


**INFRASTRUCTURE SURVEY REPORT**  
**FOR**  
**THE DEVELOPMENT OF THE FERROSILICON FACTORY**  
**IN THE REPUBLIC OF THE PHILIPPINES**

**JULY 1980**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

MPP

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# INFRASTRUCTURE SURVEY REPORT

FOR

## THE DEVELOPMENT OF THE FERROSILICON FACTORY

### IN THE REPUBLIC OF THE PHILIPPINES

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JULY 1980

JAPAN INTERNATIONAL COOPERATION AGENCY

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## PREFACE

The Japanese Government decided to conduct the survey on the development of infrastructure related to the Electro Alloys Corporation ferrosilicon plant and entrusted the Japan International Cooperation Agency (J.I.C.A.) with the survey. The J.I.C.A. sent to the Philippines a survey team headed by Mr. Hirosuke Takahashi from February 11 to March 16, 1980.

The team, in consultation with the officials concerned of the Government of the Philippines, conducted a field survey (in the Misamis Oriental Province area). After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of the Philippines for their close cooperation extended to the team.






July, 1980

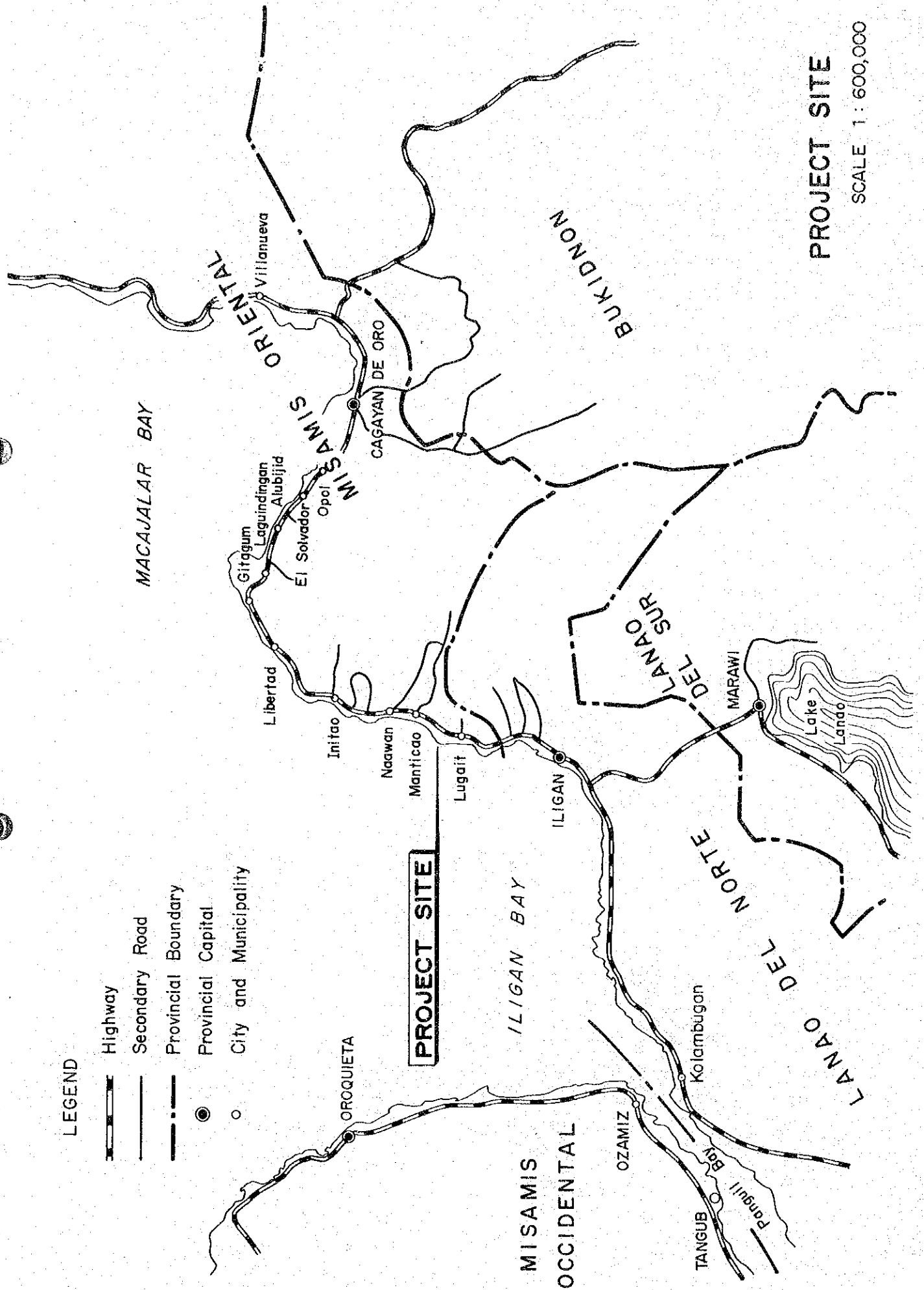


Keisuke Arita  
President  
Japan International  
Cooperation Agency



LEGEND

-  Highway
-  Secondary Road
-  Provincial Boundary
-  Provincial Capital
-  City and Municipality



PROJECT SITE

SCALE 1 : 600,000





- SUMMARY -

1. In the north Mindanao of the Republic of the Philippines, there is EAC (Electro Alloys Corporation) factory which produces 12,000 tons of ferro silicon yearly by use of silica ore from Luzon and locally obtained low-cost power. At present, raw materials and products for EAC factory are unloaded/loaded in the public pier of Iligan port which is located 23 km west of EAC factory. Onland transportation between port and factory is carried out by truck. This transportation cost occupies considerably large part in production cost of ferro silicon. Besides rapid rise of the onland transportation cost is anticipated in future in view of recent tendency of spiral hike of oil price. To cope with this situation, EAC factory envisages to put up a new port (the project port) in the vicinity of the factory site.
2. In the vicinity of the Iligan city, a total of 14 factories are operating inclusive of EAC factory, which obtain stable and cheap power supply from the nearby power station located in Maria Cristina Fall on Agus River that flows west of the Iligan city. A lot of people living there are engaged in the works dependent on those factories, so that in this sense factories play important roles for regional development.
3. In the vicinity of the project area there are two major public ports namely Cagayan de Oro port on the east and Iligan port on the west. In respect of cargo volume handled in Mindanao ports, the former ranks 4th and the latter 3rd. However, since there is no public port in the 85 km section between the above two ports, the project port shall function as a subsidiary public port to handle regional goods. Under these circumstances, our study is

to select the proposed port site that will meet the requirement of EAC factory as well as regional development.

4. Two alternative port sites have been considered for the project port. One is Punta Silum (2 km west of EAC) where an old demolished pier exists. Another is just in front of EAC factory. (Hereafter called Manticao site) The Punta Silum site has considerably steep seabed, so that the water depth required for the navigation of 5,000 DWT class can be easily obtained near the shoreline. The existence of this natural water depth is advantageous to Punta Silum site.

On the other hand, in Manticao site the required water depth is located approximately 400 m offshore, so that costly dredging or causeway connection is necessary to provide the navigable water depth. Speaking of access to EAC factory, this site is nearest to the EAC factory.

5. In order to select the final plan, four alternative plans have been prepared and compared: three plans in Punta Silum and one plan in Manticao. The basic criteria for drawing up the layouts are briefed below.

- (1) Design vessel size is 1,000 DWT for a barge and 5,000 DWT for an ocean-going vessel which are predominant in the project area.
- (2) Considering the manoeuvring characteristics of ships, the berths for barges and ocean-going vessels are separated in the port layout.
- (3) Stagewise development is considered. Phase I is provided for a barge berth and phase II for an ocean-going vessel berth.

- (4) Berth orientation of the barge berth is set parallel to the wave directions for killing rolling action of small boats in berth.
- (5) Berthing space for 10 - 20 tons class fishing boats is considered.
- (6) Special care is taken for siltation in and around the project port.
- (7) Area for future expansion plan is also considered.

6. The major characteristics of four alternative plans are summarized as below:

Alt. I - The existing old pier at Punta Silum is rehabilitated and incorporated into the berth layout. The barge berth will be constructed on the extension of this old pier. The 75 m-long ocean-going vessel berth will be oriented westwards to facilitate berthing operation of 5,000 DWT class vessels.

Alt. II - This plan has almost the same alignment as Alt. I, but the maximum barge size is reduced to 700 DWT class, in order to make the barge berth length shorter, because the most offshore side block of the berth of Alt. I is extremely costly for requiring very long piles.

Alt. III - The berth plan is laid out irrespective of the existing old pier at Punta Silum, making full use of natural water depth. This plan has less problems in ship navigation.

Alt. IV - The 60-m long barge berth is located 200 m offshore. Access will be made by a causeway starting from the left bank of Luzon creek which flows immediately west of EAC factory. The 75 m-long ocean-going vessel berth is located at the end of another 138 m-long trestle which runs on the extension of the barge berth.

7. Above four alternative plans have been compared in view of both technical and economic points. Technical comparison was made with the following important points in mind.

- (1) effective berth length
- (2) efficient cargo handling
- (3) safe mooring of small boats
- (4) easy berth extension plan

In benefit calculation for economic comparison, the quantifiable benefits has been considered such as transportation cost saving concerned with EAC factory and other three factories (EAC-SURROUNDING-FACTORY: Ferro Chemical Corp. Mindanao Steel Corp. and Refractories Corporation of the Philippines).

8. As a result of economic and technical comparison, Alt. III has been selected as the final port layout. The construction cost of the final plan is estimated at about 6.7 million pesos in phase I and 12.9 million pesos in Phase I + II. The construction period is expected to be 1 year for phase I and 1.5 years for phase I + II.

9. In order to examine the economic feasibility of the investment to the project port, the economic evaluation has been made by assessing benefit cost ratio (B/C) and

internal rate of return (I.R.R.) that can be assessed by comparing construction cost plus operation & maintenance cost and the project benefit. The discount rate in the calculation has been set at 8%. As the project benefits, the following items have been considered.

(A) EAC-oriented-benefit

- i) transportation cost saving of EAC-related-goods

(B) Public-oriented-benefit

- i) transportation cost saving of the goods related to the factories surrounding EAC factory.  
(EAC SURROUNDING FACTORY)
- ii) benefit accruing from handling of local consumer goods and agricultural products.
- iii) benefit derived through usage of the pier by fishing boats
- iv) port income to Manticao municipal
- v) other indirect benefits

Of the above benefits, the transportation cost saving of (A) (i) and (B) (i) are tangible benefits. Other benefits (B) (ii) - (v) are small in quantity and difficult to be measured monetarily. In benefit calculation, above two tangible transport benefits have been counted. The difference of transportation costs between factories-Iligan port and factories-project port (Punta Silum) is estimated and regarded as the transport benefit.

In calculation of I.R.R. the project life has been set at 20 years, same as generally accepted durable year of port facilities. The annual benefit and cost occurred in each year in project life and construction period have been capitalized to the year of 1980 and summed up to obtain total present values of benefit and cost at the

year, 1980. In the calculation, discount rate is assumed at 8%.

10. The I.R.R. that has been calculated considering only EAC-oriented-benefit (without-public-benefit) shows 9.2% in phase I and 8.9% in phase I + II. On the other hand, in case of considering both public benefit (B)(i) and EAC-oriented-benefit (with-public-benefit), I.R.R. is increased to 12.6% and 15.2% for phase I and phase I + II, respectively.

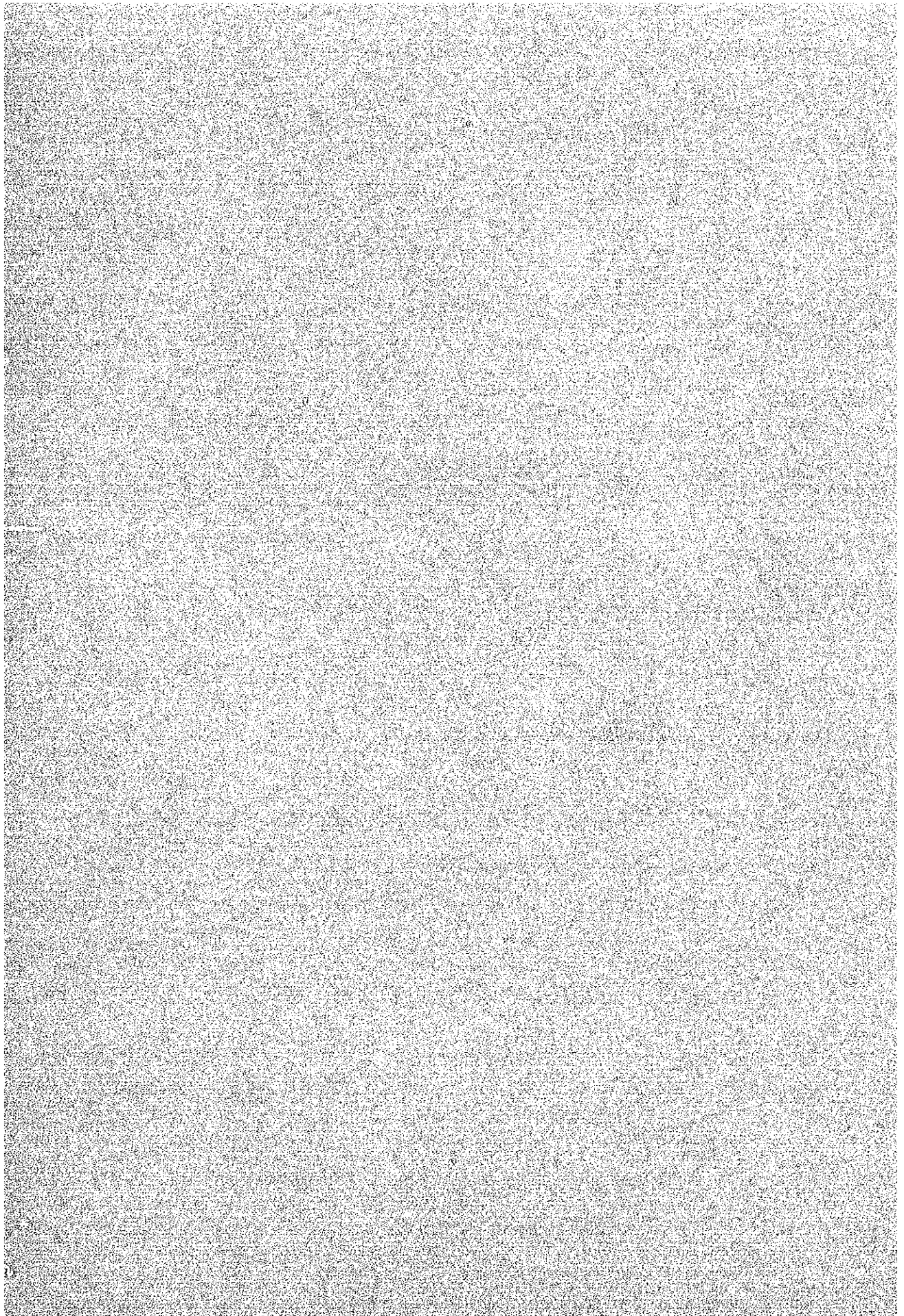
Concerning the benefit cost ratio, in case of without-public-benefit, B/C is 0.09 and 1.07 for phase I and phase II, while in case of with-public-benefit, B/C is up-graded to 1.37 and 1.67 respectively.

As stated above it can be said that this project is marginally feasible even in case that the project port is used exclusively for EAC factory, but this project is more feasible in case that the project port is used as both private and public piers.

11. Intangible benefits accruing from the project are as follows.
  - (1) There is a future plan of putting up a new coco-oil processing plant in the project area. In case that the project port is realized, there is good possibility of this plant being constructed near the project port.
  - (2) Many irrigation projects are under planning in the project area. As these projects proceed, the agricultural seaborne traffic will increase, resulting in requirement of the project port.

- (3) There is spacious undeveloped forest land in the project area. The shipping of the logs and timbers will be possible, by putting up a another pier in the open space east of the project port.
- (4) The project port site is blessed with fish production. If the berth for fishing boats can be provided in the project port, a lot of fish will be handled through the project port instead of being delivered to Cagayan de Oro port.
- (5) Project port will be owned by Manticao municipal, and berth fee will be paid to Manticao municipal. This port income is 13,000 pesos in phase I and 25,000 pesos in phase I + II.
- (6) The bulk cargoes of EAC, which are handled in Iligan port, causes dust pollution and traffic congestion at port. These problems will be alleviated by the construction of the project port.
- (7) The reduction of berth occupancy produced by removal of EAC cargoes will give some allowance to the use of the public pier in Iligan port.
- (8) The construction work itself will bring about employment opportunity and increase income of the people in the project area.

12. As mentioned above, the investment to the project has good feasibility. Therefore, it is recommended that the project is initiated at the earliest possible time. Lastly, in economical analysis, phase I + II is preferable to phase I, so that if the capital is allowed, it is recommended that both barge berth and ocean-going berth are constructed in one stage.





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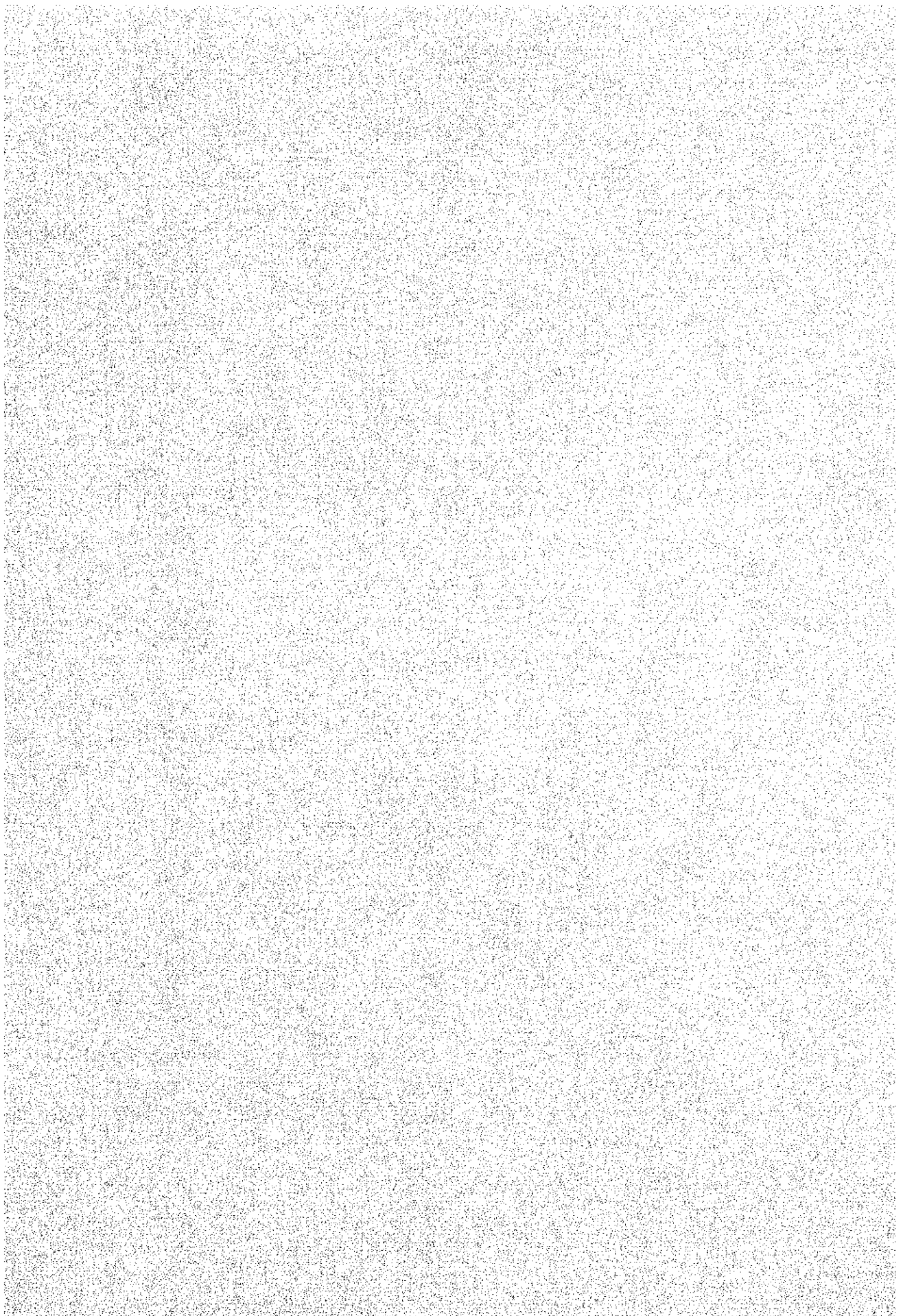
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**CHAPTER I**

**INTRODUCTION**





**CHAPTER I**  
**INTRODUCTION**

1.1 BACKGROUND

With a view to achieving self-sufficiency of industrial products, the Republic of the Philippines has been placing great emphasis on industrial development by making full use of abundant domestic natural resources.

In the project area of the northern Mindanao, there is a large river called Agus river which flows from the Lake Lanao down to Iligan city. Along this river are located a series of power station which distributes a total output of 184MW to power-consuming factories lying along the Iligan Bay and the Macajalar Bay, northern Mindanao.

Along the coastal area of Iligan city, a total of 14 factories are operating, and EAC factory at Manticao town is located at the east side of this industrial area, or 23 km east of Iligan city.

Just east of this EAC factory, there is one more factory called Ferro chemical, and along the national road of 60 km between this factory site and Cagayan de Oro city, no major factories can be found.

By use of cheap electric power and stably-obtained silica ore from Luzon, EAC factory produces ferro-silicon on 12,000 ton/year level since March, 1979.

At present, raw materials and products for EAC factory are unloaded or loaded through the public piers of Iligan Port which is located about 23 km away from EAC factory. In case that a new project port is constructed near EAC factory this pier will bring about a great deal of benefit to the factory itself as well as the surrounding regional area. Keeping in mind the above background of the project, the Japan International Cooperation Agency (JICA) decided to cooperate in infrastructure studies of port development.

## 1.2 SCOPE OF WORK

### (1) Field Work

#### a. Punta Silum Site

- i) Data Collection (Metronologic, hydrographical and geological).
- ii) Hearing about future port plan.
- iii) Water depth sounding (5 ~ 50 m intervals, a total run of 42.9 km.)
- iv) Tidal measurement (2 spots)
- v) Survey (shore area)
- vi) Offshore boring (3 nos, a total penetration of 45 m)
- vii) Data collection (Socio & economical data)

#### b. Surrounding area near Punta Silum

- i) Data collection in Manticao Bay and Iligan port.
- ii) Hearing about future port plan in Manticao Bay and Iligan Port.
- iii) Water depth sounding in Manticao Bay (50 m intervals)
- iv) Tidal measurement (1 spot)
- v) Offshore boring (1 no. a total penetration of 15 m)
- vi) Data collection (socio & economical data.)

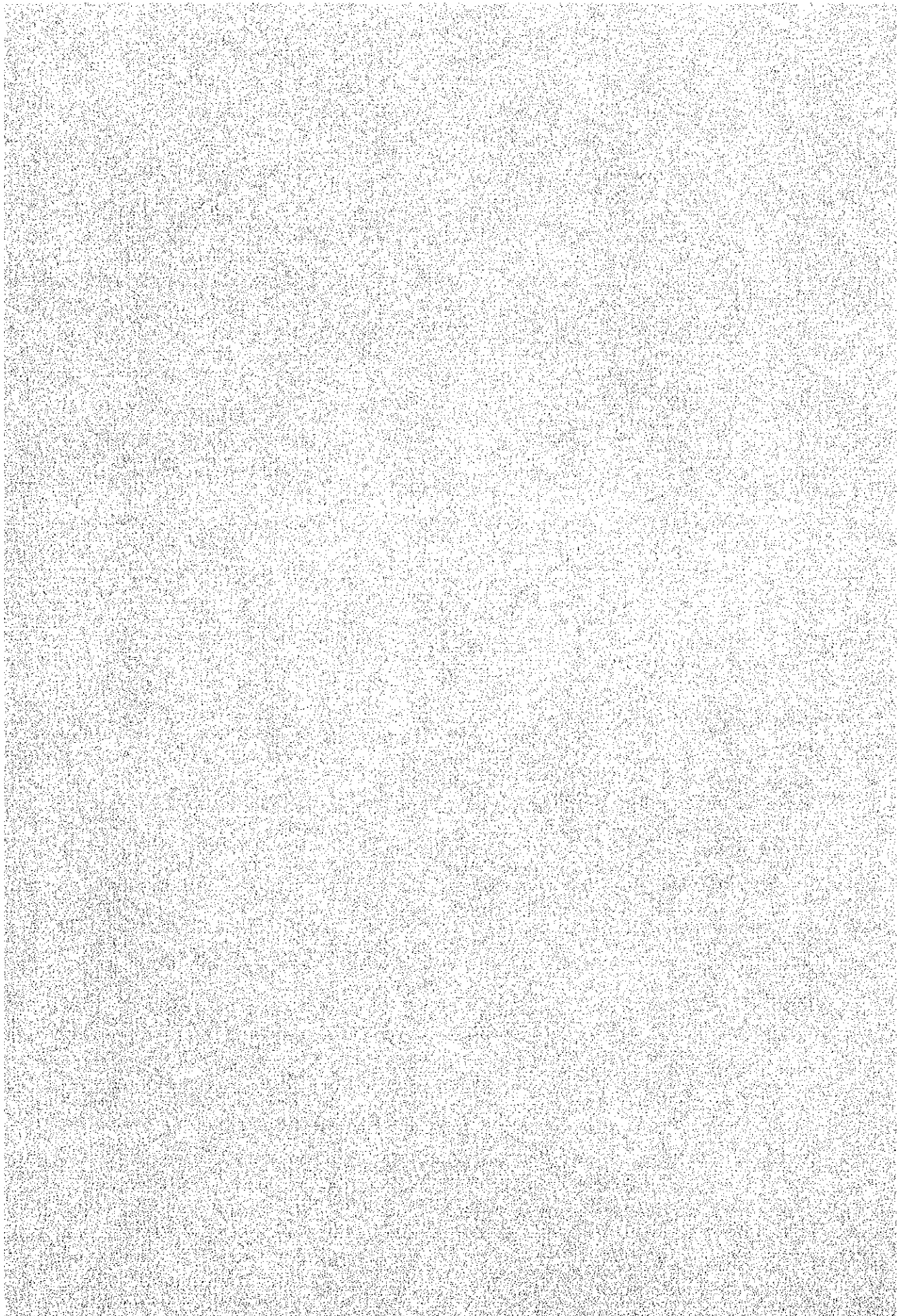
(2) Office Work

- a. Data analysis
- b. Design of Punta Silum port
  - i) pier
  - ii) access road and handling equipment
  - iii) construction plan and cost estimate
- c. Alternative study (Punta Silum, Manticao)
- d. Economical evaluation



**CHAPTER II**

**PROJECT AREA**



2.1 NATURAL CONDITION

2.1.1 Geography

The project area is located in the Misamis Oriental province where most of the mountains are below 1,000 m above sea level. Mt. Mapua is the highest mountain in the mainland, being 1,480 m above sea level. Camiguin Island, which is a part of the province, has the highest mountain named Mt. Sinablayan (1,921 m). The eastern part of the Misamis Oriental province is characterized by sharp angular hills cut by streams in deep gorges. The coast is irregular with high headlands that alternate with bays bordered by sloping lowland in river valley.

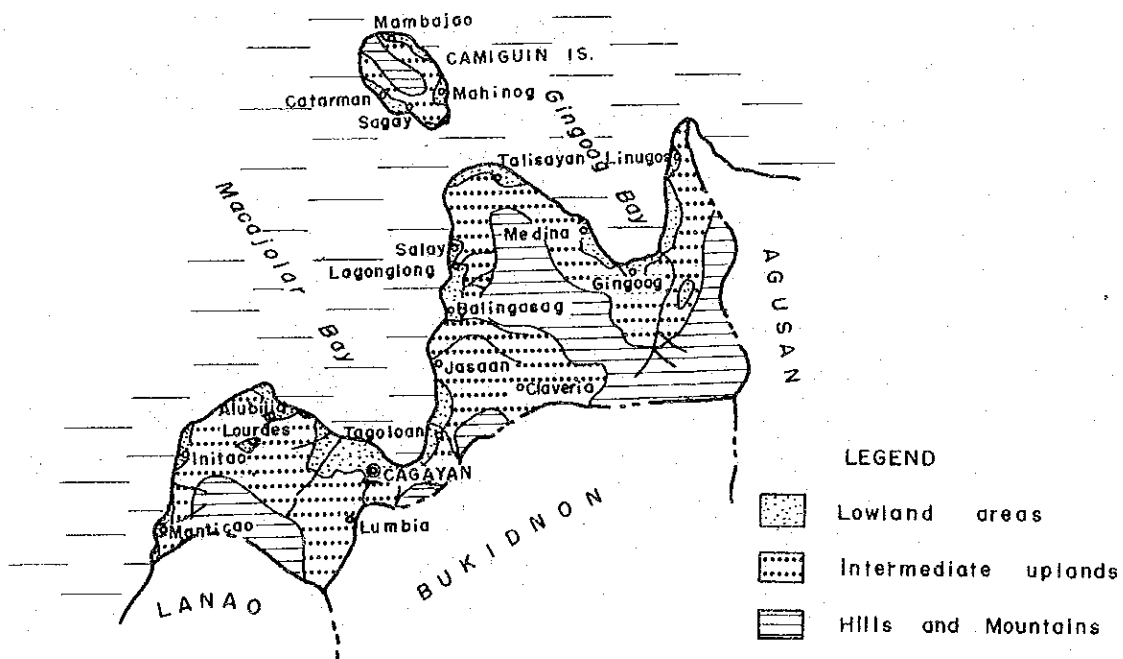


Fig. 1 GEOGRAPHICAL FEATURE OF MISAMIS ORIENTAL

In the central part, the upland surface is cut by many gullies, narrow ravines and canyons which are 150 m deep or more. The upland descends abruptly in a rough escarpment to narrow coastal lowlands which are less than 3 - 4 km in width. The Balingasag-Lagonglong and the Cagayan lowlands are the widest. Mangrove swamp is wide in Cagayan de Oro. The general trend of drainage condition of the province is in a northward direction, toward the Macajalar Bay and Gingoog Bay. Major rivers are Linugos Rv. Odiongan Rv. Gingoog Rv. and Lunao Rv. in the east, Balatucan Rv. Tagoloan Rv., Agusan Rv., Cagayan Rv. and Ipona Rv. in the center, and Alubijid Rv., Initao Rv. and Talabaan Rv. in the west.

Speaking of vegetation, most of the forest area is covered by Cogon. The woody area, once logged, are partly forested. The hilly land extending from mountainous area to coastal area are mostly covered by Cogon, and partly planted to coconut and ipil-ipil. The coastal plains are devoted to the growing of rice, wheat, tobacco and root crops. The swamps are covered with nipa palms and mangroves. Hereunder described is the geographical features of Manticao town where project port and factory is located.

As shown in Fig. 2, the plain is restricted to the coastal area facing the Iligan Bay and a 1.5 - 2.0 km wide strip extending 10 km inland (near Tuod). The remaining mostly hilly or mountainous area are devoted to the growing of coconut and corn. Generally, rice field is very scarce.

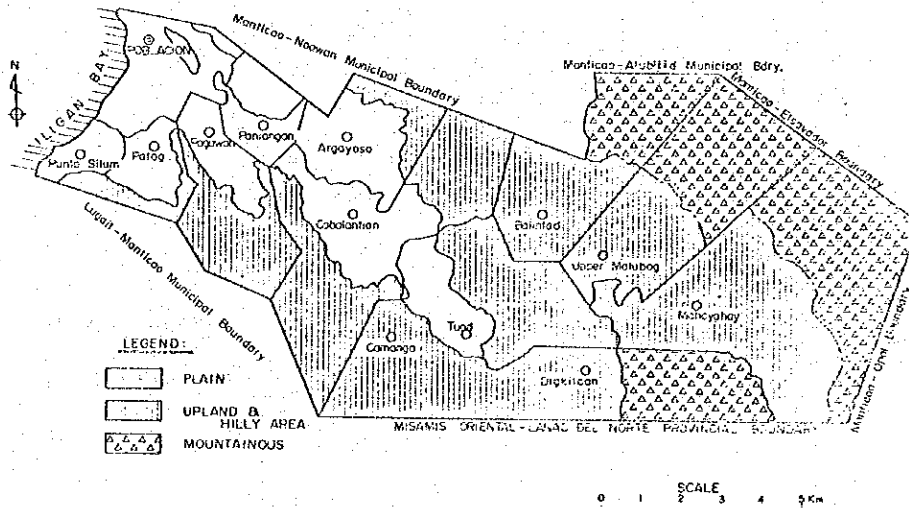


Fig. 2 GEOGRAPHICAL FEATURE OF MANTICAO



### 2.1.2 Geology

The eastern coast of Iligan Bay, particularly in the vicinity of Punta Silum Point, is marked by irregular shorelines with high headland that alternate with bays bordered with gently sloping lowlands and valleys. Punta Silum, a towering hill projecting to the shorelines as a steep bluff, is made up of tertiary sedimentary rocks dominantly composed of sandstone and conglomerate with calcareous shales and coralline limestone lenses. Massive coralline limestone presumably from the basal portion of Punta Silum slopes down 10 to 15 degree northward to the sea. Thick layers of clayey and silty fine sand found in the project area are derived from the weathering and erosion of rock formations in the uplands.

Inland hills and mountain slopes consist principally of igneous rocks such as andestic and/or basaltic flows with pyroclastics, and generally with undifferentiated metamorphic rocks like shist, slate, gneiss and quartzite.

### 2.1.3 Climate

The project area of the western Misamis Oriental province, open to the Mindanao Sea, is situated in a comparatively hot zone in Philippines.

The climate record shows the noteworthy phenomena that the annual precipitation in Iligan city is 3,600 mm, more than double of that in Cagayan de Oro city (1,600 mm). According to the regional classification on rainfalls which is specified by PAGASA (Philippine Atmospheric Geophysical and astronomical Service Administration), Iligan city belongs to Region IV and Cagayan de Oro city Region III.

The area of Region IV is characterized by high numbers of rainy day and high precipitation which has little fluctuation all through the year, while the area of Region III has some accent in monthly precipitation. In the months from November to April rainfall are of comparatively low intensity, being called a dry season. The boundary line between Region III and IV seems to be almost the same as the boundary line of the Misamis Oriental province and the Lanao del Norte province. Judging from the local records of rainfall, it can be said that the project site of Manticao town belongs to Region III.

FREQUENCY OF TROPICAL CYCLONES

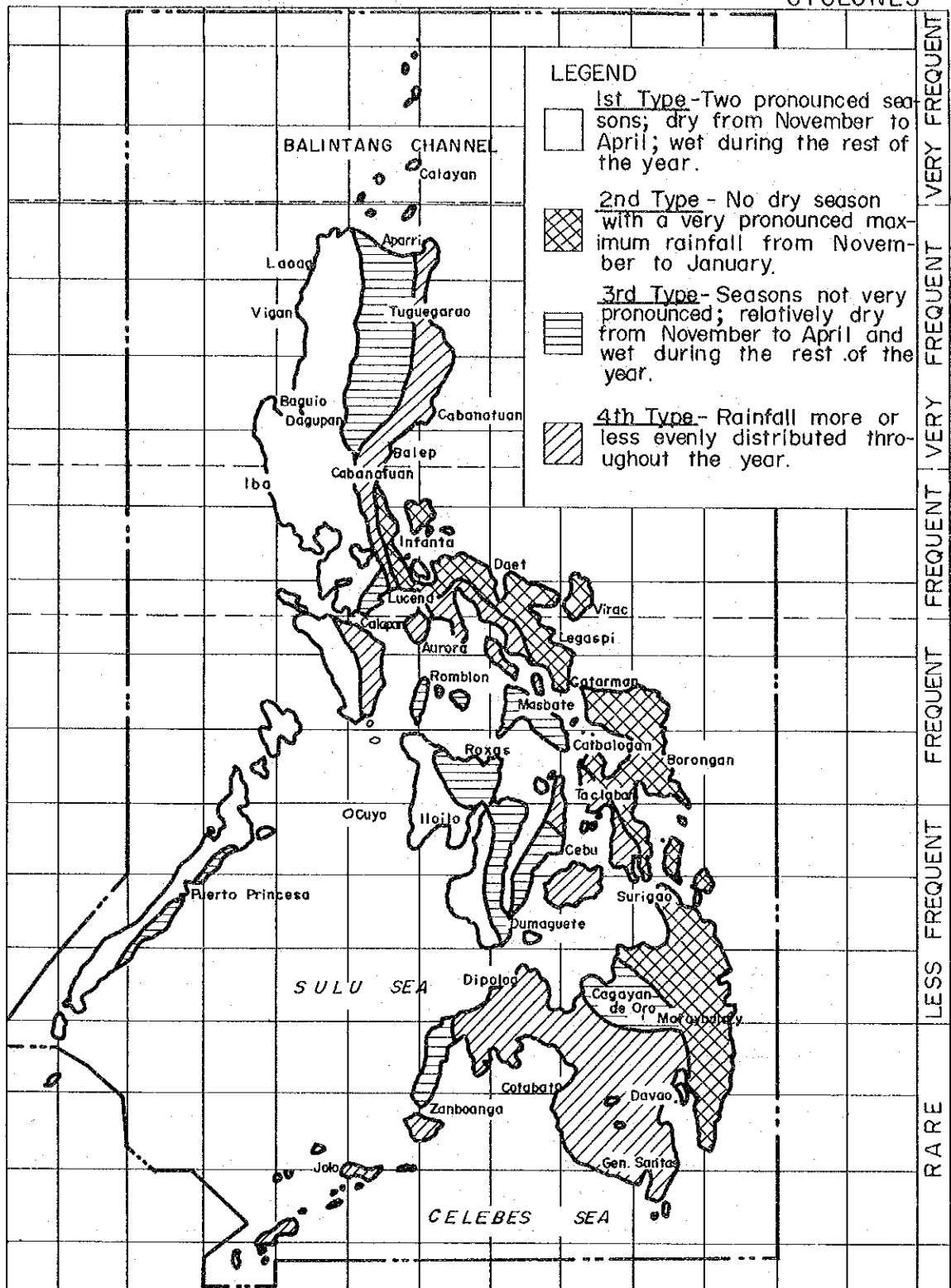


Fig. 3 CLIMATE MAP OF THE PHILIPPINES

Table 1 CLIMATE IN PROJECT AREA

Month	Cagayan de Oro (Region III)			Iligan (Region IV)		
	Precipitation (mm)	Rainy Days	Av. temperature (°C)	Precipitation (mm)	Rainy Days	Av. temperature (°C)
Jan.	96.1	9.3	25.6	88.9	11	24.0
Feb.	58.1	6.2	25.8	83.8	10	24.9
Mar.	35.1	4.9	26.5	90.2	9	25.8
Apl.	28.3	3.8	27.5	85.9	8	26.9
May	111.2	10.5	28.0	148.8	11	27.7
Jun	221.1	16.2	27.4	215.4	17	27.7
Jul.	215.2	14.8	27.3	252.5	16	27.9
Aug.	193.8	14.3	27.3	385.1	14	27.7
Sep.	212.1	14.5	27.2	718.8	13	27.9
Oct.	202.5	13.9	26.8	1048.0	14	27.9
Nov.	117.9	9.3	26.6	313.2	14	26.7
Dec.	119.9	10.2	26.0	210.8	14	25.3
Total	1603.3	127.9	26.8	3641.4	151	26.7

The annual average temperature in the project area is approximately 27°, and its monthly fluctuation is a maximum of 3 - 4°. According to the past records, the highest and the lowest are 39°C in 1976 and 16.1°C in 1976 respectively.

As easily understood by the chart showing the routes of typhoons, the northern Mindanao is located outside of a so called "typhoon belt" and a low magnitude of damage occurs, if any in the project area.

According to the past 3 years record from 1975 to 1977 at the Cagayan de Oro weather station, a maximum wind speed was 26 knots (13 m/sec).

The wind speed conversion into sea wind is required for port study, because the wind data observed at onland weather station shows sometimes comparatively conservative figures.

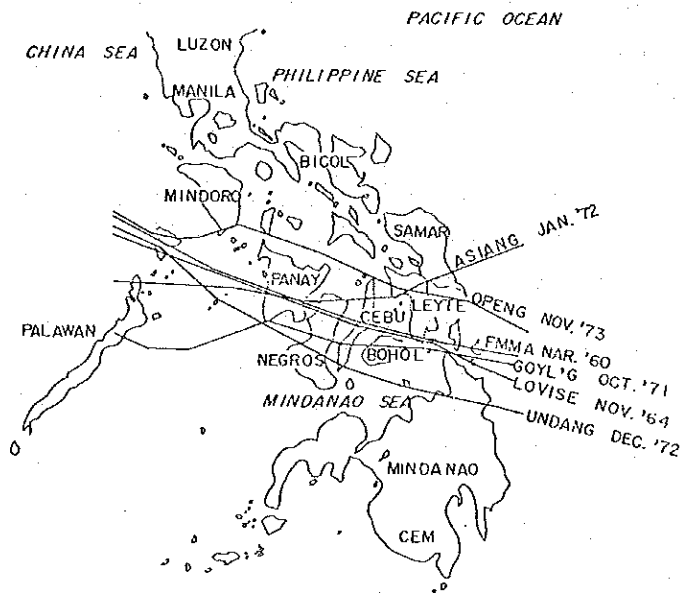


Fig. 4 ROUTES OF TYPHOONS (1971 - 1974)

#### 2.1.4 Marine Condition

The tidal range at the proposed port site in Iligan Bay is 85 cm. In the Iligan Bay, the monsoon wind is dominantly in south west direction from June to September, and in north-east direction during remaining months.

According to the local information, a maximum wave is 2.4 m during the SW monsoon season and a maximum of 1.2 m during other season.

The dominant current flows parallel to the shoreline. The southwestward running tidal currents are two times as fast as the northeastward running tidal currents. This tendency seems to be owing to the ocean currents flowing offshore.

## 2.2 SOCIAL AND ECONOMIC CONDITIONS

### 2.2.1 Populations

According to the national census, the annual growth rate of population from 1970 to 1975 was 3.5% in the Misamis Oriental province, 1.7% in the Lanao del Norte province and 2.5% in Manticao town where EAC factory is operating. It can be said that a rapid growth rate in Misamis Oriental was dependent on a rapid growth rate of 5.4% in Cagayan de Oro city where a large-scaled industrialization is under way. This rate of 5.4% is much faster than that of Metro Manila (4.6%).

Unlike the Misamis Oriental province, the Lanao del Norte province has no core industry, depending mainly on agriculture, resulting in slow population growth. On the other hand, the low growth rate in Manticao town is based on the fact that most of the commuters working in Manticao town are from Iligan city and no medium scaled industry is running due to the restricted plain area in Manticao.

Speaking of population density, Cagayan de Oro city presents an outstanding figure of 400 person/km<sup>2</sup>, followed by Kinogitan, Laguindingan and Luguit town with a population density of 300 - 400 person/km<sup>2</sup>.

Table 2 POPULATION AND POPULATION GROWTH RATE IN THE PROJECT AREA

Name of City and Province		Population		Annual Growth Rate (%)
		1970	1975	
Philippine		36,684,000	42,071,000	2.7
Metro Manila		3,967,000	4,970,000	4.6
Misamis Oriental Province	Total	472,756	560,490	3.5
	Cagayan de Oro city	128,319	165,220	5.4
	Opol	10,275	13,023	4.9
	El Salvador	14,529	16,915	3.1
	Alubijid	11,720	13,942	3.5

Name of City and Province		Population		Annual Growth Rate (%)
		1970	1975	
Misamis Oriental Province	Laguindingan	10,292	11,849	2.9
	Gitagum	8,000	9,288	3.0
	Libertad	6,523	7,309	2.3
	Initao	16,904	18,906	2.2
	Naawan	8,718	10,068	2.9
	Manticao	13,503	15,248	2.5
	Lugait	7,457	8,787	3.3
Lanao del Norte	Total	349,942	381,234	1.7
	Iligan city	104,493	118,778	2.5
Bukidnon Province		414,762	532,818	5.2

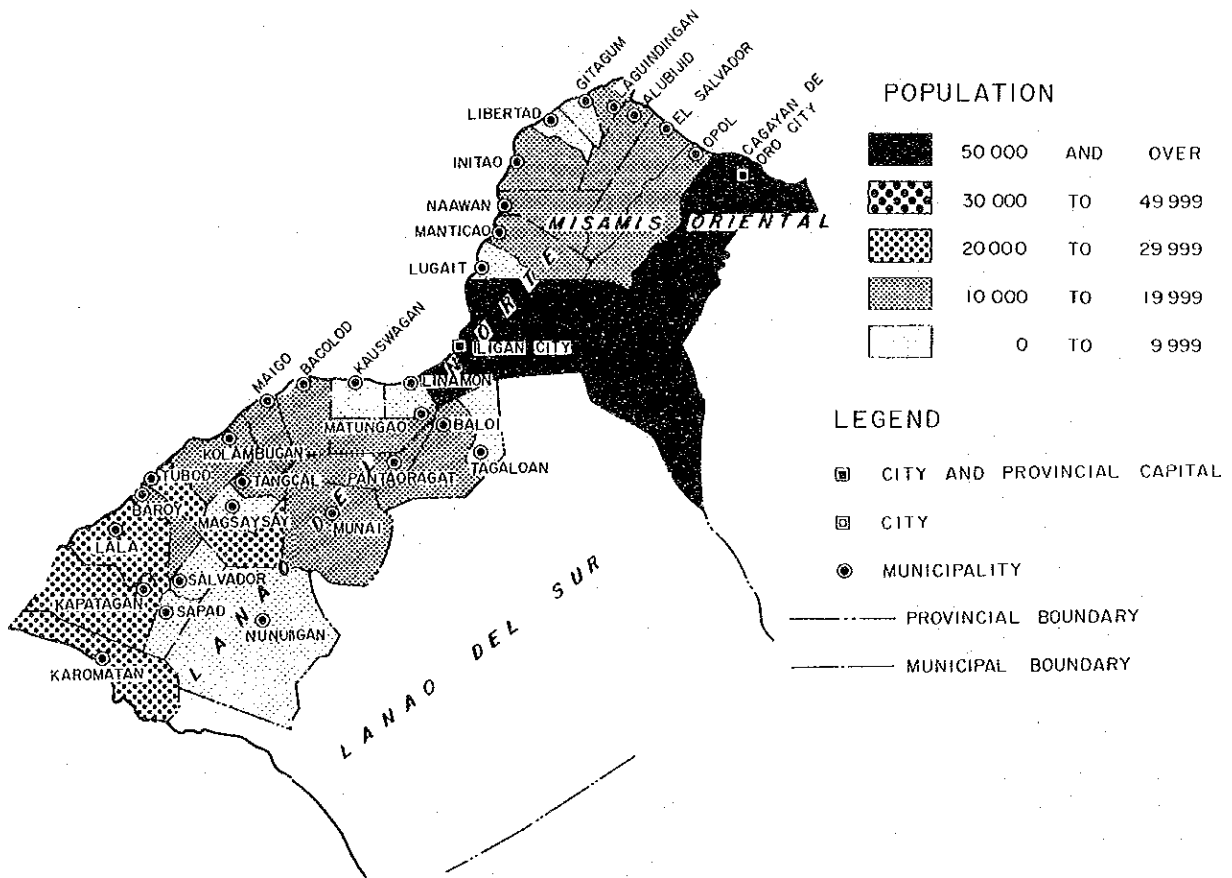


Fig. 5 POPULATION DENSITY IN THE PROJECT AREA

### 2.2.2 Major Industry

According to the 1975 census, the occupations of three provinces were classified as below. More than half of the people were engaged in the primary industry, and the groups of craftsman, service workers and sales workers were ranked next. The Misamis Oriental province and the Lanao del Norte province had the similar pattern each other in occupation classification, but the Bukidnon province was apparently different from the former two provinces in the share of the primary industry. Its share of 82.8% was about 20% larger than those of other two provinces.

Table 3 POPULATION IN 1975 CLASSIFIED BY GAINFUL OCCUPATION

Major Gainful Occupation Group	Misamis Oriental	Lanao del Norte	Bukidnon
Total	100% (380,740)	100% (110,726)	100% (162,266)
Farmers, fishermen, hunters, loggers and related workers	56.2 (89,250)	59.5 (65,931)	82.8 (134,353)
Craftsmen, production process workers and related labores	9.5 (15,120)	12.4 (13,765)	3.5 (5,717)
Service, sports, and related workers	8.0 (12,762)	6.3 (6,962)	3.6 (5,878)
Sales workers	7.9 (12,542)	6.3 (7,005)	3.1 (4,978)
Professional, technical and related workers	4.9 (7,818)	5.1 (5,627)	2.6 (4,183)
Workers in transport and communications	4.1 (6,539)	3.2 (3,581)	1.7 (2,771)
Stevedores, related freight handlers and laborers n.e.c.	3.2 (5,180)	3.0 (3,300)	0.6 (1,007)
Clerical workers	2.6 (4,058)	2.0 (2,227)	1.1 (1,860)



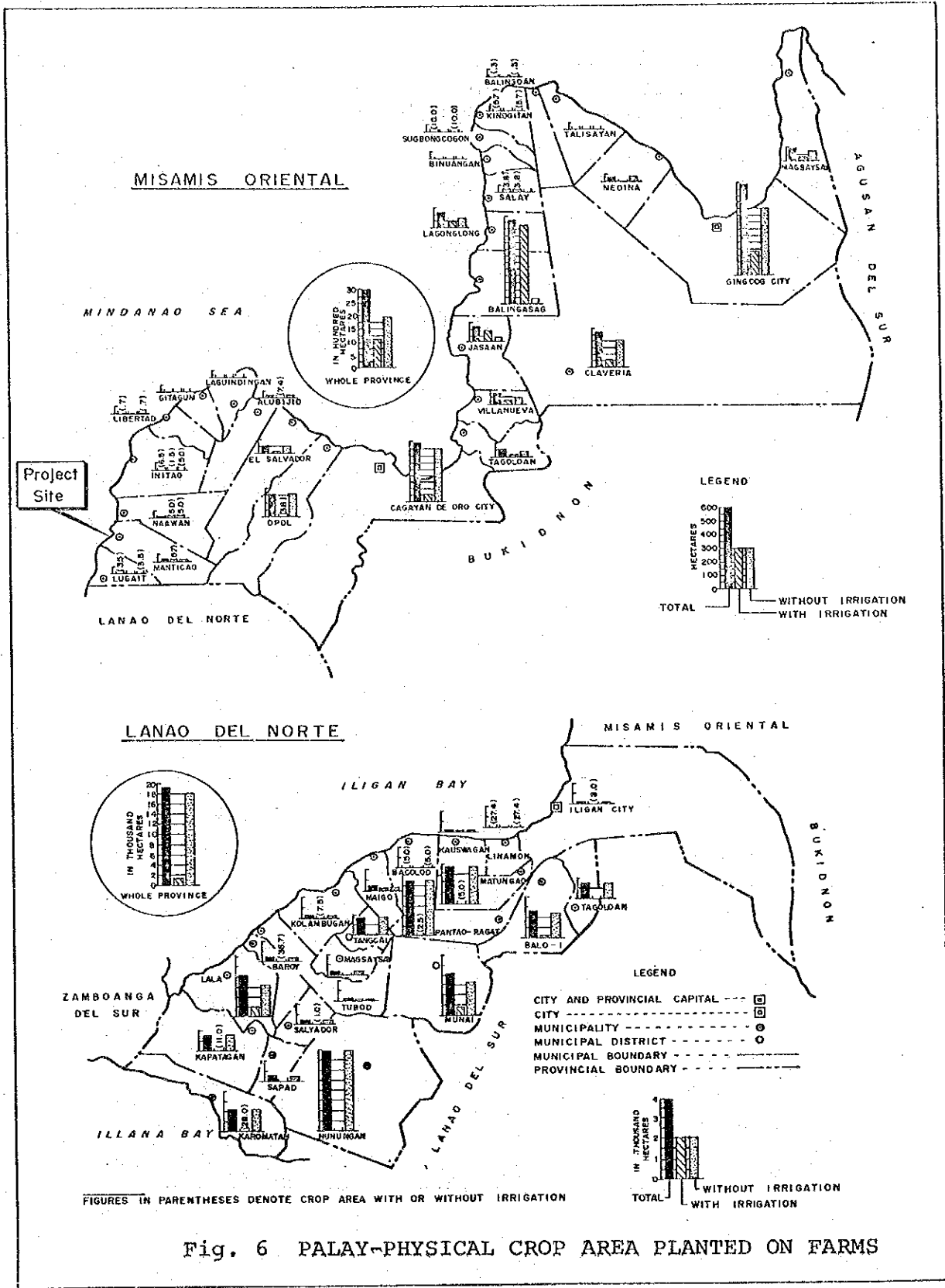
Major Gainful Occupation Group	Misamis Oriental	Lanao del Norte	Bukidnon
Administrative, executive, and managerial workers	1.5 (2,431)	0.9 (1,017)	0.4 (661)
Miners, quarrymen, and related workers	0.3 (458)	0.2 (239)	- ( - )
Others	1.8 (2,786)	1.1 (1,072)	0.6 (743)

i) Agriculture

As mentioned before, the basic industry in the project area is agriculture, and the major crops are rice, corn, coconut and banana.

Table 4 AGRICULTURAL PRODUCTION 1974-1975

	Lanao del Norte	Misamis Oriental
Palay	33,580	10,170
Corn	26,730	13,378
Coconuts	73,300	161,853
Bananas	11,750	11,512
Pineapple	80	135
Other fruits and nuts	8,850	13,550
Vegetables	450	12,948
Coffee	-	5,328
Abaca	190	1,200
Cassava	16,650	800
Root crops	1,190	500
Tobacco	-	1,211
<b>Total</b>	<b>172,770 t</b>	<b>229,431 t</b>



According to the 1971 census, the major crops in the Lanao del Norte province was represented by corn, and 50% of the cultivated land was devoted to the growing of corn. Meanwhile, recently coconut production shows outstanding growth, accounting for 40% of agricultural production. In the Lanao del Norte province the rice production is in the level of self-sufficiency.

The project area between Cagayan de Oro city and Iligan city are mostly covered by coconut plantations, and rice field can hardly be seen there. At present, a number of irrigation project is under study in this project area, so that on completion of these projects, rice will constitute much larger share in agricultural production.

The 1971 census of the Misamis Oriental province shows that 35% of the cultivated land was used for corn production, 30% for coconut and 3% for rice. Like the Lanao del Norte province, the Misamis Oriental province achieved a rapid growth of coconut production.

#### ii) Industry

Of a total of 5,310 establishments in Misamis Oriental, approximately, 60% of establishments are located in the vicinity of Cagayan de Oro city. In other area, a city or a town has an average of 100 establishments each, and 30% of them belongs to third industry like whole sale/retail, hotel and restaurant. The Manticao town has 118 establishments, of which manufacturing industry are 15 in number.

The industrial estate of the Lanao del Norte province is centered on the Iligan city area. In the area remote from Iligan city, only family industry is operated.

Table 5 CENSUS OF ESTABLISHMENT BY MAJOR INDUSTRY IN THE PROVINCE OF MISAMIS ORIENTAL

Municipalities/ City	Logging	Mining Quarrying	Manufac- turing	Electri- city gas & water	Construc- tion	Whole sale/ retail Hotel restau- rants	Trans- porta- tion storage communi- cation	Finance insurance Real estate bus. serv.	Com- munity Social Personal Recrea- tional serv.	Total
Alubijid		1	6			19	2	2	3	33
El Salvador			4			79	4	4	2	93
Gitagum			111			96		2		209
Initao			7			80	5	2	5	99
Languindingan			6	1		139	3		1	150
Libertad			6	1		36	2	1	1	47
Lugait			7			135	2	3	3	150
Manticao		1	15			92	3	6	1	118
Naawan			3			43	3	3		52
Opol			6	1		52	3	4	6	72

iii) Fishery

According to the provincial statistics of the Misamis Oriental province, the fish production in 1976 was a total of 11,620 ton. The major species are tuna and scad.

Table 6 FISH PRODUCTION IN 1976  
(unit:ton)

City and Municipal	Production
Opol	168,515
Cagayan de Oro	107,515
Jasaan	15,150
Manticao	11,620
Salay	6,860
Total	309,660

The area of Manticao shown on the above table covers a large sea ground from Manticao to Opol instead of covering administratively limited area in front of the shoreside of Manticao town. The fish production of 11,620 ton was too large to be consumed in the Manticao area, so that most of the fish were delivered directly up to Cagayan de Oro

city without being unloaded at the nearby piers in Manticao town. Some amount of processed fish are transported from Cagayan de Oro city back to Manticao town.

The major occupation of the people in the vicinity of Manticao town is fishing and this fishing sector covers 27% to 57% of all occupations. This fact shows that the people living in this area make their living by fishing.

Table 7 TOTAL NO. OF POPULATION DEPENDENT ON FISHING INDUSTRY IN MISAMIS ORIENTAL

Municipal	Fishermen	Fishery-dependent people	Ratio of Fishermen to all population
Lugait	195	3,724	42%
Manticao	219	4,124	27
Naawan	147	3,466	34
Initao	268	8,589	45
Libertad	165	4,164	57
Gitagum	135	4,618	50
Provincial level	(5,588)	(168,813)	30

Speaking the number of boats, Initao town is ranked 1st, having 220 boats. Most of the above fishing boats are left on the shore when off duty. Most of the boats are small engine-boats with shallow drafts. On the other hand there are comparatively deep-drafted 10 - 20 ton class boats which are anchored offshore, because of the absence of nearby berthing pier.

Table 8 NO. OF BOATS REGISTERED

Municipal	No. of Boats		Total
	with engine	without engine	
Lugait	42	140	182
Manticao	93	61	154
Naawan	39	87	126
Initao	89	131	220
Libertad	53	55	108
Gitagum	6	72	78
Sub total	322	546	868
Provincial level	1,401	2,717	168,813

iv) Forestry

In the Lanao del Norte province and the Misamis Oriental province, forestry is the secondary industry, next to the group of agriculture and fishing. Out of the forest which extends from the above provinces to the Bukidnon province, many species of trees can be logged. Most of logs are shipped to Cebu and Luzon area. Some part of logged trees are processed at plywood & vineer factories in Kolumbugan city, Cagayan de Oro city or Butan city. Typical species are Lauan, Molave, Yacal Narra, Mangachpoi, Tindalo and Apitong.

As of 1976, the major timbers and logging companies in Iligan city are as follows:

Table 9 TIMBER AND LOGGING COMPANIES IN THE PROJECT AREA

	Misamis Oriental	Iligan city
logging company	5	4
sawmill & plywood factory	8	-
Plywood & vineer factory	8	-

### 2.2.3 Electric Power

Most of the electric power to the project area is supplied from a series of power station which are located along the Agus river and Maria Cristina Fall. The hydraulic power development, named Mindanao Electric Power Project, is promoted by the National Power Corporation (NPC). As of 1977, a maximum power output was about 184 MW. Transmission lines have been already constructed up to Butan city on the east and up to Aurora city on the west. The towns facing the Macajalar Bay in the project area are also included in the above power-distributing zone. Since the power distribution to the south such as Davao city are now under construction, it is expeditied that those area will also get the benefit of power in near future.

In the project area, hydraulic power generation is more common than thermal power generation, so that power cost is relatively reasonable as shown on table 10.

Table 10 POWER COST OF NPC

	(unit: Peso/KWH)		
	1976	1977/7 - 1976/6	after 1978/7
Luzon	0.1696	—	—
Visayas	0.2013	—	—
Mindanao	0.0388	0.0900	0.1200

Recently, taking full advantage of this low-priced power, many electric-power-consuming factories have started operation in the area centered on Iligan city and Cagayan de Oro city. As a result, a future power development plan is one of the imperative so as to promote this tendency.

On completion of the plan I, II and VII in Agus River Power Development that was expected to start operation in 1979, additional 314 MW were supposed to be produced. Furthermore subsequent future plan III-A, IV and V is scheduled to produce another 280 MW.

In 1978, at the suburb of Cagayan de Oro city a diesel-engined-power station with a total output of 4,800 KW was established. On top of the above power plan, there is one more large scaled power development plan in Pulangui River that flows east of Malaybalsy city of Bukidnon province. A total output of this power station is expected to be approximately 900 MW.



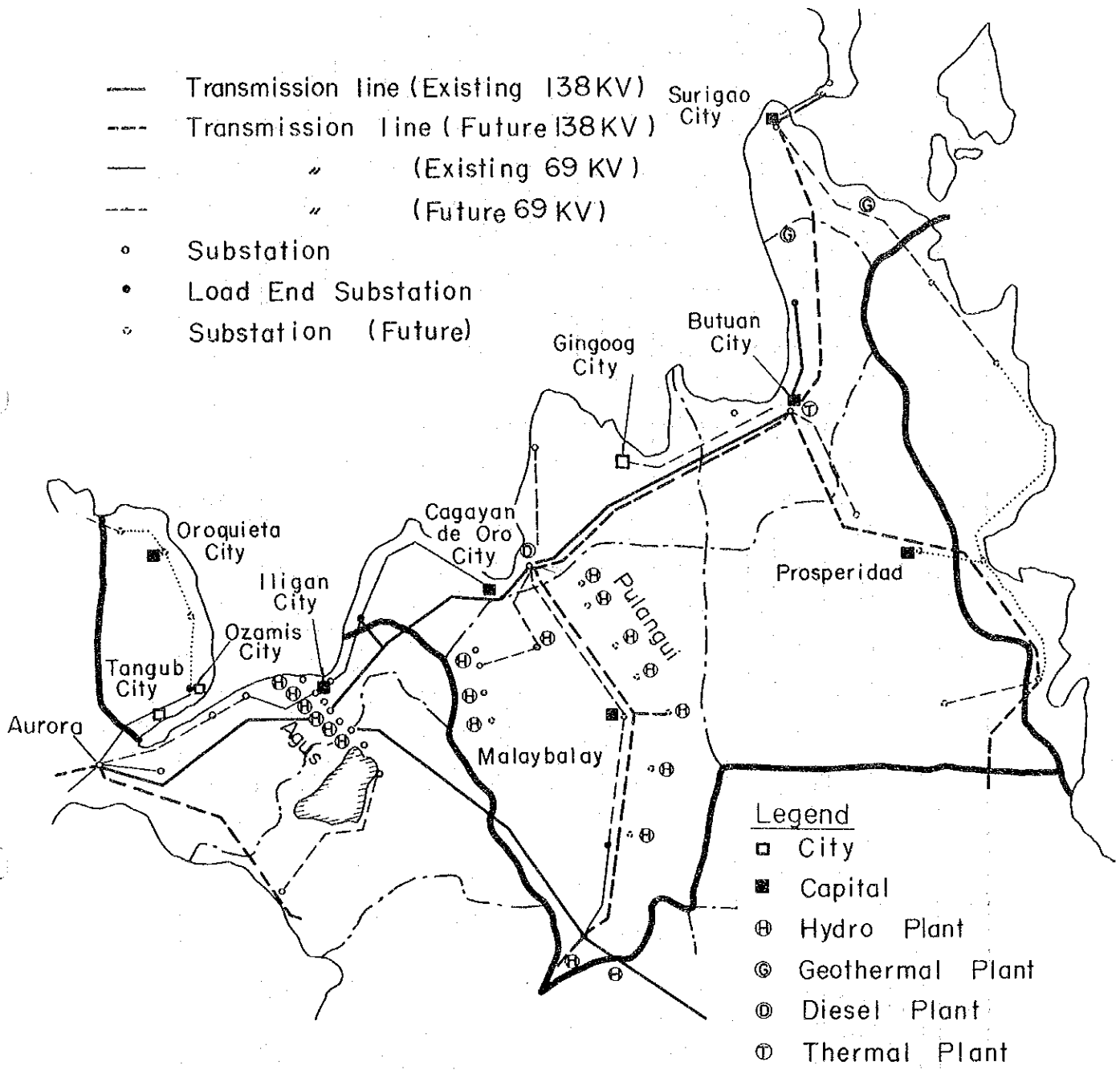


Fig. 7 POWER DEVELOPMENT PLAN

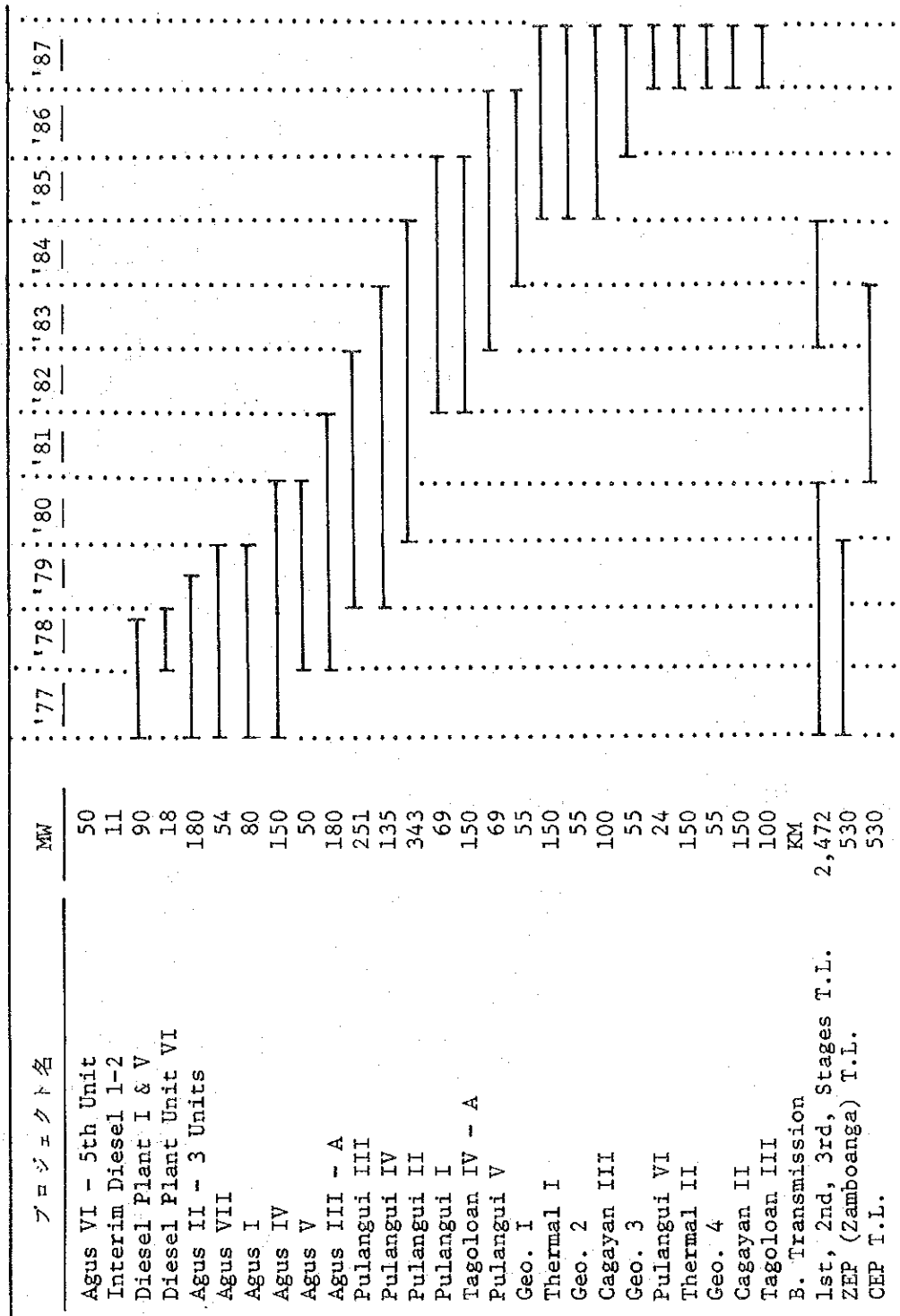


Fig. 8 POWER PROJECT IN MINDANAO ISLAND

## 2.3 INDUSTRIAL DEVELOPMENT PLAN IN THE PROJECT AREA

### 2.3.1 General

Blessed with mineral resources, the industrial development of Mindanao is natural-resources-oriented. This shows a sharp contrast to the market-oriented-development in Manila and Cebu. The core zone of industrial complex in Mindanao lies along the coastal area which opens to the Macajalar Bay and Iligan Bay. The industrial zone of the Macajalar Bay is extending from Cagayan de Oro city (the capital of the Misamis Oriental province) to Villanueva (PHIVIDEC). On the other hand, the industrial zone of the Iligan Bay is restricted to the vicinity of Iligan city. These industrial complex consists of electric-power-consuming factories such as cement, ferro-alloy fertilizer and steel. The essential points to contribute to industrialization on this area are summarized below.

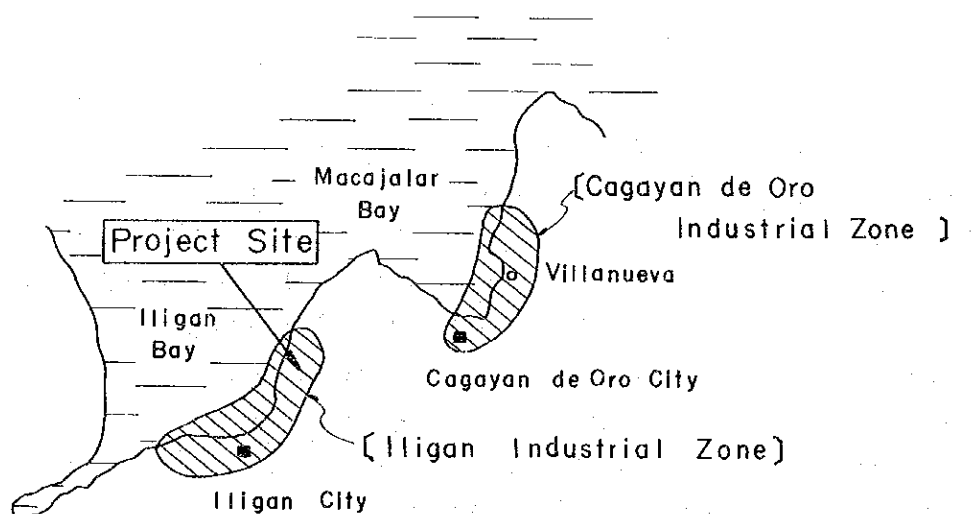


Fig. 9 INDUSTRIAL ZONE IN THE PROJECT AREA

- (1) Port facilities handling raw materials and products can be economically constructed in the nearby bays like Iligan Bay and Macajalar Bay.
- (2) Cheap and stable power can be obtained from the power station of Maria Cristina.
- (3) Though most part of factory-related goods are handled through their private piers. The Iligan port and the Cagayan de Oro port can also be used as subsidiary ports.
- (4) There is good a concrete-paved haul road for material and product between the above major ports (Cagayan de Oro & Iligan).
- (5) Since the industrial zone is situated in the northern part of Mindanao, the nautical distance to the final destination like Cebu and Manila is comparatively short.
- (6) Agricultural production in the northern Mindanao is not so high that surplus labour force can be allocated to factories as good workers.

### 2.3.2 Industrial Complex in Cagayan de Oro

The industrial complex in Iligan city is allocated in the restricted area, so that some congestion has come about. Meanwhile, the industrial complex in Cagayan de Oro city has been planned with comprehensive plant arrangement, so that this area has sufficient area for future development. Looking back into the history of industrialization in the Misamis Oriental province, agro-industry was an essential industry. In step with the progress of agricultural production, agro-industry has been promoted in the form of increasing the added values of the products. In this sense, it is said the industrialization of this province have good bearing on agricultural development.

On the other hand another big pillar required for provincial development in Misamis Oriental is heavy industry development, especially steel industry. This industrialization has a considerably tight bearing on the present activities of PHIVIDEC Industrial Estate. In spite of the existence of large-scaled industry in Misamis Oriental, it seems that medium-classed industry has been left behind as compared with other provinces.

### 2.3.3 Industrial Complex in Iligan City

This industrial complex is situated in the coastal plain extending about 30 km along the Iligan Bay. The major factories are, as shown on Table 11, nonferrous metals, & chemical (4) coconut (2) cement (3), inclusive of EAC factory. Like Cagayan de Oro city, this industrial complex is also characterized by electric-power-consuming plants. Most of the core materials such as silica, limestone and coconuts are commonly transported from the islands adjacent to Mindanao. Apart from the above large factories, no mediumscaled factories supporting large factories cannot be found in the nearby area.

Table 11 MAJOR FACTORIES AND THEIR PRODUCTS  
IN THE PROJECT AREA

Name of Factory	Products
MABUHAY VINYLL CORP. (MVC)	- VINYL (CAUSTIC SODA-CHEMICAL PRODUCTS)
MARIA CRISTINA CHEMICAL INC. (MCCI)	- FESI (FECORBIDE) METALLIC SILICON
NATIONAL STEEL CORP. (NSC)	- RE-BAR (STEEL PLATE-STEEL PRODUCTS)
PAPER INDUSTRIES COMPANY OF THE PHILIPPINES (PICOP)	- PAPER (ROLLED)
ILIGAN COCONUT INDUSTRIES INC. (ILICOCO)	- COCONUT OIL
GRANEX PORT CORP. (GRANEX)	- COCONUT OIL

Name of Factory	Products
MINDANAO PORTLAND CEMENT CORP. (MPCC)	- PORTLAND CEMENT
ILIGAN CEMENT CORP. (ICC)	- PORTLAND CEMENT
PILLSBURY MINDANAO FLOUR MILLING CO., INC. (PILMICO)	- FLOUR
REFRACTORIES CORP. OF THE PHIL. (RCP)	- BASIC REFRACTORY
FLORO CEMENT CORP. (FLORO)	- PORTLAND CEMENT
MINDANAO STEEL CORP. (MINDANAO STEEL)	- CORRUGATED G. I. SHEET
ELECTRO ALLOYS CORP. (EAC)	- FERROSILICON
FERRO CHEMICAL INC. (FERRO CHEMI.)	- FERRO CHROME - FERRO SILICON

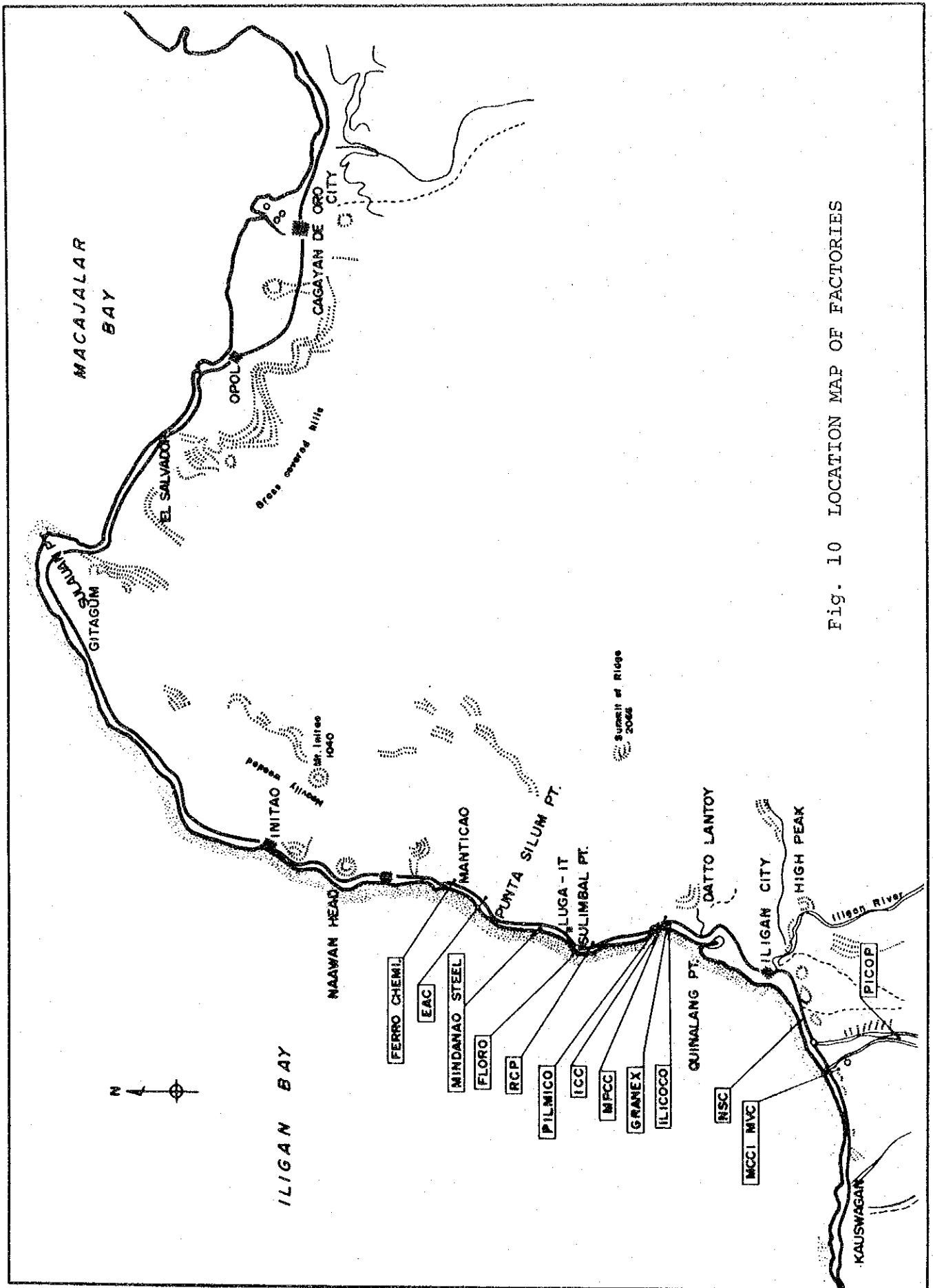


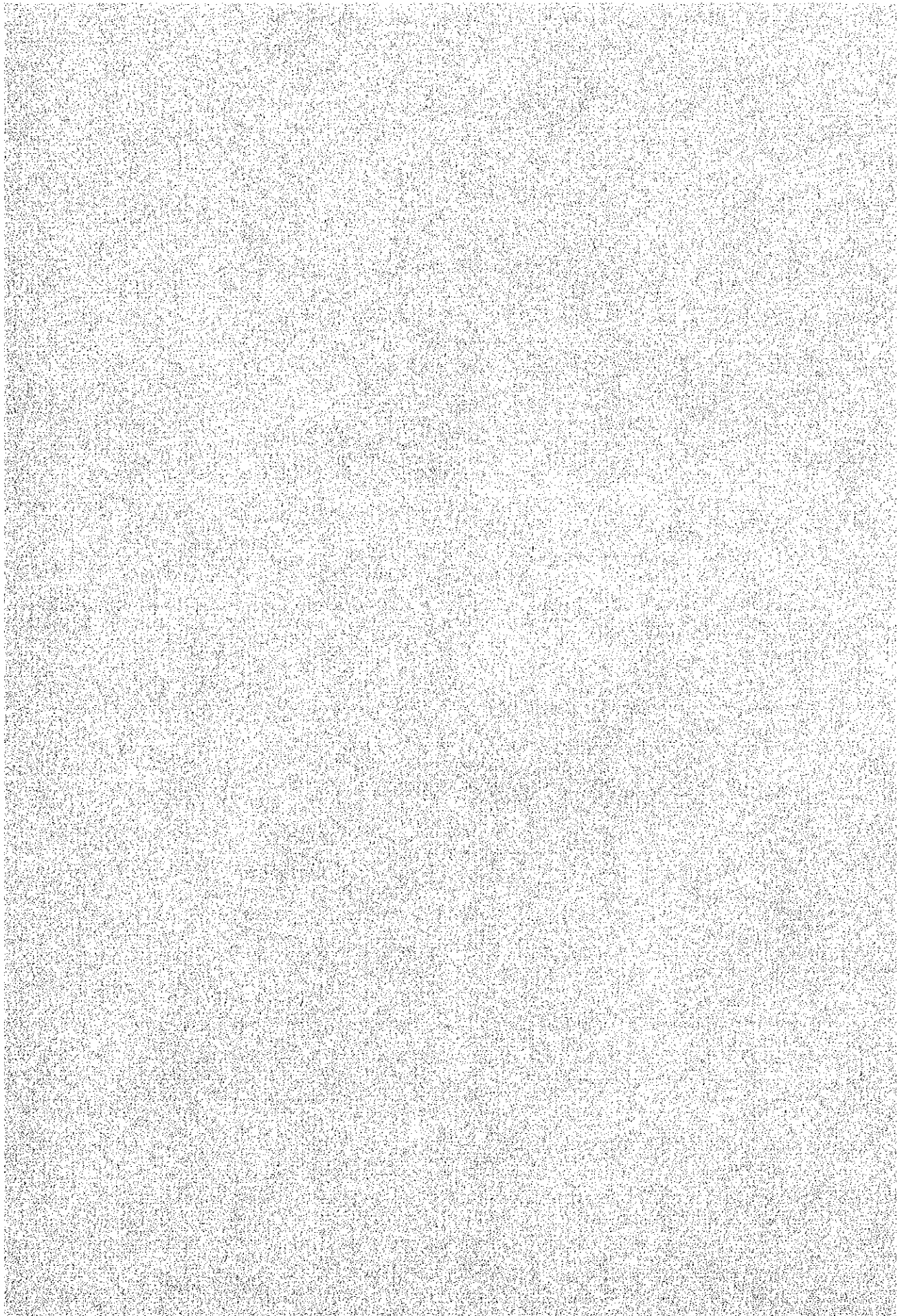
Fig. 10 LOCATION MAP OF FACTORIES





**CHAPTER III**

**PORTS IN THE PROJECT AREA**



### 3.1 PORT FACILITIES AROUND PROJECT AREA

#### 3.1.1 General

Mindanao Island, administratively composed of Region 9, 10, 11, 12 has eight Base ports and eighteen Sub ports. A total of 1,300,000 ton cargoes were handled through the above Base and Sub base ports in 1975. This volume was equal to 20% of all cargoes in Philippines. The largest 10 ports in respect of cargo volume are listed below.

Table 12 CARGO VOLUME IN MINDANAO PORTS  
1974-1975

		(unit x1000t)
	Port	Cargo Volume
1	Davao	2,900
2	Gen. Santos	2,400
3	Iligan	2,400
4	Cagayan de Oro	1,400
5	Zamboanga	1,300
6	Cotabato	1,200
7	Bislig	1,100
8	Surigao	900
9	Masao	400
10	Ozamis	270

In the seven ports out of ten, foreign cargoes exceeded domestic cargoes. On the Mindanao level, a total volume of domestic cargoes was 5,600,000 ton and foreign cargoes 7,300,000 ton in 1975. Hereunder, more detailed description has been made especially on Cagayan de Oro port, and Iligan port which are located about 65 km east and 23 km west of EAC factory respectively.

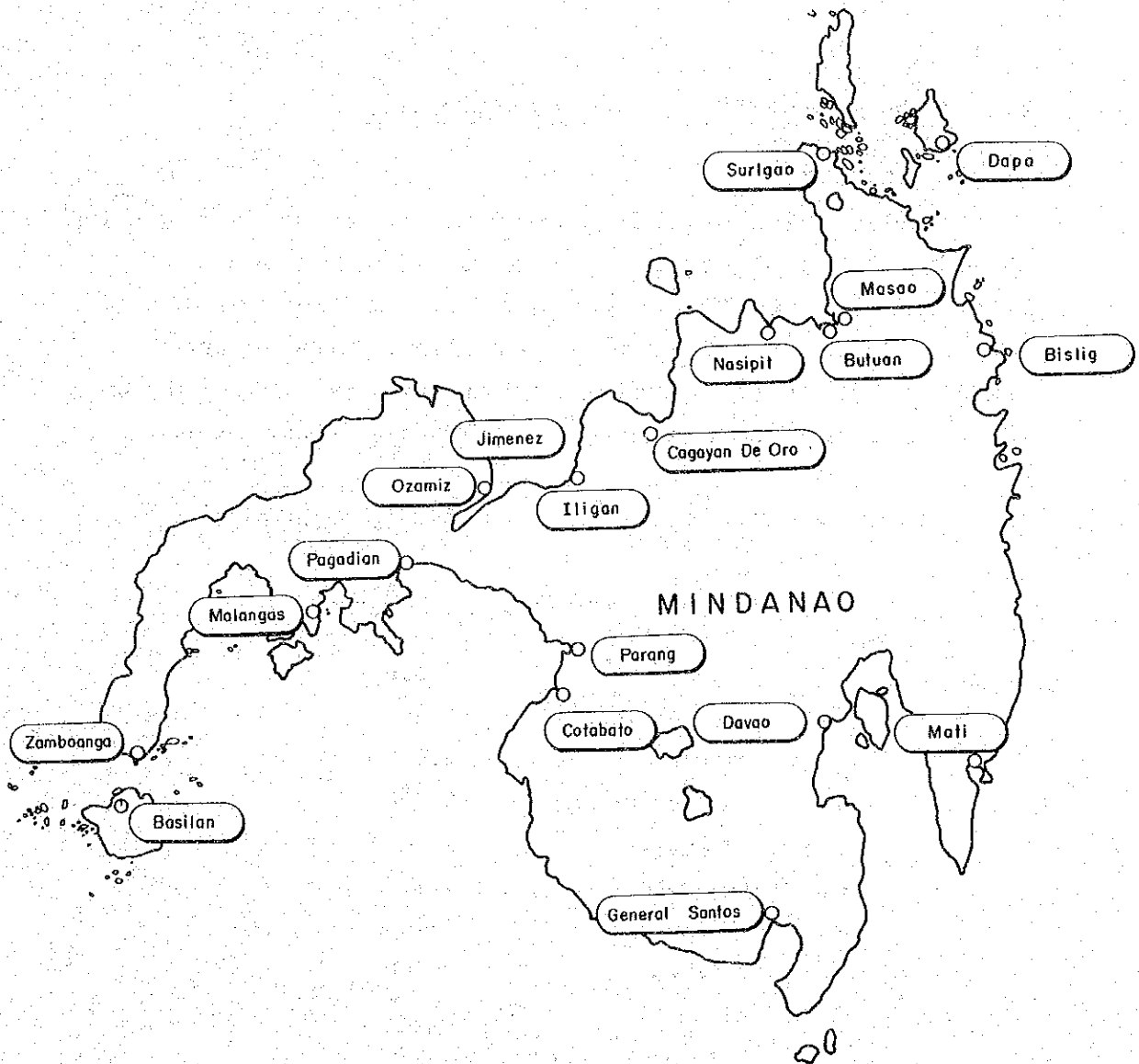


Fig. 11 PORTS IN MINDANAO ISLAND

### 3.1.2 Cagayan de Oro Port

As shown in Fig. 12, the berth alignment of public piers in Cagayan de Oro port consists of a 290 m-long old pier and a 191.5 m-long new pier. Now the port authority of Cagayan de Oro has a plan of the south pier expansion. The port statistics shows that the total cargo handled in 1979 was 660,000 ton, out of which incoming cargoes were 230,000 ton and outgoing 430,000 ton. The major outgoing commodities were agricultural products like corn, timber and general cargoes, while major incoming commodities were general cargoes and fertilizer.

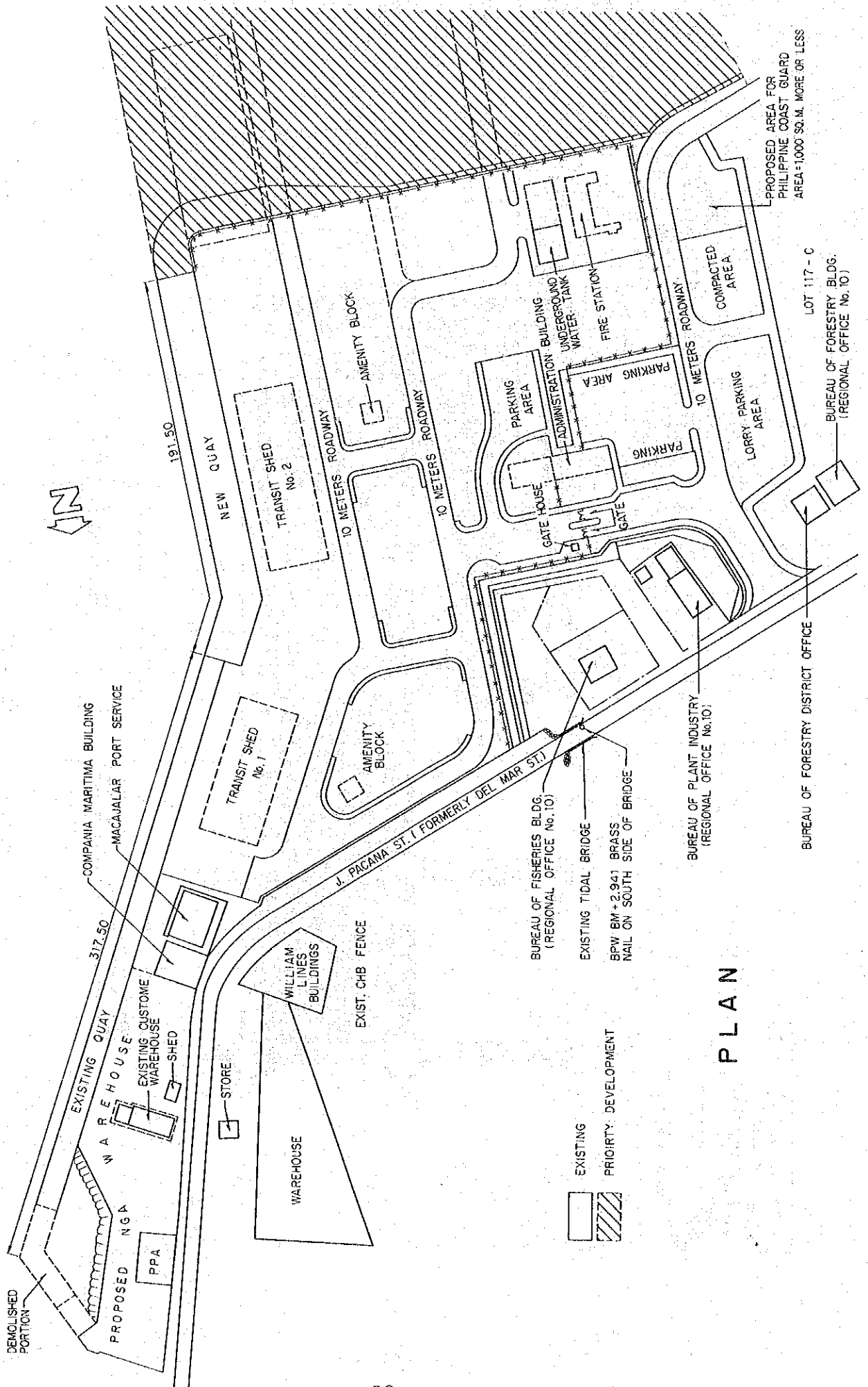
### 3.1.3 Iligan Port

As shown in Fig. 13, the berth alignment in Iligan port consists of two finger piers (No.1, No.2) and a new marginal type pier (No.3). The former two are mainly used for coastal vessels and the latter one for ocean-going vessels that carry containers and bulk cargoes. At present, half length of the pier No.3 can not be used due to shallowing in berthing area. To overcome this shallowness and growing ship callings, this berth is scheduled to be upgraded to a 240 m-long berth with a water depth of 7.60 m. The port statistics in 1979 shows that outgoing cargoes were 120,000 ton and incoming cargoes 250,000 ton. The major incoming commodities were grain, sugar and bottled goods, while the major outgoing commodities were chemical products, paper and corn.

#### 3.1.4 Private Piers

In the vicinity of Iligan city, there are a total of 9 private piers. The cargoes handled through this private piers are three times as large as those through public piers mentioned above. The private pier nearest EAC factory is the Pillsbury pier for Floro cement. In the distance of 60 km between this pillsbury pier and the logging company's pier near the Cagayan de Oro port, there is no port facility except an old demolished pier at Punta Silum.

Fig. 12 CAGAYAN DE ORO PORT



PLAN

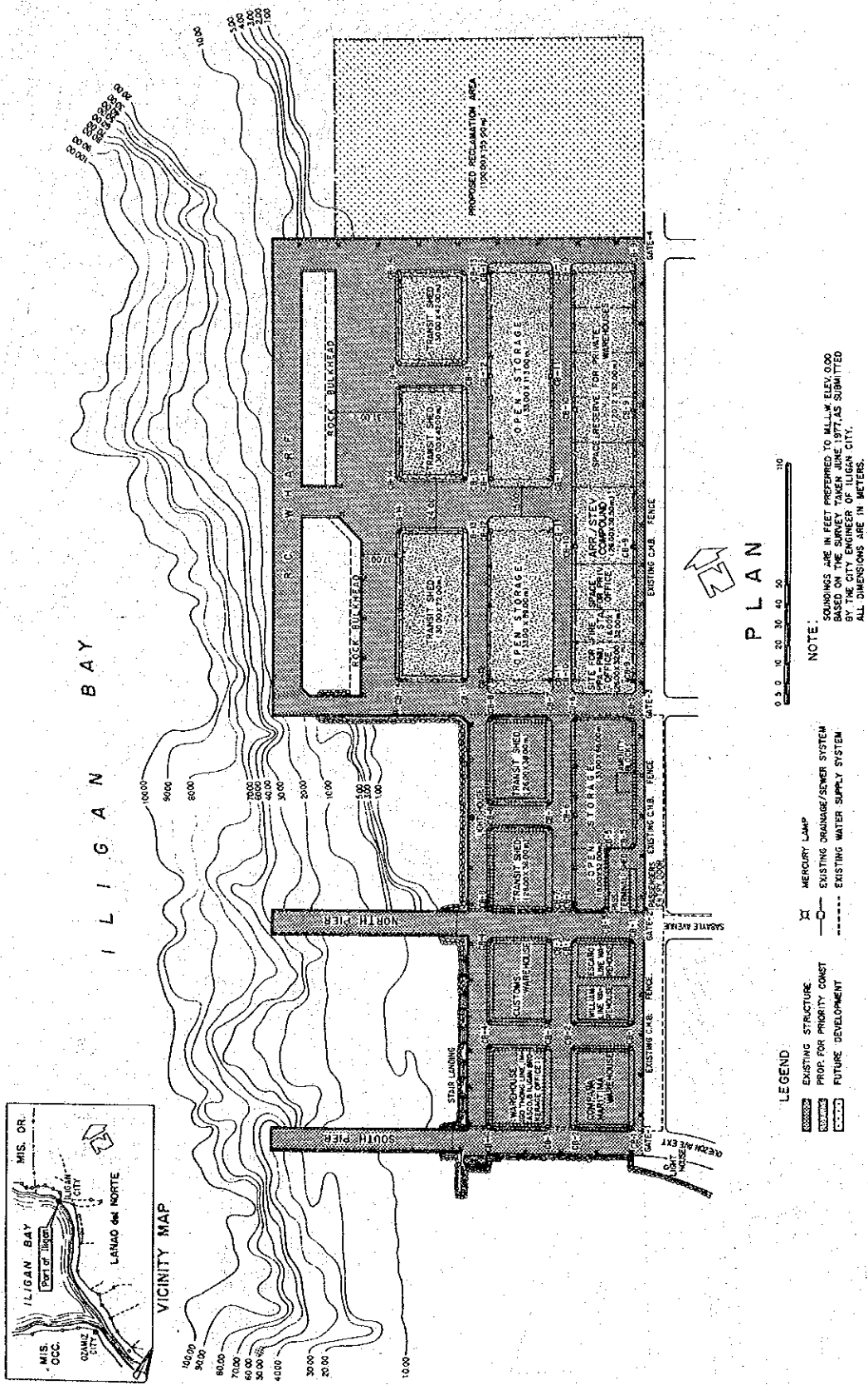


Fig. 13 IILIGAN PORT



Table 13 PORT STATISTICS OF CAGAYAN DE ORO

(unit: ton)

	Outgoing			Incoming		
	1977	1978	1979	1977	1978	1979
Live Animals	4,157	5,377	6,811	103	129	30
Palay and Rice	3,041	3,541	4,803	8,450	3,929	9,811
Corn	145,064	207,533	181,548	318	182	289
Other Cereals	664	2,363	6,802	2,749	6,836	2,971
Sugar	146	21,366	31,889	21,062	18,487	17,608
Bottled Cargo	19,878	11,821	13,938	15,257	9,854	2,117
Empty Bottles	13,593	8,789	1,344	16,381	11,538	14,726
Other Consumer Goods	3,902	4,342	2,956	19,951	19,886	15,143
Cement	347	534	686	1,168	884	2,954
Fertilizers	831	888	1,927	21,850	28,649	28,018
Chemicals	864	264	165	4,949	2,681	3,626
Lumber	49,006	74,916	80,506	2,408	1,811	899
Plywood and Veneer	6,680	5,112	5,439	3,371	3,053	1,854
Animals Feeds	7,995	9,011	20,049	4,586	4,980	7,629
Metal & Metal Products	717	223	375	7,169	4,618	10,004
Petruleum Products	123	147	136	5,323	5,650	2,896
Copra	8,404	4,047	1,431	3,680	1,232	2,212
Pineapple Products	9,836	2,553	3,382	0	0	0
Tomatoes	5,253	16,363	19,110	0	0	0
General Cargo	44,663	37,573	18,853	82,923	116,661	79,061
Pulp	0	0	0	1,535	2,146	4,217
Fuel Oil	0	0	0	80,479	-	-
Charcoal	2,252	1,750	1,750	0	0	0
Chromite	14,872	7,348	17,127	0	0	0
Others	1,963	5,002	11,610	534	1,284	23,455
<b>Total</b>	<b>344,251</b>	<b>430,863</b>	<b>432,637</b>	<b>304,246</b>	<b>244,490</b>	<b>229,520</b>

Table 14 PORT STATISTICS OF ILIGAN PORT

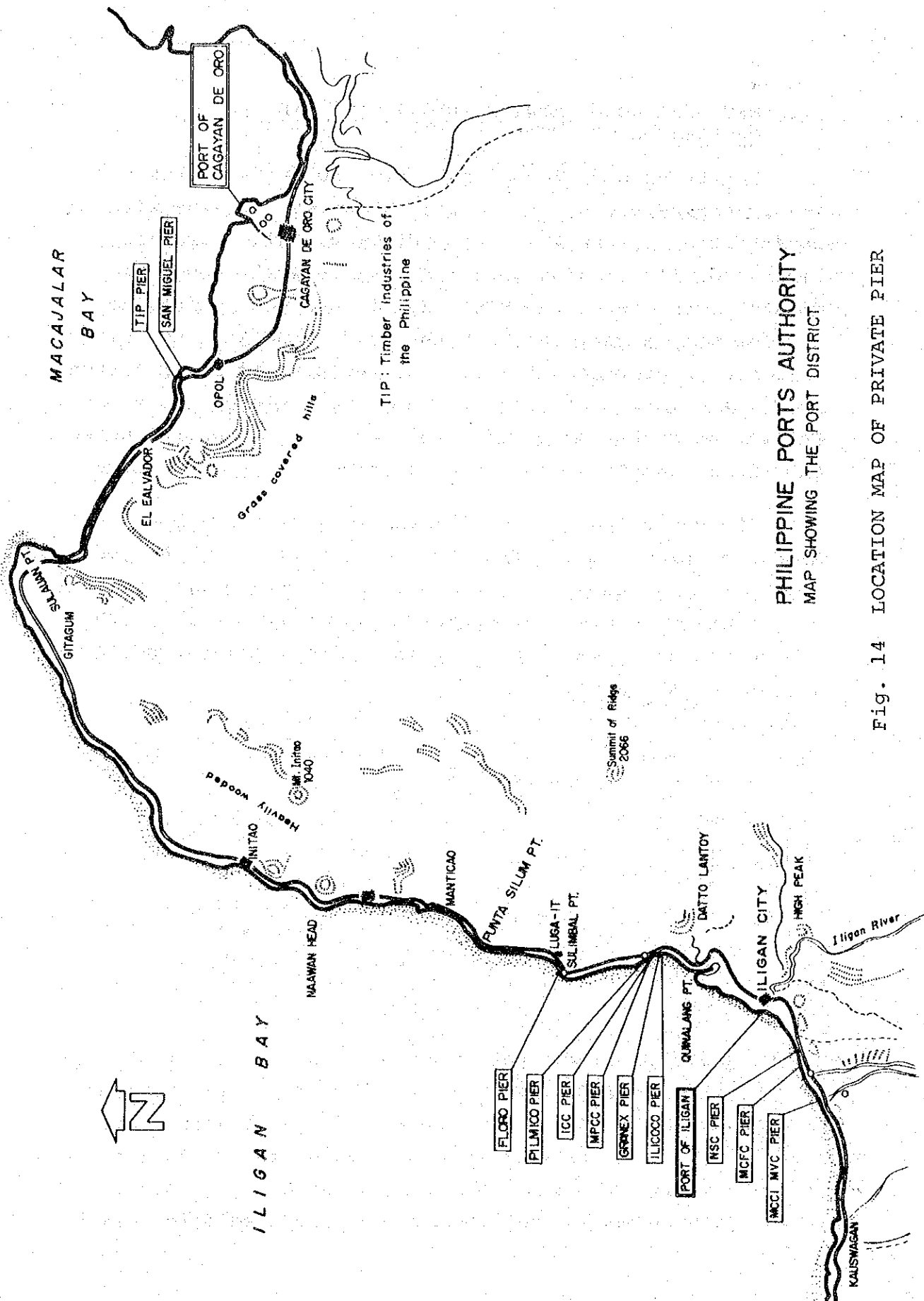
(unit: ton)

	Outgoing		Incoming	
	1978	1979	1978	1979
Live Animals	1,117	1,465	346	460
Palay and Rice	691	838	1,816	6,728
Corn	17,495	13,692	118	159
Other Cereals	1,699	989	1,138	677
Sugar	34	13	5,917	7,456
Bottled Cargo	39	48	7,363	1,959
Empty Bottles	5,832	1,964	0	0
Other Consumer Goods	627	238	9,850	5,294
Cement	87	93	200	87
Fertilizer	1,393	871	5,013	815
Chemicals	53,186	33,689	19,105	47,850
Lumber/Logs	1,850	8,428	1,471	1,380
Plywood & Veneer	4,527	11,734	788	633
Animal Feeds	2,188	158	1,348	897
Metal & Metal Products	9,330	10,897	3,163	2,721
Copra	-	253	-	-
Bananas	1,249	1,603	0	0
Flour	-	409	-	830
General Cargo	7,686	8,776	34,064	41,809
Silica Quarts	-	-	-	8,700
Charcoal	-	123	-	623
Transit Cargoes	-	2,240	3,188	89,283
Paper & Paper Pdts.	25,112	21,347	14,983	30,977
Others	-	973	-	3,039
<b>Total</b>	<b>134,142</b>	<b>120,841</b>	<b>109,871</b>	<b>252,377</b>

Table 15 PORT STATISTICS OF PRIVATE PIERS  
NEAR ILIGAN CITY

(unit: 1000 tons)

		1980	1979
Foreign Trade	Import	478	627
	Export	535	415
Domestic Trade	Incomming	491	350
	Outgoing	603	604
<b>Total</b>		<b>2,107</b>	<b>1,996</b>



PHILIPPINE PORTS AUTHORITY  
MAP SHOWING THE PORT DISTRICT

Fig. 14 LOCATION MAP OF PRIVATE PIER