

**REPORT  
ON  
PRELIMINARY SURVEY  
FOR  
DEVELOPMENT OF PELABUHAN RATU FISHING PORT**

**JUNE 1980**

**JAPAN INTERNATIONAL COOPERATION AGENCY**



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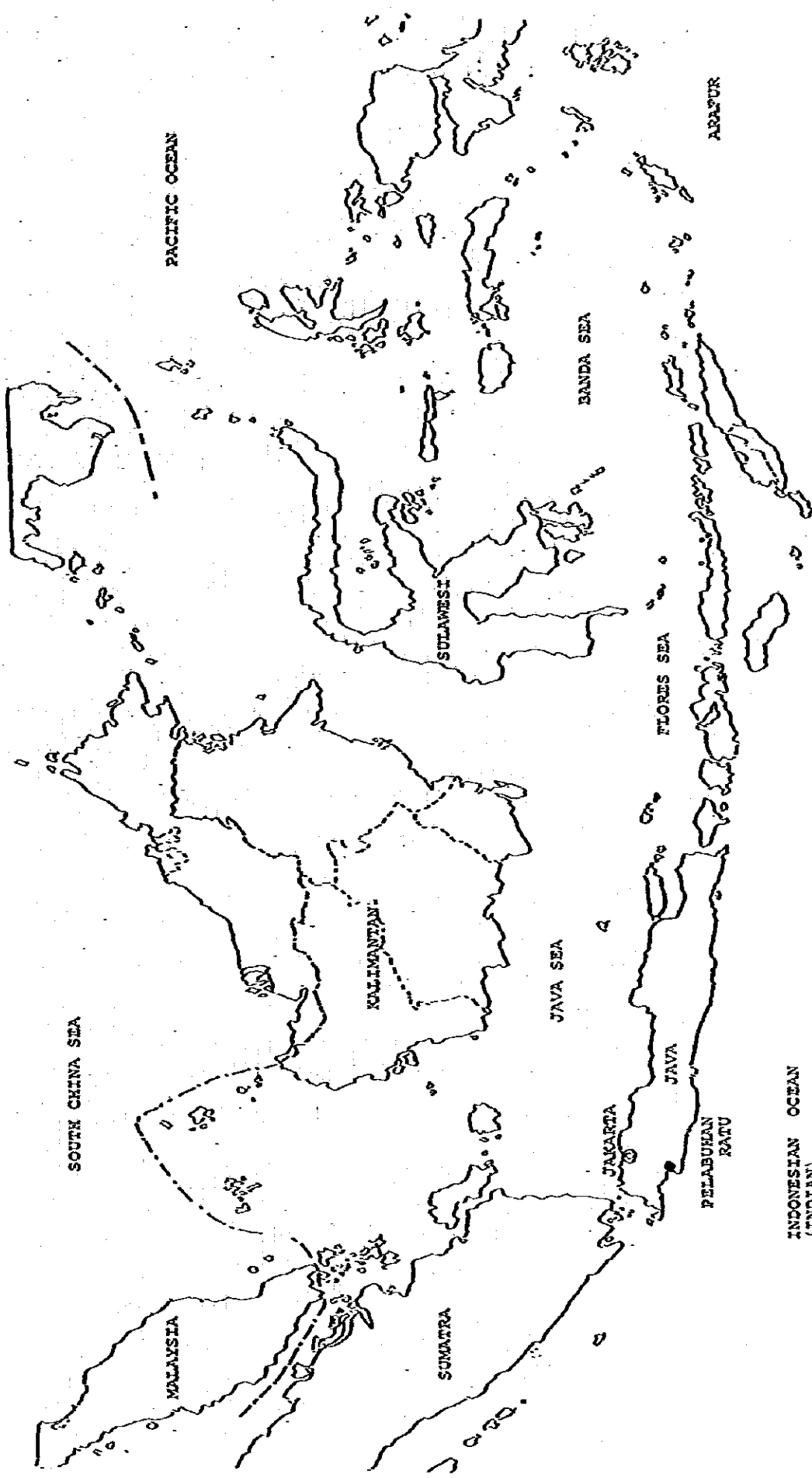
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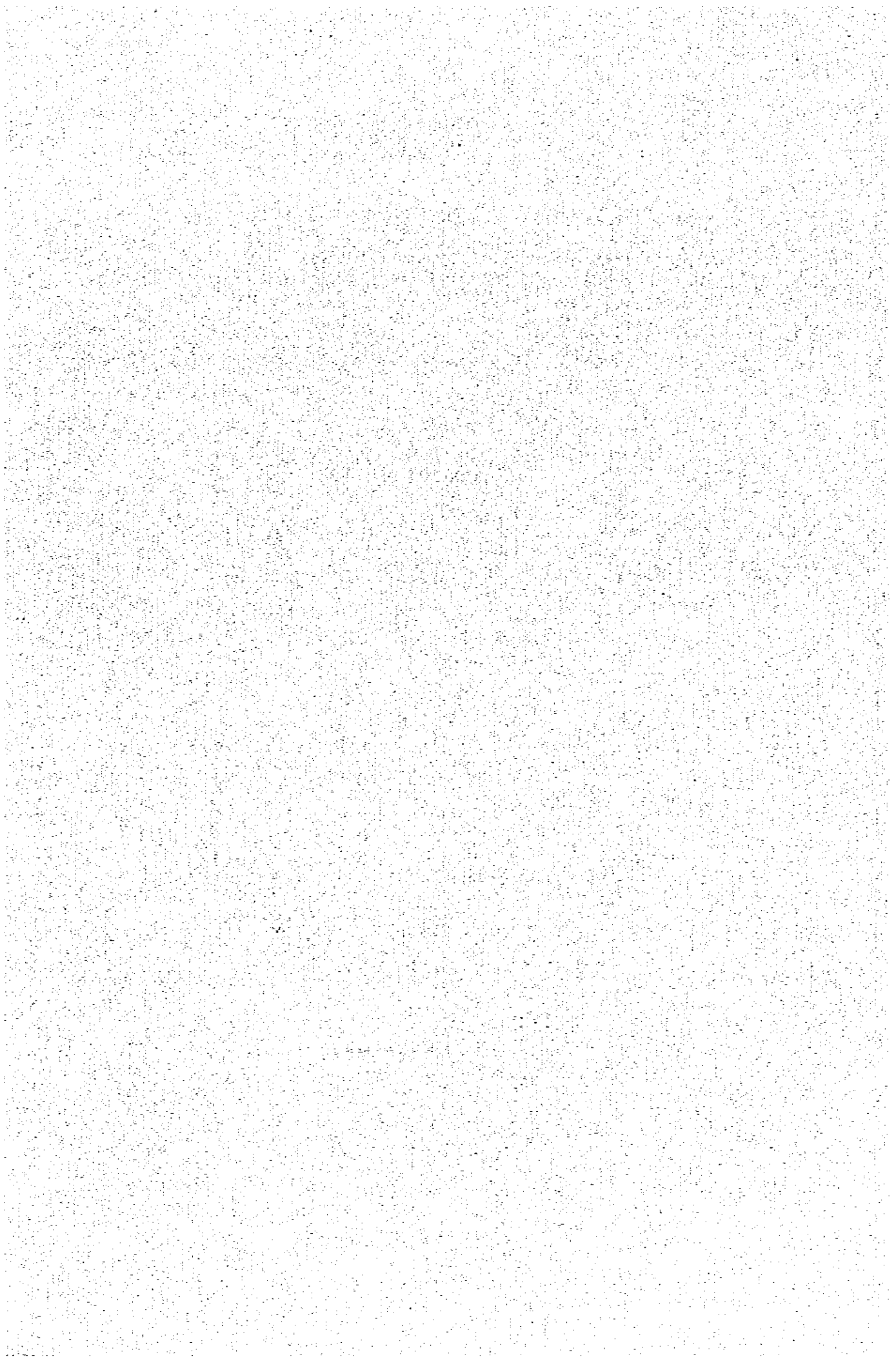
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## **INTRODUCTION**



## INTRODUCTION

### 1. Background of Survey

With the view to implementing its plan for constructing a fishing port in the Pelabuhan Ratu area, the only fishing base available on the south coast of West Java facing the Indian Ocean, the Indonesian Government requested Japan's assistance through the Japanese Embassy in Indonesia. According to the data collected in Japan, the Pelabuhan Ratu area abounds in marine resources and has a large population engaged in fishing operations, so that it is highly probable that the projected fishing port construction will accelerate the fisheries promotion in the area and at the same time contribute largely to regional development.

However, noting the fact that no attempt has been made in the past to build a large and well-equipped fishing port on the said coast which is constantly exposed to the rough waves of the Indian Ocean, the Japanese Government considered it necessary, as the first step of its assistance in the plan, to conduct a preliminary survey in order to be able to grasp the existing conditions in the area and study the feasibility of the plan, and entrusted the Japan International Cooperation Agency with the execution of the survey. The Agency organized a preliminary survey team and sent it to Indonesia for a period 22 days from March 12 to April 2, 1980.

## 2. Objective of Survey

The preliminary survey was carried out for the following purposes.

- (1) Study of production, distribution and consumption of fishes in the whole of Indonesia, West Java, Pelabuhan Ratu and neighboring areas.
- (2) Evaluation of the significance/necessity of the projected fishing port construction on the basis of (1).
- (3) Collection of data of natural conditions in general to be used as basic data for planning the fishing port construction, and study of the propriety of the plan on the basis of such data.
- (4) Selection of a suitable construction site of the fishing port on the basis of (2) and (3), and formulation of a preliminary construction plan and estimation of the construction cost.
- (5) Assessment of direct investment effects on the basis of (1) and (4).
- (6) Study of the justifiability of the plan on the basis of (1) - (5).

To achieve the purposes listed above, the survey was conducted not only in the Pelabuhan Ratu area but also in other related areas including Jakarta, Bandung and Pekalongan.

### 3. Formation of Survey Team

The survey team composed of six experts headed by Shigeo Kimura conducted the field survey and data collection during the 22-day period from March 12 to April 2, 1980. Assignment of each team member is shown in Table 1.

Table 1. Formation of Survey Team

Item	Assignment in the Team	Present Occupation
1. Shigeo KIMURA	Head	Director Construction Division Fishing Port Department Fisheries Agency
2. Satoru KOAKUTSU	Fisheries	Inspector International Affairs Division Oceanic Fishery Department Fisheries Agency
3. Kōji MITSUHASHI	Fishing Port Design	Acting Director in-charge-of Fishing Port Design Construction Division Fishing Port Department Fisheries Agency
4. Masayoshi NODA	Natural Conditions	Chief, Facilities on Fishing Port Laboratory Aquaculture and Fishing Port Engineering Division National Research Institute of Fisheries Engineering Fisheries Agency
5. Sanji KIDA	Fishing Port Planning	Unit Chief Environment Improvement Planning Unit Planning Section Planning Division Fishing Port Department Fisheries Agency
6. Kiyofumi NAKAUCHI	Coordination	Officer Fisheries Technical Cooperation Division Forestry Development Cooperation Department Japan International Cooperation Agency

#### 4. Acknowledgements

The team was given most valuable cooperation and advice from many individuals and organizations throughout the survey period. Special thanks are due to the following officials of the Indonesian Government whose helpful assistance made it possible for the team to discharge its mission smoothly as originally scheduled.

##### List of Indonesian Government Officials Concerned

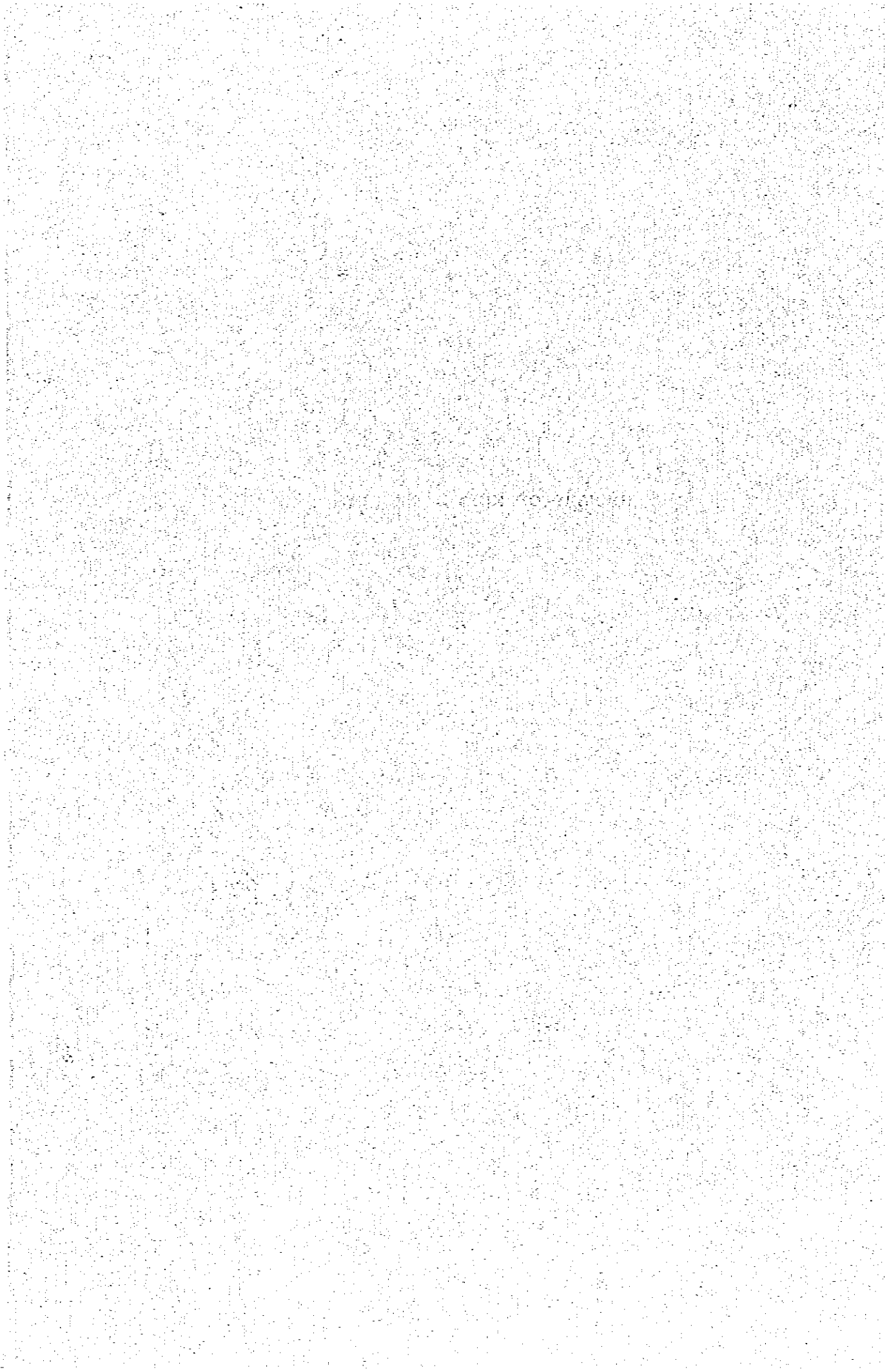
Mr. Imam Sardjono	Director-General, Directorate General of Fisheries (DGP).
Mr. T.M.D. Tambunan	Director, Directorate of Enterprise Development, DGP.
Mrs. Sri Hartati Suprayitno	Chief, Foreign Cooperation Section, Directorate of Planning, DGP.
Mr. Hamin	Staff member, Directorate of Enterprise Development, DGP.
Mr. Bambang Wahjudi	Staff member, Directorate of Planning, DGP.
Mr. Askin	Staff member, Subdirector for Fishing Gear and Method, Directorate of Resources Management, DGP.
Mr. Victor	Staff member, Directorate of Production, DGP.
Mr. Sukirno	Chief, Quality Control Laboratory.
Mr. Soleh Gandawidjaya	Chief, Fisheries, Sukabumi, West Java.
Mr. Bana Kartasasmita	Deputy Director, Development Technology Center, Institute of Technology, Bandung (ITB.).
Mr. Jan Cowie	Head, Information and Documentation, ITB.
Mr. Tjotjal Muljadi	Co-Project Leader of DTC-TOOL, ITB.
Mr. Anshori Jausal	Field Coordinator of DTC-USA Project, ITB.



Mr. Ahmad Sabur	Head, City and Regional Planning, Public Work Service, West Java Province.
Mr. Didi Kusnadi	Staff member, Regional Fisheries Office, Sukabumi District, West Java.
Mr. Mukti	Staff member, Fish Auction in Pelabuhan Ratu.
Mr. Tjarjo	- do -
Mr. Dayat	Harbor Master, Pelabuhan Ratu.
Mr. E. Sukanda	Staff member, Pelabuhan Ratu Harbor.
Mr. Budi Wiyarso	Chief, Planning Section, Fisheries Services, Central Java.
Mr. Yoenarto Kartono	Chief, Technical Marine Fisheries, Fisheries Services, Central Java.
Mr. Soekirno Djojosestono	Head of Institute of Fisheries for Quality Control Development.
Other officials concerned.	



## **SUMMARY OF SURVEY RESULTS**



## 1. Outline of Survey Results

### 1-1 Existing Condition of Fisheries

- (1) The annual fish catch landed in the Pelabuhan Ratu area ranges from 3,000 to 4,000 tons (1977 - 1979), which is not only consumed in local areas but also shipped to Jakarta, Bandung and other consuming areas either as fresh fish or after drying or salting.
- (2) In the Pelabuhan Ratu area, fisheries is a major industry of commercial importance, and fishermen's income is on a high level. Hence, fisheries occupies a large share in the regional economy. The area has a population of 20 thousand. In Pelabuhan Ratu Village situated in its central part, an urban district is developed around the fish market, suggesting the importance of fisheries in the area.
- (3) In the Pelabuhan Ratu area (Pelabuhan Ratu Village and a number of villages facing Pelabuhan Ratu Bay), about 7,000 fishermen are engaged in fishing operations using a total of 514 powered and non-powered fishing boats. They are extremely active in fishing operations and exhibit a very high level of fishing skills and techniques.
- (4) Good fishing grounds are found in the neighboring sea areas and fishing operations are performed almost through the year. However, there exist no fishing port facilities with the exception of a small fish handling shed, so that the fishermen are exposed to considerable inconvenience and danger in their fishing operations.

### 1-2 Possibility of Fishing Port Construction and Selection of Its Suitable Site as Judged from Natural Conditions

- (1) Since Pelabuhan Ratu faces the Indian Ocean, it is probable that considerably heavy waves attach its coast during the southwest monsoon season.
- (2) The bottom slope is steep, and the littoral drift on the sandy coast is active.
- (3) Due to the embayment condition and submarine topography, the coast is exposed to a relatively heavy wave action in some parts but not

in some other parts.

- (4) The likely main supply source of littoral drift is the Tjimandiri river.
- (5) A careful examination of the above factors indicates that the construction of a fishing port is technically feasible.  
Hence, it is proposed that the port be constructed at the site shown in Fig. 1. (P. 13)

### 1-3 Basic Policy for Formulating Construction Plan

- (1) The new fishing port will be constructed mainly for the fishing boats in the Pelabuhan Ratu area as a base of their coastal and offshore fishing operations.
- (2) The construction plan will be so formulated that the new port will fully exhibit the functions of a supporting port of the Jakarta Fishing Port/Fish Market Construction Project.
- (3) In view of the urgency of the plan and the investment effects, the port will be planned to have a scale large enough to accommodate all powered fishing boats in 1984.
- (4) A sufficient space of land will be secured for expansion of the port in the future.
- (5) Taking the above-mentioned conditions into careful account, it is considered that the development plan shown in Fig. 2 and 3 (P. 14 and 15) appropriate.

### 1-4 Estimated Construction Cost and Construction Period

The estimated construction cost based on the plan shown in Fig. 3 is as follows.

1) Port facilities	7,193 mil. Rp.	(¥2,877 mil.)	
2) Contingencies	1,080 mil. Rp.	(¥ 432 " )	(1) x 15%
3) Consulting fee	412 mil. Rp.	(¥ 165 " )	{(1) + (2)} x 5%
4) Total	8,685 mil. Rp.	(¥3,474 mil.)	

It is to be noted that the above cost estimation was made with account taken of the following points.

- (a) Calculation had to be made on the basis of the preliminary survey of topography, water depth and soil conditions conducted within a short period.
- (b) Design wave height was determined according to the existing meteorological data, using also the charts prepared 50 years ago and the data of rough field survey.
- (c) Unit cost was first determined according to the standard cost in Japan, and then corrected by the data of an interview survey made in Indonesia.

Considering the coverage and accuracy of the survey, it is estimated that the construction cost will range from 7,500 mil. Rp. (¥3,000 mil.) to 10,000 mil. Rp. (¥4,000 mil.) (Base: 1979 commodity price)

The Period required for completion of the port is as follows.

(1) Feasibility study	1 year
(2) Detailed planning and structures' design	1
(3) Construction work	3
<hr/>	
Total	5 years

In the cost estimation,,it was assumed that the new port would have the following main facilities.

**Civil engineering works:**

Breakwaters, rivetment, warehouse, slipway, embankment, mooring basin, port road, connecting road (fishermen's housing area - fishing port), parking area, space for port facilities.

**Buildings:**

Fish handling shed, ice making/ice storage/cold storage facilities, seamen's welfare facilities, port management and administration office.

**Others:**

Water/power/oil supply facilities, waste water disposal facilities,

fishing boat repair shop, park, lighthouse.

#### 1-5 Expected Investment Effects

The preliminary survey disclosed that the investment for the fishing port development would yield the following direct effects that can be measured and expressed numerically.

- 1) Greater number of days and trips of fishing operation.
- 2) Lower fuel cost resulting from replacement of inboard engines with outboard engines.
- 3) Extended life span of fishing boats.
- 4) Increased employment opportunities for labor force.
- 5) Higher market value of fish resulting from their improved freshness.
- 6) Improvement of fishermen's income level.

The total value of these direct benefits is estimated to amount to 750 mil. Rp. - 1,000 mil. Rp. (¥300 mil. - ¥400 mil.) a year.



## 2. Team's View Based on Survey Results

- (1) Considering the existing condition of fisheries in the Pelabuhan Ratu area, it can be said that the fishing port development plan is an important project urgently required to be implemented in the area.
- (2) Judging from the estimated construction cost and the expected promotional impacts on economy, the plan will have an immense value to national economy and will also yield great investment effects.
- (3) Since the plan aims primarily at improving the operational environment of fisheries, a thriving local industry in the Pelabuhan Ratu area, investment for its materialization can be regarded as a most sound and constructive attempt from the national point of view.

Accordingly, the plan can be evaluated as a justifiable project that deserves to be examined by a feasibility study if so requested by the Indonesian Government in the future.

### 3. Points to be Noted in Future Studies

If a feasibility study is to be conducted in the future, it should cover a number of survey items such as fisheries as a whole, distribution and processing, cost analysis, natural conditions, port planning, structural design, and port management and administration.

In the aspect of fisheries, it must be clarified what position in the Indonesian economy the new port will hold as a key fish distribution base. Further, the port planning and design must be preceded by a detailed survey of natural conditions including waves, littoral drift, submarine topography, geology and river characteristics to assure that the construction work will be planned with due regard to the influence on the surrounding natural environment.

It is advisable to conduct the feasibility study in the major fishing season, preferably in the July - September period when the sea is relatively calm and the survey at sea can be carried out without difficulty. The survey of natural conditions should include a follow-up wave observation in December and January when highest waves are observed in Pelabuhan Ratu Bay.

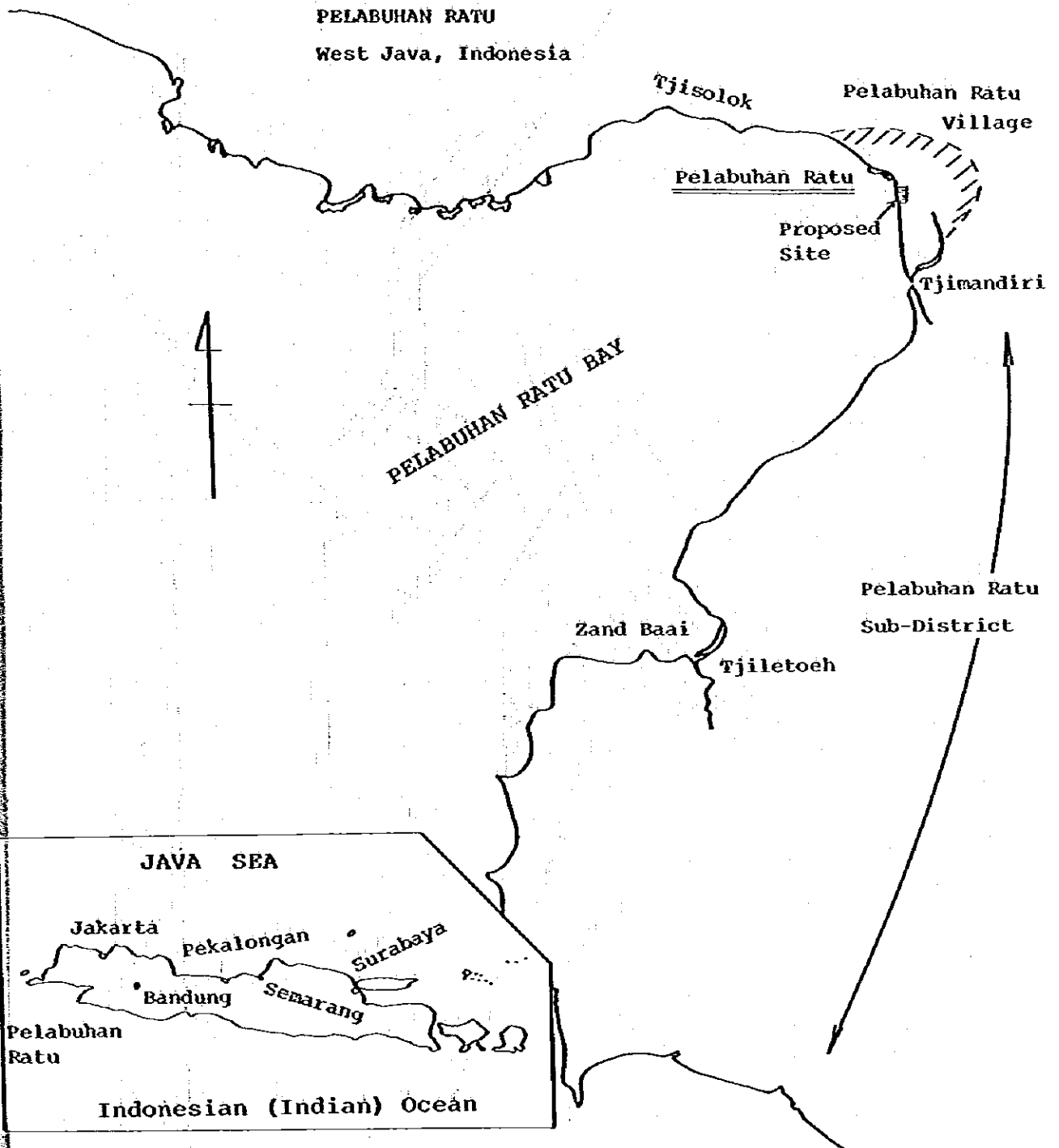


Fig. 1 Location Map of Proposed Construction Site

PELABUHAN RATU FISHING PORT PLAN

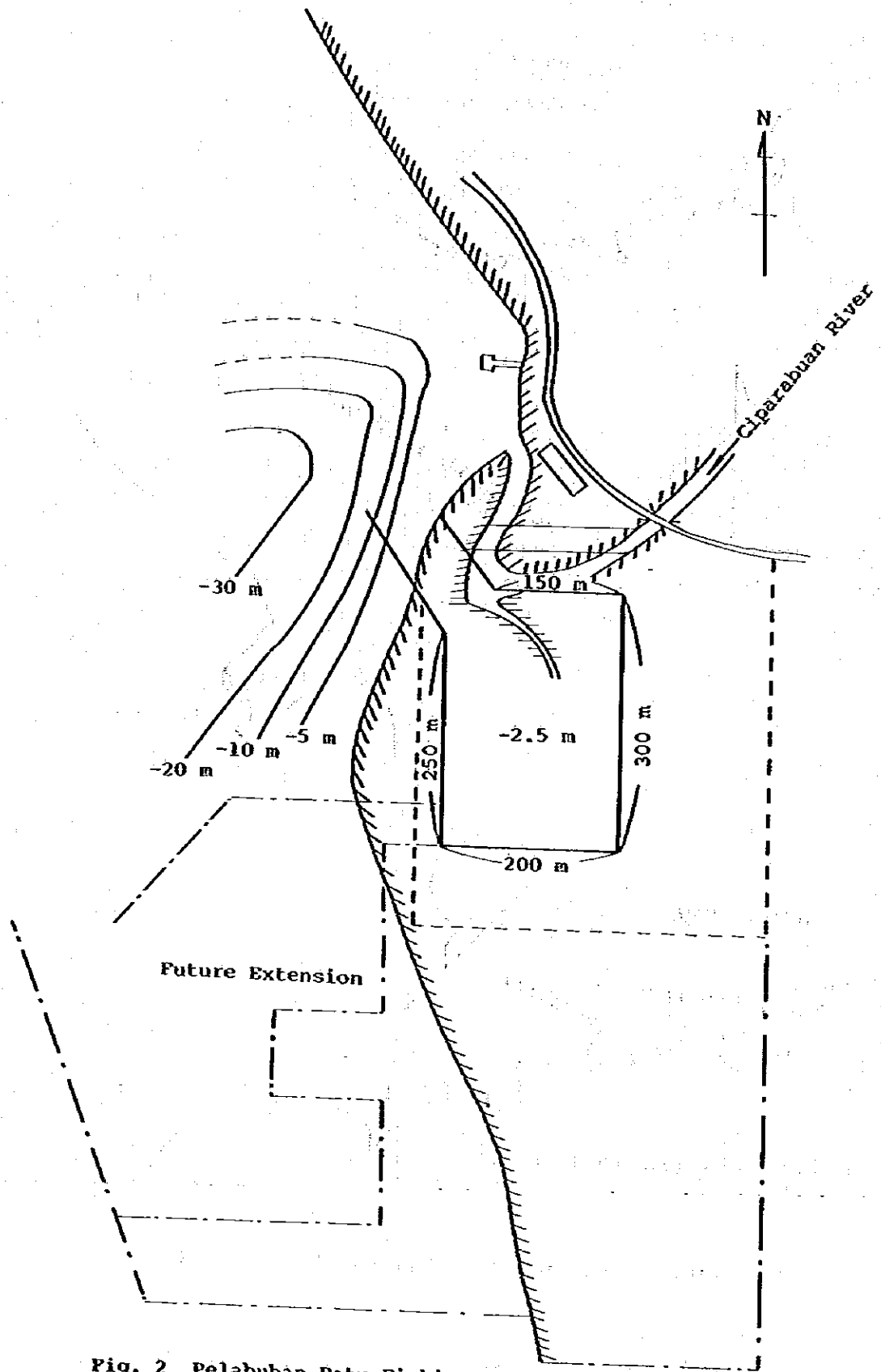
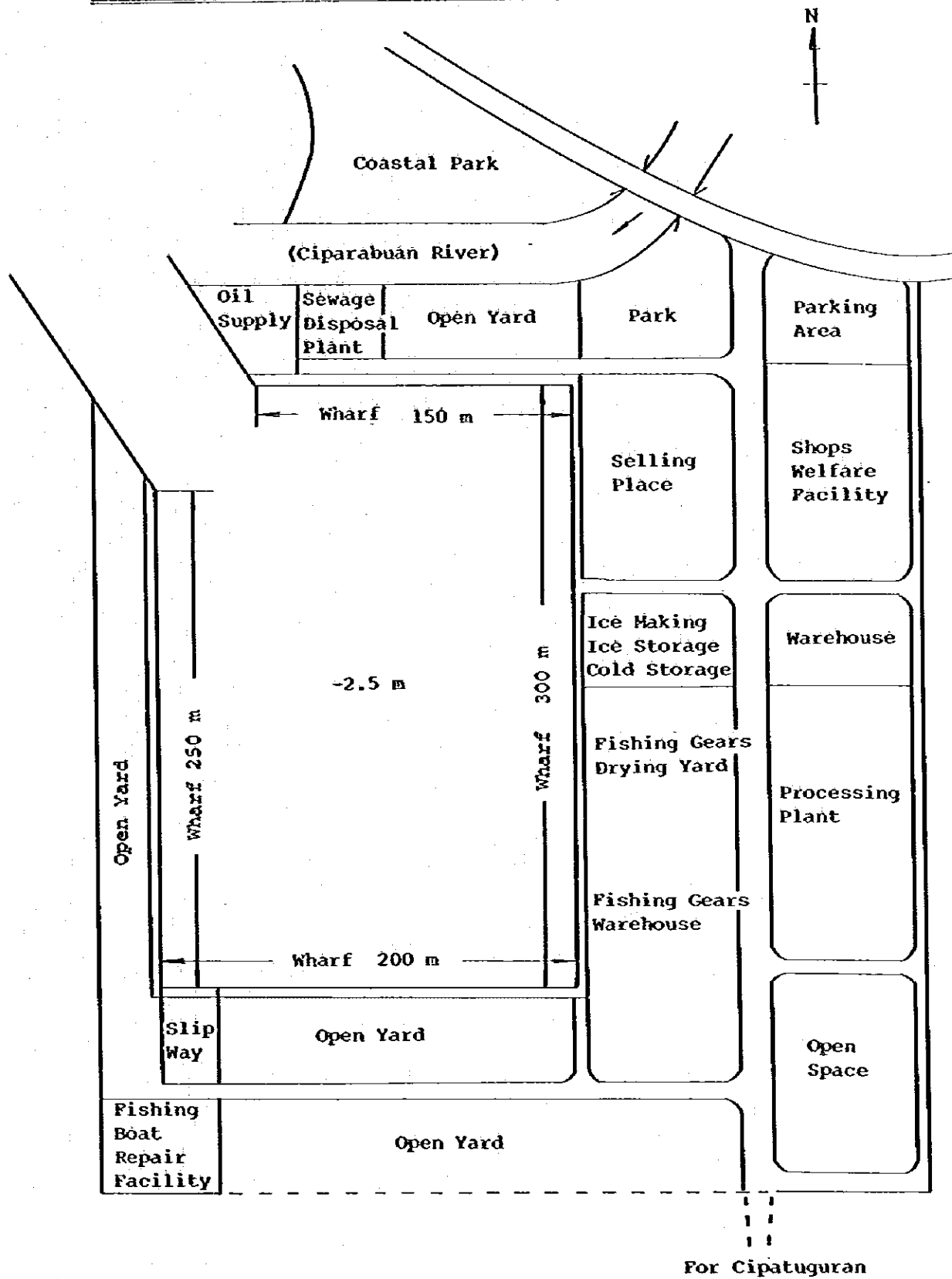


Fig. 2 Pelabuhan Ratu Fishing Port Plan (Outline)

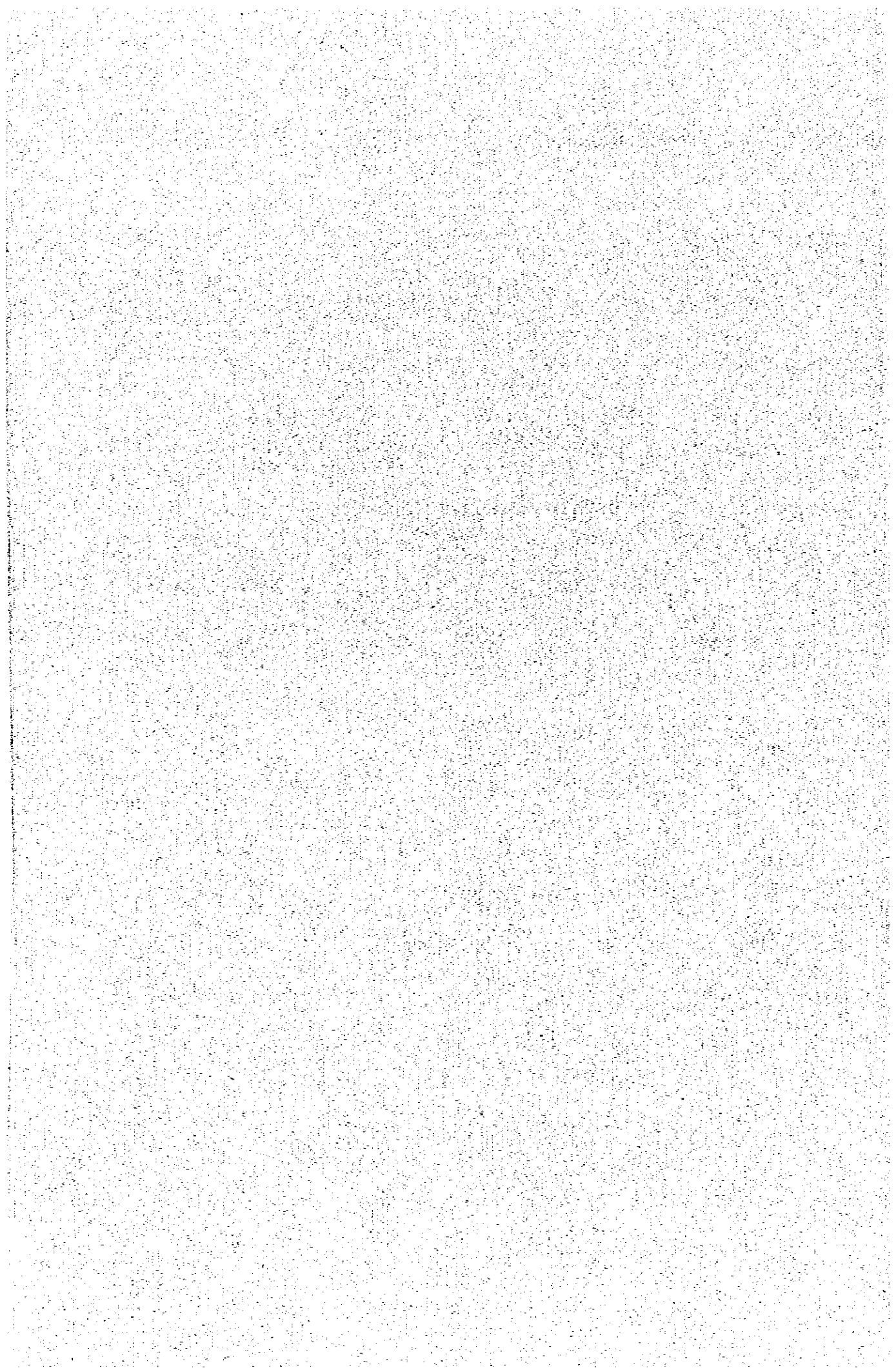
**PELABUHAN RATU FISHING PORT PLAN**



**Fig. 3 Pelabuhan Ratu Fishing Port Plan (Layout of Facilities)**



**DETAIL OF SURVEY RESULTS**





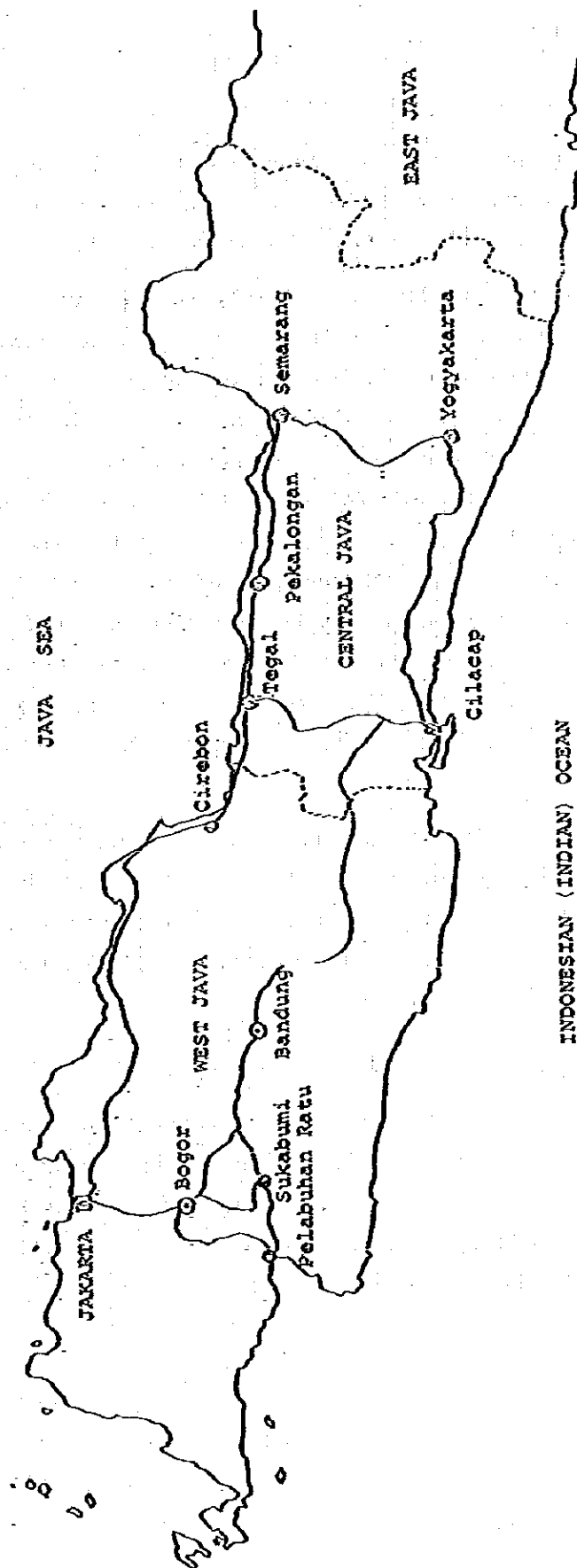


Fig. 1 Fishing Bases in Central and Western Java

## 1. Fisheries in Pelabuhan Ratu

### 1-1 Outline of Fisheries in Pelabuhan Ratu

The following is an outline of fisheries in Pelabuhan Ratu as reduced from the data provided by the Indonesian Government and the Provincial Government of West Java and from the survey results.

Indonesian fisheries is developed mainly in the Java Sea which is surrounded by a number of islands such as Java, Sumatra, Kalimantan and Sulawesi. Pelabuhan Ratu, facing the Indian Ocean at the southwestern end of Java island, is one of the few areas where the fishing operation is conducted in the outer sea area. Partly because it is close to the Sunda Strait in the west and faces the Indian Ocean on the south, it is favored with good fishing grounds and known as the area most active in fishing operation on the south coast of Java. It is situated at a distance of 150 km from Jakarta, 156 km from Bandung, and 50 - 60 km from smaller cities such as Sukabumi and Bogor. In addition, the road network linking Pelabuhan Ratu with these cities is in a fairly good condition, so that fisheries products can be transported to Jakarta and Bandung in 3 - 4 hours.

The area is blessed with the presence of good fishing grounds, which makes the year-round fishing operation possible. In the monsoon season lasting for three months from January to February, the area's fishing operation is suspended due to high waves, except for the operation of some large fishing vessels.

#### (1) Outline of Fisheries Production

The fish catch in Pelabuhan Ratu is subject to heavy annual fluctuations. The average annual catch in the four-year period from 1976 to 1979 was about 2,600 tons. However, there has been observed an increasing tendency in recent years, with a total catch of 4,016 tons recorded in 1977 and 3,498 tons in 1979.

Table 1. Fisheries Production in Pelabuhan Ratu

Type of fishing gear	1975	1976	1977	1978	1979
Payang	161	505	1,847	745	1,608
Gill-net	129	627	1,486	599	1,294
Small-Gill-net	14	55	161	65	140
Danish seine	11	41	121	49	105
Lift nets	32	123	361	146	315
Other Pole and line	4	14	40	16	35
Total	351	1,365	4,016	1,620	3,498

Seen by the type of fishing gear, Payang and gill-net fishery accounts for more than 80% of the total production. Other types of fishery include Danish seine fishery, and pole and line fishery.

Table 2. Number of Fishing Boats by Fishing Gear

Type of fishing gear	1975	1975	1977	1978	1979
Payang	95	97	102	98	101
Gill-net	133	143	164	164	166
Small-Gill-net	45	39	36	34	34
Danish seine	24	24	25	21	22
Lift nets	14	11	27	36	49
Other Pole and line	126	124	142	140	142
Total	437	438	496	493	514

## (2) Operational Condition

Up to 1965, coastal fishery by 1 - 2 ton small fishing boats was conducted to supply fish to local areas. After introduction of out-board engines in that year, the area's fishery made a rapid development. For example, gill-net fishery now holding a large share in the area's fisheries production was started in 1965, and has developed rapidly to use fishing boats with a tonnage of 3 - 5 tons. Payang, the traditional fishing method followed since before the

country gained independence, has also developed to use fishing boats of the similar size after 1965.

(a) Payang Fishery

Payang fishery holds the top place in the area's fisheries production. In 1979 it recorded a catch of 1,609 tons, accounting for as large as 46% of the area's total fish catch.



Photo 1. Salted dried fish at a fish store

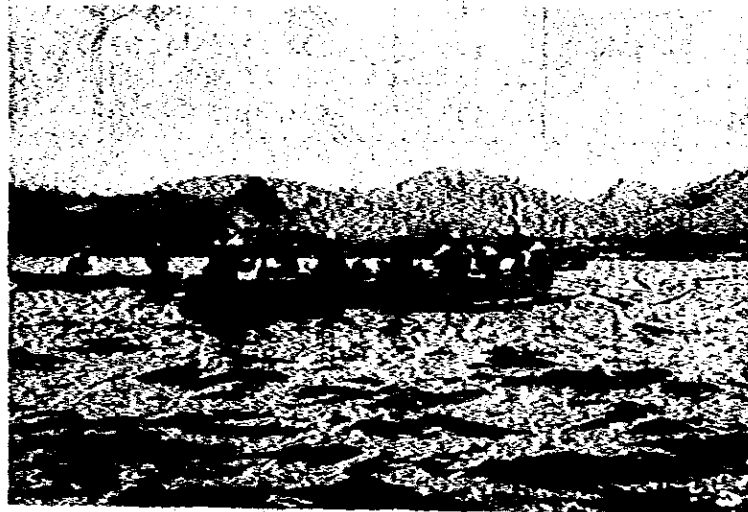


Photo 2. A line and pole fishing boat operating in Pelabuhan Ratu Bay

Main fish species caught by the Payang fishery are pelagic fish such as horse mackerel, mackerel and sardine. The major fishing season lasts for three months from July to September, but the Payang fishery can be operated through the year. In this major fishing season which coincides with the dry season, the fishing efficiency increases because fish schools approach the coast of Pelabuhan Ratu Bay due to the decreased inflow of inland water and the resultant rise of salinity. Two to three fishing operations are made a day in this period, but a single operation for a day's trip is made in the rest of the year. Fishing boats sail early in the morning and return by about 2 o'clock in the afternoon. On arriving at the fishing ground located at a distance of 2 - 4 km from the coast, each fishing boat repeats net casting and hauling 5 to 8 times, and gains a catch of 30 - 60 kg per operation. The Payang fishing boat has a crew of 20 men, composed mainly of young fishermen. Due to the total absence of mooring facilities, the fishing boats returning from the fishing ground stay afloat in the foreshore area at a point some several tens of meters from the fish market or the coast of fishing village, and the catch is landed by manual labor across the said distance using fish baskets with a handle which are carried in the sea to the coast. In the course of this landing work, the outboard engine (40 HP x 1) is dismantled from each fishing boat and placed in the warehouse in the fishing village. Guards are placed at the door of this warehouse at night, but some fishermen keep their engines in their own houses. When the major or favorable fishing season is over, some Payang fishing boats engage in trap fishery besides Payang fishery.

(b) Gill-net Fishery

The gill-net fishery in the area, developed after outboard engines were introduced in 1965, was initiated by introducing the necessary techniques from the advanced fishing areas on the Java Sea coast of West Java and from Cirebon. Its development has been so rapid that it is about to outstrip the Payang fishery. Since the catch of gill-net fishery includes fish

with a high market price such as skipjack and tuna, its operation is profitable and there has been observed an increasing number of fishing boats engaged in this fishery. In 1979 the gill-net fishery recorded a catch of 1,294 tons, the second largest catch after the Payang fishery, accounting for 37% of the area's total fish catch.

Since the gill-net fishery is a light fishing conducted at night using fish gathering lamps, its operation on moonlight nights is not possible. Hence, the number of its operational days is limited to an average of 20 days a month. The catch reaches its peak twice a year, the first peak in the major fishing season (June to July) and the second in the favorable fishing season (September to October). The gill-net fishing boats sail out at about 2 o'clock in the afternoon, perform 2 - 3 net casting and hauling operations during the night, and return by 8 - 9 o'clock in the next morning. On returning from the fishing ground, they stay afloat at sea and land the catch by manual labor just as in the Payang fishery. The average catch per boat is about 200 kg per operation.

Most of the gill-net fishing boats have a tonnage of 3 tons and they numbered 166 in 1979. Since there are 34 smaller boats, there are a total of 200 gill-net fishing boats, and this accounts for the largest portion (39%) of all fishing boats in the area.

The gill-net fishing boat has a crew of 18 - 20 men just as the Payang fishing boat. The main gill-net fishing ground is found within a distance of 60 miles from Pelabuhan Ratu. In the monsoon season, Cilangkahan on the west of Pelabuhan Ratu or Genteng on the east is used as the base of operation in the fishing grounds farther than 60 miles from the coast to avoid the danger of passing the breaker zone to reach the coast of Pelabuhan Ratu.

(c) Other Types of Fishery

In addition to the Payang and gill-net fishery mentioned above, there are other types of fishery conducted in the Pelabuhan

Ratu area such as Danish seine fishery, lift net fishery, pole and line fishery, and Bagang fishery (blanket net fishing by houseboats)

The Danish seine fishery is operated by about 20 row boats (canoes with floats) each having a crew of 2 - 3 men to catch shrimps from estuary deposits. The annual catch by this fishing operation ranges from 50 to 100 tons (incl. other fish species than shrimps).

The lift net fishery is operated in the shallow waters in the eastern sea area mainly by small non-powered boats which numbered 49 in 1979. The lift net fishing boats have increased most sharply over the past years, gaining a catch of 315 tons in 1979. This was the third largest catch recorded in the area in that year.

The pole and line fishery is operated by the largest number of non-powered small boats, totalling 162. In certain periods of the year, the pole and line fishing boats use haul nets and longlines. However, they are usually engaged in pole and line fishing to catch relatively high-priced fish such as hairtail, seerfish and mackerel tuna in the area less than 400 - 1,000 m from the coast where the depth ranges from 10 - 20 m to 70 - 100 m and the bottom slope is steep. The catch has increased in recent years by the use of new gear exhibiting a high fishing efficiency, and the fishing boats are equipped with a sail that produces a sailing speed of 3 - 4 knots.

Most of fishing boats engaged in other types of fishery sail out in the morning and return by 2 or 4 o'clock in the afternoon. Since they are small non-powered boats, they refrain from sailing out fishing in the monsoon season and when the strong southwest wind forms a breaker zone near the coast.

Table 3. Monthly Catch Landed in Pelabuhan Ratu

Unit: Ton

Months	1975	1976	1977	1978	1979
January	9	10	24	78	46
February	26	19	38	38	113
March	27	14	26	140	57
April	25	105	55	110	150
May	23	97	109	99	487
June	38	174	103	67	305
July	36	263	631	122	472
August	105	275	556	112	804
September	35	188	542	103	385
October	13	98	1,193	347	287
November	6	11	518	266	281
December	6	50	220	130	112
Total	349	1,364	4,015	1,620	3,499

## (3) Trends of Fishing Boats

In 1979 the Pelabuhan Ratu area had a total of 514 fishing boats, of which 282 were powered boats and 232 were non-powered ones. Thus, the percentage of powered boats in the area is about 55%, which is far higher than the national average of less than 10%.

Increase of powered boats has been prompted because the area's fishery is operated not in an inner sea area like the Java Sea but in the outer sea area where waves are high and a strong tidal current flows in certain places.

In 1975 the number of fishing boats in the area was 437, and this was augmented by as many as 77 boats (54 powered boats and 23 non-powered ones) by 1979. This is a good evidence to show the enthusiasm of the area's fishermen for fisheries development. It also deserves attention that in 1978 and subsequent years, fishing boats equipped with an inboard engine appeared in addition to those having an out-board engine, numbering 6 in 1979. In general, the fishing boats in the area show a tendency to become greater in size and tonnage.



Table 4. Number of Fishing Boats in Pelabuhan Ratu

	1975	1976	1977	1978	1979
Inboard Motor	-	-	-	4	6
Outboard Motor	228	240	276	274	276
Subtotal	228	240	276	278	282
Non-powered	209	198	220	215	232
Total	437	438	496	493	514

seen by the type of fishery, gill-net fishing boats are the largest in number, followed by pole and line fishing boats, Payang fishing boats and lift net fishing boats in this order. The number of lift net fishing boats increased by 35, or 3.5 times, between 1975 and 1979. In the same period, the number of gill-net fishing boats also recorded a marked increase of 35, or 24.8%. Pole and line fishing boats have likewise been on the increase. On the other hand, small gill-net fishing boats and Danish seine fishing boats are on the slight downward trend.

All fishing boats are locally constructed, but the shipbuilders are invited from Cirebon. Construction of a boat with a tonnage of 3 - 5 tons, which takes place in the open space on the coast, is completed in 20 - 30 days using planks and boards produced by sawing up logs obtained in the neighborhood of the area. The fishing boats built in the area have a rather short life span of about three years because they are manufactured with softwood except for the keelbocks and also because they are exposed to the action of drifting sand and waves while staying afloat in the foreshore area for berthing. They are pulled up on the shore only in the monsoon season. In this period, they are either drawn up by manual labor to dunes or similar high-rising places free from the runup of waves or moored in small rivers near the fish market.

Construction of a fishing boat calls for the approval of the Directorate General of Fisheries and the Regional Fisheries Office of the Provincial Government. The maximum boat length approved in the region is less than 20 m. Under the existing fund accommodation

system, loans are offered to cover a maximum of 75% of the construction cost. The construction cost of a wooden fishing boat of 3 - 4 ton class (hull only) is approximately Rp. 750,000.

(4) Utilization and Shipment of Fisheries Products

(a) Utilization of Fisheries Products

Transportation of fisheries products to distant places has now been made possible by the recent improvement of the national road networks, and the people's intake of animal protein has been on the increase with the improvement of national life. Nevertheless, domestic consumption of fisheries products is still limited to primary processed products such as salted fish, salted dried fish, and unsalted dried fish. Consumption of fresh fish is extremely small especially in inland areas.

However, supply of fresh fish to major cities of Java island such as Jakarta, Bandung and Semarang has increased notably in recent years due to introduction of cold storage facilities and insulated cars. In these cities, therefore, consumption of fresh fish shows a tendency to increase.

As regards fisheries products utilization in the Pelabuhan Ratu area, 29% (1,028 tons) of the total catch was supplied as fresh fish and the remaining 42% was sent to processing plants in 1979. Fish are fully utilized in the area, hardly used as fertilizer even if small in size or quantity. Poultry consumption used to surpass fish consumption in the area, but recent years have seen growing consumption of fish and augmented dependence on fisheries products in the people's dietary life.

Table 5. Volume of Processed Fish

Unit: Ton

	1975	1976	1977	1978	1979
Fresh Fish	148	451	1,401	273	1,028
Salted Boiled Fish	130	412	1,317	458	1,349
Salted Dried Fish	22	85	242	120	107
Total	300	948	2,960	851	2,484

(b) Shipment of Fisheries Products

The fish catch is carried in fish baskets from each fishing boat in the foreshore area directly into the fish market opened in 1966 near the fish landing place. An active auction sale takes place in the market from early in the morning, selling the catch of gill-net fishery mostly in the morning and that of Payang fishery in the afternoon.

Small size fishes are not weighed but piled up for auction sale. There are about 20 inside brokerage houses in the market, each engaged in retail business in its partitioned space. Fish to be supplied to outside consuming areas are put in boxes, some packed with ice, either inside or outside the market, or salted outside the market, and then carried by small trucks.

In 1979 shipment to outside area recrooded 515 tons for fresh fish, 489 tons for salted fish, and 10 tons for salted dried fish. Jakarta is the main destination of fresh fish, but they are also shipped to other cities such as Bandung, Sukabumi and Bogor. There is a tendency to ship a greater volume of fish to Jakarta than to other cities because the fish market in that city pays for it in cash while those in other cities pay by bill.

The fish market in Pelabuhan Ratu collects a comission equivalent to 5% of the highest bid price to cover the auction expenses, expenses for repair of market facilities and reserve fund, and pays about 0.5% of the comission to the central and provincial governments. This comission charging system was initiated in 1975.

(5) Livelihood and Income Level of Fishermen's Households

Most of the fishing clusters in Pelabuhan Ratu used to be situated in the coastal area near the fish market. From these clusters, 200 households moved to the fishermen's houses built at public cost as a part of the area's development program in the eastern coastal area about 3 km from the former clusters. The fishermen living in these houses commute to the fishing base near the fish market every day

and sail out fishing. These houses, numbering 100 and now accommodating a total of 840 persons, were built in 1976 and each house is partitioned for occupation by two households. Built at a total cost of Rp. 100 million, they are offered free to the fishermen. The average monthly income of 6-member fishermen's households in the area is about Rp. 50 thousand. The team was informed that the fishermen in the area enjoy a higher income level than those engaged in other occupations including agriculture and forestry, and there are many having the intention to engage in fishery. Their wages are paid in cash every day on a percentage basis. Specifically, the lot brokerage is deducted from the daily proceeds and 50% of the remainder is distributed among the fishermen. The captain receives twice the wages of fisherman.

(6) Fishery in Surrounding Areas

At a distance of about 15 km to the west of Pelabuhan Ratu is located Cisolok fishing village. A fishing cluster with about 400 households is also found along the coast at a distance of about 800 from the trunk road. This cluster is included in the Cisolok Sub-District in the administrative division.

As in the case of Pelabuhan Ratu, the bayhead is used as basin in these villages and an annual catch of 300 - 500 tons is attained by Payang fishery and gill-net fishery operated by 63 powered fishing boats (outboard engine) and about 20 non-powered fishing boats. The Cisolok fishing area has about 1,600 fishermen and a public fish market opened in 1975 (approx. 40 m<sup>2</sup>) where auction sales are conducted. However, about 30% of the fishing boats of this area go directly to Pelabuhan Ratu to land their catch because the bid price is higher in Pelabuhan Ratu than in Cisolok. The number of such fishing boats shows a tendency to increase. The method of fishing operations shows no differences between this area and pelabuhan Ratu.



Photo 3. Landing of Catch from Fishing Boats (Pelabuhan Ratu)

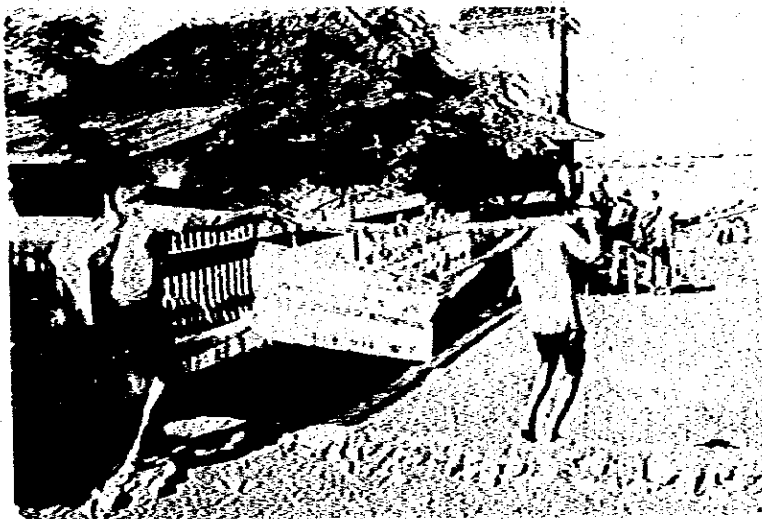


Photo 4. Transportation of an Ice Block on a Yoke (Pelabuhan Ratu)



Photo 5. Fishing Boats in Foreshore Area for Landing Catch (Pelabuhan Ratu)

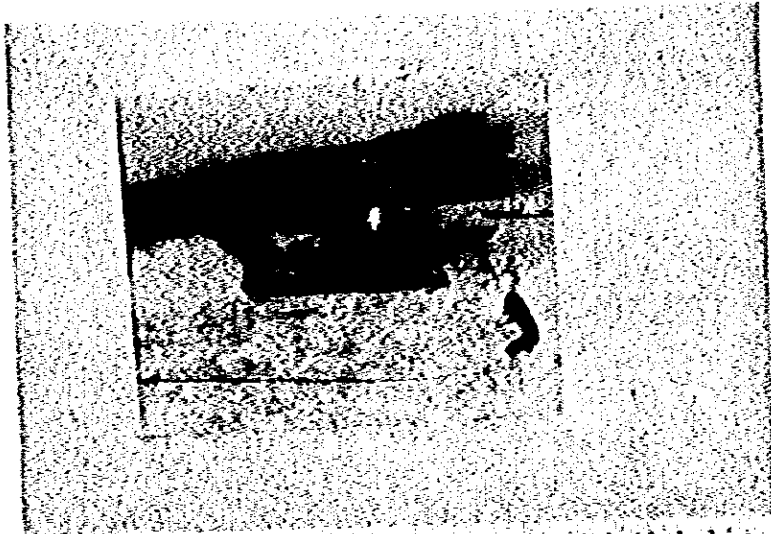


Photo 6. Landing of Catch when Waves are High (Pelabuhan Ratu - Reprinted from a Photo at Regional Fisheries Office)

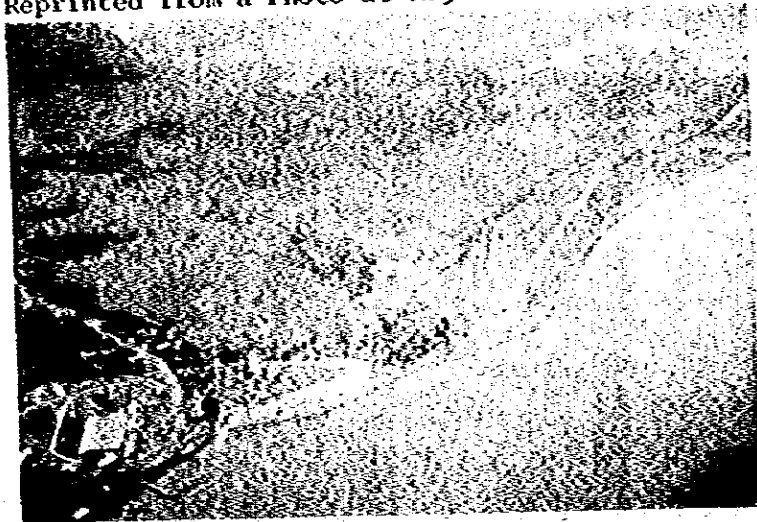


Photo 7. Proposed Construction Site of Pelabuhan Ratu Fishing Port



Photo 8. Fishermen's Houses (Pelabuhan Ratu)



Photo 9. Fish market in Pelabuhan Ratu



Photo. 10 Transportation of Fish Catch (Relabuhan Ratu)

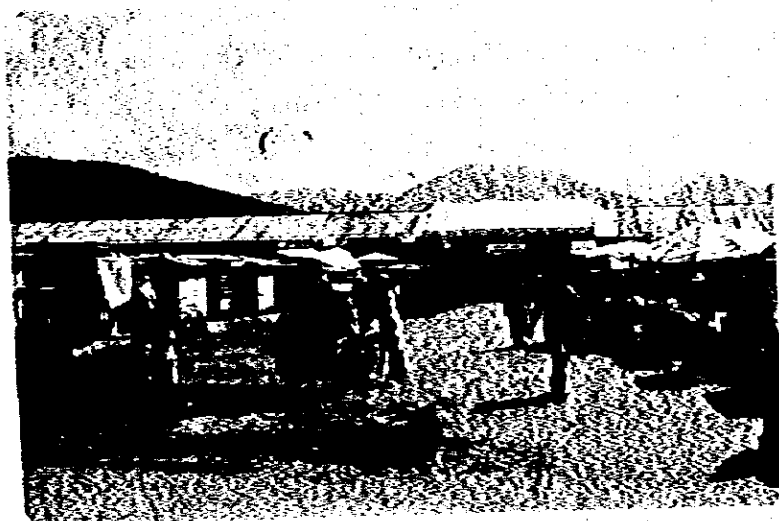


Photo. 11 Market Place in Front of Pelabuhan Ratu Fish Market

## 1-2 Problems in Fishery in Pelabuhan Ratu, and Necessity of Fishing Port Development

Pelabuhan Ratu, located on the south coast of West Java, is known as the most active fishing area on the said coast. Although agriculture and forestry are operated in the area, fisheries production holds a dominant place in terms of contribution to the area's economy. In the open space in front of the northern side of the fish market, a bus terminal is found and some 80 stores stand side by side forming a busy bazar open every day, attracting many people including those entering and leaving the fish market. The plaza is filled with an animated atmosphere which makes it the center of the area. All this is assignable to the vigorous fisheries production which bears, either directly or indirectly, upon the economy, industries and people's livelihood in the area. Thus, fishery plays a very important role in the area and its promotion calls for enforcement of two fundamental measures.

First, improvement must be effected to the present pattern of fishing operation in which the foreshore area is used as mooring basin for landing fish catch and for idle berthing as well as to the present method of handling fish catch. Second, the operation rate (number of fishing operations, etc.) should be increased for improved productivity, and this in turn calls for construction of all necessary facilities as well as for fostering of fisheries cooperative associations, technical training of fishermen, and introduction of some advanced fishing gear and equipment.

As described already, the fishing boats of the area engage in fishing operation in the outer sea area. Returning from the fishing grounds in the outer sea, they are moored at sea in the foreshore area to land the fish catch, fishing gear and outboard engines all by manual labor. Thus, the landing work is performed in an extremely inefficient manner. When moored at sea, the fishing boats are exposed to the waves beating upon the shore, which causes constant pitching and rolling and quick damage of the hull. In addition, the mooring ropes are often entangled, causing an extreme danger in maneuvering the boats when sailing out or returning. Despite such poor operational condition and working environment, Pelabuhan Ratu has many fishing boats and a large number of fishermen, and the



annual catch amounts to as much as 3,000 - 4,000 tons. This is ascribable to the presence of excellent fishing grounds in the coastal and offshore areas which are favored with frequent migration of fish schools. However, due to the absence of well-equipped fishing port facilities which are the basis for augmented fisheries production, the fishery in the area is placed under a heavy disadvantage in terms of fisheries productivity, fisheries management and fishermen's working condition, although it is blessed with abundant marine resources. Thus, further development of the area's fishery is made difficult by the adversity of conditions facing it at present.

Under its regional development program mapped out for Pelabuhan Ratu and surrounding areas, the Provincial Government of West Java is planning to develop the scenic western area into a recreational zone, the central area Pelabuhan Ratu into an advanced fishing district, and the eastern area into a mining district by taking advantage of the abundant availability of iron sand and silica in that area.

Of a number of plans envisaged by the said program, the fisheries development in Pelabuhan Ratu is most opportune and also has a greater possibility of materialization than the tourist or mining industry development. However, its successful implementation presupposes the construction of a fishing port which is an essential prerequisite to augmented fisheries production.

Pelabuhan Ratu has many factors demanding the construction of a fishing port. The new fishing port, if constructed, will undoubtedly elevate the position of fishery in the area's economy. It will promote the area's fisheries development and become an important base for supplying fresh fish to West and Central Java. Development of fish processing facilities and fish market in the neighborhood of the new port will provide increased employment opportunities, thus serving to improve the income level of local inhabitants. In addition, when cold storage facilities, ice making plants, and other associated facilities are constructed in parallel with the expansion of fisheries production made possible by the new port construction, it will become possible to supply fish on a constant basis to Jakarta where the demand for fisheries products is growing rapidly due to extreme population concentration. In other words, a fishing port constructed in the area will serve as an important supporting station in

West Java for the Jakarta Fishing Port/Fish Market Development Project, and will also play, together with Tegal and Pekalongan, an important role in promoting the national fisheries development scheme and in stabilizing the nation-wide supply of fisheries products.

## 2. Pelabuhan Ratu Fishing Port Development Plan

### 2-1 Fundamental Approach

The Pelabuhan Ratu Fishing Port Development Plan will be formulated along the following basic lines on the basis of the survey results introduced in Section 1.

#### (1) Basic Policy for Development

The new port will be planned as a fishing port capable of accommodating main powered fishing boats of Pelabuhan Ratu area (including those equipped with an outboard engine) engaged in coastal and offshore fishery as well as those of surrounding areas engaged in the same kinds of fishery and currently landing or moored at Pelabuhan Ratu. Non-powered boats will therefore be moored in the foreshore areas or rivers as at present. However, the fish handling yard and cold storage facilities will have a capacity for handling the total catch of the area. Due consideration will be given to conservation of natural environment at the construction site and in the neighboring areas.

#### (2) Scope of Development Work

The development work will be limited to basic facilities such as breakwaters and wharves whose construction is difficult on the commercial basis, functional facilities such as fish handling yard and cold storage facilities which are essential to a fishing port and can be run on a commercial basis, and other associated facilities including port staff's houses, etc.

#### (3) Level of Development Work

All facilities required for quick landing, handling and freshness preservation of the catch will be constructed. Breakwaters will also be constructed in order for the fishing boats to be able to sail out and return without crossing the dangerous breaker zone, so that the number of operational days will be increased and all boats can be moored within the port area when the sea is rough.

#### (4) Target Completion Year

The plan will be formulated on the basis of the data collected in 1979 for completion of the port in 1984.

#### 2-2 Target Fisheries Figures

Formulation of the development plan calls for determination of fisheries figures such as the number of fishing boats, fishermen, etc. in the target year (1984). These target figures, shown in Table 6, were determined along the lines described below.

##### (1) Number of Fishing Boats

In 1979 there were a total of 514 fishing boats in Pelabuhan Ratu, of which 6 were equipped with an diesel engine, 276 were equipped with an outboard engine, and 232 were non-powered boats.

The new port development will promote conversion from outboard engine to diesel engine and from non-powered boats to powered boats with an outboard engine. However, it is not considered that there will be any phenomenal increase in the number or tonnage of fishing boats because of the Government's fisheries control and the restraints imposed by the distribution mechanism.

Seen by the type of fishery, there are 166 fishing boats engaged in gill-net fishery at present, of which 6 are equipped with a diesel engine. In the target year, the said total of 166 boats is estimated to increase by 25% to 210 boats, 150 of them having a diesel engine and 60 equipped with an outboard engine.

Seine net fishery is now operated by a total of 101 boats with an outboard engine. It is estimated that this will increase by 20% to 120 boats, and 70 of them will be equipped with a diesel engine.

Small gill-net fishery is now operated by 15 boats with an outboard engine and 19 non-powered boats. It is considered that small gill-net fishery will gradually give place to gill-net fishery and the number of boats with an outboard engine will increase to 20 in the target year.

As regards Dogol, Bayan and Pancing fishery, the increase of fishing boats is estimated to be negligible on the basis of past trends, and

it is considered that about one third of the boats engaged in these fishing operations will be equipped with an outboard engine in the target year.

(2) Fish Catch

The fishing port development is expected to give rise to the operation of fishing boats with greater tonnage and higher performance and to increased number of fishing operations. Hence, it is estimated that the present annual catch of 2,600 tons will increase to 5,000 tons, or 60 tons a day. However, the present component ratio of catch by type of fishery is expected to remain the same as at present and will therefore be used in mapping out the plan.

As regards distribution of catch, it is expected that shipment of fresh fish to Jakarta and Bandung will be increased with the improvement of ice making and cold storage facilities.

(3) Number of Fishermen

The number of fishermen is estimated to increase from the present total of 4,700 to about 5,400 in proportion to the increase of fishing boats.

Table 6. Target Figures

Item	Gill Net fishery	Seine Net Fishery	Another Fishery (Dogol, Bayan, Pancing)	Total	Remarks
No. of Fishing Boat	inboard 150	inboard 70	outboard 75	inboard 220	* These boats are assumed to use natural beach or rivers.
	outboard 60	outboard 50	non-powered 155	outboard 205	
	(Small Gill Net)	120	230*	non-powered 155	
	outboard 20			580	
	230				
Fish Catch per Year	2,400 t/year	2,400 t/year	200 t/year	5,000 t/year	
Standard Fish Catch per Day				60 t/day	
Distribution of Fish Catch	For Processing	2,500 t/Year			
	For Fresh Fish	2,500 t/Year			
Fisherman		5,400 Persons			

## 2-3 Natural Conditions In Pelabuhan Ratu

### (1) Topography and Geology

Pelabuhan Ratu Bay, indenting the south coast of Java at about 7° S lat and 106° 30' E long, faces the southwest.

In its hinterland are found mountains thickly covered with trees and rising to a height of 350 to 700 m. Except in Pelabuhan Ratu, Tjidadap, Tjimaja and Balekambang, the piedmont of these mountains stretches close to the coastline with a steep slope. Due to this topography, flatland of any sizable size is not found along the coast except in the said four areas and a few other districts.

The bay is considerably deep. The depth ranges from 200 to 300 m at a distance of several kilometers from the coast. It is as large as 600 m at the center of the bay, and reaches 2,000 m in the farther offing. There is a submarine valley cutting deep into the bay close to the coast of Pelabuhan Ratu. The water depth along the coast therefore increases sharply near this valley. (Figs. 2 and 3)

Reefs are found sporadically along the coastline. Pelabuhan Ratu is an alluvial plain formed in the estuary of the Ciparabuan river having a width of about 20 m. From the results of field survey and other data, it is estimated that the surface layer in the neighborhood of the estuary is a sand layer with a thickness of 1.0 - 1.5 m, underlain by a soft rock layer.



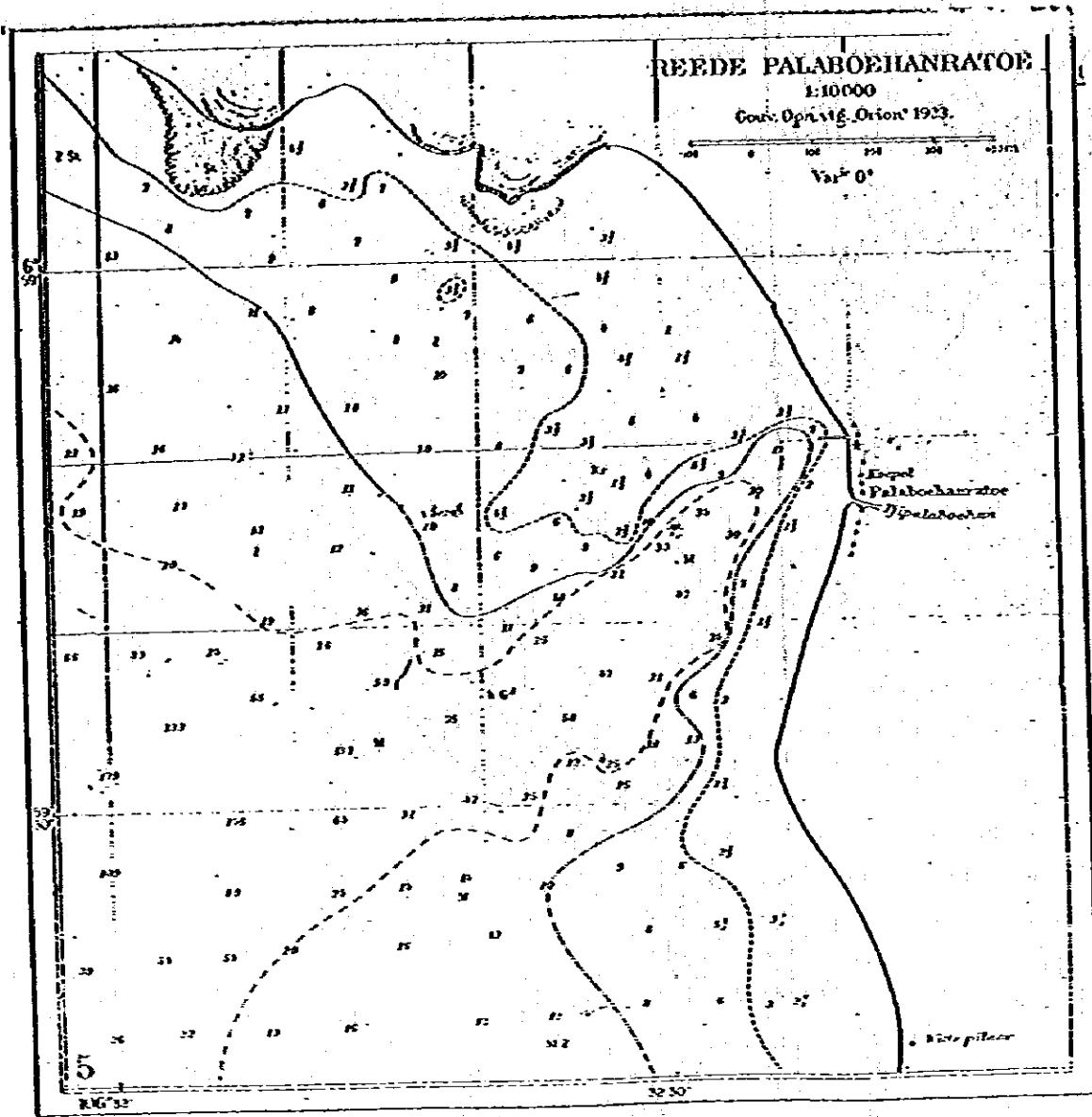


Fig. 3 Map of Pelabuhan Rau Bay



(2) Marine Phenomena

On the south coast of Java, both swells and wind waves prevail in S - SE direction. In December and January, however, they prevail in W direction.

Pelabuhan Ratu Bay is sheltered by the peninsula projecting with Genteng Point at the tip from S - E waves and by Java island from NW waves. Hence, waves propagating into the bay are considerably milder than those beating upon the south coast of Java which is exposed to the open sea.

The waves in the bay are influenced dominantly by swells rather than by wind waves. Due to the above-mentioned topography, the direction of the swells is limited to SSW - WSW. Since the central part of the bay is considerably deep, deepwater waves from the outer sea propagate close to the coast. The height of the deepwater waves as estimated from the observation data in Area shown in "Ocean Wave Statistics" and from the distribution of maximum wave height indicated in "АТЛАС ОКЕАНОВ АТЛАНТИЧЕСКИЙ И ИНДИЙСКИЙ ОКЕАНЫ," is  $H_{1/3} = 4$  m.

(c.f.)  $H_{1/3}$ : Significant Wave Height

Due to the complex submarine topography mentioned already, it is considered that the wave variability is considerably large near the breaker zone, and this must be taken into careful consideration in the design of breakwaters near Pelabuhan Ratu and the estuary of the Tjimandiri.

Details of tidal level are not known due to the lack of data. However, Based on the data of Genteng Bay (106° 24' Long. E, 7° 24' Lat. S) where MHW is observed to be 1.5 m, and from the interviews with local fishermen in Pelabuhan Ratu, HWL is estimated to be +2.0 m.

The sand spit lying in the estuary of the Ciparabuan river has a width of about 40 - 50 m, an elevation of +1.5 - 2.0 m, and a length of 150 - 200 m. This sand spit is subject to heavy seasonal fluctuations, and its shoreline makes a move of as long as 20 m in the monsoon season. The team learned that its central part, covered

with a 1.5 - 2.0 m thick sand layer, occasionally shows outcrops of rocks, and the foreshore near the jetty and in its northern part makes a change of more than 1 m in height by season. This indicates littoral drift on the coast is quite active. The estimated main supply source of littoral drift is the Tjimandiri river emptying into the bay at a distance of 4 km to the south of Pelabuhan Ratu.

#### 2-4 Selection of Construction Site

Considering the coastline configuration and beach topography, two sites can be conceived of for construction of the fishing port, Pelabuhan Ratu and the neighborhood of Tjidap.

In the neighborhood of Tjidap, wave convergence occurs due to the submarine topography. In addition, the Tjimandiri river emptying into the bay at Tjidap is a considerably large river transporting a large amount of sediment. Because of the inflow of this river into the bay and wave interference, it is difficult to secure a safe fairway in this area.

Pelabuhan Ratu, on the other hand, has a submarine valley cutting through the bay close to its coast, so that waves are likely to present complex conditions. For construction of the fishing port, however, Pelabuhan Ratu is considered better suited than the neighborhood of Tjidap for the following reasons.

- (1) Fishing boats sailing from Pelabuhan Ratu are the largest in number in the whole bay.
- (2) Its hinterland has a flatland area.
- (3) The transport route to Jakarta, the largest consuming area, is secured.
- (4) Its hinterland embraces the largest town and fishing villages in the whole coastal area.
- (5) It has long functioned as a fish landing and distribution base.
- (6) The river flowing into the bay near Pelabuhan Ratu is small and does not present any large obstacle to the fishing port planning.

- (7) Its topography makes it one of the areas exposed to relatively mild incoming waves in the bay.
- (8) There is little likelihood of the port area being sited up with littoral drift transported by the Tjimandiri river, and it is relatively easy to take effective measures against littoral drift.
- (9) It is possible to select a suitable location of port entrance through which fishing boats can sail out and back without crossing the breaker zone.
- (10) Expansion of the port in the future is possible.
- (11) It occupies an important point in the road network so that transportation of construction machinery and materials involves no difficulty.

#### 2-5 Port Facilities and Level of Development

Port facilities for ensuring safe and rational fishing operation, smooth landing and distribution of fish catch, and improved welfare of fishermen are shown below in Table 7 together with the required level of their development.

Table 7. Port Facilities and Required Level of Development

Facilities	Required Level of Development
<p>1. Basic facilities</p> <p>Breakwater (incl. lighthouse)</p> <p>Basin</p>	<ul style="list-style-type: none"> <li>◦ Fishing boats can be moored safely during rough weather (Required degree of sheltering can be secured).</li> <li>◦ Both location and design of the port entrance permit smooth entrance and sailing of fishing boats.</li> <li>◦ Silting up due to littoral drift can be prevented.</li> <li>◦ Required area for mooring and maneuvering fishing boats is secured.</li> </ul>

<p>Shed</p> <p>Slipway</p>	<ul style="list-style-type: none"> <li>◦ Required water depth (full draft + 0.5 m) is secured.</li> <li>◦ A length required for the exclusive purpose of landing, fuel and water supply, and rest is secured.</li> <li>◦ Required water depth (full draft + 0.5 m) is secured.</li> <li>◦ Both size and structure are such that simple repairs of fishing boats can made.</li> </ul>
<p>2. Functional facilities</p> <p>Fish handling/selling facilities</p> <p>Cold storage facilities</p> <p>Ice making and storage facilities</p> <p>Oil supply facilities</p> <p>Fishing gear warehouse</p>	<ul style="list-style-type: none"> <li>◦ Selection, boxing, auction sale and transportation of fish can be done with ease in the major fishing season.</li> <li>◦ Water supply facilities, officer's office, sewage treatment plant, and all other associated facilities are provided.</li> <li>◦ Capacity for storing fish temporarily to maintain their freshness is secured.</li> <li>◦ Production capacity is large enough to provide ice to be loaded on fishing boats and supply to fish handling/selling places and trucks.</li> <li>◦ Storage capacity is large enough to ensure stable ice supply and meet any changes in ice consumption.</li> <li>◦ Oil tank and associated facilities for ensuring stable fuel supply at low cost are provided.</li> <li>◦ A space large enough for safe storage of fishing gear including fishing nets is secured.</li> </ul>

Fishing boat repairing facilities	<ul style="list-style-type: none"> <li>◦ Facilities required for simple repairs and inspection of fishing boats are installed.</li> </ul>
Water supply facilities	<ul style="list-style-type: none"> <li>◦ Water supply sufficient in both volume and quality to cover the demand in the whole port area is secured.</li> </ul>
Power generation facilities	<ul style="list-style-type: none"> <li>◦ Output is large enough to cover the power demand in the whole port area.</li> </ul>
Sewage disposal facilities	<ul style="list-style-type: none"> <li>◦ Treatment capacity is large enough to dispose of waste water generated by the activities in the port area.</li> </ul>
Welfare facilities	<ul style="list-style-type: none"> <li>◦ Facilities for improving the environment in the port area such as parks, green zones, rest houses, fishermen's welfare house and illumination are provided.</li> </ul>
Port management facilities	<ul style="list-style-type: none"> <li>◦ Facilities for managing the port. They include officer's houses.</li> </ul>
Road	<ul style="list-style-type: none"> <li>◦ Roads with a length and width large enough for ensuring smooth transportation within the port area and smooth linkage with trunk roads and fishing villages are provided.</li> </ul>
Parking areas	<ul style="list-style-type: none"> <li>◦ A space large enough for accommodating vehicles gathering at the port is secured.</li> </ul>
3. Open space	<ul style="list-style-type: none"> <li>◦ In addition to the space required for the above-mentioned facilities, a sufficient land space to be used for open-air storage and drying is secured.</li> </ul>

## 2-6 Estimated Quantity and Unit Cost of Facilities

Table 8 shows the estimated quantity, size and unit cost of each of the facilities listed in Table 7.

In the present survey, the cost estimation was made for studying the suitability of the planned fishing port development. Hence, the unit cost shown in Table 8 was first calculated on the basis of the standard construction cost in Japan and then corrected according to the situation in Indonesia.

In selecting the standard structure of the port facilities, it was assumed that they could be built on compact sand ground or bedrock on the basis of the field survey, and consideration was given to the natural conditions and availability of construction machinery, materials and skilled workers so as to minimize the requirement for special machinery, materials and techniques.

In the feasibility study, therefore, it is advisable that the structure of each facility be improved to a more adequate one after a detailed study of the natural conditions and the possible utilization patterns of each facility.

Table 8. Estimated Construction Cost

Name of Facility	Quantity	Unit	Rate	Total	Remarks
Breakwater (0 -3 m)	100	m	(1,000 yen) 1,700	(1,000 yen) 170,000	Average Design Wave Height: 3 m
(-3 -5 m)	30	m	3,200	96,000	" : 4 m
(-5 -10 m)	25	m	4,500	112,500	" : 4 m
(-10 -15 m)	15	m	7,500	112,500	" : 4 m
(Winding of top)	1	SUM	20,000	20,000	(Including the construction cost
			(Subtotal)	511,000	of lighthouses)
Seawall (for coast)	450	m	130	58,500	
(for Route)	110	m	500	55,000	
(for River)	380	m	130	49,400	
			(Subtotal)	162,900	
Route & Basin (Dredge)	(60,000) 120,000	(m <sup>2</sup> ) m <sup>3</sup>	7.5	900,000	Soft rock (-0.5 -2.5 m)
	(60,000) 120,000	(m <sup>2</sup> ) m <sup>3</sup>	1	120,000	Sand (+1.5 -0.5)
			(Subtotal)	1,020,000	
Wharf (-2.5 m)	870	m	450	391,500	
Slipways	1,200	m <sup>2</sup>	20	24,000	
Lighthouse	1	SUM		10,000	
Shed (Selling place)	1	SUM		80,000	
Cold storage, Ice-Making, Ice-storage	1	SUM		280,000	

Name of Facility	Quantity	Unit	Rate (1,000 yen)	Total (1,000 yen)	Remarks
Oil supply	1	SUM		15,000	
Electricity supply	1	SUM		10,000	
Water supply	1	SUM		15,000	
Crews welfare house	1	SUM		20,000	
Parking Area	1	SUM		15,000	
Road (width 15 m)	470	m	120	56,400	
(width 7 m)	800	m	56	44,800	
(width 5 m)	2,500	m	35	87,500	
			(Subtotal)	188,700	
Park	1	SUM		50,000	
House for Fishing Port Management officer	10	Houses	3,000	30,000	
Sewage-disposal plant	1	SUM		30,000	
Reclamation	120,000	m <sup>2</sup>	0.2	24,000	
				2,877,100	(3,974,000)



## 2-7 Preliminary Development Plan, and Cost Estimation

### (1) Plan

Fig. 4 shows the plan of the fishing port equipped with the required basic facilities as prepared with account taken of the natural conditions at the proposed construction site, hinterland transport conditions, and future expansion of the port. According to this plan, the port can be expanded within the area demarcated by the dotted line.

### (2) Layout

In planning the layout of the port facilities, attention was given to the following three points.

- 1) Safe entrance and sailing of fishing boats.
- 2) Smooth maneuvering of fishing boats within the port.
- 3) Smooth flow of goods and people in the port area.
- 4) Sufficient land space for each facility.

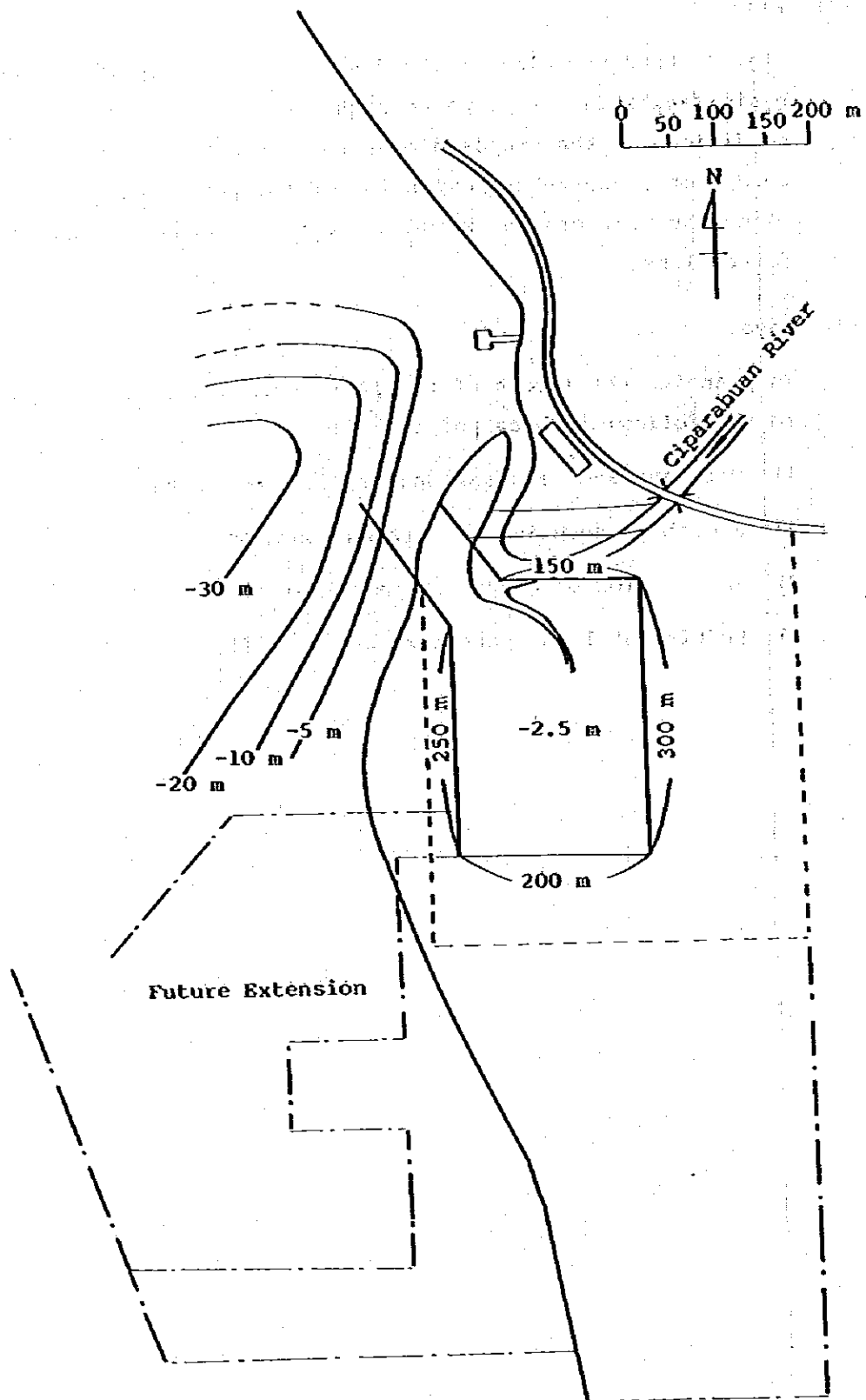


Fig. 4 Pelabuhan Ratu Fishing Port Plan

**PELABUHAN RATU FISHING PORT PLAN**

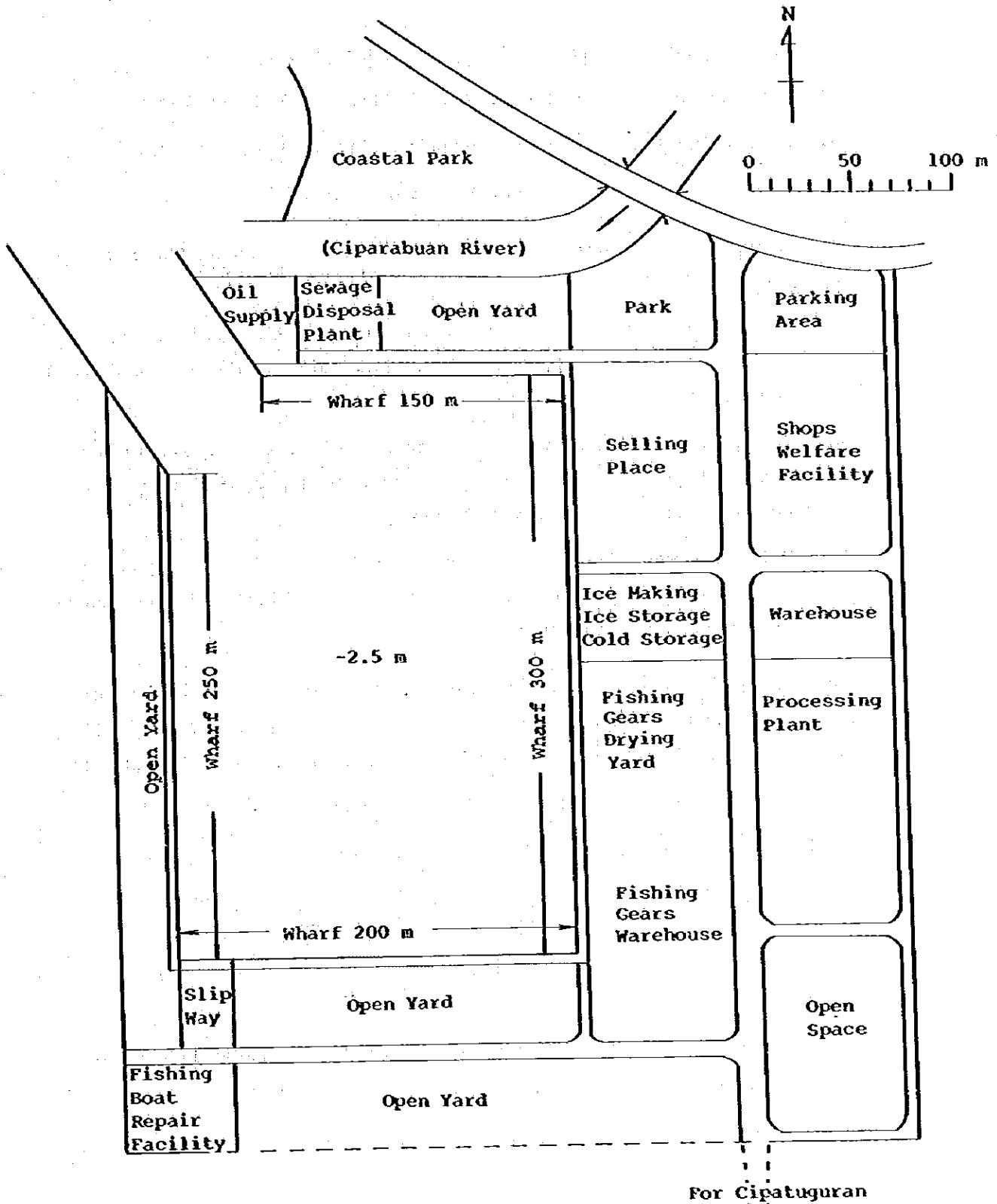


Fig. 5 Pelabuhan Ratu Fishing Port Plan

(3) Estimated Construction Cost and Construction Period

The construction cost estimated on the basis of the said plan is as follows.

1) Port facilities	7,193 mil. Rp. (¥2,877 mil.)
2) Contingencies	1,080 mil. Rp. (¥ 432 " ) (1) x 15%
3) Consulting fee	412 mil. Rp. (¥ 165 " ) [(1) + (2)] x 5%
<hr/>	
4) Total	8,685 mil. Rp. (¥3,474 mil.)

The above cost estimation was made with account taken of the following points.

- (a) Calculation had to be made on the basis of the preliminary survey of topography, water depth and soil conditions conducted within the limited period.
- (b) Design wave height was determined according to the existing meteorological data, using also the charts prepared 50 years ago and the results of field survey.
- (c) Unit cost was first determined according to the standard cost in Japan, and then corrected by the data collected in an interview survey in Indonesia.

Considering the accuracy of the survey, therefore, it is estimated that the construction cost will range from 7,500 mil. Rp. to 10,000 mil. Rp. (¥3,000 mil. to ¥4,000 mil.) (Base: 1979 commodity price).

The period required for completion of the port is as follows.

1) Feasibility study	1 year
2) Construction design	1
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3) Construction work	3
Total	5 years

In the cost estimation, it was assumed that the new port would have the following facilities.

**Civil engineering works:**

Breakwaters, rivetment, warehouse, spilway, embankment, mooring basin, port road, connecting road (fishermen's housing area - fishing port), parking area, open land space for port facilities.

**Buildings:**

Fishing handling/selling yard, ice making/storage facilities, cold storage facilities, fishermen's welfare facilities, port amangement and administration facilities.

**Others:**

Water/power/oil supply facilities, waste water disposal facilities, fishing boat repair facilities, parks and lighthouse.

**2-8 Estimation of Economic Effects Based on Preliminary Development Plan**

Construction of the fishing port in Pelabuhan Ratu will result in increased fisheries production, augmented operation rate, higher market price of fish ensuing from improved maintenance of freshness, and increased employment opportunities for labor force. It will also yield economic effects derived from the development of related industries such as fish processing, distribution and marketing.

In this section, however, direct benefits that can be expressed in numerical value are estimated, and interest on the construction cost and indirect benefits are excluded from the scope of estimation.

The Pelabuhan Ratu Fishing Port Development Plan is expected to yield the following annual economic effects when, as a result of its completion, both fish catch and fishing boats increase to some extent, outboard engines are replaced by inboard engines, fishing boats find it possible to sail out and back without passing the dangerous breaker zone, and landing work and preparations for fishing operations can be done smoothly.

- 1) Effect of augmented production due to increased number of operational days ..... Rp. 32,361,000

- 2) Effect of reduced fuel consumption due to introduction of inboard engines ..... Rp. 37,800,000
  - 3) Effect of extended life span of fishing boats ..... Rp. 15,600,000
  - 4) Effect of increasing employed labor force ..... Rp. 261,000,000
  - 5) Effect of fish price escalation due to improved maintenance of freshness ..... Rp. 170,000,000
  - 6) Effect of increase of fisheries income ..... Rp. 522,380,000
- Total ; Rp. 1,039,041,000 (Approx: Rp. 1,040 million = ¥415 million)

In the estimation of the above six effects, special care was taken so that they would be calculated independently without being added to other effects. Since there are more items of economic effects not listed above, it can be said that the actual total of economic effects is greater than given above. It is to be noted, however, that any economic benefit to be derived in the future must be reduced by applying a certain discount rate (interest rate) in order to obtain its present worth, and such calculation of present worth was not made in the above estimation.

With this taken into account and considering the accuracy of the survey, it may still be said that the construction of the new fishing port will yield an economic benefit amounting to a total of 750 mil. Rp. - 1,000 mil. Rp. (¥300 mil. - ¥400 mil.).

### 3. Conclusion and Cautions in Future Studies

#### 3-1 Conclusion

As a result of the present preliminary survey, the team reached the conclusion that the Pelabuhan Ratu Fishing Port Development Plan is a very significant project that deserves to be given further examination in a feasibility for reasons described below if so requested by the Indonesian Government.

- (1) By virtue of good fishing grounds and abundant marine resources available in the neighboring sea areas, fishing operation is performed nearly through the year.
- (2) Fisheries development potential is very high because of the presence of a large number of skilled fishermen who are positive and progressive in fishing operation.
- (3) Fishery is the most important industry in the Pelabuhan Ratu area, and plays the central role in regional development.
- (4) However, fishing port facilities are not available with the exception of a small fish handling shed. The fishermen are therefore exposed to considerable inconvenience and danger in their daily fishing operation.
- (5) Under the circumstances, investment for the fishing port development is certain to result in higher fishing efficiency, augmented production and improved freshness of fish catch, and will also promote replacement of outboard engines with inboard engines and the resultant qualitative changes in fishery including the improvement of patterns and methods of fishery.
- (6) The fishermen's income level and propensity to spend are very high, so that they can be expected to have great promotional impacts on regional economy. Fisheries development resulting from the fishing port construction will therefore provide increased employment opportunities not only for fishermen but also for those seeking jobs in commerce and other sectors.

- (7) Distribution routes to large consuming areas such as Jakarta and Bandung are already established. Hence, the new fishing port will function as an important supporting station of the Jakarta Fishing Port/Fish Market Project being under way with Japanese financial aid.
- (8) Thus, the fishing port development in Pelabuhan Ratu is expected to produce immense investment effects and promotional impacts and contribute largely to the development of less developed fishing areas on the southcoast of Java. Hence, its early implementation is desirable.
- (9) Judging from the estimated construction cost and economic benefits, the plan will have an immense value to national economy and will yield a great investment effect.

### 3-2 Basic Function of New Fishing Port, and Estimated Capital Input

The new fishing port should be developed as a base of coastal and off-shore fishery operated by powered fishing boats in Pelabuhan Ratu and surrounding fishing villages. Capital input required for its construction is estimated, as described already, at about 7,500 mil. Rp. - 10,000 mil. Rp. ( 3,000 mil. - 4,000 mil.) (Base: 1979 price).

### 3-3 Cautions in Future Studies (1)

#### 3-3-1 Coverage of Present Preliminary Survey

Since the present survey was a preliminary survey, its coverage was limited to the extent required to clear up the following basic questions.

- (1) Does the Pelabuhan Ratu area has a fishery development potential large enough to justify construction of a fishing port?
- (2) Is the construction of the fishing port possible from the viewpoint of natural conditions?
- (3) If answers to (1) and (2) are affirmative, where should the fishing port be constructed and in what scale?

Accordingly, formulation of the final construction plan should be preceded by a feasibility study and detailed survey. The present



preliminary survey produced sufficient data for judging the necessity and significance of the fishing port construction in Pelabuhan Ratu, but further detailed studies must be made to determine the scale of investment and to draw up a detailed development plan.

#### 3-4 Cautions in Future Studies (2)

If a feasibility study is conducted in the future, it should cover a number of survey items including fisheries as a whole, distribution and processing, cost analysis, natural conditions, port planning, structural design, and port management and administration.

As regards fisheries, it must be clarified what position in the Indonesian economy the new port will hold a key fish distribution base. Further, the port planning and design must be preceded by a detail survey of natural conditions such as waves, littoral drift, submarine topography, geology and river characteristics in order to assure that the construction work will be planned and executed with due regard to the influence on the surrounding natural environment.

It is advisable to conduct the feasibility study in the major fishing season, preferably in the July - September period when the relatively calm and the survey at sea can be carried out without difficulty. The survey of natural conditions should include a follow-up wave observation in December and January when highest waves are observed in Pelabuhan Ratu Bay.





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