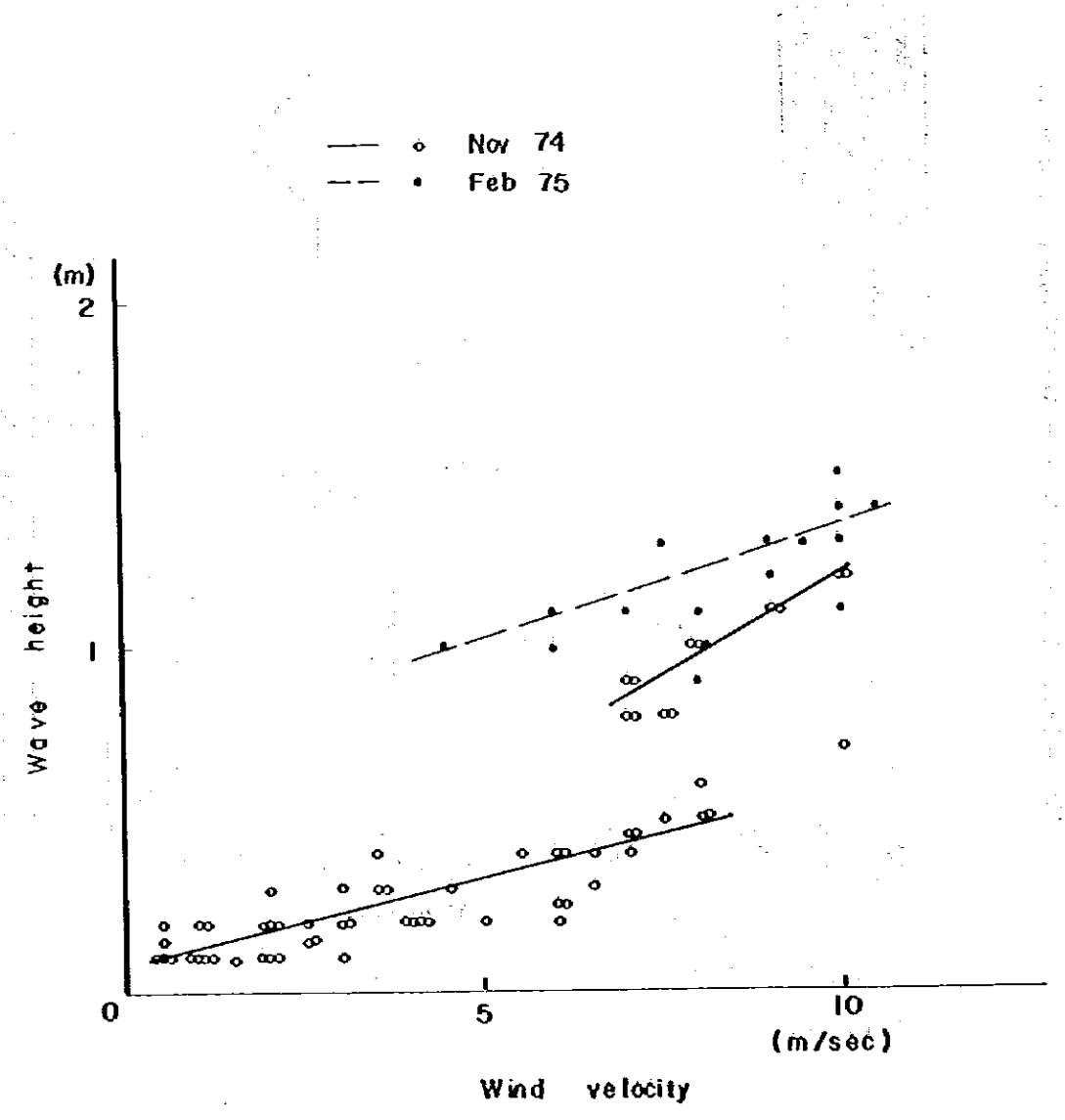


Fig. A-4-8. Correlation between Wave Height and Wave Period

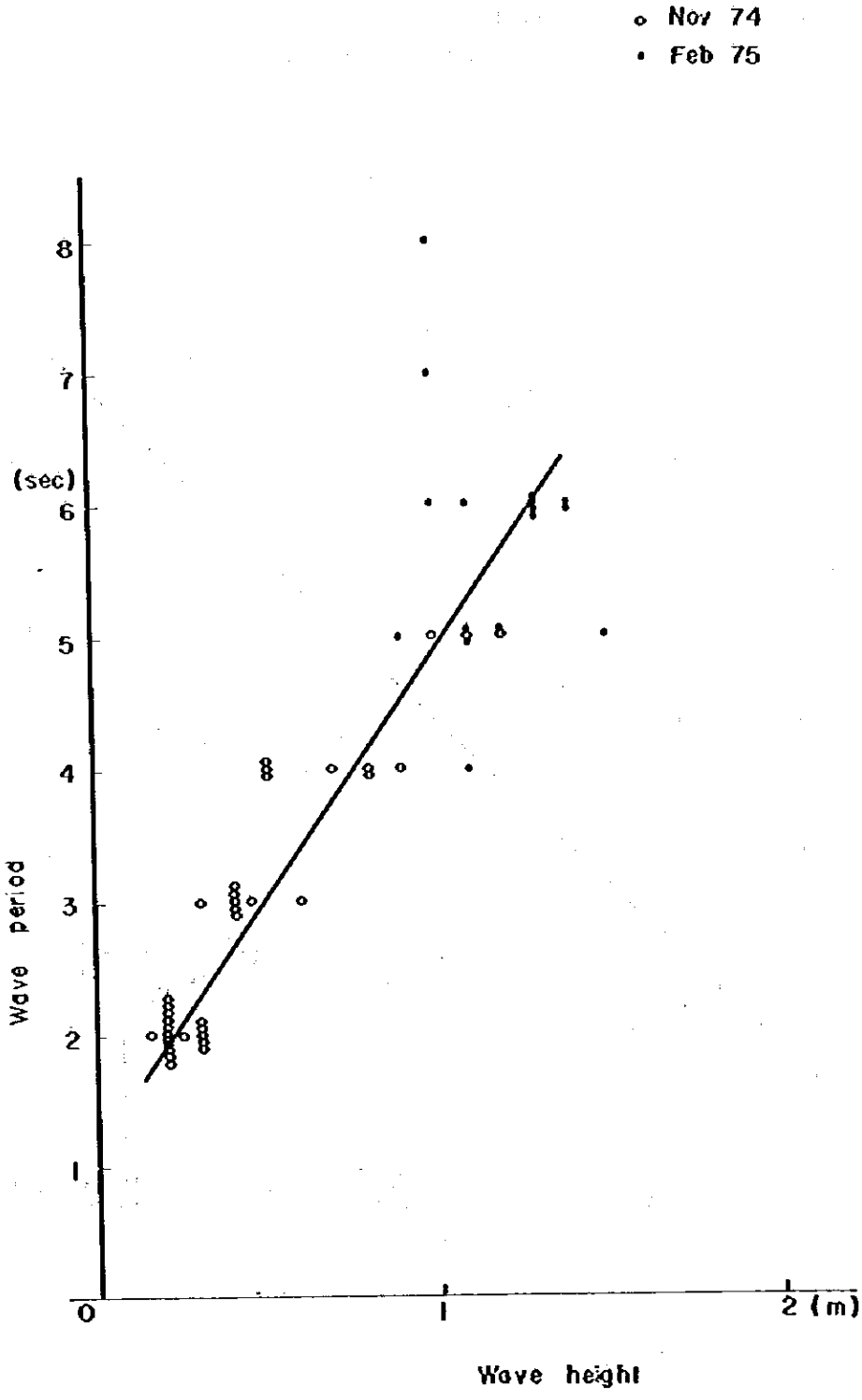


Fig. A-4-9. Correlation of Wind
in Semarang and on the Java Sea

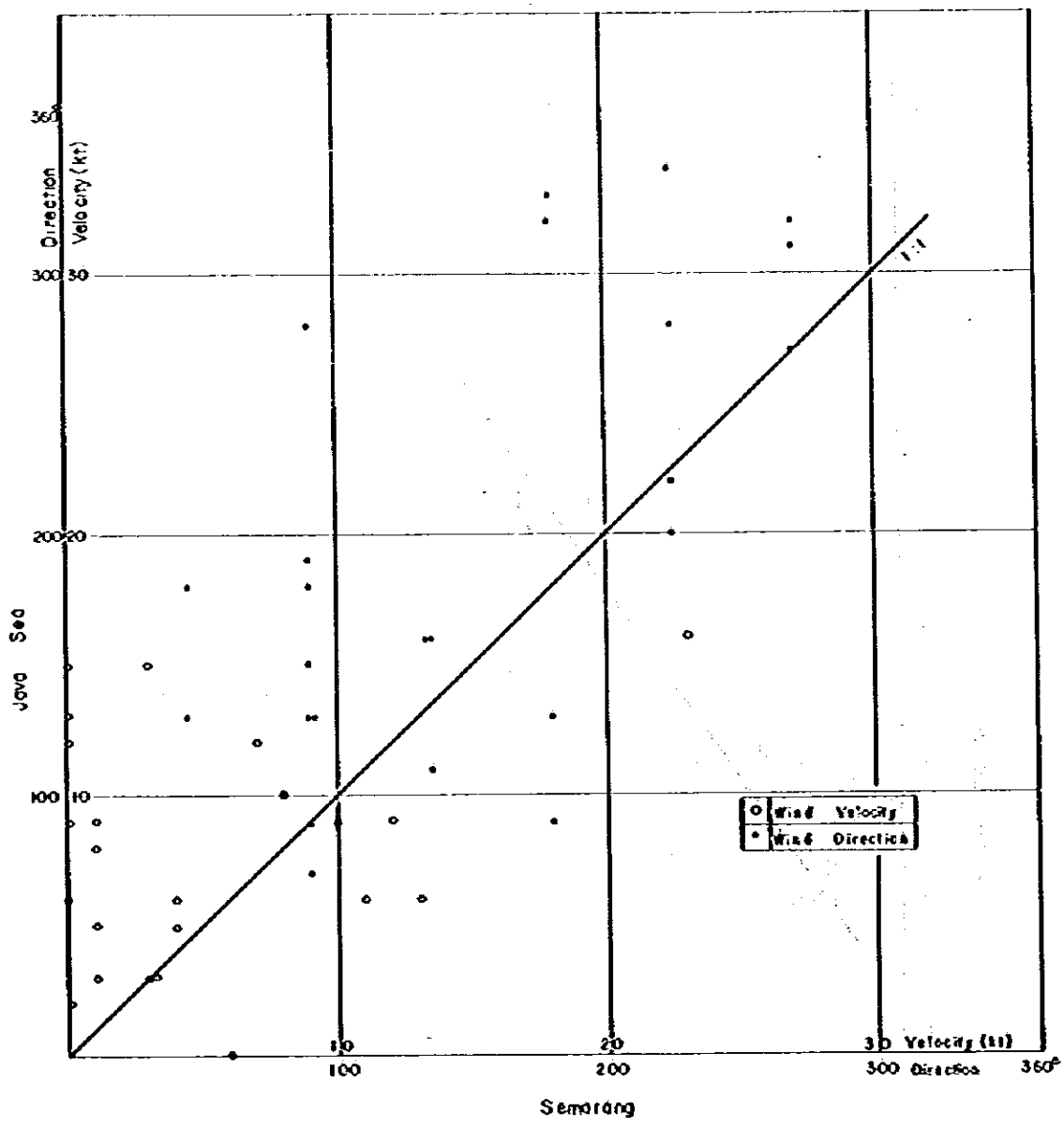


Fig. A-4-10 Boring Logs of I~I Section

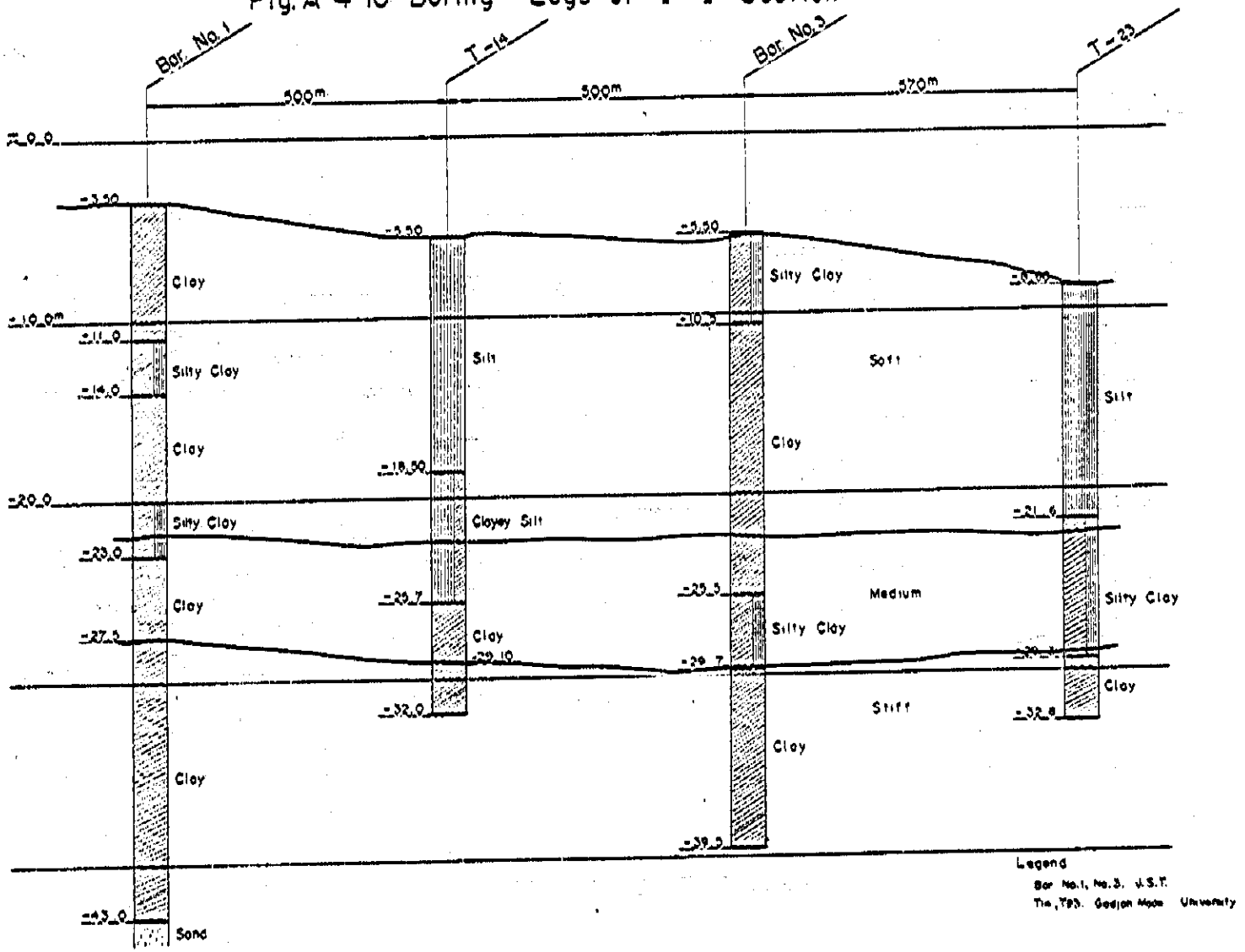
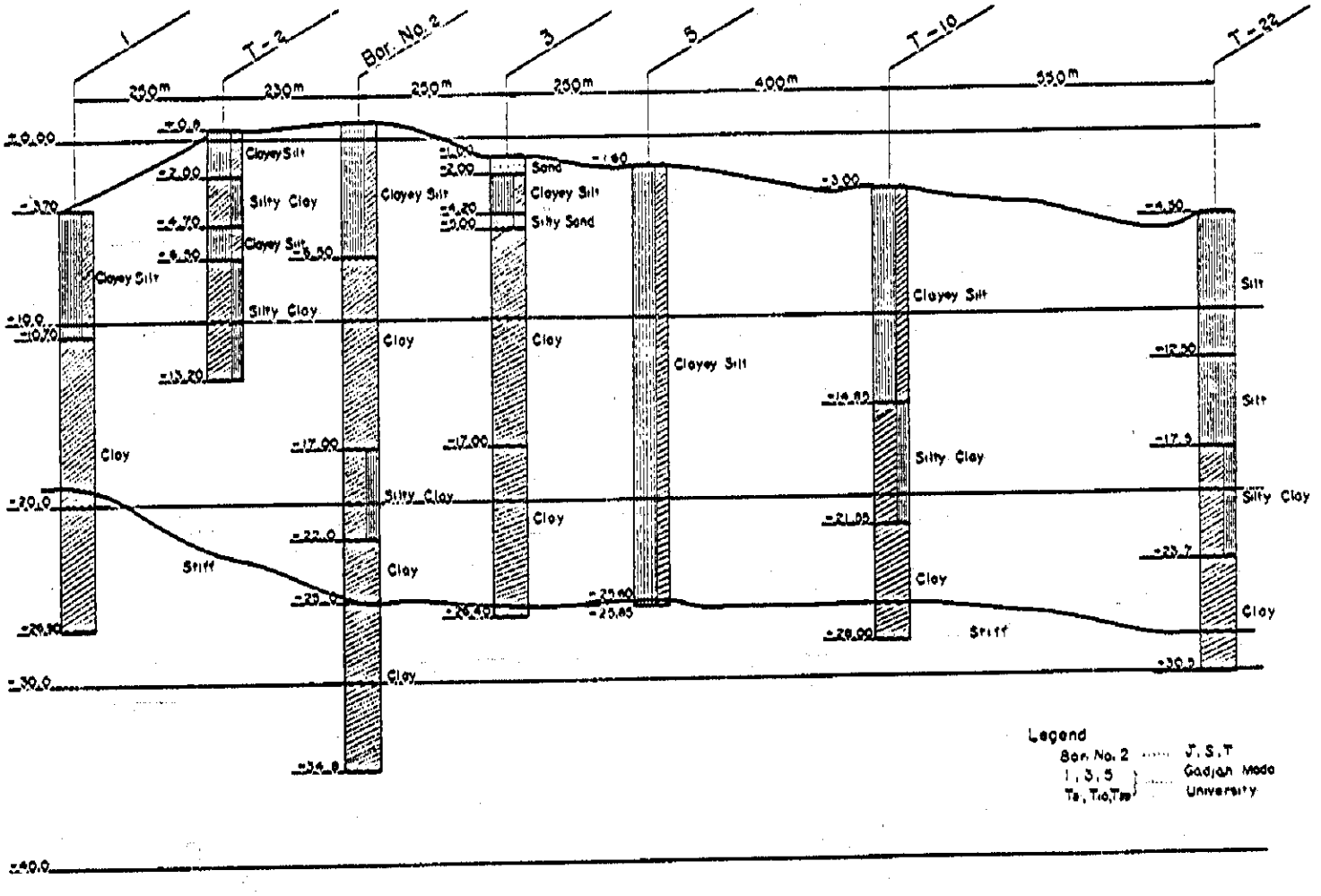


Fig. A-4-11 Boring Logs of Ⅱ~Ⅱ Section



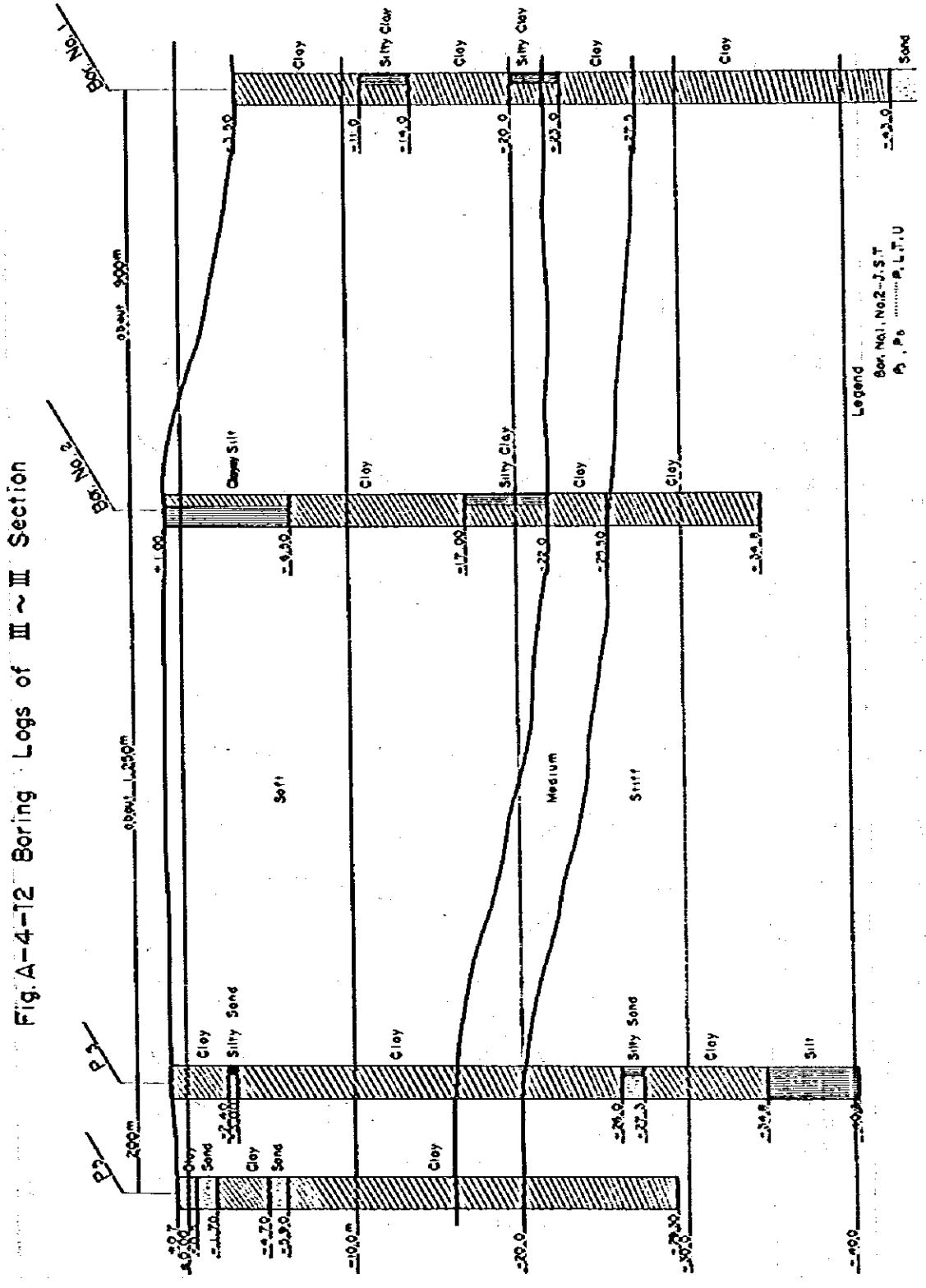



Fig. A-4-12 Boring Logs of II ~ III Section

Fig A-4-13 Soilindex of Borehole No.1

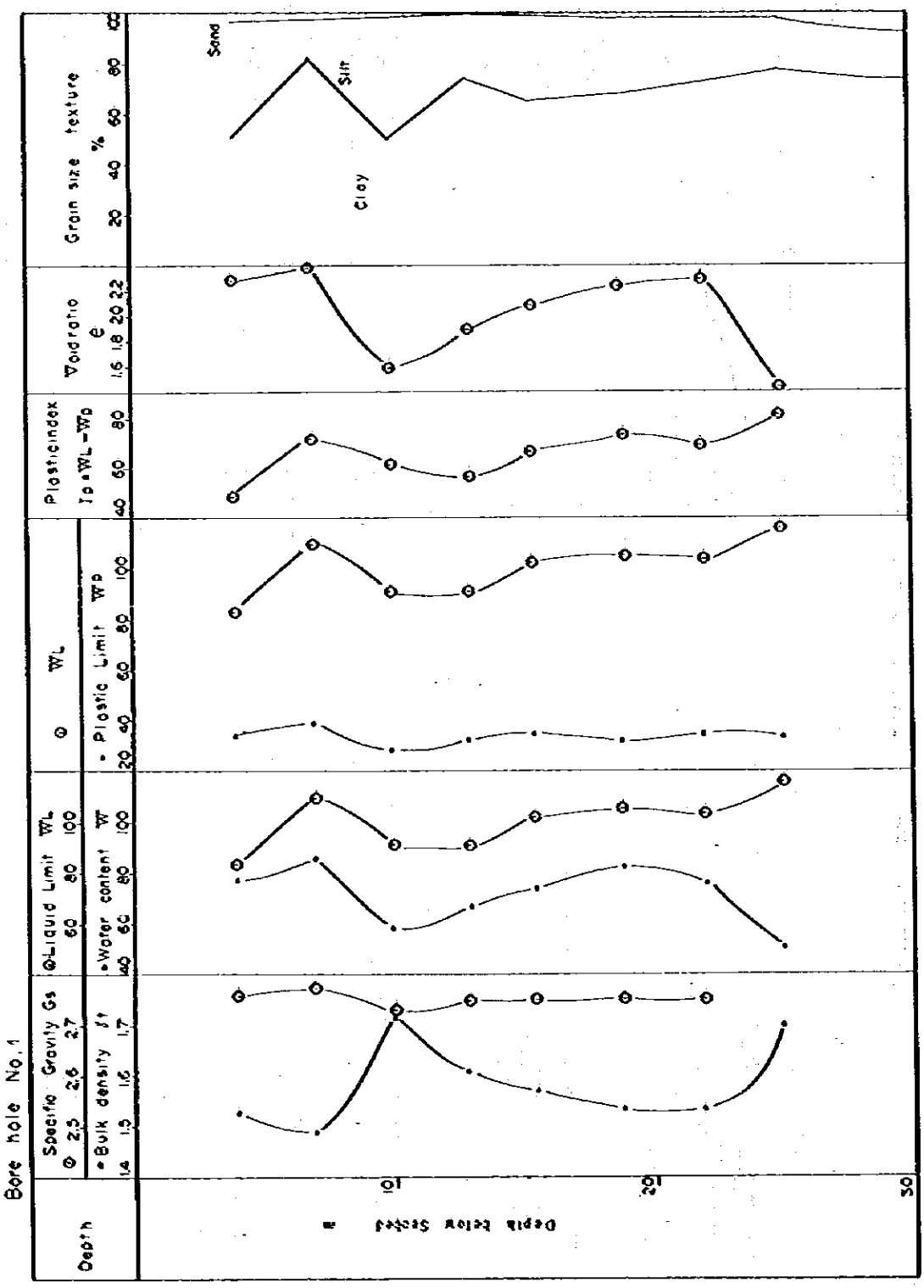
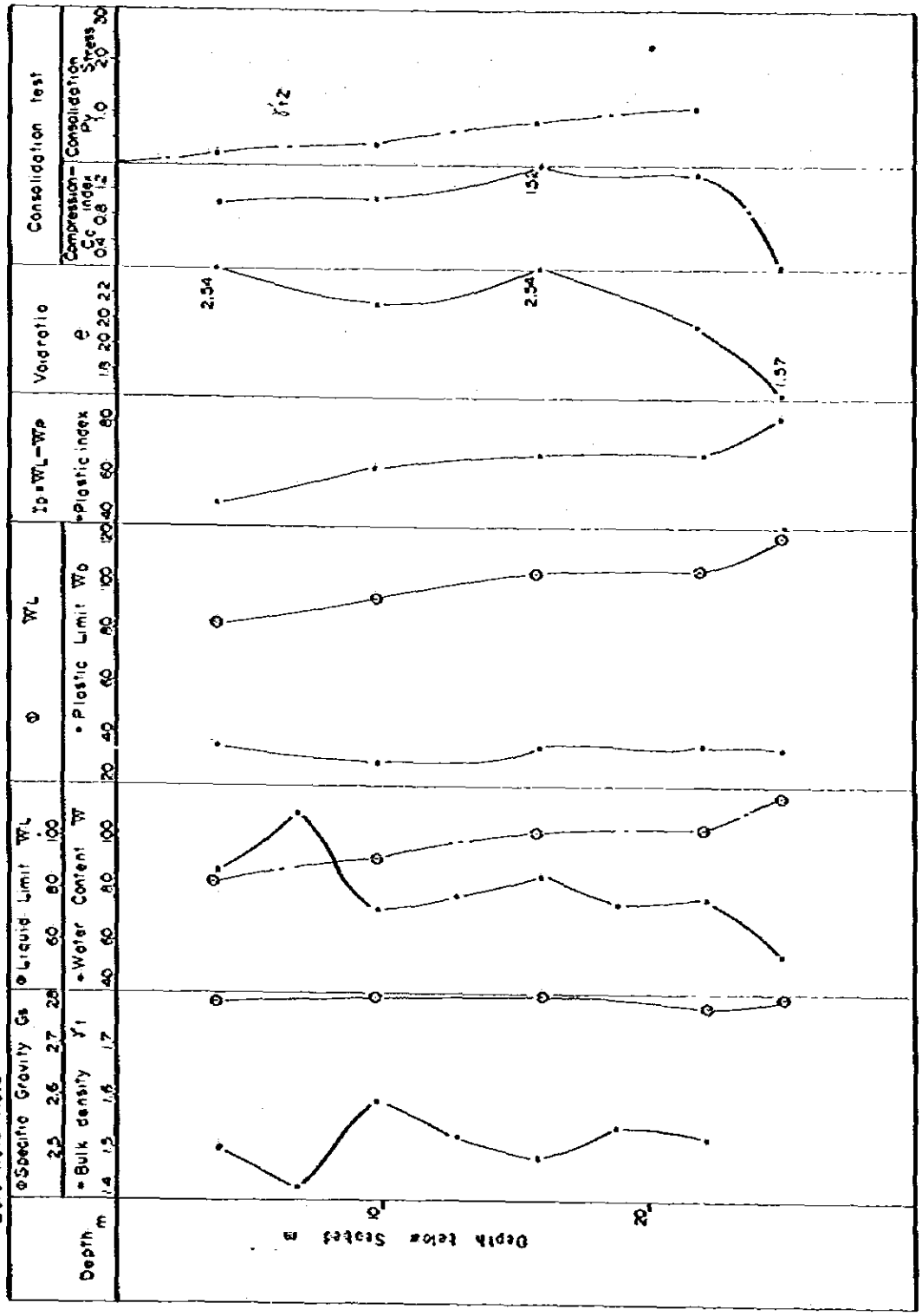


Fig-A-4-14 Soil index of Borehole No.3



# CHAPTER-5 PRESENT SITUATIONS IN THE HINTERLAND OF THE PORT OF SEMARANG

Table A-5-1 Population of Central Java by Kotamadya/Kabupaten

| Kotamadya/Kabupaten | | Area (x 1,000 Ha) | Population 1969 (Persons) | Population 1974 (Persons) | Annual Growth Rate (%) 1974/1969 | Density 1974 (Persons/Km²) |
|---|---|---|---|---|---|---|
| KDY | Magelang | 1,938 | 102,559 | 108,816 | 1.2 | 5,615 |
| | Surakarta | 4,657 | 402,247 | 467,368 | 3.1 | 10,036 |
| | Salatiga | 1,661 | 67,779 | 68,555 | 0.2 | 413 |
| | Semarang | 9,940 | 674,992 | 712,989 | 1.1 | 7,173 |
| | Pekalongan | 1,777 | 109,512 | 111,251 | 0.4 | 6,261 |
| | Tegal | 1,267 | 103,414 | 108,132 | 0.9 | 8,534 |
| KB | Cilacap | 233,415 | 1,133,406 | 1,224,309 | 1.6 | 525 |
| | Banyumas | 131,101 | 1,003,060 | 1,091,068 | 1.8 | 835 |
| | Purbalingga | 76,641 | 569,096 | 612,223 | 1.5 | 799 |
| | Banjarnegara | 113,377 | 577,438 | 615,887 | 1.3 | 543 |
| | Kebumen | 136,713 | 906,279 | 961,030 | 1.2 | 703 |
| | Purworejo | 111,240 | 626,822 | 668,376 | 1.3 | 601 |
| | Wonosobo | 96,407 | 499,603 | 539,178 | 1.5 | 559 |
| | Magelang | 117,657 | 791,033 | 848,551 | 1.4 | 721 |
| | Boyolali | 107,599 | 688,016 | 736,597 | 1.4 | 685 |
| | Klaten | 69,406 | 932,875 | 1,031,599 | 2.0 | 1,486 |
| | Sukoharjo | 48,596 | 476,893 | 524,211 | 1.9 | 1,079 |
| | Wonogiri | 192,145 | 878,405 | 929,780 | 1.1 | 484 |
| | Karanganyar | 79,397 | 493,439 | 530,864 | 1.5 | 669 |
| | Sragen | 99,989 | 617,242 | 681,185 | 2.0 | 681 |
| | Grobogan | 201,126 | 838,422 | 925,187 | 2.0 | 460 |
| | Blora | 262,348 | 586,713 | 639,991 | 1.8 | 244 |
| | Rembang | 183,634 | 348,743 | 376,878 | 1.6 | 205 |
| | Pati | 171,068 | 815,192 | 871,368 | 1.3 | 509 |
| | Kudus | 47,726 | 424,891 | 462,271 | 1.7 | 969 |
| | Jepara | 103,528 | 560,784 | 610,243 | 1.7 | 589 |
| | Demak | 112,069 | 568,425 | 614,159 | 1.6 | 548 |
| | Semarang | 109,618 | 656,068 | 695,545 | 1.2 | 635 |
| | Temanggung | 83,317 | 435,115 | 489,807 | 2.4 | 588 |
| | Kendal | 99,830 | 616,603 | 680,832 | 2.0 | 682 |
| | Batang | 75,036 | 431,591 | 484,002 | 2.3 | 645 |
| | Pekalongan | 87,554 | 542,518 | 577,713 | 1.3 | 660 |
| | Pemalang | 104,680 | 778,084 | 830,228 | 1.3 | 793 |
| | Tegal | 86,117 | 856,772 | 919,917 | 1.4 | 1,068 |
| | Brebes | 167,684 | 1,006,373 | 1,106,455 | 1.9 | 660 |

Source: Jawa Tengah Selayang Pandang, 1975

Table A-5-2 GDP of Central Java, Yogyakarta and Indonesia

| Province \ Year | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | Annual Growth Rate (%) 1969-1975 | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| Central Java | | | | | | | | | |
| GDP (Billion Rp. 1967 Price) | 363.1 | 379.8 | 392.4 | 414.3 | 426.4 | 441.4 | 468.3 | 4.3 | |
| Population (million persons) | 21.0 | 21.5 | 21.9 | 22.3 | 22.6 | 22.4 | 23.2 | | |
| Per Capita GDP (Rp.) | 17,319 | 17,673 | 17,938 | 18,578 | 18,867 | 19,275 | 20,185 | 2.6 | |
| Yogyakarta | | | | | | | | | |
| GDP (Billion Rp. 1969 Price) | 42.8 | 43.9 | 44.8 | 50.9 | ... | ... | ... | 5.9 | 1969-1972 |
| Population (million persons) | 2.43 | 2.46 | 2.49 | 2.52 | ... | ... | ... | | |
| Per Capita GDP (Rp.) | 17,599 | 17,839 | 18,005 | 20,210 | ... | ... | ... | 4.7 | 1969-1972 |
| Indonesia | | | | | | | | | |
| GDP (Billion Rp. 1969 Price) | 2,718.0 | 2,922.3 | 3,024.5 | 3,279.8 | 3,648.3 | 3,911.0 | 4,115.3 | 7.2 | |
| Population (Million persons) | 114.9 | 117.5 | 120.1 | 123.1 | 126.1 | 129.1 | 132.0 | | |
| Per Capita GDP (Rp.) | 23,655 | 24,871 | 25,183 | 26,643 | 28,932 | 30,244 | 31,244 | 4.5 | |

Source: (1) Java Regional Study, Central Java, Japan International Cooperation Agency

(2) Regional Development of Yogyakarta, United Nations Centre for Regional Development, Nagoya-Japan

Table A-5-3 GDP Estimated by Kotamadya/Kabupaten in Central Java, 1973

| District | Kabupaten/Kotamadya | | GDP (Million Rp.) | Population (x1,000 Persons) | GDP Per Capita (Rp.) |
|---|---|---|---|---|---|
| Kotamadya/ Kabupaten along the Java Sea | KDY | Semarang | 34,569 | 692 | 49,950 |
| | | Pekalongan | 6,692 | 111 | 60,280 |
| | | Tegal | 4,366 | 108 | 40,540 |
| | KB | Rembang | 12,030 | 380 | 31,640 |
| | | Pati | 30,187 | 863 | 34,990 |
| | | Jepara | 17,818 | 605 | 29,470 |
| | | Demak | 17,952 | 606 | 29,630 |
| | | Semarang | 19,841 | 692 | 28,680 |
| | | Kendal | 26,981 | 669 | 40,320 |
| | | Batang | 16,007 | 473 | 33,830 |
| | | Pekalongan | 20,548 | 570 | 36,020 |
| | | Pemalang | 19,218 | 819 | 23,460 |
| | | Tegal | 25,911 | 899 | 28,820 |
| | | Brebes | 28,292 | 1,086 | 26,060 |
| | | Sub Total | 280,412 | 8,573 | 32,710 |
| Other Kotamadya/ Kabupaten | KDY | Magelang | 4,464 | 111 | 40,210 |
| | | Surakarta | 20,028 | 464 | 43,130 |
| | | Salatiga | 3,034 | 67 | 45,220 |
| | KB | Cilacap | 36,953 | 1,217 | 30,360 |
| | | Banyumas | 30,964 | 1,032 | 30,010 |
| | | Purbalingga | 16,975 | 603 | 28,160 |
| | | Banjarnegara | 12,870 | 610 | 21,100 |
| | | Kebumen | 25,337 | 954 | 26,580 |
| | | Purworejo | 23,025 | 668 | 34,480 |
| | | Wonosobo | 15,048 | 530 | 28,380 |
| | | Magelang | 20,328 | 842 | 24,140 |
| | | Boyolali | 19,038 | 727 | 26,200 |
| | | Klaten | 36,818 | 1,016 | 36,240 |
| | | Sukoharjo | 19,585 | 517 | 37,850 |
| | | Wonogiri | 17,852 | 921 | 19,380 |
| | | Karanganyar | 15,874 | 523 | 30,340 |
| | | Sragen | 19,261 | 672 | 28,660 |
| | | Grobogan | 26,752 | 910 | 29,390 |
| | | Blora | 22,692 | 626 | 36,260 |
| | | Kudus | 25,188 | 458 | 55,040 |
| | | Temanggung | 14,506 | 484 | 29,990 |
| | | Sub Total | 426,592 | 13,952 | 30,580 |
| | D.I.Yogyakarta | | 99,100 | 2,550 | 38,860 |
| | | Total | 806,104 | 25,075 | 32,150 |

Source: Java Regional Study, Central Java, Japan International Cooperation Agency

Table A-5-4 Production of Food Crops by Region in Indonesia, 1973

(unit: 1,000 tons)

| Province | Wet Land Paddy | Dry Land Paddy | Maize | Cassava | Sweet Potatoes | Peanut | Soy Beans |
|---|---|---|---|---|---|---|---|
| West Java & Jakarta | 6,467 | 251 | 165 | 1,803 | 494 | 46 | 23 |
| Central Java & Yogyakarta | 5,240 | 166 | 1,168 | 3,188 | 301 | 70 | 145 |
| East Java | 4,764 | 159 | 1,358 | 3,112 | 376 | 101 | 272 |
| Total Java & Madura | 16,471 (63.5) | 576 (26.3) | 2,691 (72.9) | 8,103 (72.4) | 1,171 (49.1) | 217 (74.8) | 440 (81.3) |
| Sumatra | 5,094 (19.7) | 951 (43.4) | 186 (5.0) | 1,326 (11.9) | 293 (12.3) | 21 (7.2) | 48 (8.9) |
| Kalimantan | 1,074 (4.1) | 309 (14.1) | 10 (0.3) | 284 (2.5) | 29 (1.2) | 2 (0.7) | 2 (0.4) |
| Sulawesi | 1,875 (7.2) | 179 (8.2) | 534 (14.5) | 660 (5.9) | 155 (6.5) | 28 (9.7) | 6 (1.1) |
| Others | 1,388 (5.5) | 174 (8.0) | 269 (7.3) | 813 (7.3) | 739 (30.9) | 22 (7.6) | 45 (8.3) |
| Total Indonesia | 25,902 (100.0) | 2,189 (100.0) | 3,690 (100.0) | 11,186 (100.0) | 2,387 (100.0) | 290 (100.0) | 541 (100.0) |

Source: Statistical Yearbook of Indonesia, 1975, Biro Pusat Statistik, Jakarta

Table A-5-5 Production and Yield of Main Food Crops in Central Java, 1969 ~ 1976

| Crop | Production & Yield | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1976/1969 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lowland Rice | Production (x1,000 tons) | 3,904 | 3,697 | 4,453 | 4,109 | 4,156 | 4,814 | 4,749 | 4,512 | 1.16 |
| | Yield (ql./Ha) | 31.5 | 32.4 | 35.4 | 33.1 | 33.3 | 37.0 | 37.9 | 39.7 | 1.26 |
| Upland Rice | Production (x1,000 tons) | 79.6 | 102.7 | 103.0 | 102.7 | 126.3 | 84.2 | 74.4 | 84.6 | 1.06 |
| | Yield (ql./Ha) | 15.2 | 18.8 | 17.6 | 19.6 | 20.3 | 17.3 | 17.6 | 19.1 | 1.26 |
| Maize | Production (x1,000 tons) | 325.3 | 517.4 | 362.0 | 326.0 | 709.6 | 431.0 | 552.7 | 509.4 | 1.57 |
| | Yield (ql./Ha) | 7.15 | 7.49 | 7.11 | 7.76 | 8.49 | 8.68 | 11.6 | 10.8 | 1.51 |
| Cassava | Production (x1,000 tons) | 1,796 | 1,730 | 1,874 | 1,769 | 1,837 | 1,891 | 1,893 | 1,951 | 1.09 |
| | Yield (ql./Ha) | 51.4 | 53.8 | 54.0 | 50.3 | 53.2 | 58.3 | 62.4 | 60.6 | 1.18 |
| Sweet Potatoes | Production (x1,000 tons) | 202.5 | 195.5 | 172.7 | 182.4 | 226.1 | 172.8 | 189.4 | 196.9 | 0.97 |
| | Yield (ql./Ha) | 41.1 | 39.5 | 39.9 | 40.6 | 42.6 | 43.1 | 46.1 | 48.4 | 1.18 |
| Peanuts | Production (x1,000 tons) | 47.7 | 55.8 | 52.6 | 50.5 | 56.4 | 53.5 | 69.4 | 65.1 | 1.36 |
| | Yield (ql./Ha) | 6.23 | 6.62 | 6.65 | 6.04 | 6.16 | 5.95 | 6.53 | 7.07 | 1.13 |
| Soy Beans | Production (x1,000 tons) | 37.1 | 79.3 | 60.9 | 58.3 | 90.8 | 81.6 | 85.5 | 71.9 | 1.91 |
| | Yield (ql./Ha) | 4.55 | 5.19 | 4.54 | 4.78 | 5.22 | 5.06 | 6.12 | 5.71 | 1.18 |
| Green Peas | Production (x1,000 tons) | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6.2 | ..... |
| | Yield (ql./Ha) | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3.52 | ..... |
| Sorghum | Production (x1,000 tons) | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7.1 | ..... |
| | Yield (ql./Ha) | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6.06 | ..... |

Source: Java Regional Study, Central Java, Japan International Cooperation Agency

Table A-5-6 Production of Fish in Central Java, 1970 ~ 1976

(Unit: 1,000 tons)

| Kind of Fishery | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|---|---|
| Marine Fishery | 28.4 | 29.0 | 33.3 | 36.7 | 44.8 | 49.3 | 57.1 |
| | (63%) | (69%) | (73%) | (76%) | (78%) | (78%) | |
| Inland Fishery | 8.1 | 7.5 | 8.8 | 5.3 | 5.2 | 6.5 | ..... |
| Fish Culture | 8.9 | 5.3 | 3.3 | 6.2 | 7.2 | 7.4 | ..... |
| Total | 45.3 | 41.8 | 45.4 | 48.2 | 57.1 | 63.2 | ..... |
| | (100) | (100) | (100) | (100) | (100) | (100) | |

Source: Java Regional Study, Central Java, Japan International Cooperation Agency

Table A-5-7 GDP Estimated by Sector, Central Java, 1973

(Unit: Rp. Million at Current Market Price)

| Sector | GDP | Percentage |
|---|---|---|
| Agriculture, Animal Husbandry, Forestry & Fishery | 344,201 | 48.7 |
| Farm Food Crops | 269,700 | |
| Farm Non Food Crops | 30,700 | |
| Estate Crops | 21,200 | |
| Animal Husbandry | 11,600 | |
| Forestry | 5,700 | |
| Fishery | 5,101 | |
| Mining & Quarrying | 7,800 | 1.1 |
| Manufacturing | 90,703 | 12.8 |
| Construction | 14,501 | 2.1 |
| Electricity, Gas & Water Supply | 3,200 | 0.4 |
| Transportation & Communication | 16,600 | 2.3 |
| Land Transportation | 11,300 | |
| Air Transportation | 1,800 | |
| Sea Transportation | 2,300 | |
| Communication | 1,200 | |
| Trade, Restaurants & Hotels | 148,400 | 21.0 |
| Banking & Other Financial Intermediaries | 13,100 | 1.9 |
| Public Administration Ownership of Dwelling & Services | 68,500 | 9.7 |
| Gross Regional Domestic Product | 707,004 | 100.0 |

Source: Java Regional Study, Central Java, Japan International Cooperation Agency

Table A-5-8 Number of Large, Medium and Small Manufacturing Establishments by Province, 1974/75

| Province | Large | Medium | Small | Total | Percentage | | Remarks |
|---|---|---|---|---|---|---|---|
| Central Java & Yogyakarta | 272 | 1,440 | 10,374 | 12,086 | | (30.3%) | Definitions of scale of establishment |
| West Java & Jakarta | 454 | 2,028 | 12,063 | 14,545 | | (36.5) | Large : 100 or more persons |
| East Java | 363 | 1,456 | 11,422 | 13,241 | | (33.2) | Medium: 20 - 99 persons |
| Java Madura | 1,089 | 4,924 | 33,859 | 39,872 | (72.1%) | (100.0) | Small : 5 - 19 persons |
| Sumatra | 140 | 414 | 7,605 | 8,159 | (14.8) | | |
| Kalimantan | 32 | 121 | 1,347 | 1,500 | (2.7) | | |
| Sulawesi | 17 | 149 | 3,658 | 3,824 | (6.9) | | |
| Other Islands | 28 | 138 | 1,752 | 1,918 | (3.5) | | |
| Total Indonesia | 1,306 | 5,746 | 48,221 | 55,273 | (100.0) | | |

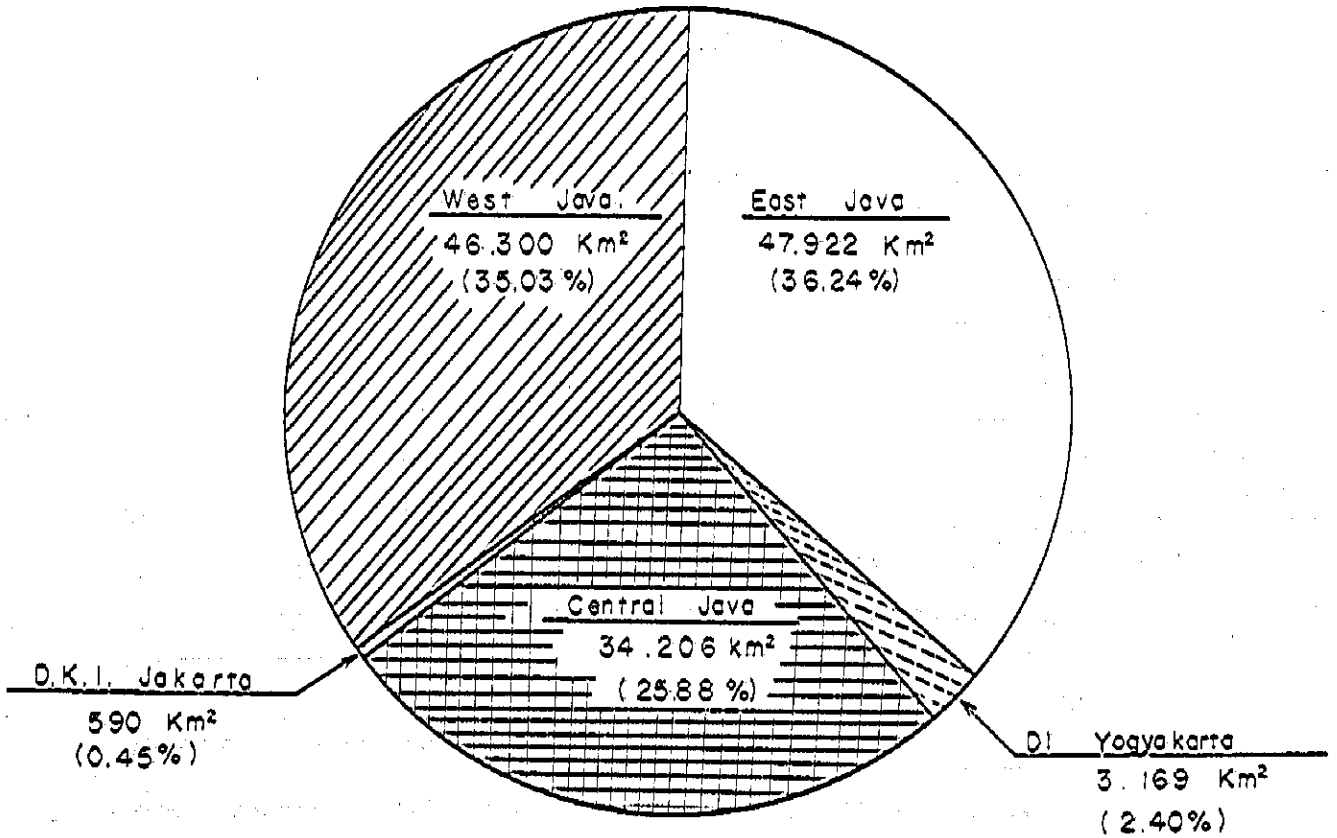
Source: Sensus Industri 1974/75

Table A-5-9 Number of Enterprises by Industry and Size in Central Java, 1975/76

| Industry | Actually Operating Enterprises | | | | Listed Enterprises | Remarks |
|---|---|---|---|---|---|---|
| | Large | Medium | Small | Total | | |
| Food & Beverage | 97 | 368 | 5,570 | 6,035 | 6,365 | Definitions of Scale of Establishment |
| Tobacco | 34 | 64 | 310 | 408 | 433 | Large scale: 100 persons or more of employees for establishments without machine, or 50 persons or more of employees for establishments with machine. |
| Textile | 108 | 627 | 7,884 | 8,620 | 10,059 | |
| Leather | 5 | 9 | 167 | 181 | 182 | |
| Woods & Furniture | 60 | 130 | 957 | 1,149 | 1,160 | |
| Paper & Printing | 61 | 80 | 226 | 367 | 373 | Medium scale: 10 to 99 persons without machine, or 5 to 49 persons with machine |
| Chemical, Rubber & Plastic | 30 | 84 | 176 | 290 | 300 | |
| Clay & Stone Products | 10 | 119 | 2,716 | 2,845 | 2,983 | Small scale: 1 to 9 persons without machine, or 1 to 4 persons with machine. |
| Basic Metal | 4 | - | - | 4 | 5 | |
| Metal Manufacturing | 21 | 163 | 1,511 | 1,696 | 1,702 | |
| Other Industries | 11 | 34 | 13,211 | 13,256 | 15,317 | |
| Total | 411 | 1,678 | 32,728 | 34,850 | 38,697 | |

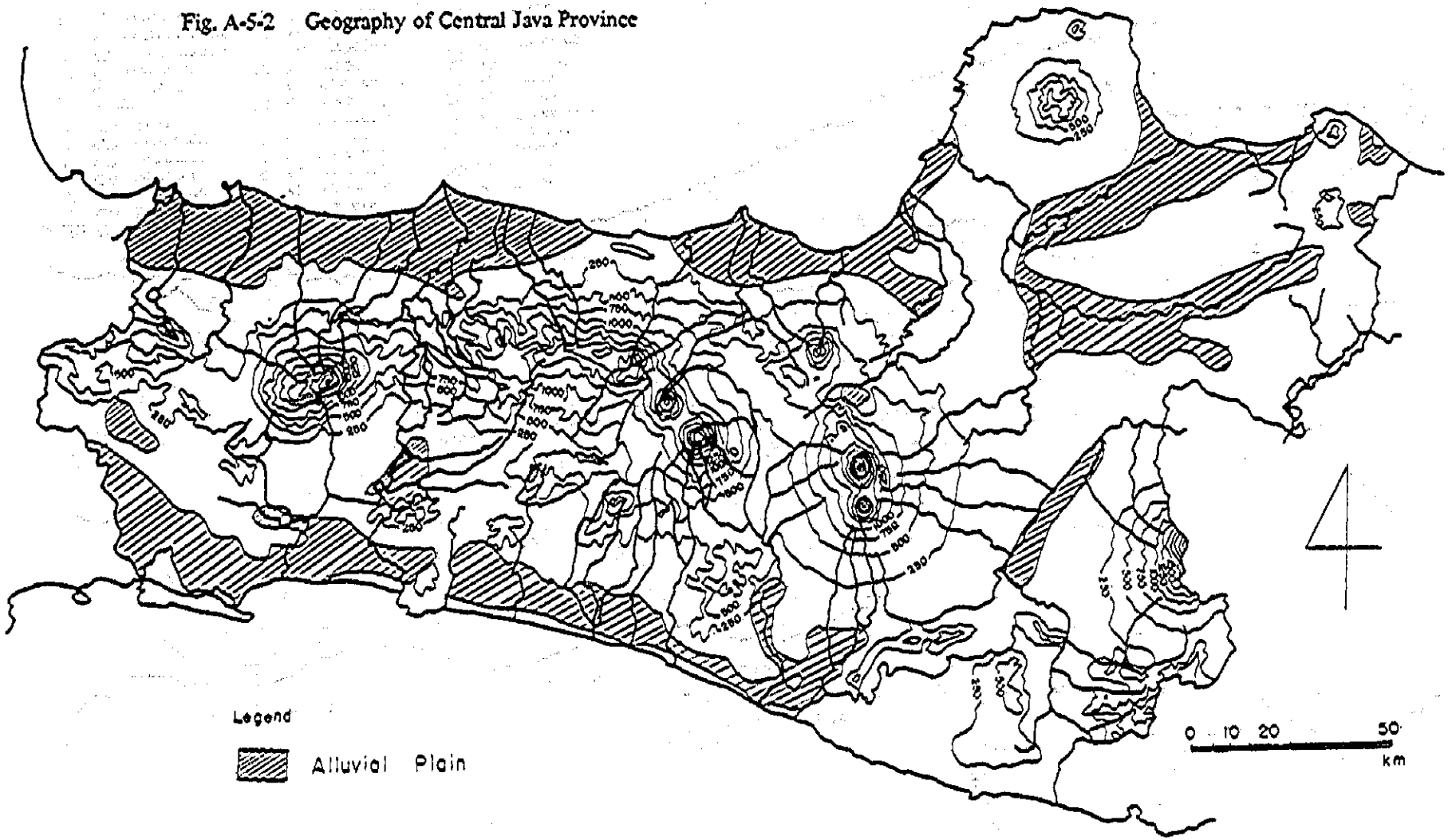
Source: Java Regional Study, Central Java, Japan International Cooperation Agency

Fig. A-5-1 Area by Province in Java Island



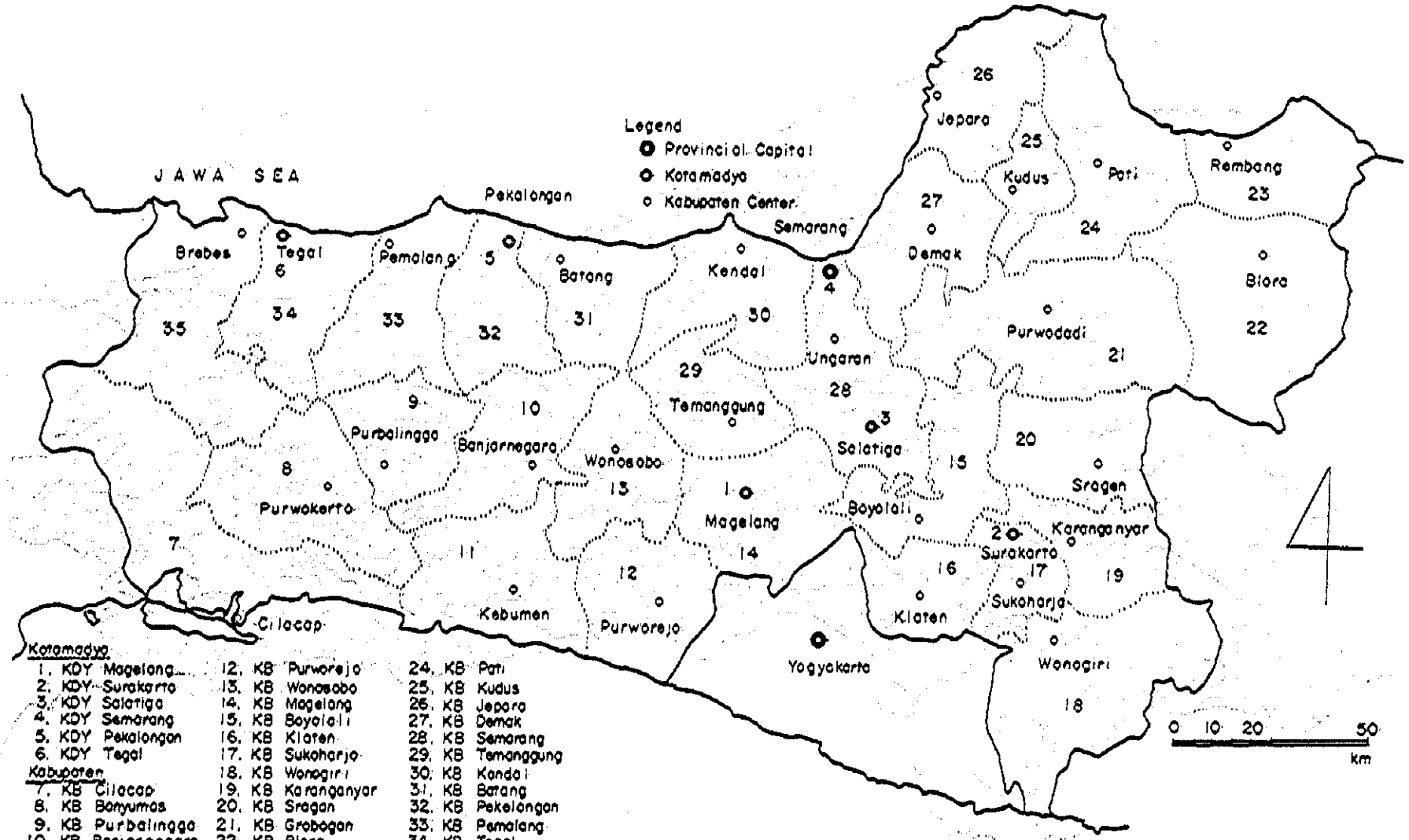

Source: Statistical Yearbook of Indonesia, 1975

Fig. A-5-2 Geography of Central Java Province




Source: Java Regional Study, Central Java, JICA

Fig. A-5-3 Administrative Divisions of Central Java, 1977

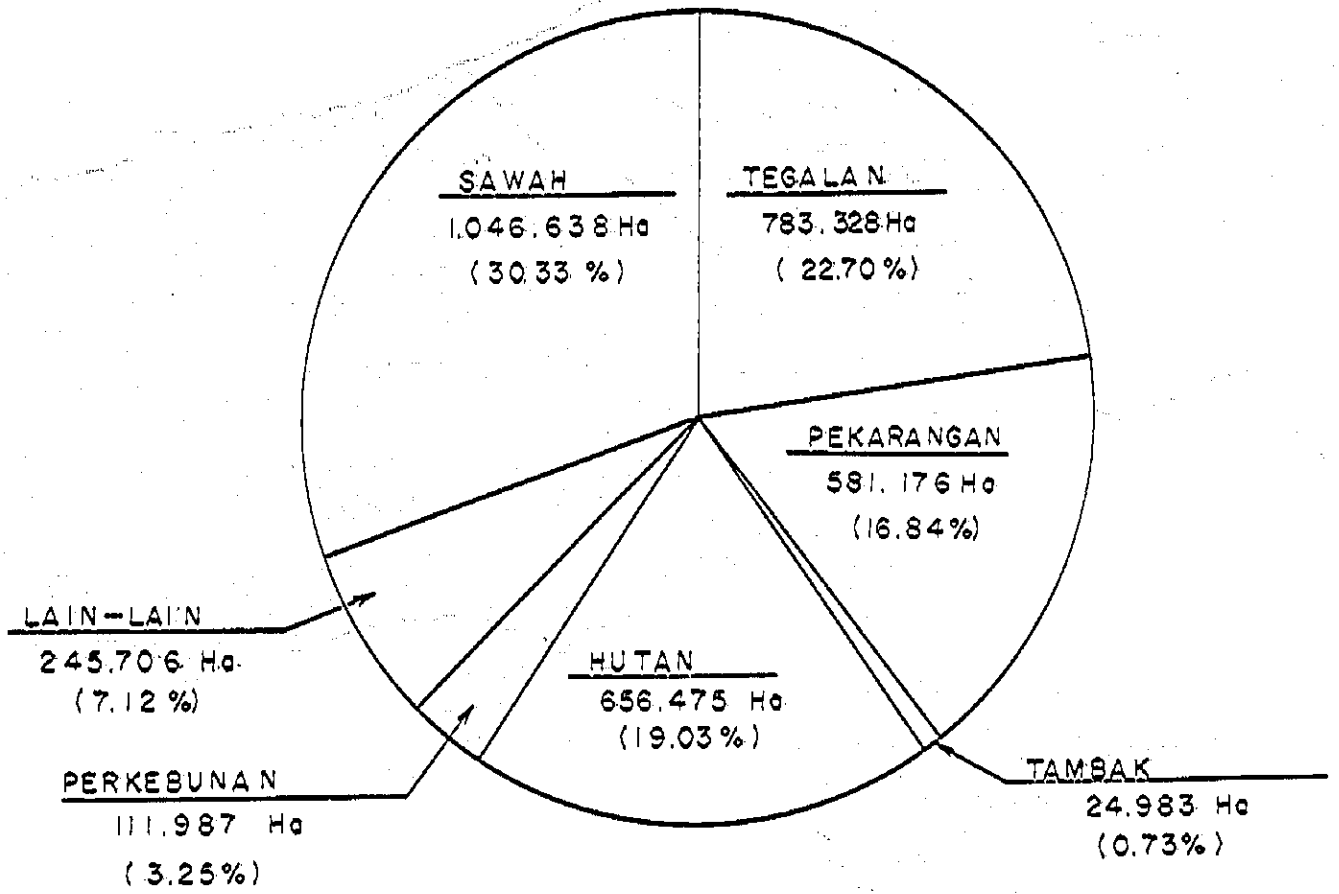



Kotamadya
1. KDY Magelang
2. KDY Surakarta
3. KDY Salatiga
4. KDY Semarang
5. KDY Pekalongan
6. KDY Tegal

Kabupaten
7. KB Cilacap
8. KB Banyumas
9. KB Purbalingga
10. KB Banjarnegara
11. KB Kebumen
12. KB Purworejo
13. KB Wonosobo
14. KB Magelang
15. KB Boyolali
16. KB Klaten
17. KB Sukoharjo
18. KB Wonogiri
19. KB Karanganyar
20. KB Sragen
21. KB Grobogan
22. KB Blora
23. KB Rembang
24. KB Pati
25. KB Kudus
26. KB Jepara
27. KB Demak
28. KB Semarang
29. KB Temanggung
30. KB Kendal
31. KB Batang
32. KB Pekalongan
33. KB Pemalang
34. KB Tegal
35. KB Brebes

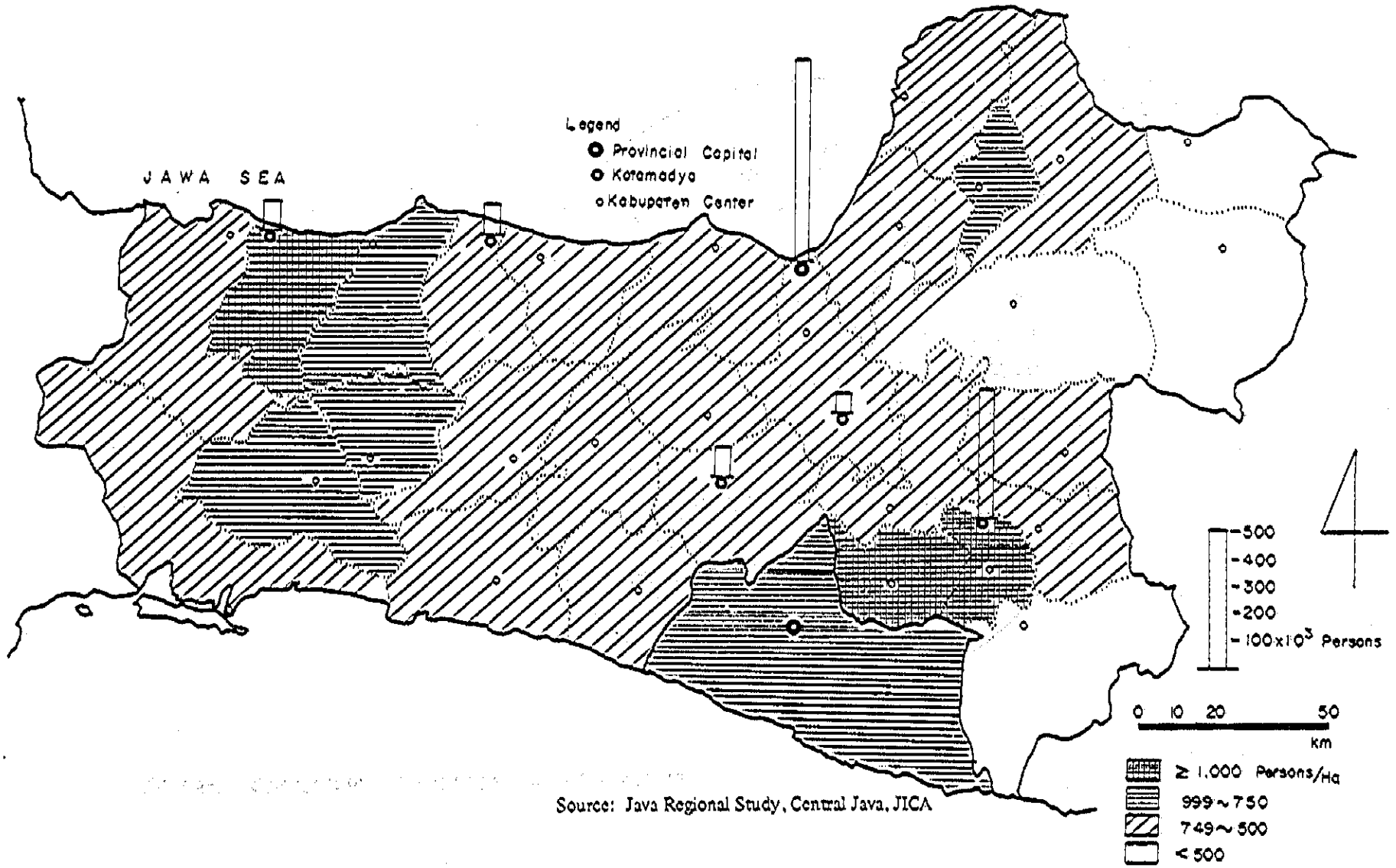
Source: Java Regional Study, Central Java, JICA

Fig. A-5-4 Classification of Land Utilization in Central Java



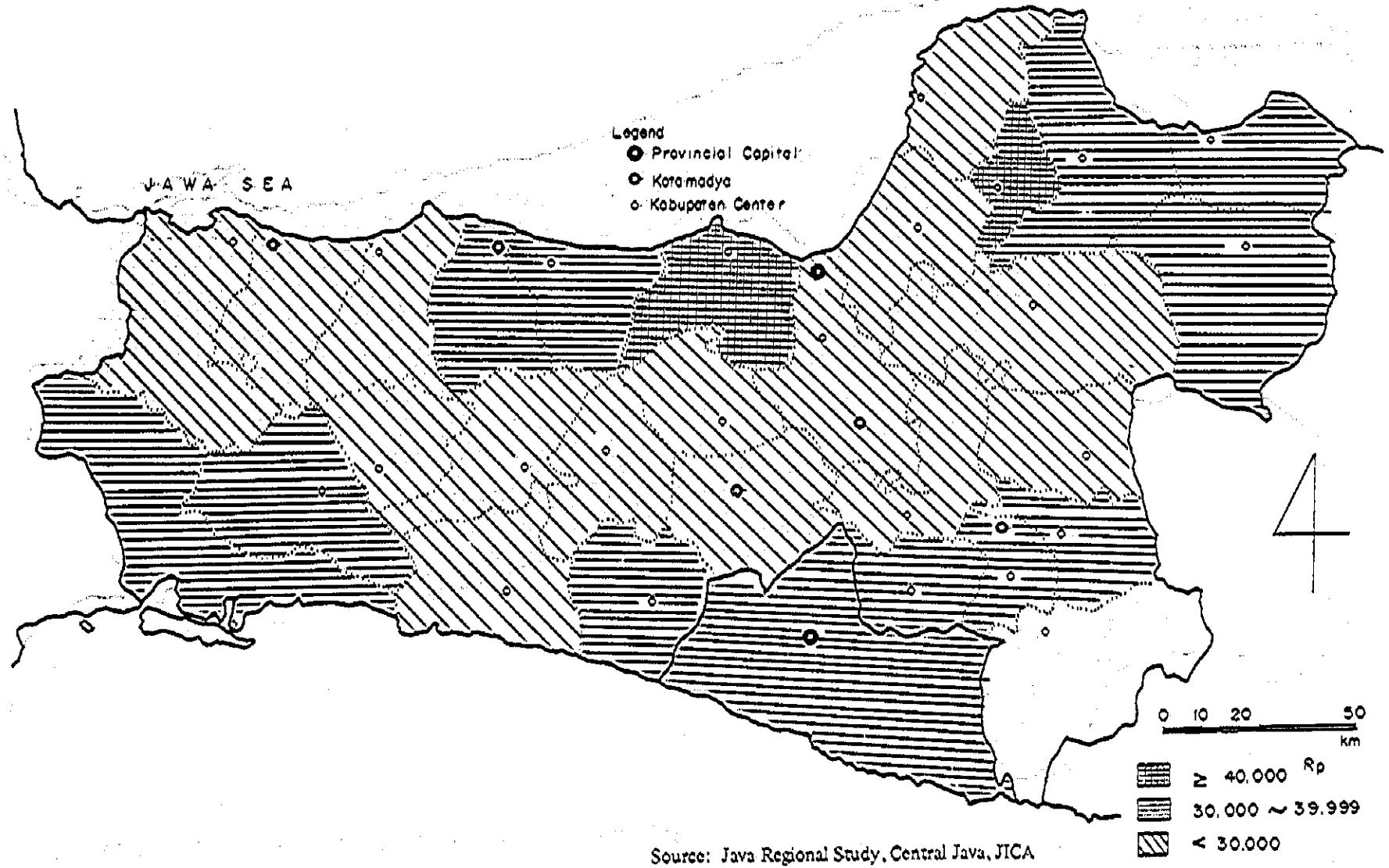

Source: Jawa Tengah Selayang Pandang, 1975

Fig. A-5-5 Population of Kotamadya and Population Density of Kabupaten in Central Java, 1974



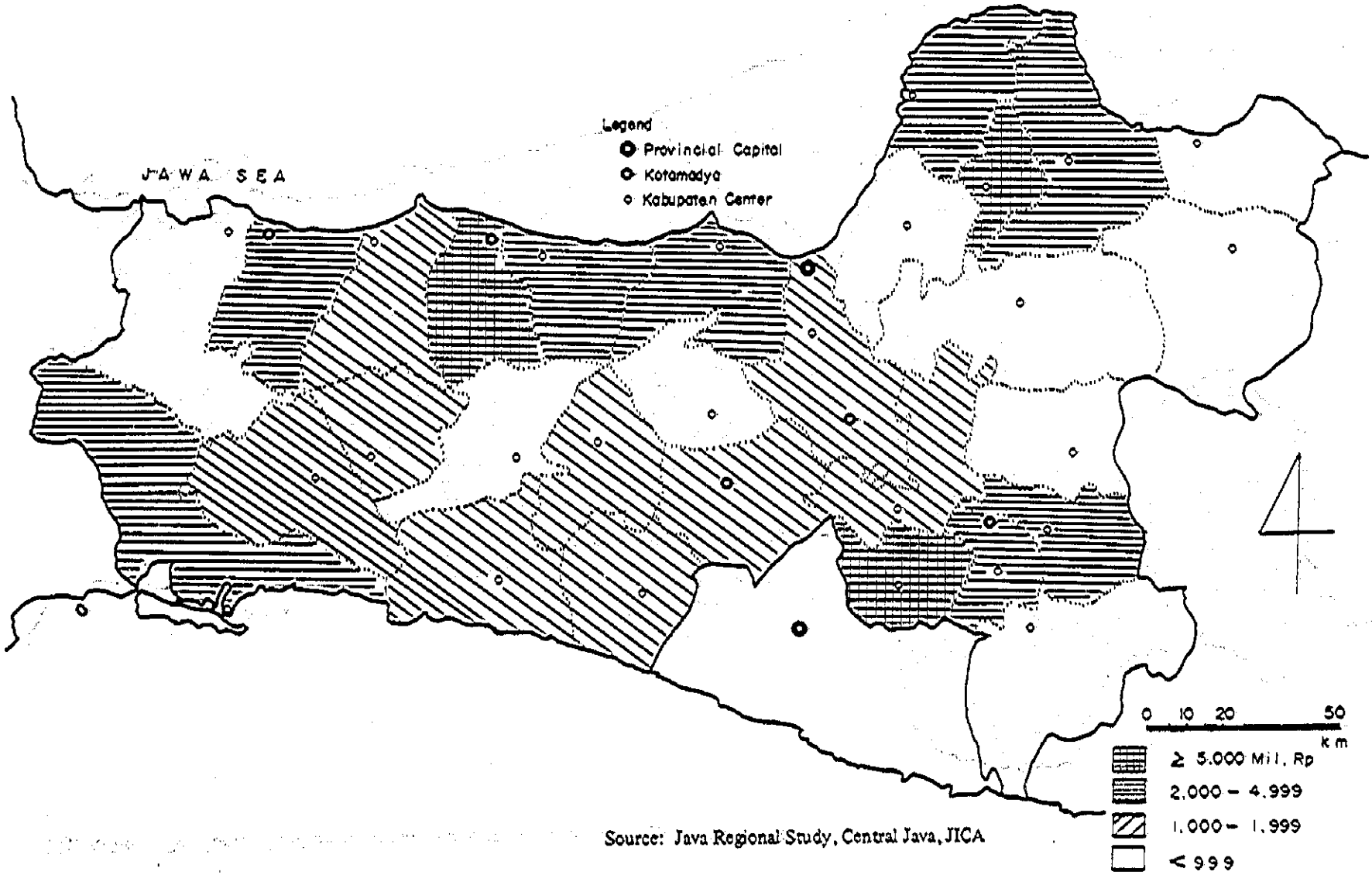

Source: Java Regional Study, Central Java, JICA

Fig. A-5-6 Per Capita GDP by Kabupaten in Central Java and Yogyakarta, 1973



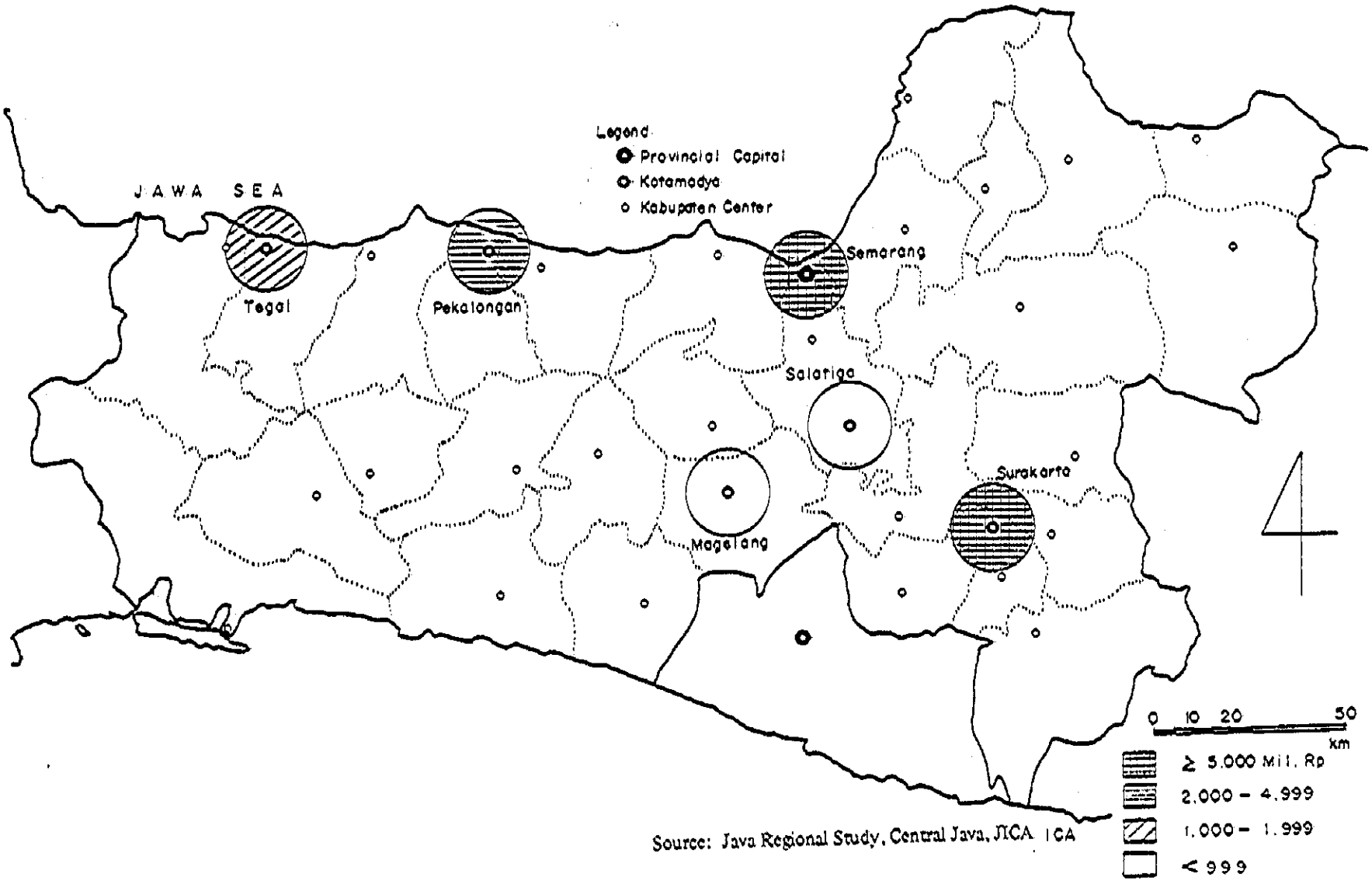

Source: Java Regional Study, Central Java, JICA

Fig. A-5-7 Manufacturing Product by Kabupaten in Central Java, 1973

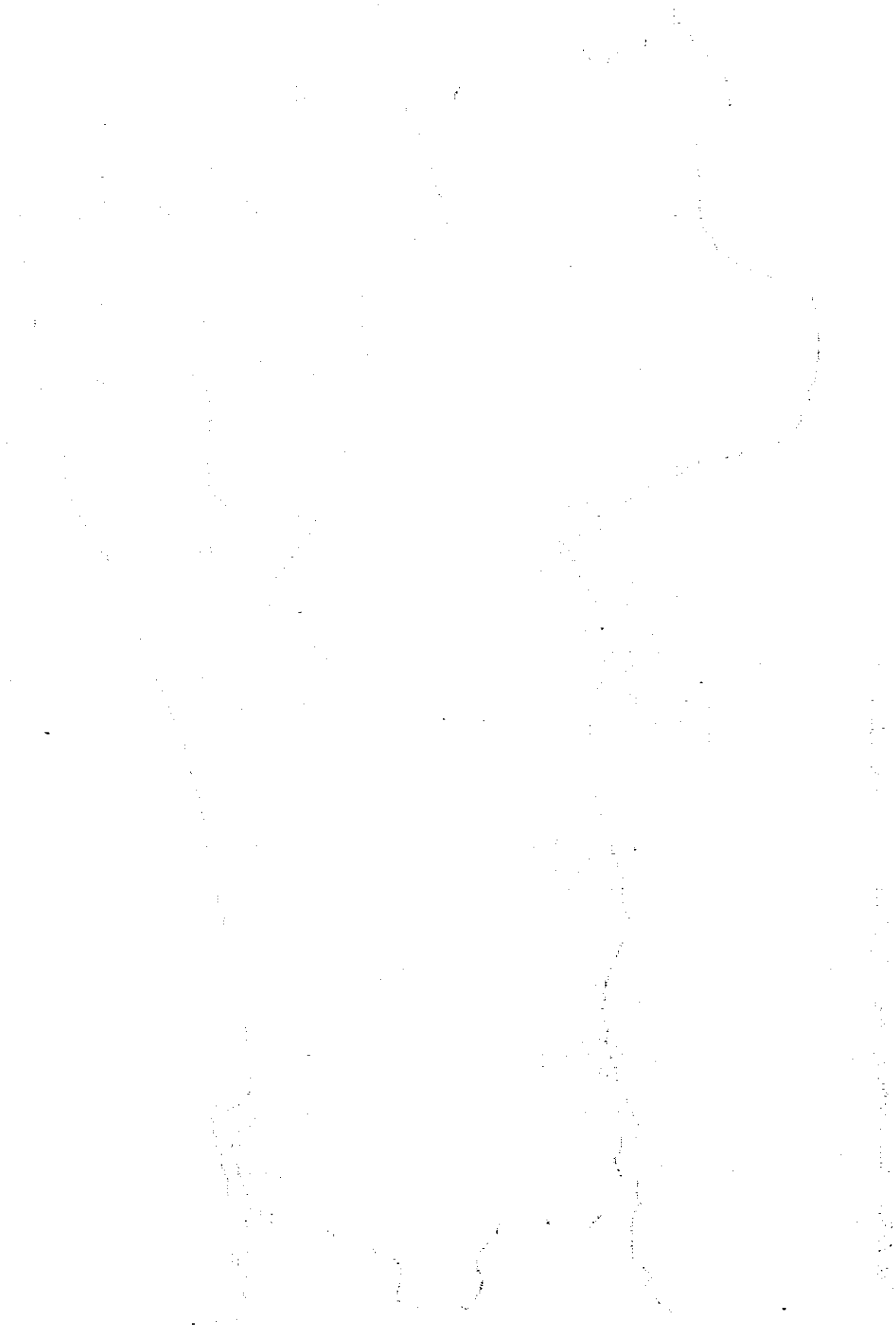



Source: Java Regional Study, Central Java, JICA

Fig. A-5-8 Manufacturing Product by Kotamadya in Central Java, 1973




Source: Java Regional Study, Central Java, JICA ICA



## Table A-6-1 Volume and Share of Cargo Handled at Ports in Indonesia by Island, 1970 – 1975

| Island | Trade | 1970 | | 1971 | | 1972 | | 1973 | | 1974 | | 1975 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | x1,000 tons | % | x1,000 tons | % | x1,000 tons | % | x1,000 tons | % | x1,000 tons | % | x1,000 tons | % |
| Sumatra | Foreign | 31 745 | 85.8 | 34 556 | 78.5 | 50 557 | 83.5 | 56 476 | 77.6 | 52 526 | 76.6 | 49 053 | 78.7 |
| | Domestic | 15 954 | 76.4 | 16 903 | 75.5 | 16 740 | 70.0 | 20 789 | 69.2 | 19 450 | 67.2 | 14 337 | 54.0 |
| | Total | 47 699 | 82.4 | 51 459 | 77.5 | 67 297 | 79.6 | 77 265 | 75.1 | 71 976 | 73.9 | 63 390 | 71.3 |
| Java | Foreign | 4 879 | 13.2 | 5 838 | 13.3 | 6 203 | 10.2 | 8 755 | 12.0 | 10 525 | 15.4 | 9 069 | 14.5 |
| | Domestic | 4 230 | 20.3 | 4 560 | 20.4 | 5 610 | 23.5 | 6 750 | 22.5 | 7 874 | 27.2 | 8 638 | 32.6 |
| | Total | 9 109 | 15.7 | 10 398 | 15.6 | 11 813 | 14.0 | 15 505 | 15.1 | 18 399 | 18.9 | 17 707 | 19.9 |
| Kalimantan | Foreign | ... | .. | 2 315 | 5.3 | 2 300 | 3.8 | 4 571 | 6.3 | 4 722 | 6.9 | 4 038 | 6.5 |
| | Domestic | ... | .. | 81 | 0.4 | 119 | 0.5 | 280 | 0.9 | 201 | 0.7 | 1 950 | 7.4 |
| | Total | ... | .. | 2 390 | 3.6 | 2 419 | 2.9 | 4 851 | 4.7 | 4 923 | 5.1 | 5 988 | 6.8 |
| Sulawesi | Foreign | 336 | 0.9 | 1 298 | 2.9 | 903 | 1.5 | 1 618 | 2.2 | 623 | 0.9 | 201 | 0.3 |
| | Domestic | 461 | 2.2 | 611 | 2.7 | 955 | 4.0 | 1 467 | 4.9 | 735 | 2.5 | 990 | 3.7 |
| | Total | 797 | 1.4 | 1 909 | 2.9 | 1 858 | 2.2 | 3 085 | 3.0 | 1 358 | 1.4 | 1 191 | 1.3 |
| Bali & Nusatenggara | Foreign | 35 | 0.1 | 12 | - | 42 | 0.1 | 823 | 1.1 | 36 | 0.1 | 6 | - |
| | Domestic | 220 | 1.1 | 226 | 1.0 | 334 | 1.4 | 553 | 1.8 | 482 | 1.7 | 554 | 2.1 |
| | Total | 255 | 0.5 | 238 | 0.4 | 376 | 0.4 | 1 376 | 1.3 | 518 | 0.5 | 560 | 0.6 |
| Maluku & Irian Jaya | Foreign | ... | .. | ... | .. | 573 | 0.9 | 541 | 0.8 | 34 | - | 9 | - |
| | Domestic | 9 | - | 14 | - | 155 | 0.6 | 222 | 0.7 | 187 | 0.7 | 53 | 0.2 |
| | Total | 9 | - | 14 | - | 728 | 0.9 | 763 | 0.8 | 221 | 0.2 | 62 | 0.1 |
| Indonesia | Foreign | 36 994 | 100.0 | 44 019 | 100.0 | 60 578 | 100.0 | 72 784 | 100.0 | 68 466 | 100.0 | 62 376 | 100.0 |
| | Domestic | 20 874 | 100.0 | 22 395 | 100.0 | 23 913 | 100.0 | 30 061 | 100.0 | 28 929 | 100.0 | 26 522 | 100.0 |
| | Total | 57 868 | 100.0 | 66 414 | 100.0 | 84 491 | 100.0 | 102 845 | 100.0 | 97 395 | 100.0 | 88 898 | 100.0 |

Source: Cargo Loading and Unloading at Ports in Indonesia, 1970 - 1975

## Table A-6-2 Volume and Share of Cargo Handled at Main Ports in Central Java and Java Island, 1970 – 1975

| Port | Trade | 1970 | | 1971 | | 1972 | | 1973 | | 1974 | | 1975 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | tons | % | tons | % | tons | % | tons | % | tons | % | tons | % |
| Semarang | Foreign | 366 072 | 7.50 | 394 077 | 6.75 | 438 130 | 7.06 | 510 827 | 5.84 | 553 685 | 5.26 | 581 687 | 6.41 |
| | Domestic | 100 418 | 2.36 | 115 884 | 2.54 | 146 074 | 2.60 | 172 781 | 2.56 | 189 277 | 2.40 | 199 402 | 2.31 |
| | Total | 466 490 | 5.12 | 509 961 | 4.90 | 584 204 | 4.94 | 683 608 | 4.41 | 742 962 | 4.03 | 781 089 | 4.41 |
| Cilacap | Foreign | 59 421 | 0.75 | 348 880 | 5.98 | 378 282 | 6.09 | 407 724 | 4.66 | 514 088 | 4.88 | 572 044 | 6.31 |
| | Domestic | 439 601 | 10.40 | 475 382 | 10.41 | 464 952 | 8.29 | 472 111 | 6.99 | 826 728 | 10.50 | 891 889 | 10.32 |
| | Total | 499 022 | 5.48 | 824 262 | 7.92 | 843 234 | 7.14 | 879 835 | 5.68 | 1 340 816 | 7.29 | 1 463 933 | 8.27 |
| Tegal | Foreign | - | - | 94 488 | 1.62 | 80 846 | 1.30 | 27 846 | 0.32 | 50 841 | 0.48 | 57 568 | 0.63 |
| | Domestic | - | - | 1 682 | 0.04 | 3 418 | 0.06 | 5 678 | 0.08 | 4 037 | 0.05 | 21 997 | 0.25 |
| | Total | - | - | 96 170 | 0.92 | 84 264 | 0.71 | 33 524 | 0.22 | 54 878 | 0.30 | 79 565 | 0.44 |
| Pekalongan | Foreign | - | - | - | - | - - | - | - | - | - | - | - | - |
| | Domestic | 1 584 | 0.04 | 1 318 | 0.03 | 1 810 | 0.03 | 2 037 | 0.03 | 2 687 | 0.03 | 2 631 | 0.03 |
| | Total | 1 584 | 0.02 | 1 318 | 0.01 | 1 810 | 0.02 | 2 037 | 0.01 | 2 687 | 0.01 | 2 631 | 0.01 |
| Ports of Central Java | Foreign | 425 493 | 8.72 | 837 445 | 14.35 | 897 258 | 14.46 | 946 397 | 10.81 | 1 118 614 | 10.63 | 1 211 299 | 13.36 |
| | Domestic | 541 603 | 12.80 | 594 266 | 13.03 | 616 254 | 10.98 | 652 607 | 9.67 | 1 022 729 | 12.99 | 1 115 919 | 12.92 |
| | Total | 967 096 | 10.62 | 1 431 711 | 13.77 | 1 513 512 | 12.81 | 1 599 004 | 10.31 | 2 141 343 | 11.64 | 2 327 218 | 13.14 |
| Tg. Priok | Foreign | 2 890 166 | 59.23 | 3 115 900 | 53.37 | 3 315 938 | 53.46 | 4 610 998 | 52.67 | 4 632 557 | 44.02 | 4 406 463 | 48.59 |
| | Domestic | 1 904 807 | 45.04 | 1 929 685 | 42.32 | 2 561 621 | 45.67 | 3 223 434 | 47.75 | 3 814 668 | 48.45 | 4 341 713 | 50.26 |
| | Total | 4 794 973 | 52.63 | 5 045 585 | 48.52 | 5 877 559 | 49.75 | 7 834 432 | 50.53 | 8 447 225 | 45.91 | 8 748 176 | 49.40 |
| Surabaya | Foreign | 1 272 653 | 26.09 | 1 538 014 | 26.34 | 1 594 040 | 25.70 | 1 975 813 | 22.57 | 2 342 986 | 22.26 | 2 211 006 | 24.38 |
| | Domestic | 799 457 | 18.87 | 952 431 | 20.87 | 1 096 815 | 19.55 | 1 265 097 | 18.74 | 1 398 423 | 17.75 | 1 434 775 | 16.61 |
| | Total | 2 072 110 | 22.75 | 2 490 445 | 23.95 | 2 690 855 | 22.78 | 3 240 910 | 20.90 | 3 741 411 | 20.33 | 3 645 781 | 20.59 |
| Cirebon | Foreign | 201 051 | 4.12 | 218 796 | 3.75 | 291 952 | 4.71 | 1 066 276 | 12.18 | 2 012 782 | 19.12 | 1 045 420 | 11.53 |
| | Domestic | 152 292 | 3.59 | 240 663 | 5.28 | 228 537 | 4.08 | 279 569 | 4.15 | 356 986 | 4.53 | 498 948 | 5.78 |
| | Total | 353 343 | 3.88 | 459 459 | 4.41 | 520 489 | 4.40 | 1 345 845 | 8.68 | 2 369 768 | 12.88 | 1 544 368 | 8.72 |
| Total Java | Foreign | 4 878 705 | 100.00 | 5 837 608 | 100.00 | 6 203 225 | 100.00 | 8 755 254 | 100.00 | 10 525 461 | 100.00 | 9 068 905 | 100.00 |
| | Domestic | 4 230 319 | 100.00 | 4 560 562 | 100.00 | 5 610 371 | 100.00 | 6 750 078 | 100.00 | 7 874 106 | 100.00 | 8 638 428 | 100.00 |
| | Total | 9 109 024 | 100.00 | 10 398 170 | 100.00 | 11 813 596 | 100.00 | 15 505 332 | 100.00 | 18 399 567 | 100.00 | 17 707 333 | 100.00 |

Source: Cargo Loading and Unloading at Ports in Indonesia, 1970 - 1975

## Table A-6-3 Potential Indexes of Major Ports in Central Java

| Kotamadya/Kabupaten | | GDP① (mill. Rp.) | Distance (km) ② | | | ①/② | | |
|---|---|---|---|---|---|---|---|---|
| | | | Semarang | Tegal | Cilacap | Semarang | Tegal | Cilacap |
| KDY | Magelang | 4 464 | 75 | 240 | 176 | 59.5 | 18.6 | 25.4 |
| | Surakarta | 20 027 | 102 | 267 | 261 | 196.3 | 75.0 | 75.9 |
| | Salatiga | 3 033 | 48 | 213 | 299 | 63.2 | 14.2 | 10.1 |
| | Semarang | 34 569 | 10 | 165 | 251 | 3,456.9 | 209.5 | 137.7 |
| | Pekalongan | 6 692 | 100 | 65 | 249 | 66.9 | 103.0 | 26.9 |
| | Tegal | 4 366 | 165 | 10 | 184 | 26.5 | 436.6 | 23.7 |
| KB | Semarang | 19 840 | 40 | 192 | 224 | 496.0 | 103.3 | 88.6 |
| | Kendal | 26 980 | 29 | 136 | 320 | 930.3 | 198.4 | 84.3 |
| | Demak | 17 952 | 26 | 191 | 277 | 690.5 | 94.0 | 64.8 |
| | Grobogan | 26 752 | 47 | 212 | 298 | 569.2 | 126.2 | 89.8 |
| | Pati | 30 187 | 75 | 240 | 326 | 402.5 | 125.8 | 92.6 |
| | Kudus | 25 187 | 51 | 216 | 302 | 493.9 | 116.6 | 83.4 |
| | Jepara | 17 817 | 70 | 235 | 321 | 254.5 | 75.8 | 55.5 |
| | Rembang | 12 030 | 111 | 276 | 362 | 108.4 | 43.6 | 33.2 |
| | Blora | 22 692 | 147 | 312 | 398 | 154.4 | 72.7 | 57.0 |
| | Pekalongan | 20 548 | 100 | 65 | 249 | 205.5 | 316.1 | 82.5 |
| | Batang | 16 007 | 93 | 72 | 256 | 172.1 | 222.3 | 62.5 |
| | Pemalang | 19 218 | 135 | 30 | 214 | 142.4 | 640.1 | 89.8 |
| | Tegal | 25 911 | 165 | 20 | 184 | 157.0 | 1,295.6 | 140.8 |
| | Brebes | 28 292 | 178 | 13 | 198 | 158.9 | 2,176.3 | 143.6 |
| | Banyumas | 30 963 | 211 | 114 | 40 | 146.7 | 271.6 | 774.1 |
| | Cilacap | 36 952 | 251 | 184 | 40 | 147.2 | 200.8 | 923.8 |
| | Purbalingga | 16 974 | 191 | 134 | 60 | 88.9 | 126.7 | 282.9 |
| | Banjarnegara | 12 870 | 146 | 179 | 105 | 88.2 | 71.9 | 122.6 |
| | Magelang | 20 328 | 75 | 245 | 176 | 271.0 | 83.0 | 115.5 |
| | Temanggung | 14 506 | 77 | 242 | 174 | 188.4 | 59.9 | 83.4 |
| | Wonosobo | 15 048 | 116 | 242 | 135 | 129.7 | 62.2 | 111.5 |
| | Purworejo | 23 024 | 118 | 207 | 133 | 195.1 | 111.2 | 173.1 |
| | Kebumen | 25 336 | 162 | 317 | 94 | 156.4 | 79.9 | 269.5 |
| | Klaten | 36 818 | 113 | 278 | 228 | 325.8 | 132.4 | 161.5 |
| | Boyolali | 19 037 | 75 | 240 | 326 | 253.8 | 79.3 | 58.4 |
| | Sragen | 19 260 | 129 | 278 | 291 | 149.3 | 69.3 | 66.2 |
| | Sukoharjo | 19 584 | 113 | 278 | 275 | 173.3 | 70.4 | 71.2 |
| | Karanganyar | 15 874 | 115 | 280 | 277 | 138.0 | 56.7 | 57.3 |
| | Wonogiri | 17 851 | 133 | 298 | 295 | 134.2 | 59.9 | 60.5 |
| D.I. | Yogyakarta | 99 100 | 113 | 278 | 228 | 877.0 | 356.5 | 434.6 |
| Total | | | 3,905 | 6,964 | 8,229 | 12,267.9 | 8,355.9 | 5,234.2 |

Table A-6-4 (1) Traffic Forecast of the Port of Semarang (High Projection)

(Unit: 1,000 tons)

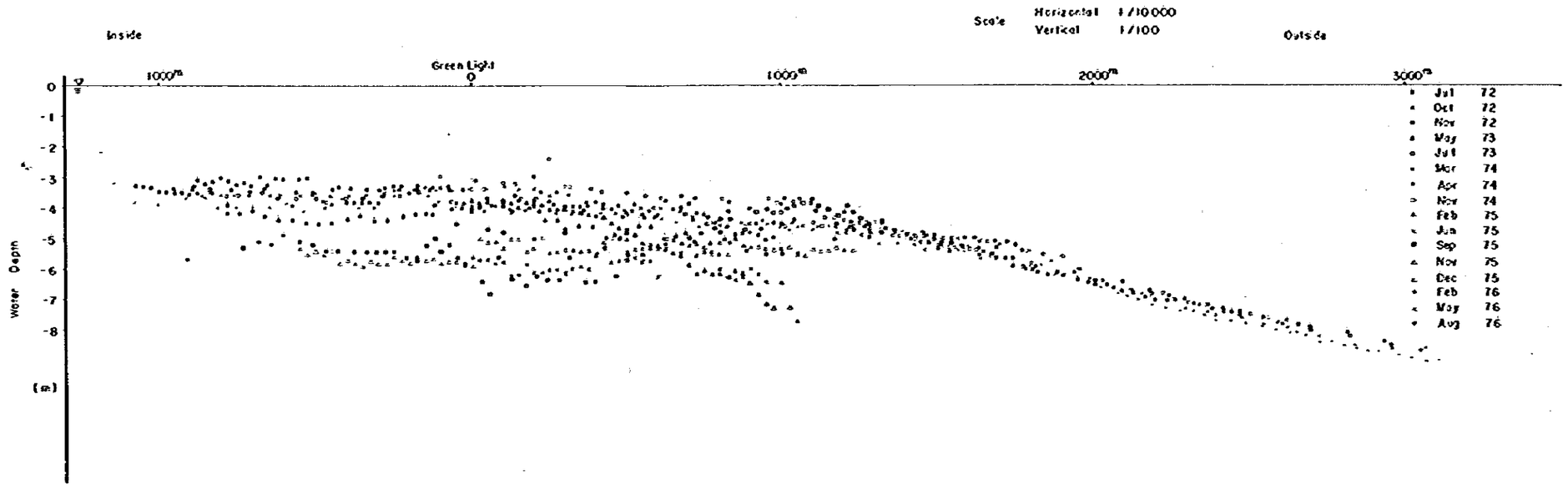
| Kind of Trade | | Commodity Groups | 1976 | 1980 | 1985 | 2000 |
|---|---|---|---|---|---|---|
| Foreign Trade | | | 569.6 | 690 | 870 | 3,000 |
| | Export | | 77.8 | 100 | 130 | 330 |
| | | Food Crops | 17.5 | 30 | 50 | 100 |
| | | Estate Crops | 24.7 | 30 | 30 | 60 |
| | | Manufactured Products | 4.4 | 10 | 20 | 130 |
| | | Marine Products and Livestock Products | 8.4 | 10 | 10 | 20 |
| | | Forest Products | 22.8 | 20 | 20 | 20 |
| | Import | | 491.8 | 590 | 740 | 2,670 |
| | | Industrial Materials and Equipments | 99.7 | 140 | 220 | 1,200 |
| | | Food Crops | 61.7 | 90 | 120 | 210 |
| | | Foodstuffs | 37.6 | 40 | 40 | 100 |
| | | Manufactured Products | 152.5 | 170 | 200 | 470 |
| | | Construction Materials | 112.5 | 120 | 130 | 610 |
| | | Others | 27.8 | 30 | 30 | 80 |
| Domestic Trade | | | 238.5 | 420 | 860 | 3,360 |
| | Outward | | 102.3 | 150 | 230 | 1,180 |
| | | Food crops and Fruits | 12.3 | 20 | 30 | 60 |
| | | Estate Crops | 0.7 | – | – | – |
| | | Manufactured Products | 89.3 | 130 | 200 | 1,120 |
| | Inward | | 136.2 | 270 | 630 | 2,180 |
| | | Food stuffs | 3.5 | 10 | 10 | 20 |
| | | Manufactured Products | 3.9 | 10 | 10 | 20 |
| | | Industrial Materials and Equipments | 16.9 | 30 | 40 | 230 |
| | | Construction Materials | 81.2 | 120 | 190 | 940 |
| | | Fertilizer and Others | 30.7 | 100 | 380 | 970 |
| Total | | | 808.1 | 1,110 | 1,730 | 6,360 |

Table A-6-4(2) Traffic Forecast of the Port of Semarang (Low Projection)

| Kind of Trade | | Commodity Groups | 1976 | 1980 | 1985 | 2000 |
|---|---|---|---|---|---|---|
| Foreign Trade | Export | | 569.6 | 650 | 780 | 1,960 |
| | | | 77.8 | 100 | 130 | 280 |
| | | Food Crops | 17.5 | 30 | 50 | 100 |
| | | Estate Crops | 24.7 | 30 | 30 | 60 |
| | | Manufactured Products | 4.4 | 10 | 20 | 80 |
| | | Marine Products and Livestock Products | 8.4 | 10 | 10 | 20 |
| | | Forest Products | 22.8 | 20 | 20 | 20 |
| | Import | | 491.8 | 550 | 650 | 1,680 |
| | | Industrial Materials and Equipments | 99.7 | 130 | 180 | 700 |
| | | Food Crops | 61.7 | 90 | 120 | 210 |
| | | Foodstuffs | 37.6 | 40 | 40 | 70 |
| | | Manufactured Products | 152.5 | 160 | 180 | 310 |
| | | Construction Materials | 112.5 | 100 | 100 | 350 |
| | | Others | 27.8 | 30 | 30 | 40 |
| Domestic Trade | Outward | | 238.5 | 380 | 740 | 1,980 |
| | | | 102.3 | 140 | 200 | 710 |
| | | Food Crops and Fruits | 12.3 | 20 | 30 | 60 |
| | | Estate Crops | 0.7 | - | - | - |
| | | Manufactured Products | 89.3 | 120 | 170 | 650 |
| | Inward | | 136.2 | 240 | 540 | 1,270 |
| | | Foodstuffs | 3.5 | 10 | 10 | 10 |
| | | Manufactured Products | 3.9 | 10 | 10 | 10 |
| | | Industrial Materials and Equipment | 16.9 | 20 | 30 | 130 |
| | | Construction Materials | 81.2 | 110 | 170 | 550 |
| | | Fertilizer and Others | 30.7 | 90 | 320 | 570 |
| Total | | | 808.1 | 1,030 | 1,520 | 3,940 |

# CHAPTER-7 LONG TERM DEVELOPMENT PROGRAM

Fig. A-7-1. Depth Change along the Center Line of Channel (Line I-I)




Location of Sections

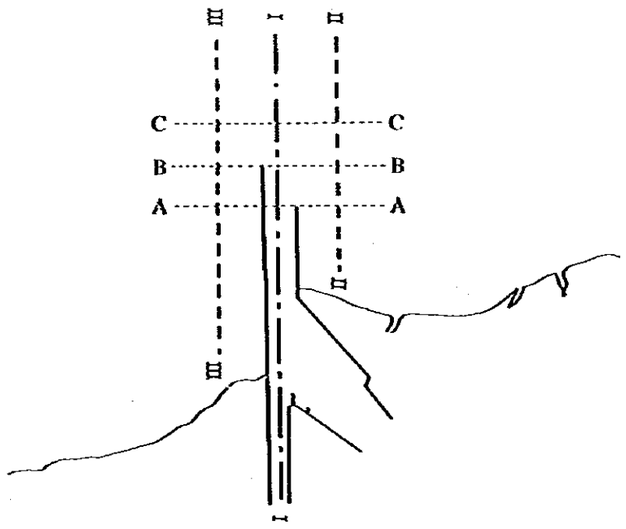


Fig. A-7-2. Depth Change on 300[m] east from the Channel (Line II-II)

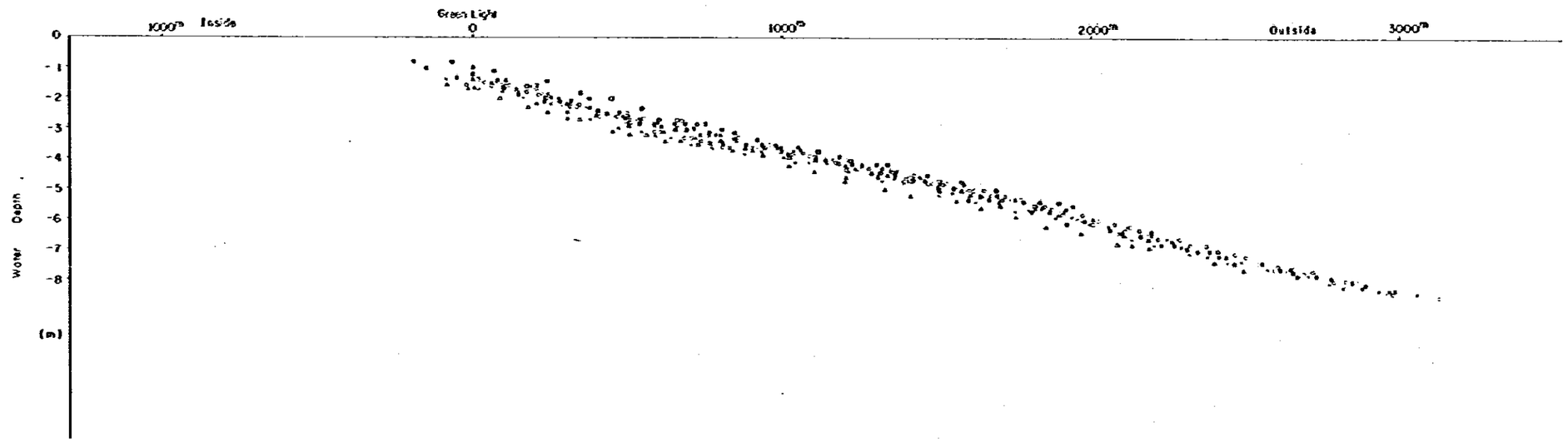
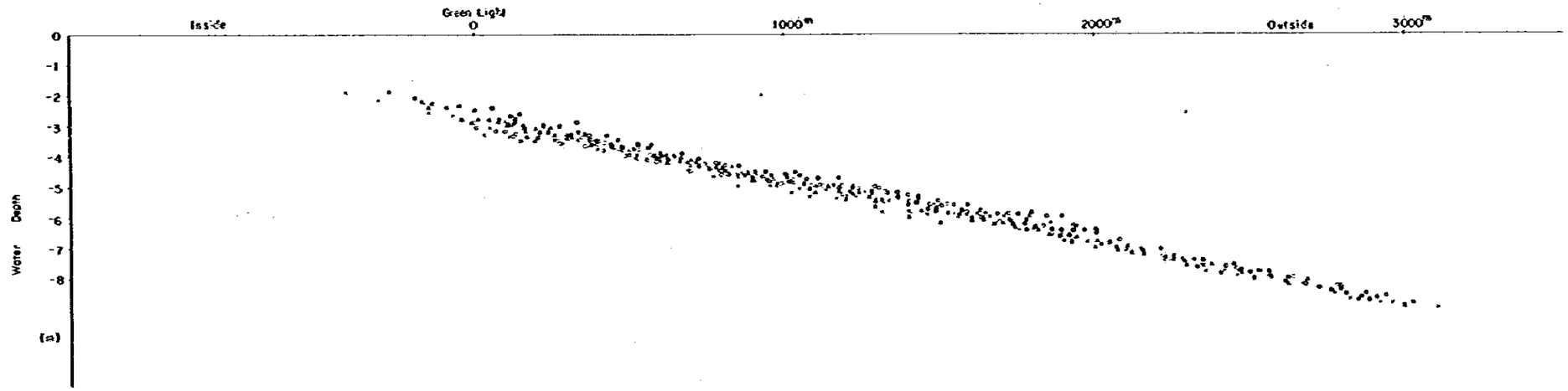


Fig. Fig. A-7-3. Depth Change on 300[m] west from the Channel (Line III-III)



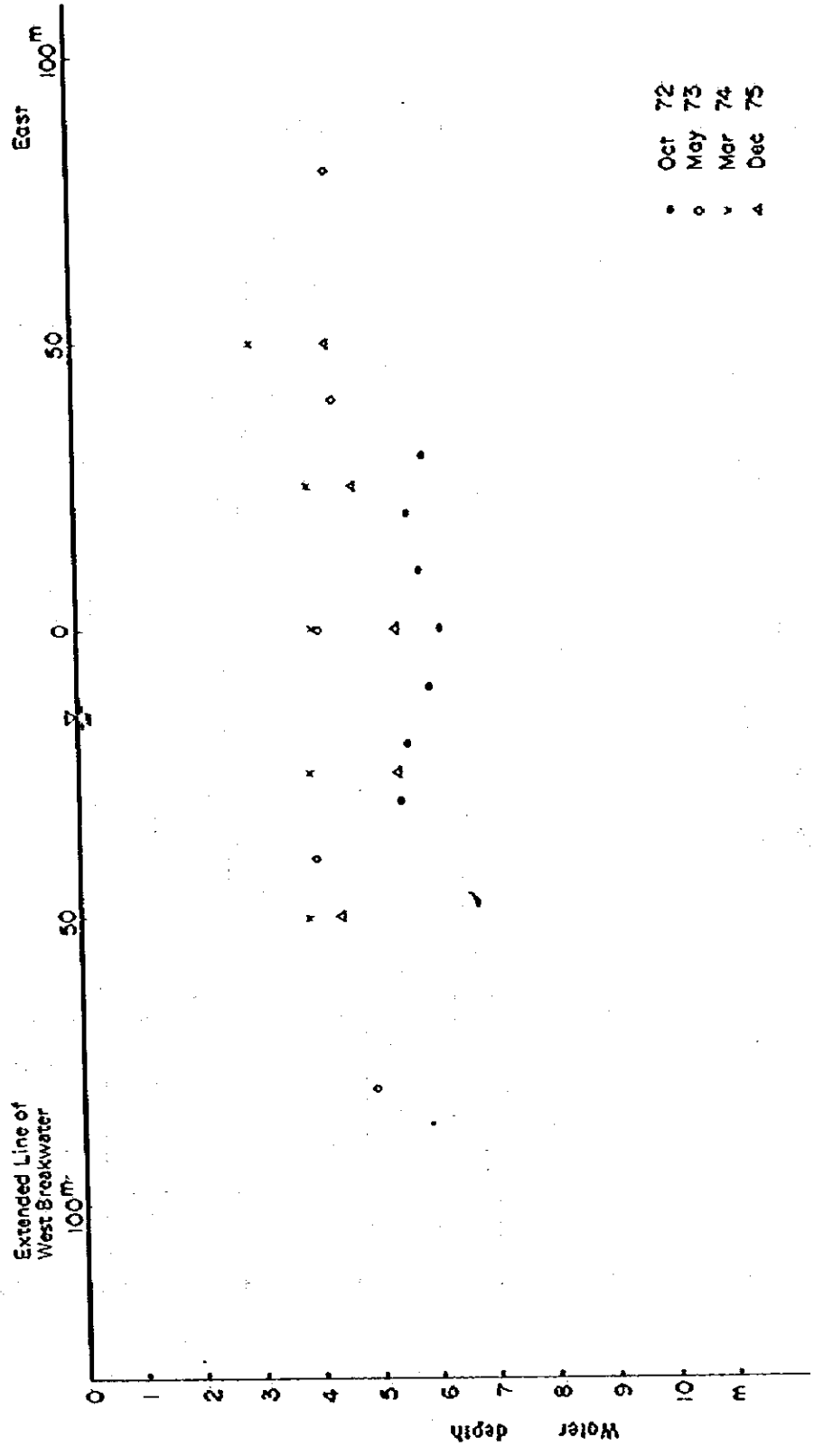
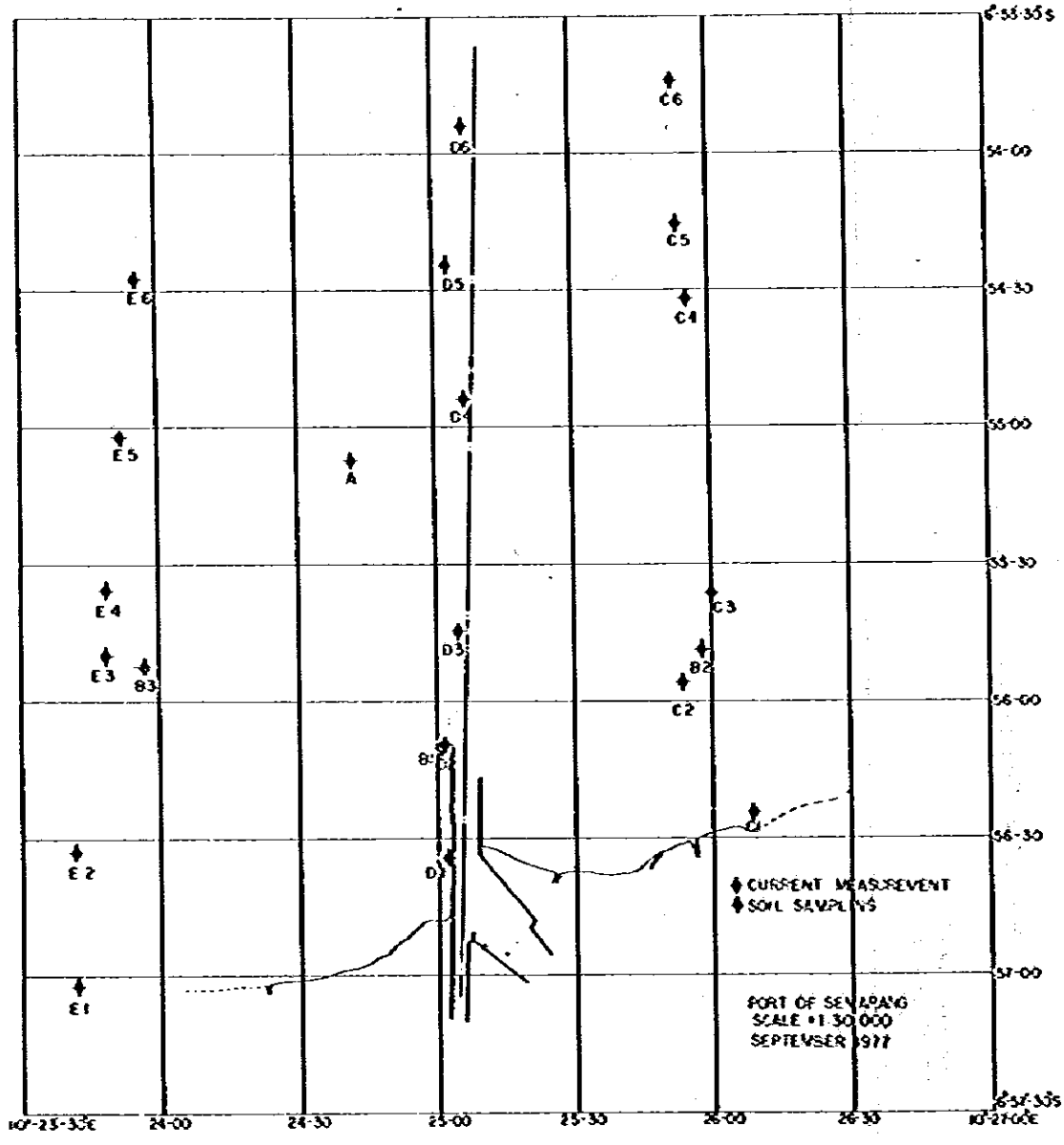



Fig. A-7-4 Depth Change on Line C-C

Fig. A-7-5 Location of Field Survey



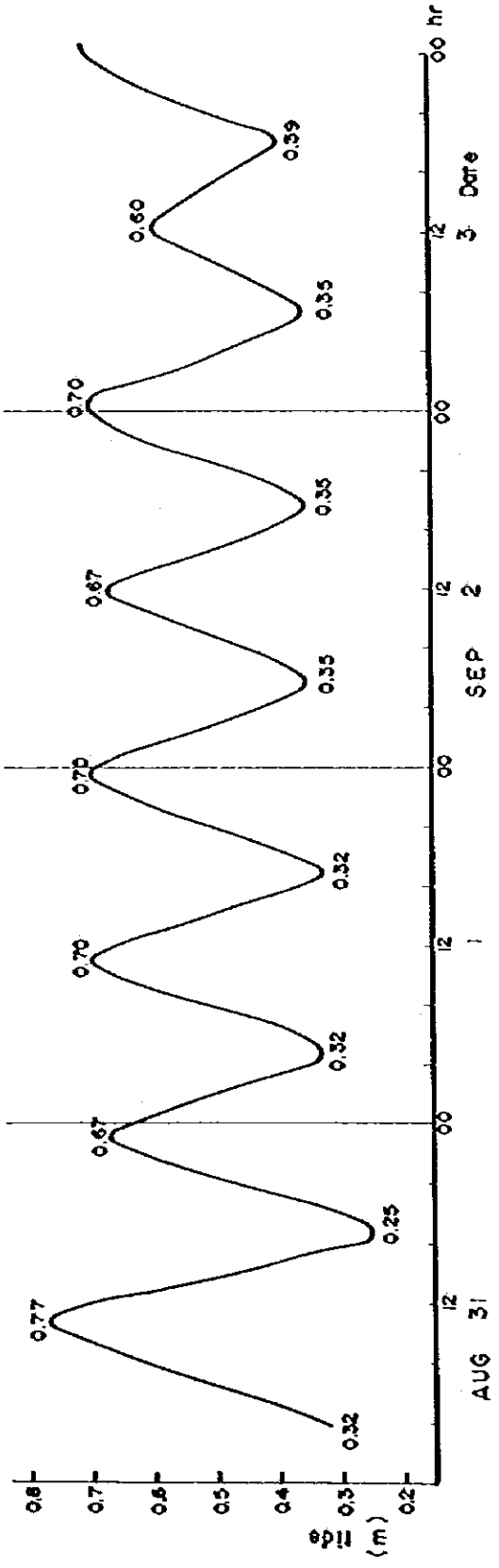



Fig. A-7-6. Tide at Semarang during the Field Suvey

Fig. A-7-7. Observed Density and Temperature

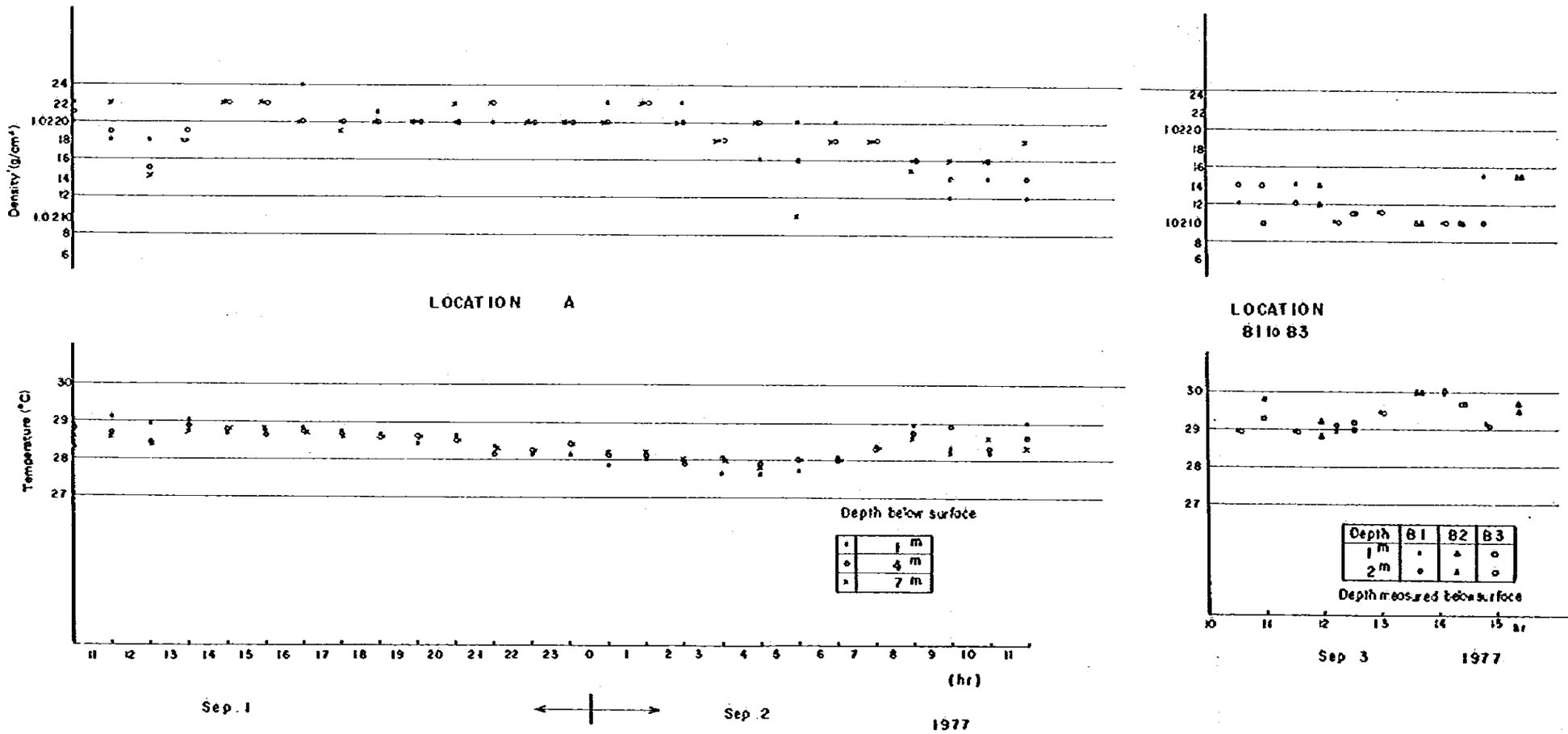


Fig. A-7-8. Converted Density in Standard Temperature 15°C

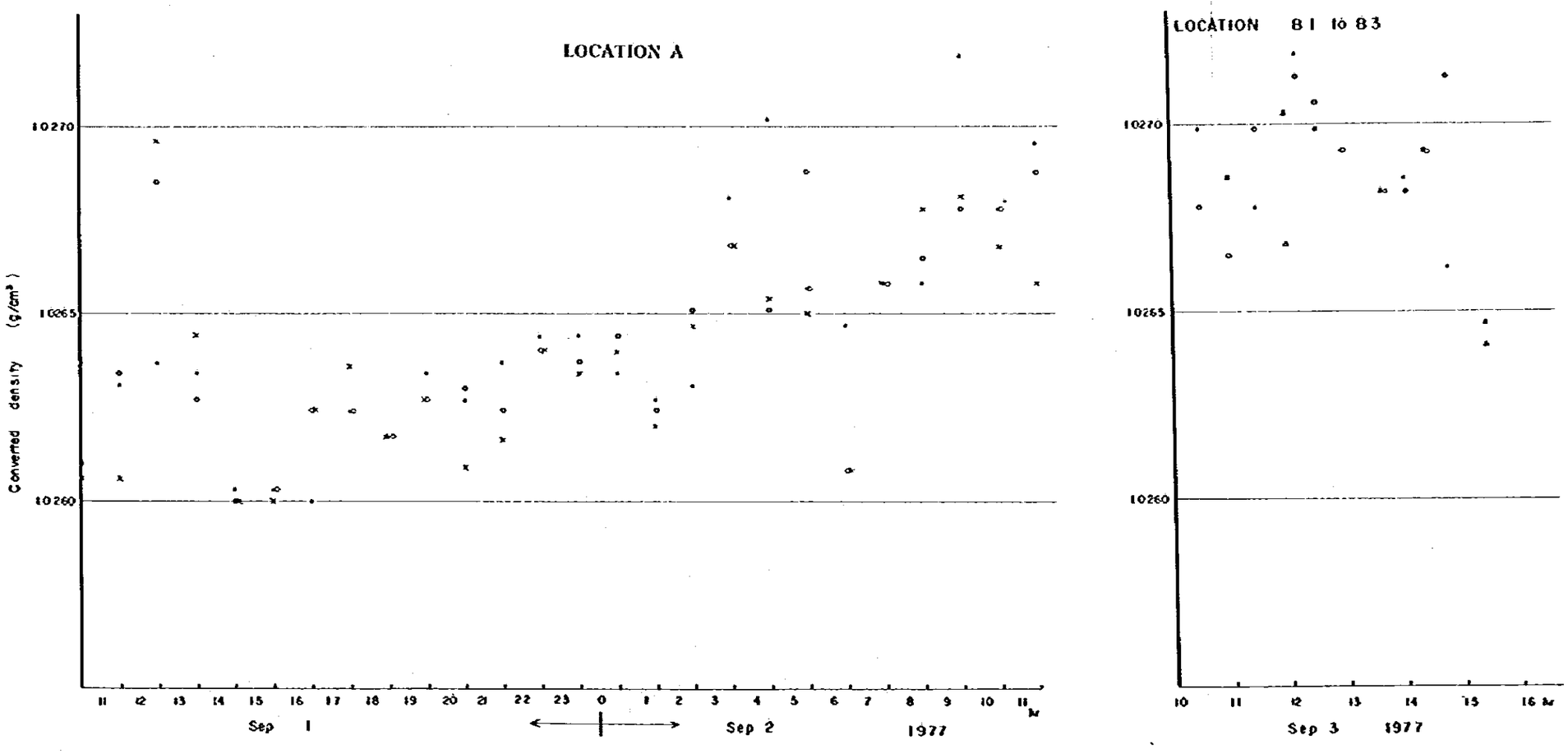
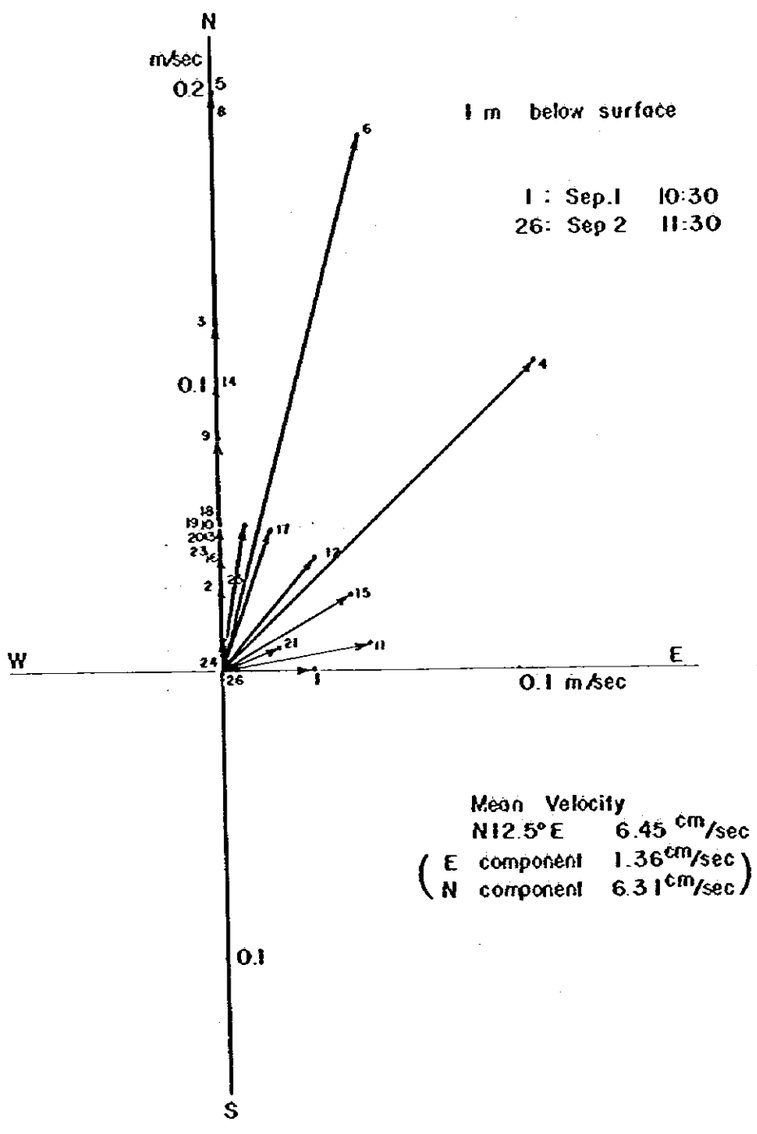
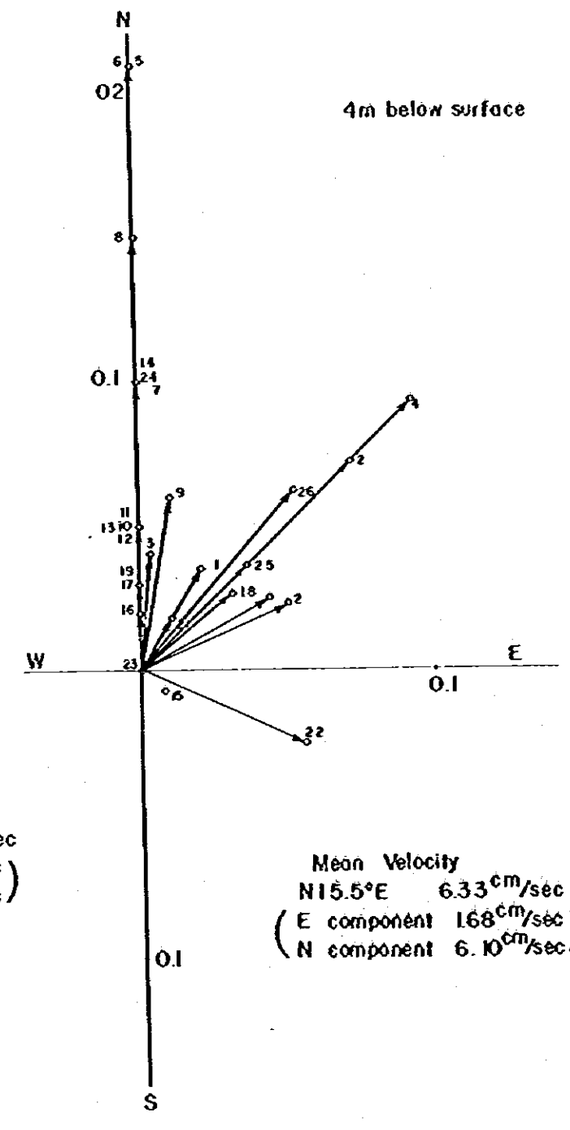


Fig. A-7-9. Hourly Change of Current (Location A)



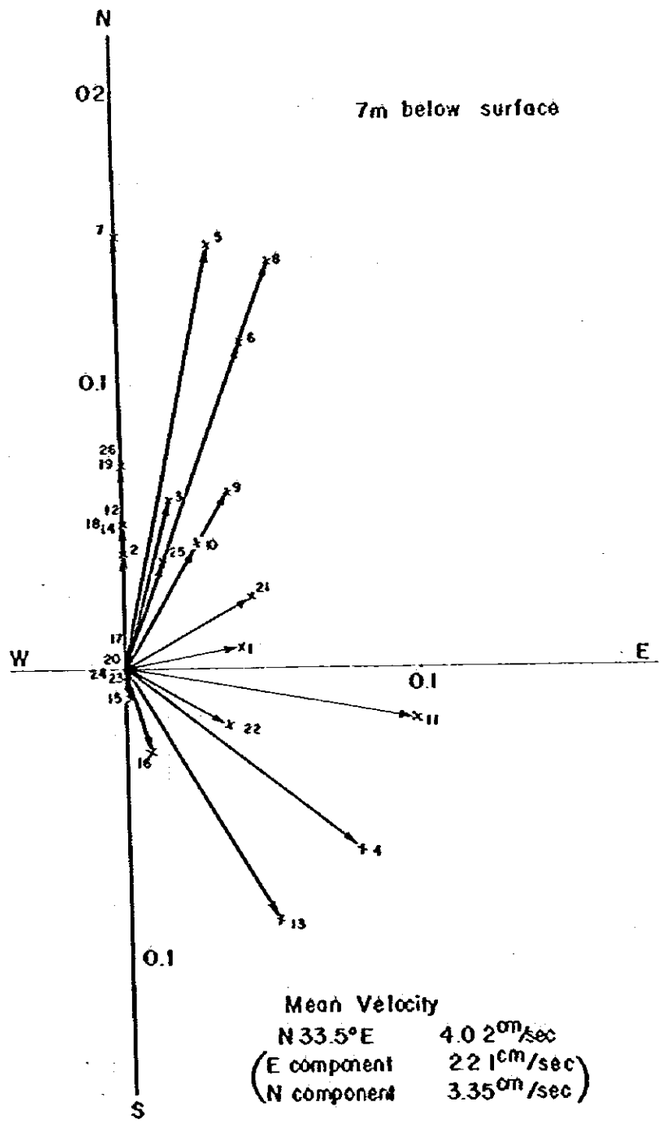
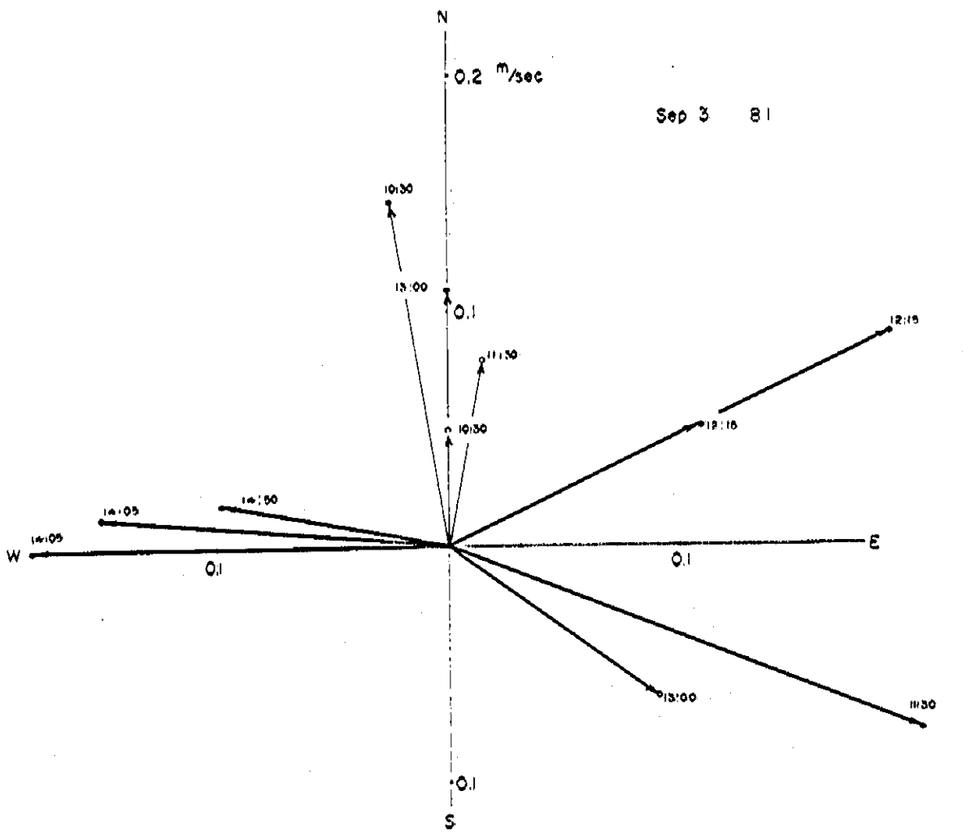



Fig. A-7-10. Current at B 1 to B 3



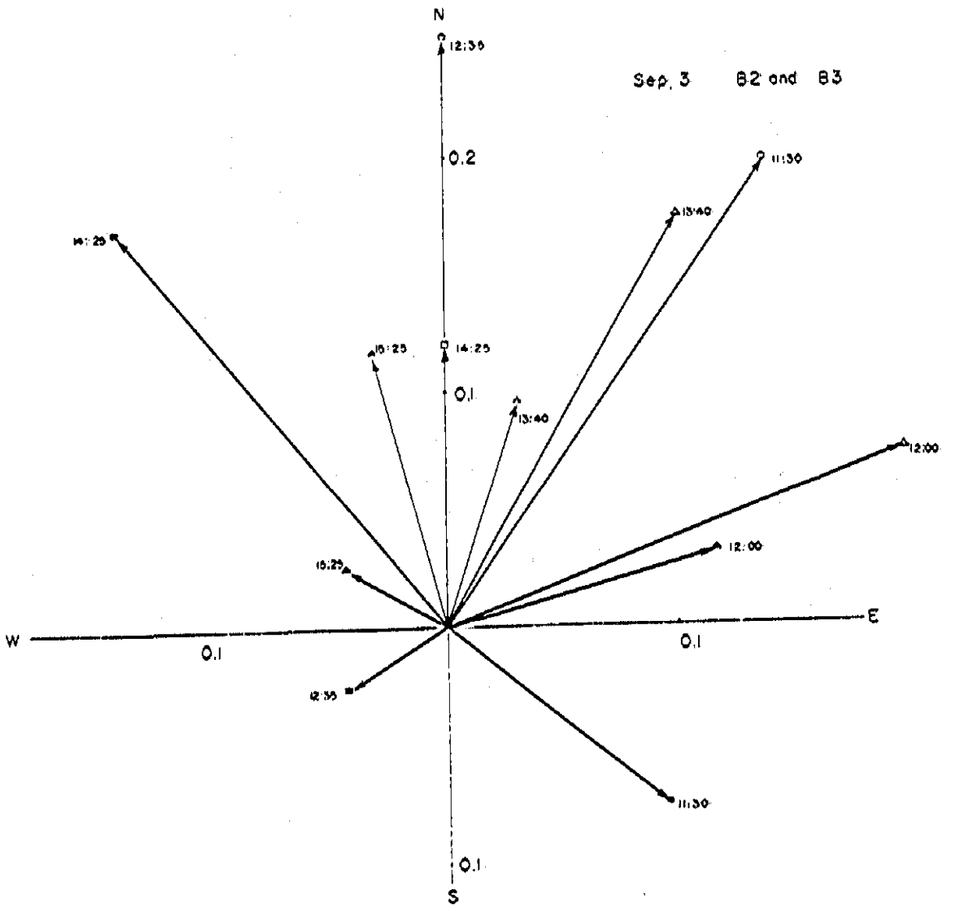
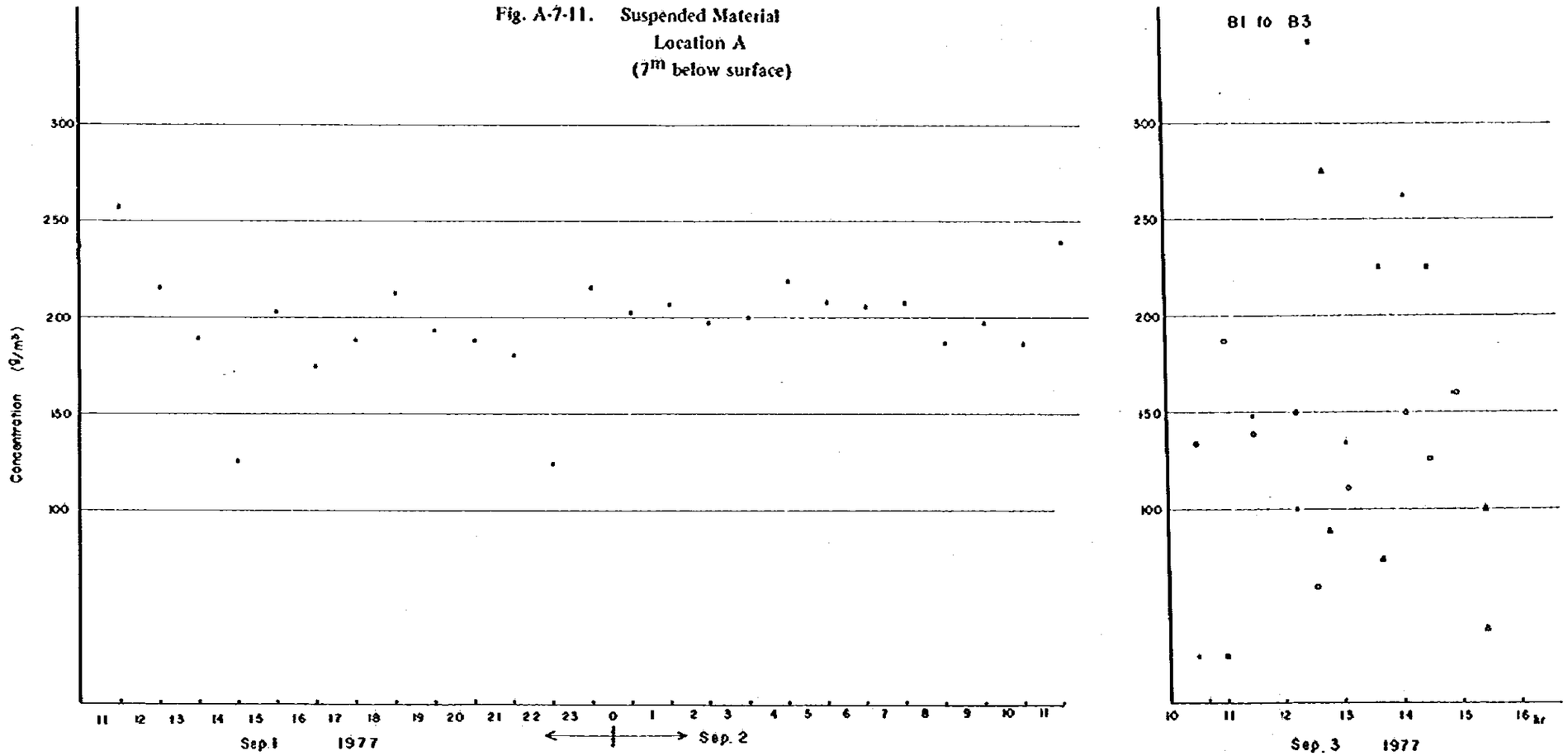



Fig. A-7-11. Suspended Material
Location A
($7^{m}$ below surface)



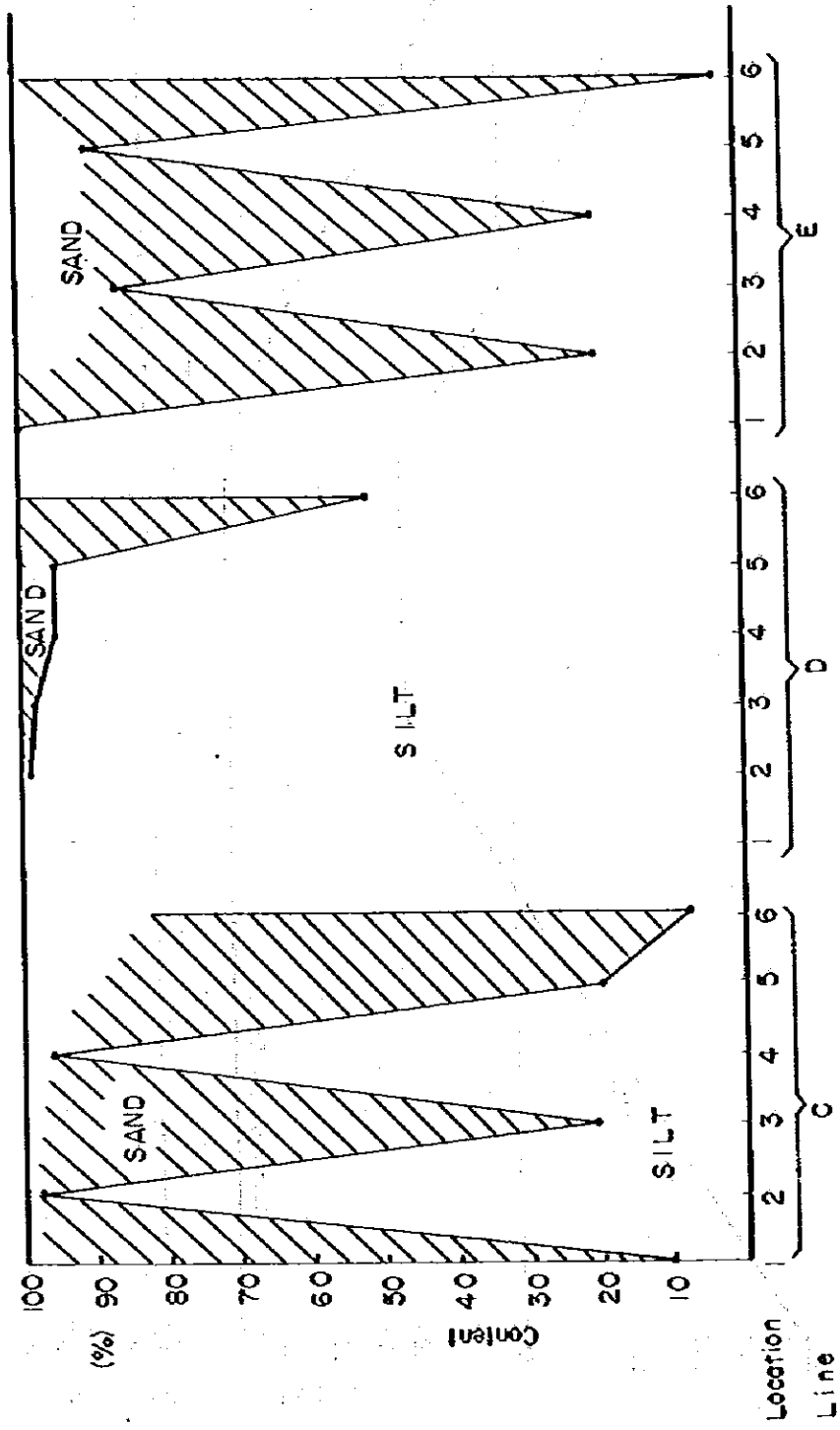



Fig. A-7-12. Classification of Soil

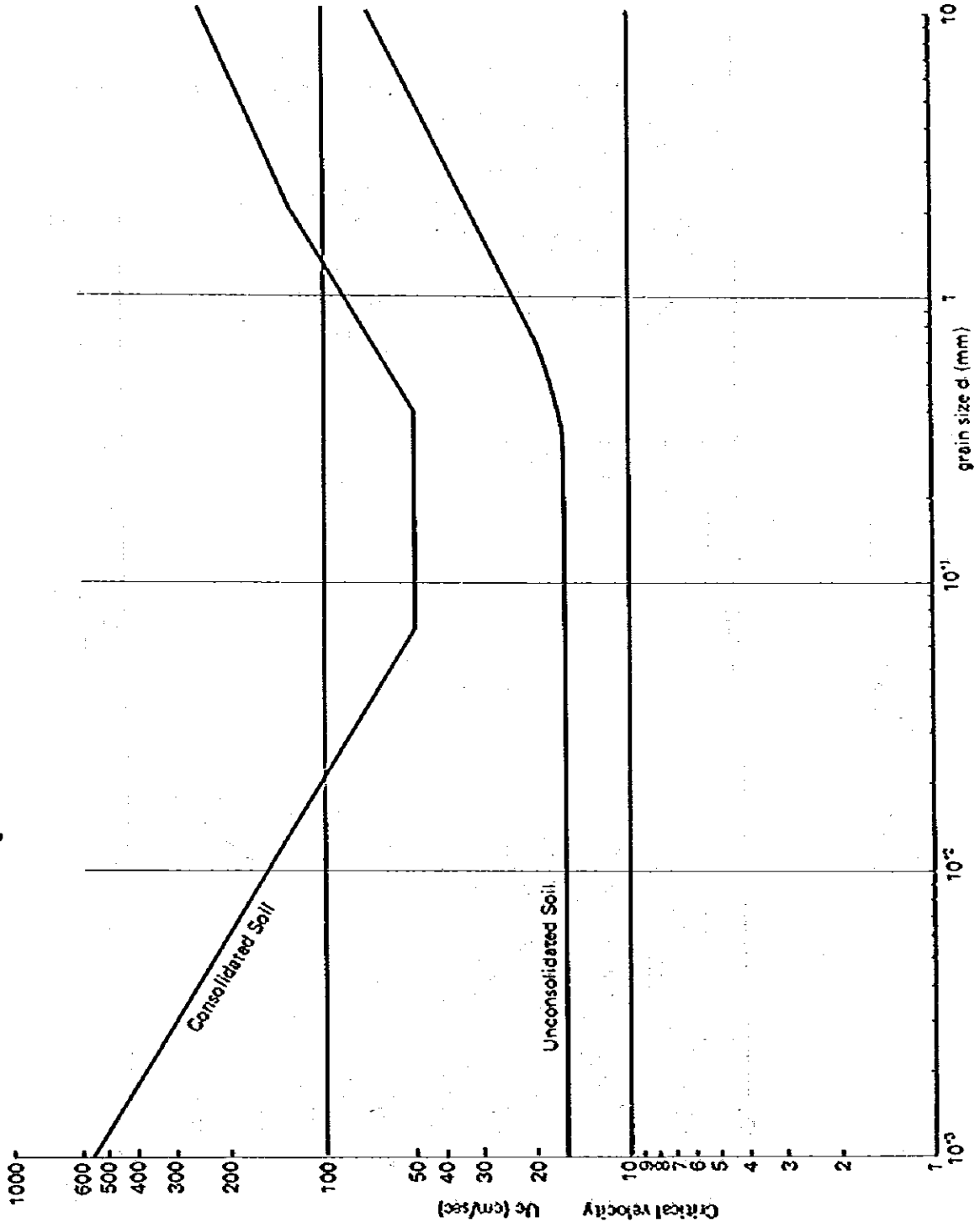



Fig. A-7-13 Critical Velocity

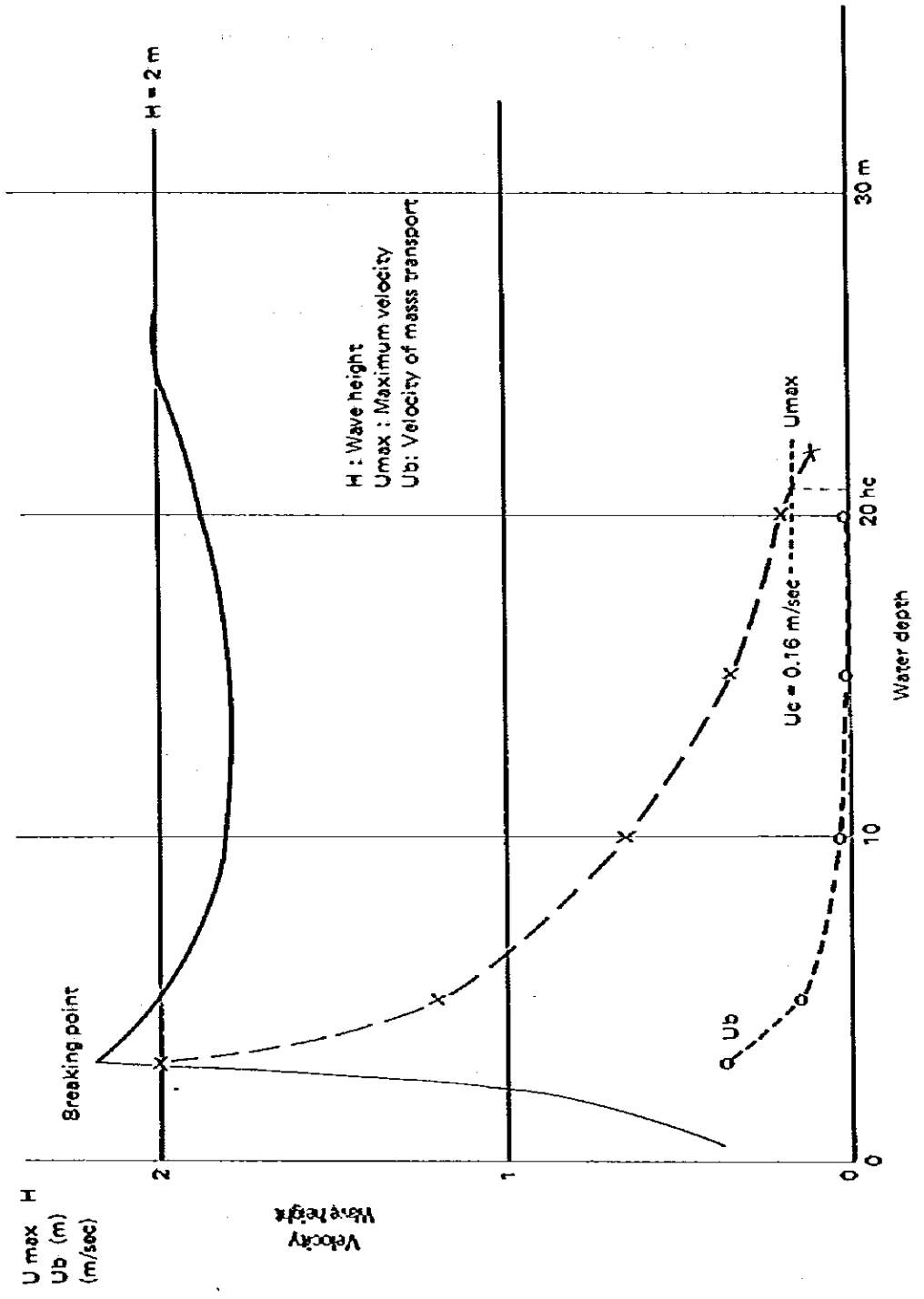



Fig. A-7-14 Transformation of Shallow Water Wave

# CHAPTER-9 ECONOMIC ANALYSES

## Table A-9-1(1) Related Project Cost for Urgent Improvement Program

| Item No. | Description | Unit | Quantity | Rate | | | Amount | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Local Currency U.S.$ | Foreign Currency U.S.$ | Total Rate U.S.$ | Local Currency 1000 U.S.$ | Foreign Currency 1000 U.S.$ | Total Rate 1000 U.S.$ |
| 1. | Warehouse | m² | 6,000 | 253 | - | 253 | 1,520 | - | 1,520 |
| 2. | Sales Tax (5%) | Sum | 1 | | | | 70 | - | 70 |
| 3. | Engineering Study | " | 1 | | | | 70 | - | 70 |
| 4. | Contingency for Related Facilities | | | | | | | | |
| 1) | Physical Contingency (Approx. 15%) | Sum | 1 | | | | 240 | - | 240 |
| 2) | Price Contingency (Approx. 15%) | " | 1 | | | | 260 | - | 260 |
| | Total | | | | | | 2,160 | - | 2,160 |

## Table A-9-1(2) Related Project Cost at High Projection for Short Term Development Program

| Item No. | Description | Unit | Quantity | Rate | | | Amount | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Local Currency U.S.$ | Foreign Currency U.S.$ | Total Rate U.S.$ | Local Currency 1000 U.S.$ | Foreign Currency 1000 U.S.$ | Total Rate 1000 U.S.$ |
| 1. | Warehouse | m² | 14,800 | 253 | - | 253 | 3,750 | - | 3,750 |
| 2. | Approach Road | m | 1,050 | 760 | - | 760 | 800 | - | 800 |
| 3. | Sales Tax (5%) | Sum | 1 | | | | 220 | - | 220 |
| 4. | Engineering Study | " | 1 | | | | 180 | - | 180 |
| 5. | Contingency for Related Facilities | | | | | | | | |
| 1) | Physical Contingency (Approx. 15%) | Sum | 1 | | | | 740 | - | 740 |
| 2) | Price Contingency (Approx. 40%) | " | 1 | | | | 2,270 | - | 2,270 |
| | Total | | | | | | 7,960 | - | 7,960 |

## Table A-9-1(3) Related Project Cost at Low Projection for Short Term Development Program

| Item No. | Description | Unit | Quantity | Rate | | | Amount | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Local Currency U.S.$ | Foreign Currency U.S.$ | Total Rate U.S.$ | Local Currency 1000 U.S.$ | Foreign Currency 1000 U.S.$ | Total Rate 1000 U.S.$ |
| 1. | Warehouse | m² | 13,200 | 253 | - | 253 | 3,340 | - | 3,340 |
| 2. | Approach Road | m | 1,050 | 760 | - | 760 | 800 | - | 800 |
| 3. | Sales Tax (5%) | Sum | 1 | | | | 200 | - | 200 |
| 4. | Engineering Study | " | 1 | | | | 160 | - | 160 |
| 5. | Contingency for Related Facilities | | | | | | | | |
| 1) | Physical Contingency (Approx. 15%) | Sum | 1 | | | | 670 | - | 670 |
| 2) | Price Contingency (Approx. 40%) | " | 1 | | | | 2,060 | - | 2,060 |
| | Total | | | | | | 7,230 | - | 7,230 |

## Table A-9-1(4) Related Project Cost at High Projection for Long Term Development Program

| Item No. | Description | Unit | Quantity | Rate | | | Amount | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Local Currency U.S.$ | Foreign Currency U.S.$ | Total Rate U.S.$ | Local Currency 1000 U.S.$ | Foreign Currency 1000 U.S.$ | Total Rate 1000 U.S.$ |
| 1. | Warehouse | m² | 44,000 | 253 | – | 253 | 11,130 | – | 11,130 |
| 2 | Approach Road | m | 1,050 | 760 | – | 760 | 800 | – | 800 |
| 3. | Replacement of East Bandjil Canal | " | 3,000 | 114 | – | 114 | 3,400 | – | 3,400 |
| 4. | Domestic Trade Wharf Including Transit Shed (Inter insular) | " | 820 | 10,400 | – | 10,400 | 8,500 | – | 8,500 |
| 5. | Sales Tax (5%) | Sum | 1 | | | | 1,190 | – | 1,190 |
| 6. | Engineering Study | " | 1 | | | | 1,000 | – | 1,000 |
| 7. | Contingency for Related Facilities | | | | | | | | |
| 1) | Physical Contingency (Approx. 15%) | " | 1 | | | | 3,900 | – | 3,900 |
| | Total | | | | | | 29,920 | – | 29,920 |

## Table A-9-1(5) Related Project Cost at Low Projection for Long Term Development Program

| Item No. | Description | Unit | Quantity | Rate | | | Amount | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Local Currency U.S.$ | Foreign Currency U.S.$ | Total Rate U.S.$ | Local Currency 1000 U.S.$ | Foreign Currency 1000 U.S.$ | Total Rate 1000 U.S.$ |
| 1. | Warehouse | m² | 22,400 | 253 | – | 253 | 5,670 | – | 5,670 |
| 2. | Approach Road | m | 1,050 | 760 | – | 760 | 800 | – | 800 |
| 3. | Replacement of East Bandjil Canal | " | 3,000 | 114 | – | 114 | 3,400 | – | 3,400 |
| 4. | Sales Tax (5%) | Sum | 1 | | | | 490 | – | 490 |
| 5. | Engineering Study | " | 1 | | | | 410 | – | 410 |
| 6. | Contingency for Related Facilities | | | | | | | | |
| 1) | Physical Contingency (Approx. 15%) | " | 1 | | | | 1,610 | – | 1,610 |
| | Total | | | | | | 12,350 | – | 12,350 |

Table A-9-2(1) Cost Benefit Table for Urgent Improvement Program (H.P., PLAN A-1)

| Year | | Cost | | | | Benefit | | | Discounted Value I.R.R. = 10.7% | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Port Investment | Maintenance Dredging | Increased Operating Cost | Total | Direct Handling at Quay | Direct Import and Export | Total | Cost | Benefit |
| 1 | 1979 | 35,650 | – | – | 35,650 | – | – | – | 35,650 | – |
| 2 | 1980 | 35,650 | – | 300 | 35,950 | – | 4,420 | 4,420 | 32,473 | 3,992 |
| 3 | 1981 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 832 | 7,221 |
| 4 | 1982 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 751 | 6,524 |
| 5 | 1983 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 679 | 5,893 |
| 6 | 1984 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 613 | 5,323 |
| 7 | 1985 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 554 | 4,809 |
| 8 | 1986 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 500 | 4,344 |
| 9 | 1987 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 452 | 3,924 |
| 10 | 1988 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 408 | 3,545 |
| 11 | 1989 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 369 | 3,201 |
| 12 | 1990 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 333 | 2,893 |
| 13 | 1991 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 301 | 2,613 |
| 14 | 1992 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 272 | 2,360 |
| 15 | 1993 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 245 | 2,132 |
| 16 | 1994 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 222 | 1,926 |
| 17 | 1995 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 200 | 1,739 |
| 18 | 1996 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 181 | 1,571 |
| 19 | 1997 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 163 | 1,420 |
| 20 | 1998 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 147 | 1,282 |
| 21 | 1999 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 133 | 1,158 |
| 22 | 2000 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 120 | 1,046 |
| 23 | 2001 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 108 | 945 |
| 24 | 2002 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 98 | 854 |
| 25 | 2003 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 88 | 771 |
| 26 | 2004 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 80 | 697 |
| 27 | 2005 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 72 | 629 |
| 28 | 2006 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 65 | 568 |
| 29 | 2007 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 59 | 513 |
| 30 | 2008 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 53 | 464 |
| Residual Value | | | | | | | | 32,730 | | 1,716 |
| Total | | 71,300 | 11,760 | 17,100 | 100,160 | – | 252,220 | 284,950 | 76,221 | 76,073 |

Table A-9-2(2) Cost Benefit Table for Urgent Improvement Program (H.P., PLAN A-2)

| | Year | Cost | | | | Benefit | | | Discounted Value I.R.R. = 15.2 % | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Port Investment | Maintenance Dredging | Increased Operating Cost | Total | Direct Handling at Quay | Direct Import and Export | Total | Cost | Benefit |
| 1 | 1979 | 25,250 | - | - | 25,250 | - | - | - | 25,250 | - |
| 2 | 1980 | 25,250 | - | 300 | 25,550 | - | 4,420 | 4,420 | 22,179 | 3,333 |
| 3 | 1981 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 866 | 6,668 |
| 4 | 1982 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 752 | 5,788 |
| 5 | 1983 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 652 | 5,025 |
| 6 | 1984 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 566 | 4,362 |
| 7 | 1985 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 491 | 3,786 |
| 8 | 1986 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 427 | 3,286 |
| 9 | 1987 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 370 | 2,853 |
| 10 | 1988 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 321 | 2,477 |
| 11 | 1989 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 279 | 2,149 |
| 12 | 1990 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 242 | 1,866 |
| 13 | 1991 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 210 | 1,620 |
| 14 | 1992 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 182 | 1,406 |
| 15 | 1993 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 158 | 1,220 |
| 16 | 1994 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 137 | 1,059 |
| 17 | 1995 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 119 | 919 |
| 18 | 1996 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 103 | 798 |
| 19 | 1997 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 90 | 693 |
| 20 | 1998 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 78 | 601 |
| 21 | 1999 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 67 | 522 |
| 22 | 2000 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 58 | 453 |
| 23 | 2001 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 51 | 393 |
| 24 | 2002 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 44 | 341 |
| 25 | 2003 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 38 | 296 |
| 26 | 2004 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 33 | 257 |
| 27 | 2005 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 29 | 223 |
| 28 | 2006 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 25 | 193 |
| 29 | 2007 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 21 | 168 |
| 30 | 2008 | - | 550 | 600 | 1,150 | - | 8,850 | 8,850 | 18 | 146 |
| Residual Value | | | | | | | | 24,150 | | 398 |
| Total | | 50,500 | 15,400 | 17,100 | 83,000 | - | 252,220 | 276,370 | 53,856 | 53,299 |

Table A-9-2(3) Cost Benefit Table for Urgent Improvement Program (L.P., PLAN A-1)

| | Year | Cost | | | | Benefit | | | Discounted Value I.R.R. = 10.6 % | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Port Investment | Maintenance Dredging | Increased Operating Cost | Total | Direct Handling at Quay | Direct Import and Export | Total | Cost | Benefit |
| 1 | 1979 | 35,650 | – | – | 35,650 | – | – | – | 35,650 | – |
| 2 | 1980 | 35,650 | – | 300 | 35,950 | – | 4,420 | 4,420 | 32,505 | 3,996 |
| 3 | 1981 | – | 420 | 600 | 1,020 | 330 | 7,960 | 8,290 | 833 | 6,777 |
| 4 | 1982 | – | 420 | 600 | 1,020 | 170 | 8,410 | 8,580 | 753 | 6,342 |
| 5 | 1983 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 681 | 5,914 |
| 6 | 1984 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 616 | 5,348 |
| 7 | 1985 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 557 | 4,834 |
| 8 | 1986 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 503 | 4,371 |
| 9 | 1987 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 455 | 3,952 |
| 10 | 1988 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 411 | 3,573 |
| 11 | 1989 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 372 | 3,231 |
| 12 | 1990 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 336 | 2,921 |
| 13 | 1991 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 304 | 2,641 |
| 14 | 1992 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 275 | 2,388 |
| 15 | 1993 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 248 | 2,159 |
| 16 | 1994 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 225 | 1,952 |
| 17 | 1995 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 203 | 1,765 |
| 18 | 1996 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 184 | 1,596 |
| 19 | 1997 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 166 | 1,443 |
| 20 | 1998 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 150 | 1,305 |
| 21 | 1999 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 135 | 1,179 |
| 22 | 2000 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 122 | 1,066 |
| 23 | 2001 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 111 | 964 |
| 24 | 2002 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 100 | 872 |
| 25 | 2003 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 90 | 788 |
| 26 | 2004 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 82 | 712 |
| 27 | 2005 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 74 | 644 |
| 28 | 2006 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 67 | 582 |
| 29 | 2007 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 60 | 527 |
| 30 | 2008 | – | 420 | 600 | 1,020 | – | 8,850 | 8,850 | 54 | 476 |
| Residual Value | | | | | | | | 32,730 | | 1,762 |
| Total | | 71,300 | 11,760 | 17,100 | 100,160 | 500 | 250,890 | 283,620 | 76,322 | 76,080 |

Table A-9-2(4) Cost Benefit Table for Urgent Improvement Program (L.P., PLAN A-2)

| Year | | Cost | | | | Benefit | | | Discounted Value I.R.R. = 15.0 % | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Port Investment | Maintenance Dredging | Increased Operating Cost | Total | Direct Handling at Quay | Direct Import and Export | Total | Cost | Benefit |
| 1 | 1979 | 25,250 | – | – | 25,250 | – | – | – | 25,250 | – |
| 2 | 1980 | 25,250 | – | 300 | 25,550 | – | 4,420 | 4,420 | 22,218 | 3,843 |
| 3 | 1981 | – | 550 | 600 | 1,150 | 330 | 7,960 | 8,290 | 869 | 6,268 |
| 4 | 1982 | – | 550 | 600 | 1,150 | 170 | 8,410 | 8,580 | 756 | 5,641 |
| 5 | 1983 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 657 | 5,060 |
| 6 | 1984 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 571 | 4,400 |
| 7 | 1985 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 497 | 3,825 |
| 8 | 1986 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 432 | 3,326 |
| 9 | 1987 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 375 | 2,893 |
| 10 | 1988 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 326 | 2,516 |
| 11 | 1989 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 284 | 2,187 |
| 12 | 1990 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 247 | 1,901 |
| 13 | 1991 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 214 | 1,654 |
| 14 | 1992 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 186 | 1,438 |
| 15 | 1993 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 162 | 1,250 |
| 16 | 1994 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 141 | 1,087 |
| 17 | 1995 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 122 | 946 |
| 18 | 1996 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 106 | 822 |
| 19 | 1997 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 92 | 715 |
| 20 | 1998 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 80 | 621 |
| 21 | 1999 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 70 | 540 |
| 22 | 2000 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 61 | 470 |
| 23 | 2001 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 53 | 408 |
| 24 | 2002 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 46 | 355 |
| 25 | 2003 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 40 | 309 |
| 26 | 2004 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 34 | 268 |
| 27 | 2005 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 30 | 233 |
| 28 | 2006 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 26 | 203 |
| 29 | 2007 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 22 | 176 |
| 30 | 2008 | – | 550 | 600 | 1,150 | – | 8,850 | 8,850 | 19 | 153 |
| Residual Value | | | | | | | | 24,150 | | 419 |
| Total | | 50,500 | 15,400 | 17,100 | 83,000 | 500 | 250,890 | 275,040 | 53,986 | 53,927 |

Table A-9-2(5) Cost Benefit Table for Short Term Development Program (H.P., PLAN A-1)

| | Year | Cost | | | | Benefit | | | Discounted Value I.R.R. = 11.9 % | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Port Investment | Maintenance Dredging | Increased Operating Cost | Total | Direct Handling at Quay | Direct Import and Export | Total | Cost | Benefit |
| 1 | 1979 | 35,650 | – | – | 35,650 | – | – | – | 35,650 | – |
| 2 | 1980 | 35,650 | – | 300 | 35,950 | – | 4,420 | 4,420 | 32,128 | 3,950 |
| 3 | 1981 | 12,990 | 420 | 600 | 14,010 | – | 8,850 | 8,850 | 11,188 | 7,067 |
| 4 | 1982 | 12,990 | 420 | 760 | 14,170 | 590 | 9,510 | 10,100 | 10,113 | 7,208 |
| 5 | 1983 | 12,990 | 420 | 910 | 14,320 | 1,260 | 9,950 | 11,210 | 9,133 | 7,149 |
| 6 | 1984 | 12,990 | 420 | 1,210 | 14,620 | 2,760 | 10,620 | 13,380 | 8,333 | 6,053 |
| 7 | 1985 | 12,990 | 420 | 1,310 | 14,720 | 3,010 | 11,280 | 14,290 | 7,498 | 7,279 |
| 8 | 1986 | – | 420 | 1,420 | 1,840 | 3,180 | 12,390 | 15,570 | 837 | 7,087 |
| 9 | 1987 | – | 420 | 1,510 | 1,930 | 3,180 | 13,710 | 16,890 | 785 | 6,870 |
| 10 | 1988 | – | 420 | 1,510 | 1,930 | 2,680 | 15,040 | 17,720 | 701 | 6,441 |
| 11 | 1989 | – | 420 | 1,510 | 1,930 | 2,180 | 16,370 | 18,550 | 627 | 6,026 |
| 12 | 1990 | – | 420 | 1,510 | 1,930 | 1,510 | 18,140 | 19,650 | 560 | 5,704 |
| 13 | 1991 | – | 420 | 1,510 | 1,930 | 840 | 19,910 | 20,750 | 500 | 5,382 |
| 14 | 1992 | – | 420 | 1,510 | 1,930 | 80 | 21,900 | 21,980 | 447 | 5,097 |
| 15 | 1993 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 399 | 4,583 |
| 16 | 1994 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 357 | 4,096 |
| 17 | 1995 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 319 | 3,660 |
| 18 | 1996 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 285 | 3,271 |
| 19 | 1997 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 254 | 2,922 |
| 20 | 1998 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 227 | 2,612 |
| 21 | 1999 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 203 | 2,333 |
| 22 | 2000 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 182 | 2,086 |
| 23 | 2001 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 162 | 1,864 |
| 24 | 2002 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 145 | 1,666 |
| 25 | 2003 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 129 | 1,488 |
| 26 | 2004 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 116 | 1,330 |
| 27 | 2005 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 103 | 1,188 |
| 28 | 2006 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 92 | 1,062 |
| 29 | 2007 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 82 | 949 |
| 30 | 2008 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 74 | 848 |
| Residual Value | | | | | | | | 68,850 | | 2,641 |
| Total | | 136,250 | 11,760 | 39,730 | 187,740 | 21,270 | 526,010 | 616,130 | 121,629 | 119,912 |

Table A-9-2(6) Cost Benefit Table for Short Term Development Program (H.P., PLAN A-2)

| Year | | Cost | | | | Benefit | | | Discounted Value I.R.R. = 12.6 % | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Port Investment | Maintenance Dredging | Increased Operating Cost | Total | Direct Handling at Quay | Direct Import and Export | Total | Cost | Benefit |
| 1 | 1979 | 25,250 | – | – | 25,250 | – | – | – | 25,250 | – |
| 2 | 1980 | 25,250 | – | 300 | 25,550 | – | 4,420 | 4,420 | 22,690 | 3,925 |
| 3 | 1981 | 17,160 | 550 | 600 | 18,310 | – | 8,850 | 8,850 | 14,441 | 6,979 |
| 4 | 1982 | 17,160 | 520 | 760 | 18,440 | 590 | 9,510 | 10,100 | 12,917 | 7,075 |
| 5 | 1983 | 17,160 | 490 | 910 | 18,560 | 1,260 | 9,950 | 11,210 | 11,546 | 6,973 |
| 6 | 1984 | 17,160 | 470 | 1,210 | 18,840 | 2,760 | 10,620 | 13,380 | 10,409 | 7,392 |
| 7 | 1985 | 17,160 | 450 | 1,310 | 18,920 | 3,010 | 11,280 | 14,290 | 9,282 | 7,010 |
| 8 | 1986 | – | 420 | 1,420 | 1,840 | 3,180 | 12,390 | 15,570 | 801 | 6,783 |
| 9 | 1987 | – | 420 | 1,510 | 1,930 | 3,180 | 13,710 | 16,890 | 746 | 6,536 |
| 10 | 1988 | – | 420 | 1,510 | 1,930 | 2,680 | 15,040 | 17,720 | 663 | 6,090 |
| 11 | 1989 | – | 420 | 1,510 | 1,930 | 2,180 | 16,370 | 18,550 | 589 | 5,661 |
| 12 | 1990 | – | 420 | 1,510 | 1,930 | 1,510 | 18,140 | 19,650 | 523 | 5,327 |
| 13 | 1991 | – | 420 | 1,510 | 1,930 | 840 | 19,910 | 20,750 | 464 | 4,994 |
| 14 | 1992 | – | 420 | 1,510 | 1,930 | 80 | 21,900 | 21,980 | 412 | 4,699 |
| 15 | 1993 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 366 | 4,200 |
| 16 | 1994 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 325 | 3,729 |
| 17 | 1995 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 289 | 3,313 |
| 18 | 1996 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 256 | 2,941 |
| 19 | 1997 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 227 | 2,612 |
| 20 | 1998 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 202 | 2,320 |
| 21 | 1999 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 179 | 2,060 |
| 22 | 2000 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 159 | 1,830 |
| 23 | 2001 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 141 | 1,625 |
| 24 | 2002 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 125 | 1,443 |
| 25 | 2003 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 111 | 1,281 |
| 26 | 2004 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 99 | 1,138 |
| 27 | 2005 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 88 | 1,011 |
| 28 | 2006 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 78 | 897 |
| 29 | 2007 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 69 | 797 |
| 30 | 2008 | – | 420 | 1,510 | 1,930 | – | 22,120 | 22,120 | 61 | 708 |
| Residual Value | | | | | | | | 70,120 | | 2,245 |
| Total | | 136,300 | 12,140 | 39,730 | 188,170 | 21,270 | 526,010 | 617,400 | 113,508 | 113,594 |

Table A-9-2(7) Cost Benefit Table for Short Term Development Program (L.P., PLAN A-1)

| | Year | Cost | | | | Benefit | | | Discounted Value I.R.R. = 10.5% | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Port Investment | Maintenance Dredging | Increased Operating Cost | Total | Direct Handling at Quay | Direct Import and Export | Total | Cost | Benefit |
| 1 | 1979 | 35,650 | – | – | 35,650 | – | – | – | 35,650 | – |
| 2 | 1980 | 35,650 | – | 300 | 35,950 | – | 4,420 | 4,420 | 32,534 | 4,000 |
| 3 | 1981 | 10,820 | 420 | 600 | 11,840 | 330 | 7,960 | 8,290 | 9,696 | 6,789 |
| 4 | 1982 | 10,820 | 420 | 680 | 11,920 | 590 | 8,410 | 9,000 | 8,835 | 6,670 |
| 5 | 1983 | 10,820 | 420 | 760 | 12,000 | 840 | 8,850 | 9,690 | 8,048 | 6,499 |
| 6 | 1984 | 10,820 | 420 | 910 | 12,150 | 1,590 | 9,070 | 10,660 | 7,375 | 6,470 |
| 7 | 1985 | 10,820 | 420 | 1,060 | 12,300 | 2,260 | 9,510 | 11,770 | 6,756 | 6,465 |
| 8 | 1986 | – | 420 | 1,250 | 1,670 | 3,100 | 10,180 | 13,280 | 830 | 6,601 |
| 9 | 1987 | – | 420 | 1,250 | 1,670 | 2,760 | 11,060 | 13,820 | 751 | 6,217 |
| 10 | 1988 | – | 420 | 1,250 | 1,670 | 2,510 | 11,720 | 14,230 | 679 | 5,793 |
| 11 | 1989 | – | 420 | 1,250 | 1,670 | 2,180 | 12,610 | 14,790 | 615 | 5,448 |
| 12 | 1990 | – | 420 | 1,250 | 1,670 | 1,760 | 13,710 | 15,470 | 556 | 5,157 |
| 13 | 1991 | – | 420 | 1,250 | 1,670 | 1,420 | 14,600 | 16,020 | 504 | 4,834 |
| 14 | 1992 | – | 420 | 1,250 | 1,670 | 1,000 | 15,710 | 16,710 | 456 | 4,563 |
| 15 | 1993 | – | 420 | 1,250 | 1,670 | 590 | 16,810 | 17,400 | 412 | 4,299 |
| 16 | 1994 | – | 420 | 1,250 | 1,670 | 80 | 18,140 | 18,220 | 373 | 4,073 |
| 17 | 1995 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 338 | 3,716 |
| 18 | 1996 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 305 | 3,363 |
| 19 | 1997 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 276 | 3,044 |
| 20 | 1998 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 250 | 2,754 |
| 21 | 1999 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 226 | 2,493 |
| 22 | 2000 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 205 | 2,256 |
| 23 | 2001 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 185 | 2,041 |
| 24 | 2002 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 168 | 1,847 |
| 25 | 2003 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 152 | 1,671 |
| 26 | 2004 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 137 | 1,512 |
| 27 | 2005 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 124 | 1,369 |
| 28 | 2006 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 112 | 1,239 |
| 29 | 2007 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 101 | 1,121 |
| 30 | 2008 | – | 420 | 1,250 | 1,670 | – | 18,360 | 18,360 | 92 | 1,014 |
| Residual Value | | | | | | | | 65,430 | | 3,616 |
| Total | | 125,400 | 11,760 | 33,060 | 170,220 | 21,010 | 429,800 | 516,240 | 116,741 | 116,934 |

Table A-9-2(8) Cost Benefit Table for Long Term Development Program (H.P., PLAN A-1)

| | Year | Cost | | | | Benefit | | | Discounted Value I.R.R. = 12.8 % | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Port Investment | Maintenance Dredging | Increased Operating Cost | Total | Direct Handling at Quay | Direct Import and Export | Total | Cost | Benefit |
| 1 | 1979 | 35,650 | – | – | 35,650 | – | – | – | 35,650 | – |
| 2 | 1980 | 35,650 | – | 300 | 35,950 | – | 4,420 | 4,420 | 31,869 | 3,918 |
| 3 | 1981 | 12,990 | 420 | 600 | 14,010 | – | 8,850 | 8,850 | 11,010 | 6,955 |
| 4 | 1982 | 12,990 | 420 | 760 | 14,170 | 590 | 9,510 | 10,100 | 9,872 | 7,036 |
| 5 | 1983 | 12,990 | 420 | 910 | 14,320 | 1,260 | 9,950 | 11,210 | 8,845 | 6,924 |
| 6 | 1984 | 12,990 | 420 | 1,210 | 14,620 | 2,680 | 10,620 | 13,300 | 8,005 | 7,283 |
| 7 | 1985 | 12,990 | 420 | 1,310 | 14,720 | 3,010 | 11,280 | 14,290 | 7,146 | 6,937 |
| 8 | 1986 | 8,500 | 420 | 1,420 | 10,340 | 3,180 | 12,390 | 15,570 | 4,450 | 6,701 |
| 9 | 1987 | 8,500 | 420 | 1,560 | 10,480 | 3,430 | 13,710 | 17,140 | 3,998 | 6,538 |
| 10 | 1988 | 8,500 | 420 | 1,680 | 10,600 | 3,600 | 15,040 | 18,640 | 3,584 | 6,304 |
| 11 | 1989 | 8,500 | 420 | 1,830 | 10,750 | 3,930 | 16,370 | 20,300 | 3,223 | 6,087 |
| 12 | 1990 | 8,500 | 420 | 1,980 | 10,900 | 4,100 | 18,140 | 22,240 | 2,897 | 5,911 |
| 13 | 1991 | 8,500 | 420 | 2,160 | 11,080 | 4,440 | 19,910 | 24,350 | 2,611 | 5,739 |
| 14 | 1992 | 8,500 | 420 | 2,340 | 11,260 | 4,690 | 21,900 | 26,590 | 2,352 | 5,554 |
| 15 | 1993 | 8,500 | 420 | 2,540 | 11,460 | 4,940 | 24,110 | 29,050 | 2,122 | 5,380 |
| 16 | 1994 | 8,500 | 420 | 2,760 | 11,680 | 5,270 | 26,540 | 31,810 | 1,917 | 5,223 |
| 17 | 1995 | 8,500 | 420 | 3,020 | 11,940 | 5,780 | 28,980 | 34,760 | 1,738 | 5,061 |
| 18 | 1996 | 8,500 | 420 | 3,260 | 12,180 | 6,030 | 31,850 | 37,880 | 1,571 | 4,886 |
| 19 | 1997 | 8,500 | 420 | 3,530 | 12,450 | 6,280 | 35,170 | 41,450 | 1,424 | 4,741 |
| 20 | 1998 | 8,500 | 420 | 3,840 | 12,760 | 6,610 | 38,710 | 45,320 | 1,293 | 4,595 |
| 21 | 1999 | 8,500 | 420 | 4,170 | 13,090 | 7,030 | 42,470 | 49,500 | 1,176 | 4,450 |
| 22 | 2000 | 8,500 | 420 | 4,530 | 13,450 | 7,450 | 46,670 | 54,120 | 1,072 | 4,313 |
| 23 | 2001 | – | 420 | 4,530 | 4,950 | 5,690 | 51,320 | 57,010 | 349 | 4,028 |
| 24 | 2002 | – | 420 | 4,530 | 4,950 | 3,770 | 56,410 | 60,180 | 310 | 3,770 |
| 25 | 2003 | – | 420 | 4,530 | 4,950 | 1,670 | 61,940 | 63,610 | 274 | 3,532 |
| 26 | 2004 | – | 420 | 4,530 | 4,950 | – | 66,360 | 66,360 | 243 | 3,266 |
| 27 | 2005 | – | 420 | 4,530 | 4,950 | – | 66,360 | 66,360 | 216 | 2,896 |
| 28 | 2006 | – | 420 | 4,530 | 4,950 | – | 66,360 | 66,360 | 191 | 2,567 |
| 29 | 2007 | – | 420 | 4,530 | 4,950 | – | 66,360 | 66,360 | 169 | 2,276 |
| 30 | 2008 | – | 420 | 4,530 | 4,950 | – | 66,360 | 66,360 | 150 | 2,018 |
| Residual Value | | | | | | | | 146,950 | | 4,468 |
| Total | | 263,750 | 11,760 | 81,950 | 357,460 | 95,430 | 948,060 | 1,190,440 | 149,727 | 149,357 |