Report

on

the Survey for the Industrialization in the Republic of the Philippines

March, 1965

Overseas Technical Cooperation Agency

ERRATA

Page	Line	Errors	Correction
78	3rd from bottom	900,0	300,0
79	15th	30-100 tons	30-50 tons
80	2nd from bottom	trawlers	tuna boat
80	bottom	trawling in the South China Sea	tuna fishing in the open sea
85	8th from bottom	in the case of 4 tuna boats the items are:	Bonito boat 50GT×4 Catch per boat 80t. per month Total catch 80t×10month×4 =3,200t

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PREFACE

The Government of Japan which, at the request of the Government of the Republic of the Philippines, undertook the task of making a fundamental investigation, by means of its budget for fiscal year 1964, of the medium and small scale industries of the country, especially those four lines of cement manufacture, refrigiration and canning, small-sized shipbuilding and diesel engine manufacture, has entrusted Overseas Technical Cooperation Agency, the executive organ of the Government, with the accomplishment of the task.

The Agency, in view of the importance of developing such medium and small scale industries of the country and for the purpose of making a successful execution of its task, has organized a survey mission headed by Mr. Kaoru. Kajitani, Managing Director of Japan Engineering Consultants Co., Ltd., and consisting of six experts.

The mission which had left Tokyo on 29th September 1964 stayed in the Philippines for about a month, discussing and studying the matters concerning each of the above-said lines of industry, making field investigations and collecting necessary data. Thanks to the special assistance and cooperation of the proper authorities of the Philippine Government the survey was performed smoothly. All members of the mission have come home safe and sound and got ready to submit the present report.

Even since the Agency was established in June 1962 as an executive organ of the Government in connection with Japan's overseas technical cooperation it has made steady achievements in various fields such as the dispatch of experts to developing countries, receiving their trainees into Japan, offer of consulting service, etc.

Nothing would be more gratifying to the Agency if the present report could be of any use to the development by the Philippine Government of the medium and small scale industries of the country and contribute, at the same time, to the promotion of the amicable relations and economic interchange between the two countries.

In conclusion the Agency takes this opportunity to express its deepest sense of gratitude for the assistance extended to the investigation work on the spot to the

authorities concerned of the Philippine Government, resident Japanese Government officials and each member of the survey mission, and also for the cooperation given to it in the dispatch of the mission by the Ministry of International Trade and Industry Government of Japan, Japan Engineering Consultants Co., Ltd., Naigai Consultants Co., Ltd., Koyo Marine Products Co., Ltd., Yamma Diesel Co., Ltd. and Kanazashi Shipbuilding Co.

March 1964

Director-General

Overseas Technical Cooperation Agency

Important Officials of the proper authorities of the Government, Public Corporations and State-operated Companies of the Republic of the Philippines:

(1) Authorities concerned in charge of the general affairs concerning the present investigation

OEC (Office of Economic Coordination)

Hon. Eleuterio Adevoso	Economic Coordinator
Atty. Serverino M. Salang	Acting Deputy Coordinator
Mr. Jesus H. Ortiz	Public Information Staff
Mr. Alfredo Solatan, Jr.	Chairman, Economic Advisory Committee
Mr. Ramon Montinola	Administrative Officer
Mr. Henry Pangkatinawan	Chief, Budget and Finance Control Services
Mr. Lindy Nombrado	Photographer, the Economic Coordinator

(2) Authorities concerned in co-operation with the Survey Mission in connection with the cement manufacturing industry

CEPOC (Cebu Portland Cement Company)

Atty. Ramon P. Martinez	General Manager
Mr. Laurente	Director
Mr. Kapunan	Chief Engineer, Mining Dep't

Bureau of Mines

Mr. Ricardo de Arca	Chief Engineer
Mr. Cruz	Engineer

(3) Authorities concerned in co-operation with the Survey Mission in connection with the refrigiration, canning and diesel engine manufacturing industries

NDC (National Development Company)

Mr. Jose H. Panganiban	General Manager & Vice Chairman
Mr. Demetrio Brillantes	Assistant General Manager
Mr. Placido Valenzuela	Staff Civil Engineer

Mr. Caward	Engineer
Mr. Porfirio Manacop	Engineer
Mr. Uenco	Engineer

Philippines Fisheries Commission

Mr. Gonzalo C. Ferrer	Chief, Technical Service Division

(4) Authorities concerned in co-operation with the Survey Mission in connection with the small-sized vessels

NASSCO (National Shipyards and Steel Corporation)

Col. Juan E. Arroyo	Chairman, Board of Directors
Mr. Bernardo P. Abrera	General Manager & Vice Chairman
Mr. Roberto L. Cinco	Programming & Planning Officer
Mr. Demetrio L. O. Aguila	Technical Consultant
Mr. Fidel A. Perez	Naval Architect & Engineer
Mr. Adalia	Engineer

NASSCO Bataan Shipyard

Mr. Mendigorin	Chief Engineer

(5) Other important authorities concerned

Corporations under OEC

National Power Corporation

Manila Gas Corporation

Manila Hotel Company

Government Service Insurance System

People's Homesite and Housing Corporation

Philippine National Railways

District Philippine Fisheries Commission, and others

CONTENTS

Chapter I

Purpose of the Survey Mission and Outline of Investigation

1 Circumstances which have led to the dispatch of the survey mission and its purpose

The Philippines Government, which has formulated a social and economic five-year plan for the purpose of making a higher development of its economy, is now laying utmost stress on the development of its manufacturing industry. In this connection Hon. Eleuterio Adevoso, Director of the O.E.C. (Office of Economic Co-ordination) which is one of the most influential government organs, has asked the Government of Japan for its technical cooperation regarding the staple industries of the Republic, especially in the four fields of cement manufacture. refrigiration and canning, small-sized shipbuilding and diesel engine manufacture.

The Overseas Technical Cooperation Agency of Japan, therefore, has decided to dispatch a survey mission in order to make a fundamental investigation of the possibility of developing the above-said industries.

2 Organization of Survey Mission

Name	Capacity	Assignment	Present Office
Kaoru Kajitani	Leader	General Affairs	Managing Director, Japan Engineering Consultants Co., Ltd.
Toshio Yamane	Member	Cement Industry	Engineer, Naigai Consultants Co., Ltd.
Chuichi Tashiro	"	"	"
Zenkuro Kawakami	"	Refrigiration and Canning	President, Koyo Marine Products Co., Ltd.

Kikuo Miyata	Member	Diesel Engine	Chief, Tokyo Branch, Yamma Diesel Co., Ltd.
Yoshisuke Goto	"	Small-sized Shipbuilding	Chief, Shipbuilding Section, Kanazashi Shipbuilding Co., Ltd.

Chapter II

Cement Manufacturing Industry

1 Field investigation

1-1 Outline

Field investigation of the seven proposed sites of the cement works, which will be described later, was made by making reference to the suggestion of CEPOC (Cebu Portland Cement Company), beginning on October 7th and ending on 27th of the same month. However, the precision of each investigation work classified by the items and districts in view is different according to the means of communication, scope of investigation on the spot and documentary records available in each individual case. This was inevitable because the period of investigation in each case was extremely limited, that is, to only two days or so. Consequently the contents of this report have had to be rather a mere description clarifying the problems of the fundamental investigation which must be performed in future than a statement of the preliminary survey conducted in connection with the construction of the proposed cement works. It is desirable that more detailed survey and study will be made in future on the basis of this report.

The seven sites in view of the cement works which have been surveyed are as follows:-

(1) Pangasinan (Pangasinan)

(2) Batan Island (Albay)

(3) Balatan (Camarines Sur)

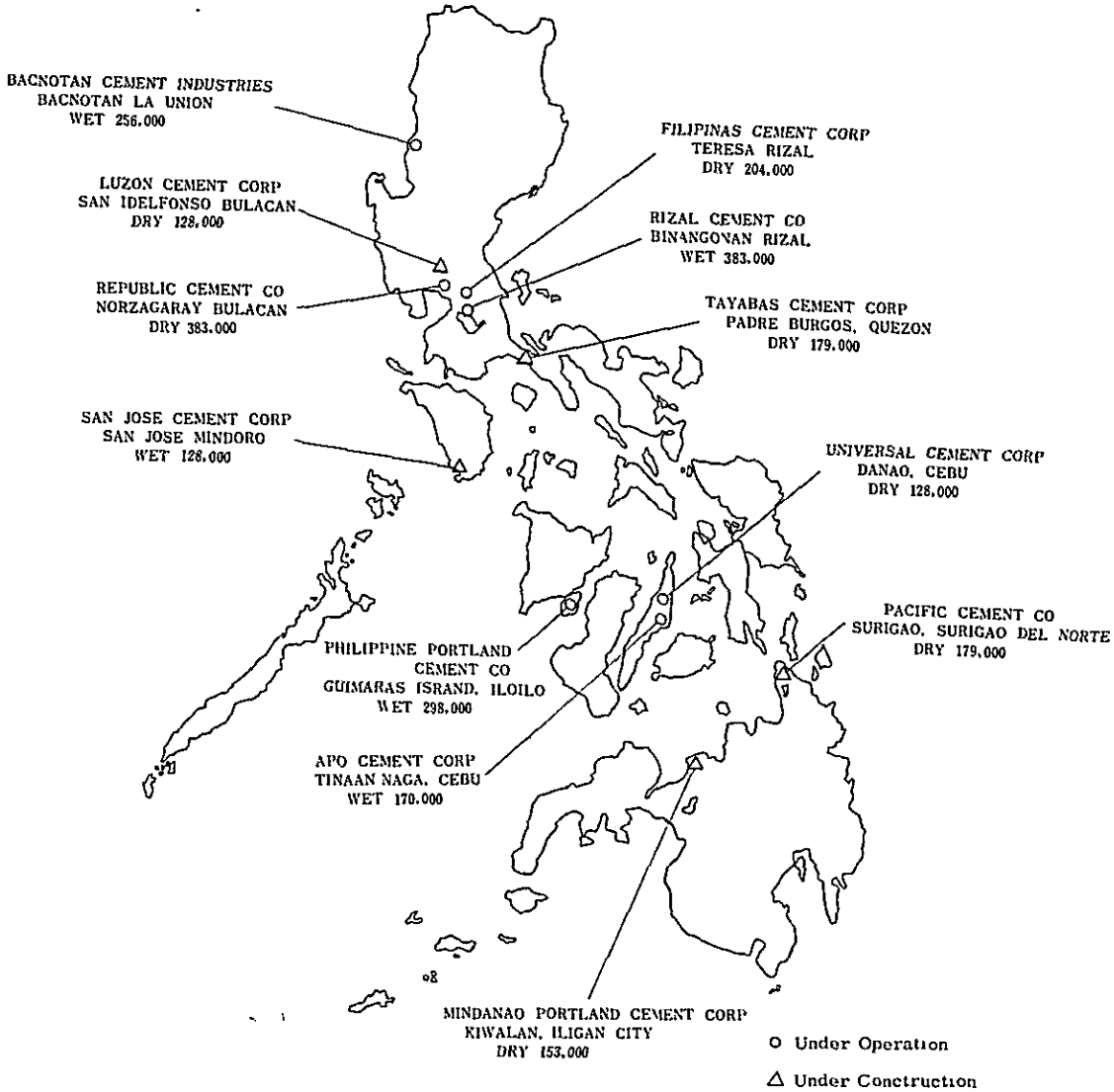
(4) Ilog (Negros. Occ)

(5) Sagay (Negros. Occ)

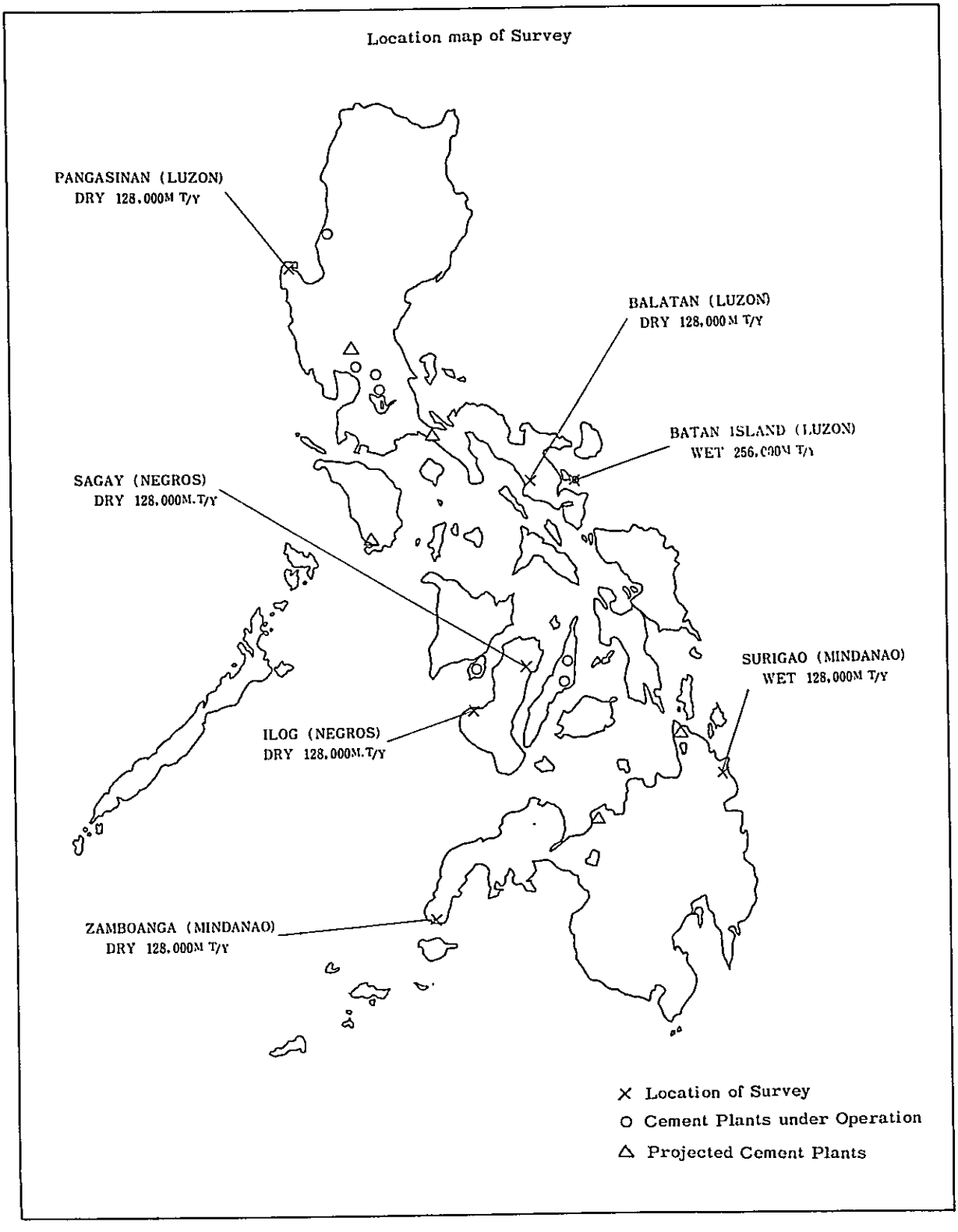
(6) Zamboanga (Zamboanga del Sur)

(7) Surigao (Surigao del Sur)

Distribution map of Cement Plants



Location map of Survey



The result of our investigation indicates that each of the above may be considered suitable as a site of constructing cement works. In our opinion, however, it is premature to decide the merits and demerits of each location because of the reasons stated above, and at the present moment we had better postpone our conclusion pending further study in future.

We recommend in this case that four cement works in four districts be constructed; they are: either at Cagayan or Pangasinan in Northern Luzon: either at Batan Island or Balatan in Southern Luzon: either at Ilog or Sagay in Visayan: either at Zamboanga or Surigao in Mindanao.

The results of the fundamental investigation classified by items necessary for the construction of plants are as follows:-

Material: According to the source material of the Bureau of Mines of the Republic there are in thirty-six mine-lots throughout the country deposits of limestone amounting to 4,600 million tons in total sum available for exploitation. The data seem to be evidently backed up by the fact that the limestone in the seven places above-said has proved available enough for use as material of cement manufacture both in quality and quantity. However, it is anticipated that some of them may contain heterogeneous or dolomite element and a more detailed investigation of the geology and even survey by means of boring will be necessary in future.

Generally speaking, this country is also rich in clay as in the case of limestone, but, as it exists in the form of alternate layers of the Tertiary shale and sandstone, the variation of its components must be carefully watched.

As for silica it is sometimes needless in cement manufacture according to the composition of the limestone or clay. However, in most of the surveyed spots the limestone is of high-grade and the clay insisting of the Tertiary shale and sandstone, so in this case it follows that the use of silica in the proposed cement manufacture will be indispensable. However, according to our survey, the obtainable silica consists principally of the silica sand on the seashore, whose variation in quality together with its small quantity are anticipated. This will require a more detailed study in future.

As for ferrous substance which is also one of the materials, a vast amount of laterite deposits exists in Surigao of Mindanao which, although we did not go to survey, needs to be prospected in future.

Gypsum which is rarely found in the country is now being imported for the most part from Australia, Canada, etc., the import amount being about 40,000 tons yearly. Incidentally a kind of gypsum which is a by-product of phosphatic manure industry has recently come into use and it is desirable to develop such one in future.

Fuel: As for the fuel it will be inevitable to rely entirely on heavy oil. However, the use of coal is also conceivable in such districts as Batan Island, Sagay and Surigao; in this case many problems must be considered such as the quality, technic of its exploitation, expenses in comparison with those of heavy oil.

Electric power: Electric power in each district has of course to rely on an independent power plant driven by diesel engines of heavy oil, but thermal power generation is expected in such district as Batan Island where coal is obtainable with facility.

Industrial water: As it is possible in each proposed site to conduct the necessary water from the large or small rivers and creeks near-by, the situation is comparatively favourable. However, in most of the cases construction of a small dam will be necessary for storing water. The quality of the water is good beyond question for industrial use.

Plant site: Each plant site is wide enough for the present construction and future enlargement. Ground investigation by drilling will be necessary.

Market: In view of the market each proposed site may be said to be favourably situated. Considering the progress of the local development policy as well as the dispersal of manufacturing industry into localities, it is conceivable that the local demand for cement will more and more increase. In addition cement works in Zamboanga and Surigao will play an important role in export.

Transport: As the Republic consists of a large number of islands, transport by sea is extremely important here. However, on the seashore near the proposed

cement works except that of Zamboanga there has grown a wide area of coral reef which has caused the shoal to extend to a great distance, constituting unfavourable conditions for the construction of piers.

As for transport by land, on the contrary, the road condition is generally good, while the bridges are of weak construction which will need reinforcement in many points in the case of cement transport, especially it is so in Surigao district. At any rate transport, either by sea or by land, is an important question in cement industry and needs careful examination beforehand as in the case of plant construction.

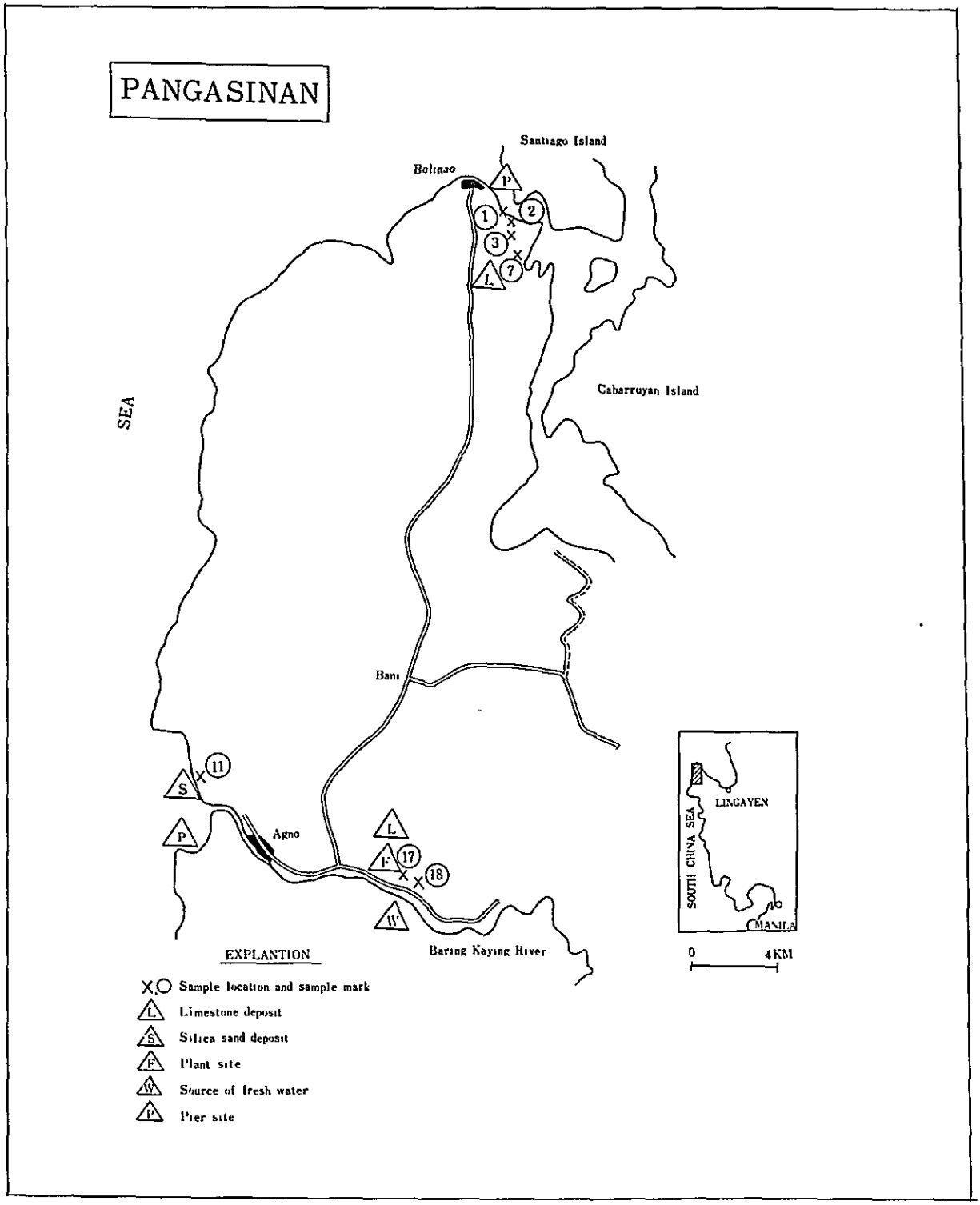
Atmospheric phenomena: Termperature is about 30°C all the year round and almost the same in each district, but there is a great difference in rainfall; especially in Surigao district it amounts to 200 in. for a year and is the largest of all, while in Zamboanga it is small, being 45 in a year. Taiphoon seldom hits those districts except Northern Pangasinan.

Process of manufacture and size of plant: As for the manufacture either wet process or Lepol process is considered suitable. Generally speaking, the former is preferred where there is a large amount of contained water or variation of quality in the material or when simple operation of the manufacturing equipments is desirable. Therefore, it is necessary to consider the wet process in such districts as Batan Island and Surigao where there is much rainfall and in such districts as Agno of Pangasinan and Manicahan of Zamboanga where the variation of ingredients in the material is anticipated.

The size of the plants is of course to be determined by the amount of prospective demand. However, in view of the reality of the Republic consisting of a large number of islands where the dispersal of industries into localities and development of localities are being planned, it will be in conformity with the situation to construct a number of comparatively small scale plants each with daily output of 430 - 650 tons (10,000 - 15,000 bags) (*)

Technologically speaking, construction of a fairly large cement works in each district will be possible.

* One bag contains 2.5 kg.


PANGASINAN
Santiago Island
Bolinao
Cabarruyan Island
SEA
Bani
Agno
Baring Kaying River
LINGAYEN
SOUTH CHINA SEA
MANILA
0
4KM
EXPLANTION
Sample location and sample mark
Limestone deposit
Silica sand deposit
Plant site
Source of fresh water
Pier site

1-2 Pangasinan District

Survey time	October 26th - 27th 1964
Survey Companions	Mr. Jose Kapunan
	Mr. Recaredo D. Arca
	Mr. Antonio F. DE Guzman

(1) Summary

Bolinao and Agno are the conceivable sites of the proposed cement works in this district.

Conditions of location in Bolinao are comparatively favourable so far as the limestone, plant site, pier and transport are concerned, but there are some problems in such points as the industrial water, clay and silica.

As for Agno conditions of location are generally good as there are highways, lime hills and sources of water in the vicinity of the proposed site, which is about ten kilometers distant from the spot favourable to the construction of a pier; this will be a little inconvenient to the works. The additional characteristic of this district consists in its lime source which is marl containing some siliciferous ingredients.

Conditions common to both of them are that the import of gypsum and fuel or heavy oil is necessary and electric power must be generated by an independent power plant.

Principal market will be found in Pangasinan district centering around Dagupan City and Manila and its vicinity. We are afraid that a certain extent of competition may occur in the cement market with Bacnotan Cement Co. in La Union, but, considering the prospective demand, too much fears may prove groundless.

Transport to the above market: Although there runs a highway which is 60 - 70 kilometers long to Dagupan City, the road surface is badly conditioned, which means a disadvantage of transport by land. Therefore, transport by sea must be developed, as both proposed plants are situated near such spots as suitable for the construction of piers; especially sea transport is to Manila district will be inevitable in view of the cost.

Process: Dry process is recommendable to Bolinao where the supply of industrial water will be insufficient, while wet process may be suitable to Agno where the heterogeneity of the ingredients of marl is anticipated.

The relative merits of the conditions of location concerning Bolino and Agno can hardly be determined so long as the present survey, which is unsatisfactory, is concerned, but the latter may be slightly superior to the former.

(2) Material

Bolinao: Adjacent to the southwest side of the proposed plant site limestone is widely distributed, forming a plateau 30 - 40 m. high (photo. 4). Although its exact size is unkonwn, as the area certainly spreads more than four square kilometers, we can place our hope on its quantity. The shape of the deposits is an approximately horizontal heap, in some parts descending slowly with layers of calcareous sandstone as an foreign element. The surface soil, which is 1 - 2 m. thick, is not much in quantity. The nature of the rock is of good quality, white - gre-white in colour, carolline and microcrystalline.

Clay has not been investigated yet.

The source of silica is seashore sand whose content of silicic acid is of low-grade with some variations in quality; as for the quantity we cannot expect much of it.

Agno: The source of lime here consists of two: carolline limestone and marl. The former is distributed along the coast of Agno, being solid, microcrystalline, often containing red tuff element. The latter is widely distributed in Anapo Agno (Photos. 4, 5) forming a plateau, 50 - 70 m. in relative height, of approximately horizodntal deposits which, according to the Bureau of Mines, extend to a distance of more than ten kilometers. The layers of the marl whose bedding planes are clearly observed consist generally of a pile of several single layers, each being 0.3 - 0.5 m. thick and of slightly different components. Therefore, when using it as a cement material full knowledge of the variation of the components, both vertical and horizontal, will be necessary. The nature of the rock is gray - gray-white in colour, somewhat coarse and fragile.

Clay deposits are found in the shape of a hill about 30 m. in relative heights, adjacent to the above-said limestone and consisting of alternate layers of shale and sandy shale.

The source of silica is the sand of the seashore of Agno (Photo. 4) and a variation in its quality is anticipated; the quantity cannot be much expected.

As for the ferrous material no investigation has been made in the two districts of Agno and Bolinao; future survey will be necessary.

Gypsum will have to be imported. However, it is reported that they are planning to establish a new phosphatic fertilizer plant in Bataan, whose chemical gypsum a by-product, will be made use of; this is a matter to be considered, too.

As to the samples microscopically examined please make a reference to Photo. 8, 9.

Preparation of the materials will be omitted , as each of them is now under analysis. However, as the marl of Agno is anticipated to contain a considerable amount of SiO_2 and Al_2O_3 ingredients, the quantity of silica and clay to be used in compounding may show a wide difference from the case of using high-grade limestone

(3) Plant location

Plant site: The proposed plant site of Bolinao is near the site in view of the pier and the lime hill; it is situated along the coast with some ups and downs.

As is shown in Photo 2. the proposed plant site of Agno is situated in a flat land adjacent to the marl deposits, sources of the industrial water and the highway. It is a paddy-field now and about ten kilometers from the proposed site of the pier.

Generally speaking, both plant sites are suitable for plant location. The ground will have to be investigated.

Industrial water: Bolinao: Acquisition of industrial water is inconvenient here, for there are only a few fountains nearby the proposed plant site, as shown in Photo. 5. On the other hand, in Agno it is possible to conduct water from the River Baring Kaying which runs to the southeast of the proposed plant site; in this case a dam for storing the water must be built to enable the conduction.

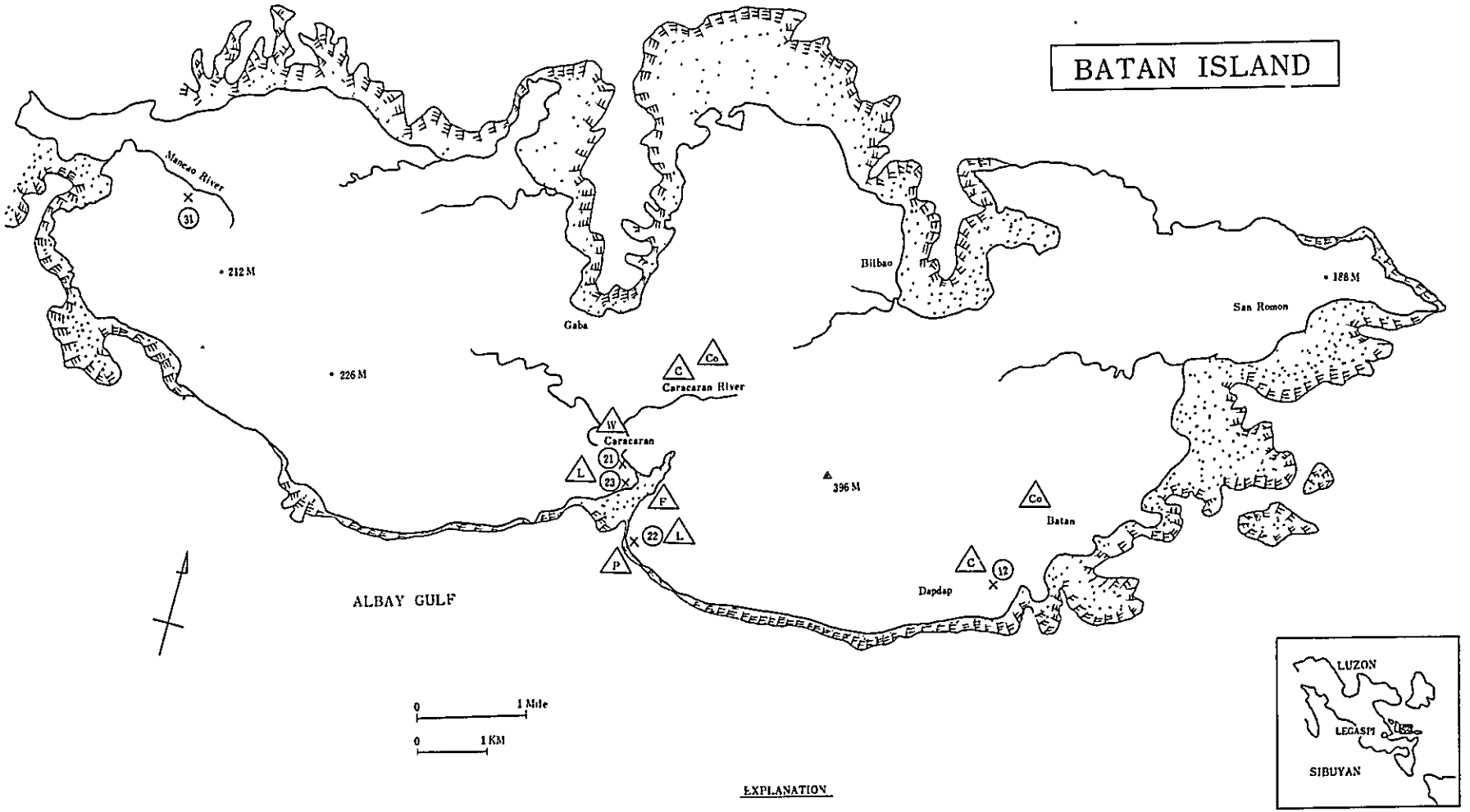
Moreover, measures must be taken to hold back the flowing-in of the sea-water at high tide.

Fuel and electric power: These are problems common to all Philippines. The source of the former is imported heavy oil, while the latter must be generated at independent power stations driven by diesel engines.

Market: Important market will be found in Pangasinan district centering around Dagupan City and, moreover, in Manila Competition with Bacnotan Cement Co. of La Union is conceivable, but, considering the prospective development of Northern Luzon, the fears may be imaginary.

Transport: Transport by land from the two spots of Agno and Bolinao to Dagupan City is considered disadvantageous , for not only the distance is rather long, that is 60 - 70 kilometers, but also the road is badly conditioned. Fortunately the conditions of location of the proposed pier site are favourable (Photo. 6); this means that transport should be conducted principally by sea; especially shipment to Manila which is more than two hundred kilometers distant must rely on sea transport in view of the cost. The pier facilities merit special attention, because they have a great effect not only on the transport of cement but also on the cost of such imports as fuel, machinery and implements, gypsum, etc. Incidentally at Agno the use of the mouth of the River Baring Kaying as a port is worth considering. The river is 60 - 60 m. wide and 4 - 5 m. deep near Agno hamlet.

Atmospheric phenomena: As this district belongs to the so-called 1st type, the dry season lasts from November to April. By way of reference the statistics of rainfall in Dagupan City during the past 5th years show that the yearly one is 96.01 in., the maximum 21.31 in. recorded in August and the minimum 21.31 in. recorded in January. Typhoon is observed a few times a year.


BATAN ISLAND
Mancao River
31
• 212 M
• 226 M
Gaba
Bilbao
• 188 M
San Ramon
C
Co
Caracaran River
W
Caracaran
21
23
L
F
22
L
P
396 M
Co
Batan
C
12
Dapdap
ALBAY GULF
0 1 Mile
0 1 KM
LUZON
LEGASPI
SIBUYAN
EXPLANATION
×,○ Sample location and sample mark
L Limestone deposite
C Clay deposit
Co Coal deposit
F Plant site
W Source of fresh water
P Pier site

1-3 Batan Island District

Survey time October 7th-8th, 1964

Survey companions Mr. German D. Songco

(1) Summary

The most suitable site of a cement works on this island is a location nearby Caracaran bay, where there are not only deposits of limestone, clay, coal, etc. but also industrial water and plant site are obtainable with facility. Furthermore, the vicinity of a headland on the east coast of the bay is favourably conditioned to the construction of a pier. Regarding the market it is also favourably situated in connection with the Southern Luzon and Bisayan district.

However, it is anticipated that there are in the limestone such layers of impurities as sandstone, shale and, moreover, dolomite element. In order to clarify such composition investigation of the geology and survey by means of boring are necessary. As regards clay and silica investigation of their quality and quantity is needed; also, search for ferrous material and gypsum is necessary. In case of using coal survey and plan of developing a coal-mine and further, comparison of the cost of products with that in the case of heavy oil process will be required. Electric power has to be obtained from an independent power plant either by coal or by heavy oil.

As for manufacture wet process is considered suitable for this island, because the yearly rainfall due to frequent rainy days amounts to much here, and a certain degree of heterogeneity of the materials is anticipated.

As we have stated above, this island, in spite of its isolated position, is comparatively well-conditioned for the construction of a cement works and its future development can be expected.

(2) Material

The investigation of the geology of this island has already gone a pretty long way centering around the coal deposits; especially in 1955 Mr. O. Crispin and other persons made a fairly detailed survey.

Limestone: The distribution of limestone has been ascertained by Mr. Crispin's investigation. We made a field survey of three spots: Batan, Caracaran and Mankao. Each deposit, although different in thickness, consists of alternate layers of sandstone, sandy shale and shale, and its strike is NE, its dip being 10° - 20° in the direction of NE or SE. Although the thickness of each deposit is indistinct, it is presumed to be more than 100 m. at Caracaran and Mankao. However, all layers of the limestone cannot be homageneous, but have some variations, horizontally and vertically, at each deposit or even within the same layer. It is anticipated also that the layers contain sandstone, shale and dolomite element. Therefore, investigation, aiming at the limestone, of the geology and boring survey will have to be performed to grasp the above-said points. Incidentally, their formation is said to be long to the Miocene - Pliocene. The nature of the rock is grey - brown-gray in colour, solid, adamantine and chiefly obscure micro-crystalline - microcrystalline and in some cases coralline. The chemical composition, as is shown in Table 1, is CaO 52 - 55% and MgO 1 - 2.5%; it is a good material for cement manufacture.

Clay: Such sandstone, sandy shale and shale as forming alternate layers with lime layers or sandwiching coal seams constitute useful clay for cement manufacture and, quantitatively speaking, we can place our hope on them. However, they often form alternate layers made up of comparatively thin sheets; attention must be given to the variation of the ingredients when making use of them. The nature of the sandstone and shale is yellow-brown - brown in colour and soft. Chemical composition of the sandstone of shale matter picked up at a spot 1.5 kilometers to the west of Batan hamlet is shown in Table 1, consisting of S_1O_2 60.48%, Al_2O_3 17.96% and Fe_2O_3 6.08%. which, when considered with the grade of the limestone, necessitates the addition of silica and ferrous material in the case of manufacturing ordinary Portland cement.

Table 1 : Chemical Composition of Materials of Batan Island

No. of Specimen	Name of Specimen	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	1g loss	Total
12	Fine Sandstone	60.48	17.96	6.08	3.81	2.04	5.40	95.77
21	Limestone	0.18	0.03	0.37	55.15	1.05	42.46	99.24
22	Limestone	1.32	1.29	0.73	51.93	2.23	42.54	100.04
23	Silica Sand	87.96	5.05	1.03	1.20	0.41	2.04	97.79
31	Limestone	0.66	0.03	0.73	53.35	1.96	43.00	99.73

(Analysis: Bureau of Mines)

Silica: In those places where sandstone and shale of sandy element is distributed near the seashore silica sand is usually found in a more or less quanity. An example, though on a small scale, is seen on the west coast of Caracaran bay; 100 parts of this silica sand contain SiO_2 87.96, a comparatively high percentage of siliceous matter. In order to grasp the silica sand both in quality and quantity an investigation of wide scope around the island as well as that in it will be necessary. As to the microscopic examination of the samples picked up please refer to Photo 13.

Other materials: We have not made an investigation of ferrous material, but that of laterite system may be obtained with facility. Gypsum has to be imported.

Preparation: As the composition of the ferrous material is unknown, preparation is impossible. In case of a trial compounding, by way of a reference, using known materials and letting SM = 2.5 and HM = 2.1 *, a result is obtained as shown in Table 2 which clearly indicates the shortage of ferrous matter.

Table 2: Trial Calculation of Prepared Materials of Batan Island

Preparation				Composition of Clinker											
Specimen No.		Name of Specimen	%	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Al	SM	IM	HM	C_3S	C_2S	C_3A
A	21	Limestone	76.3	22.4	6.6	2.6	66.4	2.0	3.4	2.4	2.5	2.1	51.9	25.2	12.6
	12	Sandstone	23.7												
B	22	Limestone	82.9	22.3	6.4	2.5	65.5	3.3	3.5	2.5	2.6	2.1	50.5	25.9	12.7
	12	Sandstone	16.7												
	23	Silica Sand	0.4												

(3) Plant location

Plant site: From the viewpoint of the material, industrial water, transport and several other factors the coast along Caracaran bay is considered a suitable location of the plant. (Photo. 10) As the place in view is of gentle slope, a certain degree of cutting is necessary for the construction of the site. The ground is considered to be made up of sandstone layers, but its boring test will be necessary.

Industrial water: There are flowing a few small rivers in Batan Island, but in view of the flux and quality the River Caracaran is considered suitable for the sources of the industrial water. Although its quality test has not been conducted yet, they say that it is good to drink. The flux measured nearby the month amounted to 150 cubic m. per hour. As both banks of the river are composed of limestone, they are favourable, we believe, to the construction of a small dam for storing water. The flux of a river must be observed throughout the year, but in this district where rainy days are frequent and rainfall amounts to much a flux approximately as large as the above will be secured all the year round. The expected capacity of the plant is a daily output by wet process of 425 tons (10,000 bags), which requires the industrial water amounting to 700 - 800 tons a day. The above flux will be enough to meet these figures.

Fuel and electric power: It is expected that the coal to be produced here will be appropriated for the fuel of the cement works. However, those kinds of coal whose Btu is less than 9,000 - 10,000 are undesirable.

Analytical value of coal produced in Batan Island

	Mapisai	Calanage	Buri	Batan	Manela	Tinukanan	Liguan
Moisture	30.9	25.9	28.7	23.3	11.5	14.3	15.4
Volatile matter	33.5	35.7	33.4	35.5	40.3	36.9	37.3
Fixed carbon	29.5	36.8	32.3	35.1	44.7	45.7	42.2
Ash	6.1	1.6	5.6	6.1	3.5	3.1	5.1
Btu	7,760	8,690	7,930	8,680	11,390	10,760	10,550

Accordingly, it will be necessary not only to investigate the development of such coal as available for the calcination of Portland cement but also to compare it with heavy oil from economic point of view. Besides, the initial cost of mining together with its complicated work must also be considered.

As for the electric power, its transmission across the strait from Bacacay and Sandomingo districts seems to be planned, but, for the time being, either thermal power generation by means of coal or generation by means of diesel engines of heavy oil is necessary.

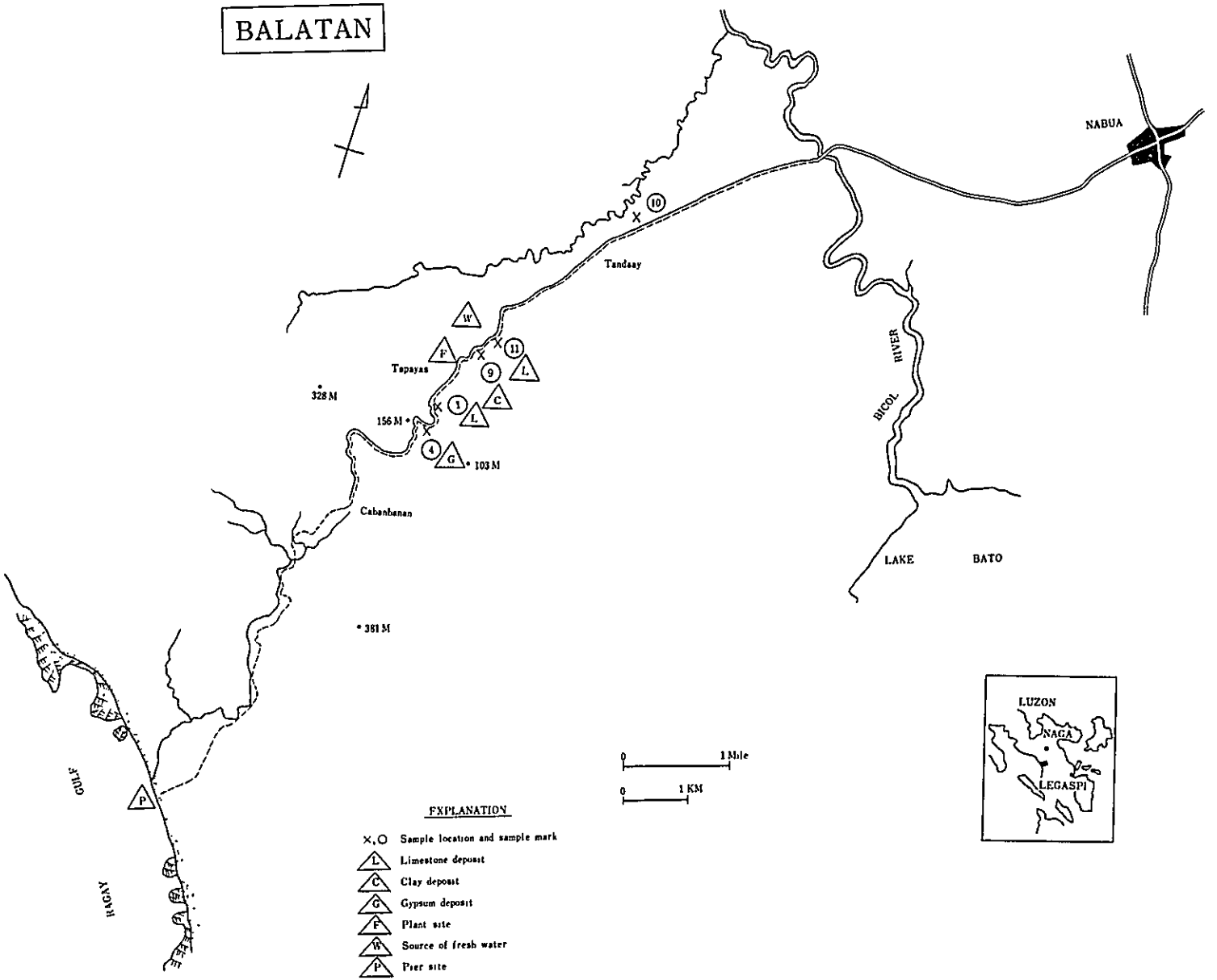
Incidentally, the coal-bed, according to Mr. Crispin's report, consists of more than twenty seams, the thickness of which varies with spots, being generally 40 - 100 cm., amounting to 150 - 200 cm. at the greatest. The estimated amount of the coal reserves is said to be 5,700,000 tons at spots of over 100 m. above sea level and containing seams of more than 75 cm. thickness. At present the Republic Mines is working the crops on a small scale by manpower, producing monthly about 500 - 1,000 tons which are being shipped to various parts of the Republic from a simple jetty in the vicinity of the hamlet of Batan.

Market: This island is situated at about the centre of the Republic which stretches from north to south. This is convenient to the shipment of products to various markets of the country; especially to Camarines, Albay and Sorsogon districts which center around Daet, Naga, Legaspi and Sorsogon City, and further to Bisayan.

Transport: Being an island, transport naturally depends on that by sea. Fortunately, as above-said, such sites are found on the eastern coast of Caracaran bay as favourable to the construction of piers, which will make convenient the shipment to the above markets. Besides, the railway service is available to the good harbour of Manila. The island has another advantage of transport, as it is situated quite near Legaspi City. The existing pier for coal loading is so poorly conditioned that it will be of no use to the shipment of cement.

Atmospheric phenomena: This district belongs to the so-called 4th type, and rainy days are frequent throughout the year. The statistics of Legaspi City during

the past fifty-two years show that the yearly rainfall amounts to 133.18 in., the maximum monthly one being 19.80 in., the largest number of rainy days per month twenty-four, and the minimum monthly rainfall is 6.22 in., the smallest number of rainy days per month fifteen.


BALATAN
NABUA
Tandaay
Tapayas
328 M
156 M
103 M
381 M
Cabanbanan
BICOL
RIVER
LAKE
BATO
GULF
HAGAY
1 Mile
1 KM
EXPLANATION
Sample location and sample mark
Limestone deposit
Clay deposit
Gypsum deposit
Plant site
Source of fresh water
Pier site
LUZON
NAGA
LEGASPI

1-4 Balatan District

Survey time October 9th, 1964

Survey Companion Mr. Isabelo B. Austria

(1) Summary

The manufacture plan of this district consists of two: Portland cement and white cement.

As for material both limestone and clay seem good enough in quantity as well as in quality, but a future investigation of silica and ferrous materials is necessary. Although a prospect of gypsum is found close by, only two kilometers from the proposed plant site, both its quality and quantity are problems which need a more detailed survey in future. Although the limestone, whose ferrous content is small, seems to possess a good quality, a more detailed investigation will be needed, as there is a penetration of the surface soil. The existing argil for whitening purpose seems to be of shale matter and rich in ferrous content; this is unsuitable for use, and a further prospecting is necessary.

As for the conditions of location, the proposed plant site seems favourable in view of the size of the site, industrial water, market and transport by land. That is to say, the location is near the market of the Southern Luzon centering around Naga and Legaspi and only twenty kilometers distant from Iriga Station of the Manila Railway. On the contrary, Balatan, which is supposed to be the base of transport by sea, is not in all aspects well-conditioned for the construction of piers.

As for the fuel, the use of the coal produced in Balatan is expected. However, it is advisable to use heavy oil, as it is necessary for the calcination of white cement; besides, the regular working of the coal-mine has not been commenced yet.

Electric power, like in other districts, has to rely on an independent power plant by means of diesel engines.

As to the process of manufacture either dry or wet process will do in this case.

(2) Material

Limestone: A range of outcrops about 500m. long of the limestone for the manufacture of white cement is observed along the highway near Tapayas, but the details of the deposits are indistinct. However, considering its extension in the direction of NW-SE at right angles with the road, the above outcrops may be thought to indicate the approximate thickness of the deposits; and considering, at the same time, its relative height which is tens of meters we may expect a fairly large amount. The nature of the rock is grey in colour, solid, adamantine, microcrystalline and of good quality. On the other hand deposits of the limestone for whitening purpose are found on such a small scale as 50 – 70 m. in width along the highway near Cabanbanan. It is white, porous and looks to be of good quality, but its grade, when dug out, will fall fairly low (Photo. 14); for it is full of chasms and penetrated by red-brown clay which forms the surface soil. If this penetration is limited to the outcrops alone, there will be no question. However, considering that the deposits are a low hill only 10 – 15 m. in relative height whose upper part near the surface is the object in view of working, fears are felt that the penetration has reached even inside the rock body. This is a matter which needs future survey and examination. As to the microscopic examination please refer to Photo. 17.

Clay: Shale and sandy shale which have been fairly weathered are distributed everywhere near the limestone deposits. This is considered a material of clay of good quality. We can place our hope on its quality and quantity as well. As for the argil for whitening purpose deposits of gray clay of shale matter are found near Tapayas (Photo. 15), which, being rich in ferrous content, is considered unsuitable for use. Future prospecting is necessary.

Silica: Deposits of silica have not been ascertained yet in the vicinity and future prospecting will be necessary, and increased efforts are needed to search for such one for whitening purpose as containing little ferrous matter.

Other materials: No investigation has been made regarding ferrous material.

As for the gypsum it is conceivable to make use of the deposits found along

the road about 1.5 kilometers to the southwest of the proposed plant site, but there seems to be some problems. That is, the deposits are vein-stuff originated from andesite matter (Photo. 16), the strike being NW, the dip nearly vertical and the width 10 - 15 m. However, the vein is of banded structure consisting of gypsum of good quality, which amounts to little in quality, that stained by pyrite and sulfide gangue. Therefore, dressing will be necessary when working that part containing gypsum of good quality. Future prospecting of the deposits to grasp their reality together with consideration of cost will be necessary.

(3) Plant location

Site of plant: The location is favourable because an adequate area is obtainable in the neighbourhood of Tapayas adjacent to the material deposits and sources of the industrial water. However, ground survey by means of boring will be necessary.

Industrial water: Conduction of water is possible from the creek and tributary of the River Bicol which flow in the vicinity of Tapayas and Kobanbanan, but construction of a small dam for storing water is necessary.

Fuel and electric power: As for fuel it is supposed to make use of the coal produced in Batan Island. However, considering the supplying capacity of the island, its transport cost, and further, the necessity of heavy oil for the purpose of calcinating white Portland cement, it is advisable to rely on heavy oil rather than coal.

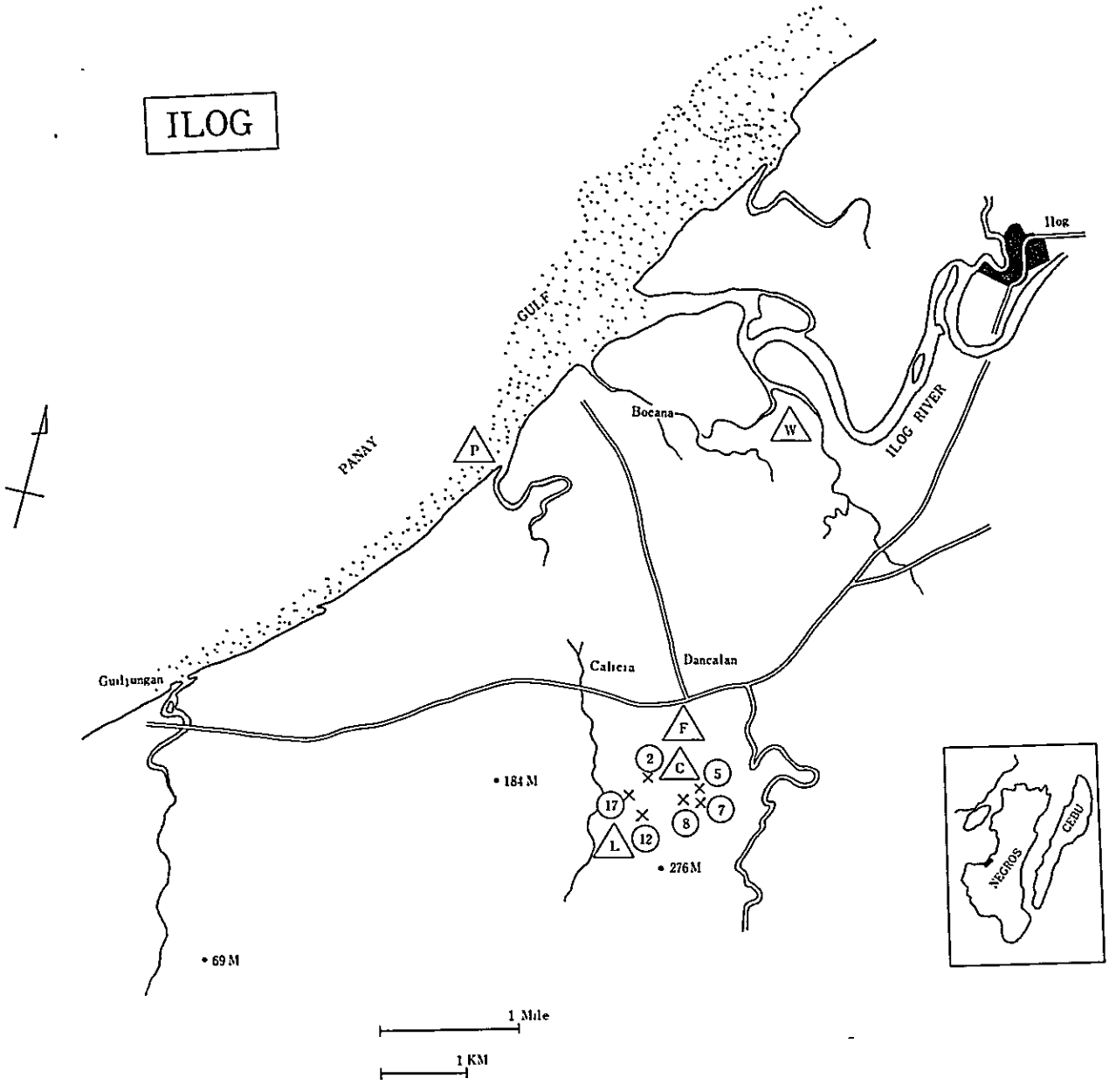
Electric power, like in other district, will have to be supplied by an independent power plant.

Market: This district, like Batan Island, is favourably situated in connection with the market in Southern Luzon and Visayan. Incidentally white Portland cement is prospective, as it is not produced in the Republic now. However, they say that a crushing mill of white Portland cement clinker is being planned; appropriate consideration must be given to it.

Transport: Transport by land is favourably conditioned, as the proposed plant site is along the highway and not so distant from Naga and Legaspi City;

the road condition is also good. Besides, the site is situated not more than 200 kilometers away from Iriga Station of the Manila Railway. As regards transport by sea, although no field survey was made of the coast, the greater part of it is, according to the chart, made up of coral reef and sandy beach, which make unfavourable conditions to the construction of the pier. Such being the case transport in this case should lay stress on that by land by which important markets are reached with facility.

Atmospheric phenomena: This district belongs to the so-called 4th type and a sharp distinction between dry and wet seasons cannot be made. By way of reference the statistics of Naga City during the past nine years show that the rainfall throughout the year is 88.82 in., the monthly maximum, 15,06 in. recorded in October with 20 rainy days, the monthly minimum, on the contrary, 1.95 in. recorded in February with 8 rainy days.


ILOG
Ilog
GULF
PANAY
P
Bocana
W
ILOG RIVER
Guiljungan
Caliera
Dancalan
F
2
C
5
7
17
8
L
12
• 184 M
• 276 M
• 69 M
CEBU
NEGROS
1 Mile
1 KM
EXPLANATION
Samplme location and sample mark
Limostone deposit
Clay deposit
Plant site
Source of fresh water
Pier site

1-5 Ilog District

Survey time October 10th-13th , 1964

Survey Companion Mr. Romon A. Martinez

Mr. Jose Kadunan

Mr. Anable J. Cruz

Mr. Oscar Anglo

(1) Summary

In this district the deposits of limestone and argil are found adjacent to the proposed plant site of Dancalan. The limestone is homogeneous and its quantity is prospective. As for the industrial water conduction from the neighbouring River Tabla is conceivable, but, as its drying-up during the dry season is anticipated, measures to make use of the underground water by sinking wells must be considered. Conduction of water from the River Ilog which is 4 kilometers away is also possible.

This district is favourably situated in connection with the market of the western part of Negros Island and southeastern part of Iloilo Island. Although it is somewhat distant from Bacolod and Canlaon City which are in the centre of Negros Island, the road condition is good.

However, the deposits of silica and ferrous matter could not be ascertained; future prospecting is necessary.

As the shoal extends to some distance, the construction of a pier which is extremely important to the transport of cement is not favourably conditioned. This is a matter which needs consideration in future.

Fuel, like in other districts, will have to depend on heavy oil. Electric power will be supplied by generators consisting of diesel engines by heavy oil.

Dry process of manufacture is considered suitable here, as the limestone is anticipated to be homogeneous with little moisture content, but wet process will be also possible as sufficient supply of the industrial water is likely to be secured.

(2) Material

Limestone: Limestone, which is distributed over the whole area about 500 m.

to the south of Dancalan, the proposed plant site, exists discordantly and nearly horizontally on the alternate layers of the Tertiary shale, sandstone and tuff, its thickness being about 100 m. and its extension more than 800 m.; therefore, the quantity is fairly prospective. (Photo. 18) The nature of the rock is gray-white - light yellow in colour, and of solid and adamatine kind containing CaO 51 - 54 % which is of high grade. The bedding planes of these limestone layers are comparatively clear as is shown in Photo. 20. Its formation is said to belong to the miocene. As Photo. 19 shows, the quantity of the surface soil is not large.

Clay: Those alternate layers of shale, sandstone and tuff which correspond to the lower part of the limestone layers can be utilized as clay. But in some parts the alternate layers are so complicated that attention must be given when making use of them. The strike of these layers is NW and the dip 20 - 25° in the direction of NE. As is illustrated in Table 3 chemical composition of shale and tuff is approximately SiO_2 50% and Al_2O_3 20%; it seems to be of good quality when microscopically examined, as in Photo. 24.

Table 3: Chemical composition of materials of Ilog District

Specimen No.	Name of Specimen	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Ig.loss	Total
2	Tuff	47.13	22.13	10.45	3.23	4.95	11.37	99.26
5	Limestone	1.43	0.23	0.37	54.23	0.56	42.72	99.54
7	Limestone	0.81	0.21	0.29	54.20	0.64	43.29	99.44
8	Limestone	0.67	0.18	0.37	54.87	0.43	43.13	99.65
12	Limestone	0.33	0.09	0.17	54.98	0.42	43.53	99.52
17	Shale	58.51	15.42	3.95	5.99	1.96	11.15	96.98

(Analysis: Bureau of Mines)

Silica: In view of the quality of the limestone and clay silica will be necessary in manufacturing Portland cement. Future prospecting will be necessary.

Other materials: As in the case of silica future prospecting of ferrous material will be necessary. Gypsum will have to be imported.

Preparation: In the case of letting HM=2.1, SM=2.1 or HM=2.1 the trial calculation of compounding is tabulated in Table 4, which shows the necessity of adding to ferrous material.

Table 4: Trial Calculation of Prepared Materials of Ilog District

Preparation				Composition of Clinker											
	Specimen No.	Name of Specimen	Shale %	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Al	SM	IM	HM	C_3S	C_2S	C_3A
A	7	Limestone	74.5	23.4	6.9	2.4	65.5	1.8	3.4	2.5	2.9	2.1	38.9	37.9	14.2
	2	Tuff	5.0												
	17	Shale	20.5												
B	7	Limestone	75.2	19.2	8.8	4.4	64.9	2.7	2.2	1.5	2.0	2.1	52.8	15.3	15.9
	2	Tuff	24.8												
C	7	Limestone	74.4	24.5	6.4	1.9	65.7	1.5	3.8	2.93	3.35	2.1	35.1	43.9	13.7
	17	Shale	25.6												

(3) Plant location

Plant site: A flat area of land which is wide enough and suitable for the plant site is found along Dancalan highway (Photo. 21). Although the ground looks good, survey by means of boring is necessary. If the boring is conducted together with the well-sinking of industrial water, it will be killing two birds with one stone.

Industrial water: Conduction of the industrial water is possible from the River Tabla which flows 1.5 kilometers to the west of the proposed plant site or from the River Ilog which is 4 kilometers away. (Photo. 22) As there is a possibility of the former running dry in the dry season, conduction from the latter will be surer. Another supply source of the water is conceivable; that is, from the wells sunk in the vicinity of the proposed site.

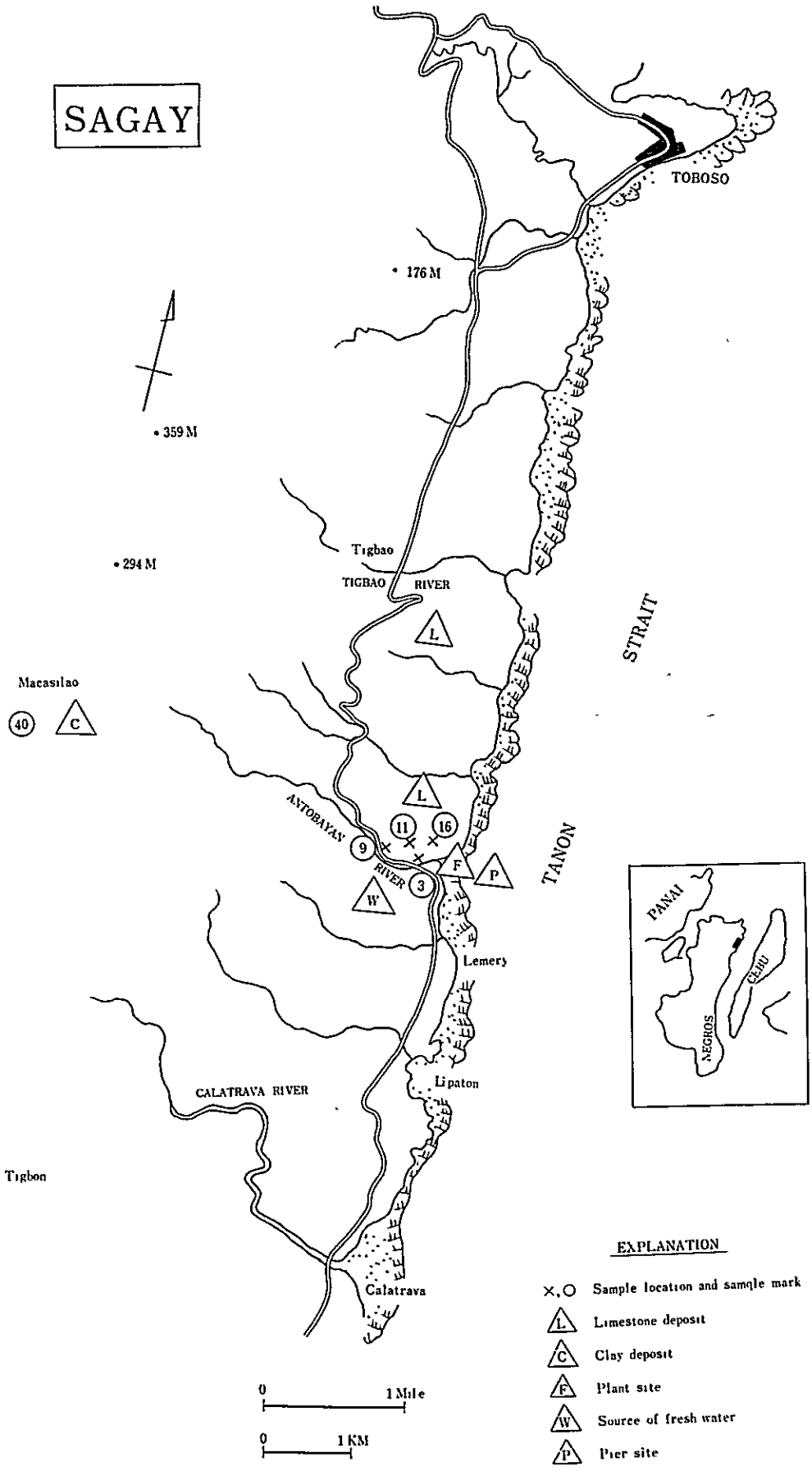
Fuel and electric power: Like in other districts fuel will have to be imported and electric power supplied by an independent power plant by means of diesel engines.

Market: This district, being situated in the west of Negros Island, is close by the market on the western side of the island which centers around Bacalod and

Canlaon City and the one in southeastern Iloilo which centers around Iloilo City; that is, it has prospective markets. Although competition with the existing Philippine Portland Cement Co. is conceivable, in view of its scale of production as well as future increase of demand this anxiety will prove groundless.

Transport: Because of the presence of the Sugar Centre in this island the road is generally good, which enables the transport by land to such consumer towns as Bacolod and Canlaon City which are a hundred and tens of kilometers distant. On the other hand, at Bacana, the proposed spot of the pier nearest from the plant site in view, the beach is muddy and the shoal extends to some distance, which make inconvenient the condition of pier construction. As shipment to such coastal markets as Iloilo and vicinity can be conducted through transport by inland sea, two-boat transport may be worth considering by making use of the mouth of the River Iloilo or that of a small river near Bacano.

Atmospheric phenomena: This district belongs to the so-called 1st type and the dry season begins in November and ends in April. According to the statistics of La Granza and Carlota during the past 39 years, the yearly rainfall is 116.08 in. and the monthly maximum 17.83 in. recorded in July with 22 rainy days; the monthly minimum 1.94 recorded in February with 6 rainy days.


SAGAY
TOBOSO
• 176 M
• 359 M
• 294 M
Tigbao
TIGBAO RIVER
STRAIT
Macasilao
40
C
L
ANTOBAYAN RIVER
11
16
9
3
F
P
W
TANON
PANAI
CEBU
NEGROS
Lemery
Lipaton
CALATRAVA RIVER
Tigbon
Calatrava
0 1 Mile
0 1 KM
EXPLANATION
×,○ Sample location and samqle mark
L Limestone deposit
C Clay deposit
F Plant site
W Source of fresh water
P Pier site

1-6 Sagay District

Survey time. October 14th-15th

Survey companion Mr. Jose L.L. Vazquez

(1) Summary

This district seems to be blessed with such materials, both in quality and quantity, as limestone, clay and silica. As for the industrial water the River Antobayam which flows near the proposed plant site is available for use in a way. But the disadvantage of this district lies in its market and transport.

As the district is situated in the east of Negros Island whose demand for Portland cement is comparatively small and such important market as the western coast of the island cannot be reached without a transport of at least over 150 kilometers. At the same time regarding transport by sea the condition of constructing a pier is unfavourable because of the extreme growth of coral reef.

And also competition with the existing cement works of Cebu, which is situated nearby. is anticipated.

As for fuel, the use of the coal deposits in the vicinity of Toboso which is a few kilometers in the north is conceivable in a way, but there is some doubt about its quality and quantity.

Electric power must be supplied either through thermal power generation by means of coal or through generators driven by diesel engines of heavy oil.

As for the manufacture process either dry or wet process will be possible.

(2) Material

Limestone: The limestone which is more than 500 m. wide extends a few kilometers along the coast from north to south. (Photo. 25) Its strike is generally NS and dip 50 - 60° in the direction of east, but partial variation is fairly large. The horizon appears to correspond to the so-called Carcar Limestone Formation of the Oligocene - Miocene. The nature of the rock is gray in colour, solid and adamantine; it is considered nearly homogeneous, but in some parts the existence of dolomite matter is anticipated; therefore, the survey of the geology will be

necessary once. It is prospective both in quality and quantity.

Clay: As for clay the deposits of shale rock found at Makasilo, 7 kilometers to the west of Remery, seems, from the look of the sample*, to be prospective, but we had no time to conduct a survey on the spot. This is considered to belong to the so-called Macasilao Formation and we can place our hope on its quantity.

Silica: Regarding silica, as in the case of clay, we could only obtain some sample pieces and the details about it were unknown. They say that the deposits are somewhere about 5 - 4 kilometers from Sagay which is situated about 35 kilometers from the proposed plant site. The nature of the rock is of silica sand and, microscopically examined, consisting principally of quartz, feldstone and siliciferous rock, the size being 200 - 500 μ. (Photo. 30) The quality is said to amount to several hundred thousands of tons.

Other materials: Ferrous material needs future survey. Gypsum is said to be obtainable near Tayasan, about 100 kilometers to the south of Remery, but its quality, quantity and other details are unknown.

(3) Plant location

Plant site: The suitable site will be at the foot of the lime hill near Remery and along the highway (Photo. 26), but, we are afraid, it might be swampy partially, and a ground survey by means of boring will be necessary. The site is favourably conditioned because it is adjacent to the coast-line.

Industrial water: Conduction of industrial water is possible from the River Antobayan which flows near Remery, the proposed plant site. (Photo. 27) At the time of our measurement the flux of the river amounted to 100 m^3/h, but, considering that there is in October the maximum rainfall throughout the year, it will diminish considerably in January when the rainfall is anticipated to decrease; therefore, future investigation of the matter is necessary. The water looks to be of good quality. A small dam for storing water will be necessary.

Fuel and electric power: The source of the fuel expected is the deposits of coal near Tobosa, 7 kilometers to the north of Remery. Both quality and quantity are

* By courtesy of Mr. Jose L.L. Vazquez

unknown yet and future survey is needed; especially so is the comparison with the use of heavy oil.

Like in other districts, electric power must be supplied by an independent power plant either by thermal generation or by a generator driven by diesel engines of heavy oil.

Market: This district is favourably situated in connection not only with the market of Visayan district but also with that in the western as well as the eastern parts of Negros Island. However, the district cannot expect Cebu, which lies just close by across the sea, to be its market, because there is already a cement works operating in the town. As compared with Ilog district which is on the western part of the same island, the location of this district is a little disadvantageous.

Transport: Conditions of transport by land are favourable, as the proposed plant site is situated along the highway. (Photo. 28) The distance to its important market in the western part of Negros is about 150 kilometers, which is rather too far. The road condition is comparatively good, its pavement rate amounting to 50%.

As for transport by sea the use is conceivable in a way of Port S. Caros (where entry of 2,000 - 3,000 ton class ships is possible) which is about 30 kilometers to the south of Remery. In view of the fact, however, that the sugar companies themselves are making use of independent piers of their own, the permanent use of the port for shipment of cement will be impossible. As regards the conditions of constructing a pier near Remery, there is seen a conspicuous growth of coral reef which is unfavourable to the construction. (Photo. 29) Besides, according to the chart, the sea is about three fathoms deep at a distance of 200 m. from the coast.

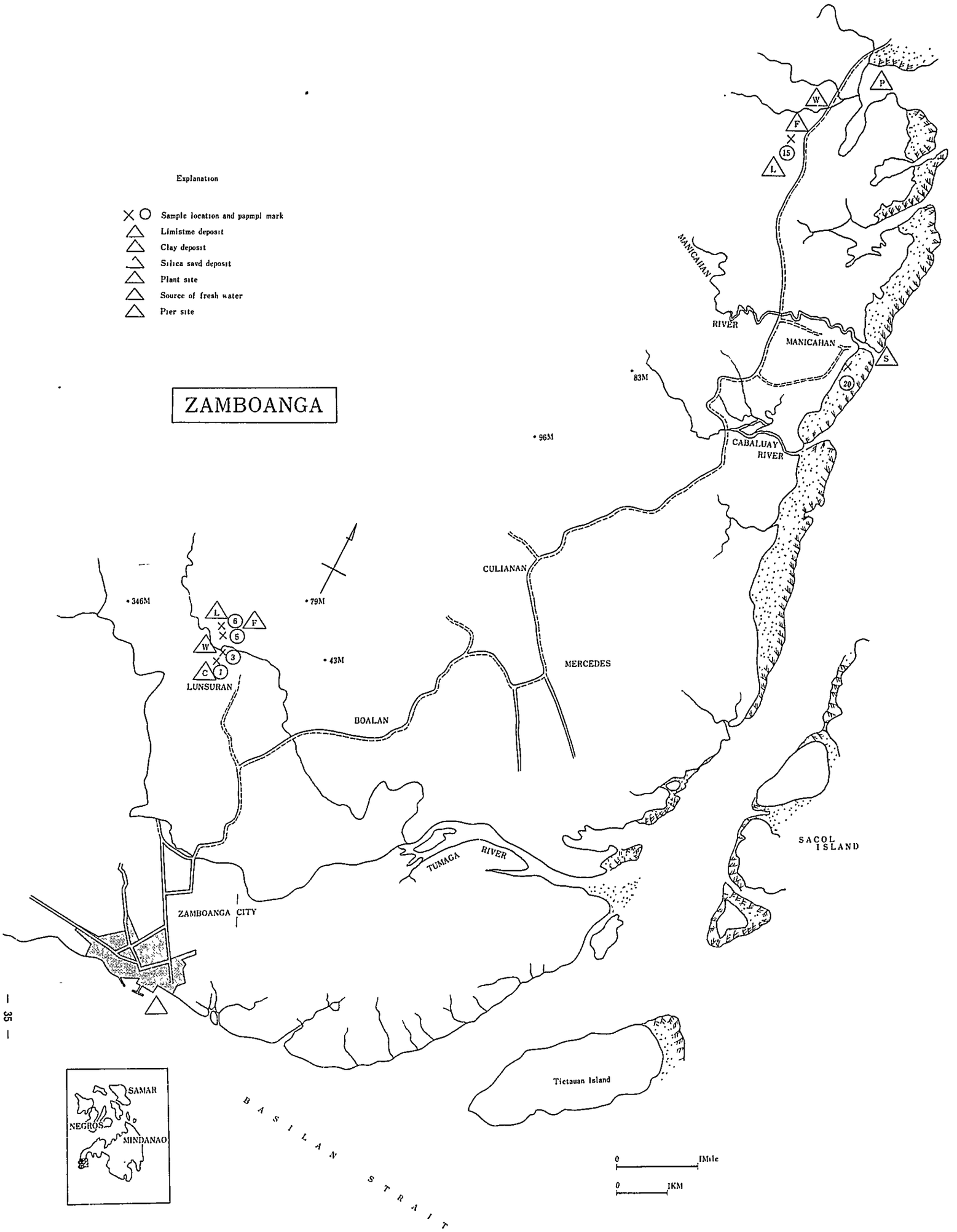
As we have seen above, this district involves problems so far as transport is concerned.

Atmospheric phenomena: This district belongs to the so-called 3rd type and the distinction between the dry and wet seasons is not so clear. Rainfall is small from November to April. According to the statistics during the past thirteen years at Manapla Millsite which is in the vicinity of Remery, the yearly rainfall is 106.95 in., the monthly maximum 16.79 in. of October with 22 rainy days and the monthly minimum is 4.03 in. of January with 13 rainy days.

Explanation

- Sample location and papmpl mark
- Limistme deposit
- Clay deposit
- Silica savd deposit
- Plant site
- Source of fresh water
- Pier site

ZAMBOANGA



1-7 Zamboanga District

Survey time	October 19th - 20th
Survey companion	Mr. Jose Kapuman
	Mr. Ricardo H. Veloso

(1) Summary

Two spots are conceivable in this district as the proposed plant sites: Lunsuran and Manicahan.

Lunsuran is situated about 7 kilometers from Port Zamboangan, where the entry of 5,000 ton class ships is possible, and adjacent to the deposits of such materials as limestone and clay as well as to the sources of industrial water. Its conditions of location are favourable.

On the other hand, Manicahan is 30 kilometers from Zamboangan City, which is rather too distant. However, the proposed plant site is adjacent to the highway, lime hills, sources of industrial water and the coast. Furthermore, the limestone is siliceous, which is a favourable condition in this district where silica deposits are rarely found.

As we have seen above, the conditions of location of each case are generally favourable, and as a result of our comparison of the two Lunsuran is considered superior to Manicahan in view of its transport convenience.

As for market, this district, although situated at the southern tip of the Republic, can seek market all over the Southern Philippines by dint of Port Zamboanga Export to the Southeastern Asia is also possible.

Transport by sea is blessed with the convenience above-said, but transport by land to various parts of Mindanao Island is unfavourable, as the roads are badly conditioned. This trouble can naturally be overcome by sea transport.

Like in other districts fuel source is imported heavy oil and electric power is supplied by a generator driven by diesel engines of heavy oil.

Both dry and wet process of manufacture are possible in Lunsuran, but in Manicahan wet process may be advisable, as the variation of the components is

anticipated of the limestone which is siliciferous. In case of selecting Lunsuran as the plant site it may be advisable from the viewpoint of transport cost to construct a clinker crushing mill at Zamboanga and to transport its products. This is a matter worthy of studying. In the case of Manicahan the construction of a pier in the vicinity may be more advisable than the use of Port Zamboanga.

Material: In Lansuran two layers of limestone are observed: one is rather thin, being 150 m. in thickness: the other is of a large scale, the thickness being more than 500 m. Details of the deposits are unknown, but each layer, besides extending to the direction of NNW, comes in touch with clastic rock of andesite element or andesite. The relative height is about 80 - 100 m. (Photo. 31) The nature of the rock is gray-white in colour, solid and adamantime, but contains some siliciferous part. An investigation of the geology will be necessary in order to grasp the reality of the deposits and the variation in the rock nature.

The above-said clastic rock of andesite element is widely distributed. (Photo. 31); its nature is red-brown in colour, fragile and weathered and considered to make a good material of argil. However, further investigation is necessary as a gradual transition with andesite is anticipated. The source of silica is the sea-shore sand in the vicinity of Zamboanga City, but the deposits of highly siliceous one cannot be expected.

Gypsum must be imported. Prospecting of ferrous material will be necessary in a way, although it is conceivable that this is sometimes unnecessary according to the quality of limestone, clay and silica.

Manicahan: The limestone forms a plateau about 80 m. in relative height to the west of the highway; it is 500 m. long along the road and extends more than 800 m. in the west of the road. Details of the deposits are unknown, but they are considered to be nearly horizontal heaps.

The nature of rock is light-brown - gray-white in clour. solid, adamantine and siliciferous partially, containing much coral and fossil. Further prospecting of the variation of the rock will be necessary.

No investigation of clay has been made yet. Source of silica will be the sea-

shore sand about 4 kilometers from the lime deposits. As the sand is of andesite matter, highly siliceous content cannot be hoped for; this will need further prospecting.

Incidentally the materials of the two districts are now under analysis, and their microscopic examination is shown in Photos. 35, 36 and 37.

(3) Plant location

Lunsuran: Adjacent to the limestone and argil deposits there is a lot of land, which is now consiting of cultivated land and a palm forest, available for the plant site. (Table 41).

Manicahan: An adequate area of the site can be secured along the limestone deposits, sources of industrial water and highway. Survey of the ground by means of boring will be necessary in both sites to ascertain its nature.

Industrial water: In Lunsuran conduction of water is possible from the tributary of the River Tumaga which flows in the vicinity of the prosed plant site. The flux was 250 m^3 per hour at the time of our measurement. The quality was so good as to fit for drink.

In Manicahan there is a creek of considerable size available for conducting water. The flux was 500 m^3 per hour at the time of our survey.

Fuel and electric power: Like in other districts source of fuel will be heavy oil. Electric power must be supplied by a generator driven by diesel engines of heavy oil.

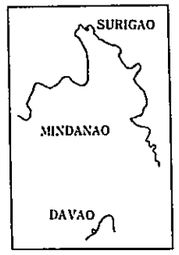
Market: By dint of Port Zamboanga available for the docking of 5,000 ton class vessels this district can seek market not only in Mindanao but also in Southern Luzon and further in the Southeastern countries. Considering the low cost of transport by sea this district, although situated in the southern tip of the Philippines, is prospective in developing the market.

Transport: Transport by land to various parts of Mindanao is inconvenient due to the long distance and badly arranged road, but transport by sea can be conducted with facility by making use of Port Zamboanga (Photo. 34); it is especially so, as the leading cities of Mindanao are situated mostly on the coast.

In case of constructing a cement works in Lunsuran it would be advisable to build its crushing mill alone in Zamboanga in view of the fact that the transport of clinker is facile as compared with that of finished cement and that all machinery and equipments have to be landed at Port Zamboanga. In the case of Manicahan construction plan of the pier in the neibouring coast must naturally be considered.

Atmospheric phenomena: As this district belongs to the so-called 3rd type, the weather is almost like that of the dry season from September to April. According to the statistics of Zamboanga City during the past 54 years, the yearly rainfall is 44.25 in., which is small in quantity. The monthly maximum is 6.12 in. of October with 17 rainy days, and the monthly minimum is 1.51 in. of March with 10 rainy days.

SURIGAO



0 Mile

0 1KM

Explanation

×, ○ Sample location and sample mark.

L Limeshone deposite

C Clay deposite

F Plant site

W Source of fresh water

P Pier site

1-8 Surigao District

Survey time October 21st - 22nd

Survey companion Mr. Damian L. Laurente

(1) Summary

The conceivable spots of cement works in this district are Lanuza and Cortes, and so far as our survey is concerned, the difference of the conditions of location between the two is very little. That is to say, Lanuza is blessed with limestone, industrial water and a plant site, but it involves many problems which need further investigation such as clay, silica and the construction of a pier for transport use, and especially the poor condition of the bridges of the highway to Surigao. On the other hand, the location of Cortes is favourable in connection with limestone, argil and a plant site, but it has problems concerning silica and transport.

As for fuel both districts rely on the coal produced in the vicinity of Bislig which is 120 kilometers to the south of the proposed plant. However, both quality and quantity of the coal is unknown, use of heavy oil must be considered.

Electric power must be supplied by independent power plants driven either by coal or heavy oil.

As for manufacture wet process is considered suitable here, because, like in Batan Island, there is much rainfall together with many rainy days in this district throughout the year.

As for the market for products, this district is not blessed with it at present, as it is situated in the Eastern Mindanao where the demand is small and, besides, it is near the Pacific Cement Co. of Surigao which is scheduled to commence its operation before long. However, considering export to the Southeastern countries together with the future development of Surigao district, the location can be said in a way favourable.

(2) Material: The limestone of Lanuza forms a plateau 50 - 80 m. in relative height along the road connecting Lanuza and Danube and the range of its outcrops is observed as long as about 200 m. Details of the deposits are unknown, but

they are considered to extend in the direction of S-E, and a fairly large quantity can be expected. The nature of the rock is gray-brown - gray in colour, adamantime, partially of breccia containing dark-brown tuff matter. Chemical composition of the gray limestone is shown in Table 5 which indicates its good quality.

The source of clay is the deposits of shale on the banks of the River Kilop which is 3-4 kilometers from Danube, but, as it is not facile to carry the clay out, prospecting of the zone along the highway will be necessary in future. However, the chemical composition of this shale rock indicated in Table 5 is, as compared with the shale in general, rich in Fe_2O_3 with low Al_2O_3, which, when compounding the materials, makes the ferrous material unnecessary and diminishes the use of silica; this may prove useful in this district where the deposits of silica material has not been ascertained yet.

Table 5: Chemical Composition of Materials of Lanuza District

Name of Specimen	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Ig.loss	Total
Limestone	0.97	0.09	0.58	54.17	1.35	42.85	100.01
Shale	59.44	12.78	9.61	10.64	2.91	3.76	99.14

(Analysis: Bureau of Mines)

As we have pointed out above, no silica has been found in our present survey, and future investigation is necessary. The seashore sand near Lanuza may be the source of silica in a way.

Cortes: At three places along the highway outcrops of limestone, each 50-100 m. in size, are observed (Photo. 38), but the condition of the deposits together with the extension are unknown. Considering however, that besides each limestone of the three deposits forming alternate layers with shale, sandstone, distribution in some parts of intrusive basalt body is observed, the size of the limestone deposits cannot be so large. General run is E-N, but the dip is indefinite in the direction of N or S. The nature of the rock is gray-white - white in colour, solid and microcrystalline and looks of good quality.

The shale, sandy shale. tuff, etc. which are accumulative layers of the limestone are considred . useful material of clay, but in view of the shape of their alternate layers, it seems difficult to obtain clay of good quality in a large quantity. The nature of each individual rock looks suitable for cement manufacture. Microscopic examination is shown in Photo. 41.

Survey of the coast near Cortes in search for silica has indicated that the sand is of andesite element and small in quality, on which we cannot place much hope. Although no investigation of ferrous material has been made either in Lanuza or Cortes district, laterite deposits of a large scale, as illustrated in Photo. 39, has been found near Kinablahan which is about 50 kilometers from Lanuza. This will make a conceivable source of ferrous material.

Preparation: As the analysis of the materials picked up has not been finished yet, preparation is impossible. But a trial calculation made by letting HM=2.1 on the basis of the data offered by Mr. D.L. Laurente shows a result, as indicated in Table 6, which shows the shortage of Al_2O_3 component. As a matter of fact, however, such shale as containing more Al_2O_3 compcnent can be obtained with facility; this is rather convenient.

Table 6: Trial calculation of prepared materials of Lanuza District

Preparation		Composition of Clinker											
Name of Specimen	%	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Al	SM	IM	HM	C_3S	C_2S	C_3A
Limestone	76	22.6	4.7	4.2	65.9	2.6	4.8	2.5	1.1	2.1	58.9	20.5	5.4
Shale	24												

(3) Plant location

Plant site: An adequate area of plant site on the flat land and along the coast and highway is obtainable in the case of Lanuza and in that of Cortes as well. Regarding the conditions of location the two sites have their own strong and weak points respectively and their relative merits cannot be determined with ease. But, if anything, Lanuza is more favourably conditioned than Cortes in view of its con-

venient situation in connection with the pier and industrial water. The ground survey by means of boring will be necessary.

Industrial water: As is indicated in the survey map of Surigao district, Lanuza can conduct water from the River Kilop, and in view of the size of the river, the supply of the water will be sufficient; its quality is considered all right, too. In the case of Cortes conduction of water is conceivable from a small creek in the neighbourhood, but both in quality and quantity it is inferior to that of Lanuza.

Fuel and electric power: As for fuel, use of the coal deposits in the vicinity of Bislig which lies 120 kilometers to the south of Cortes is conceivable, but the details of its quality and quantity are unknown. Like in other districts electric power must be obtained from an independent power plant driven by diesel engines of heavy oil. However, it might be advisable to depend on a thermal power plant according to the quality and quantity of the above-said coal.

Market: Competition is anticipated with the Pacific Cement Co. which is scheduled to start its operation. Furthermore, in view of the small demand for cement in the Eastern Mindanao including Surigao district, this district, we are afraid, is not blessed with market. However, we can place our hope on the future development of Surigao district as well as the export to the Southeastern countries.

Transport: Conditions of transport by land look favourable in a way because both Lanuza and Cortes are situated along the highway. In reality, however, it is not an easy matter because of the long distance to carry to such important markets as Surigao, Butuan, Davao City, etc. as well as to the poor condition of the bridges of the highway. As for transport by sea the conditions are also unfavourable because of the extension of the shoal caused by the growth of coral reef, which makes inconvenient the construction of piers. (Photo. 40) The use of Port Tago, which is situated about 30 kilometers to the south of Cortes, is conceivable in the case of transport by sea, but we cannot expect of it because of its small scale.

Atmospheric phenomena: This district belongs to the 2nd type and much rain

is experienced throughout the year. According to the statistics of Cantilan during the past 17 years, the yearly rainfall is 196.49 in., the monthly maximum 36.89 in. of December with 17 rainy days and the monthly minimum is 6.14 in. of June with 11 rainy days.

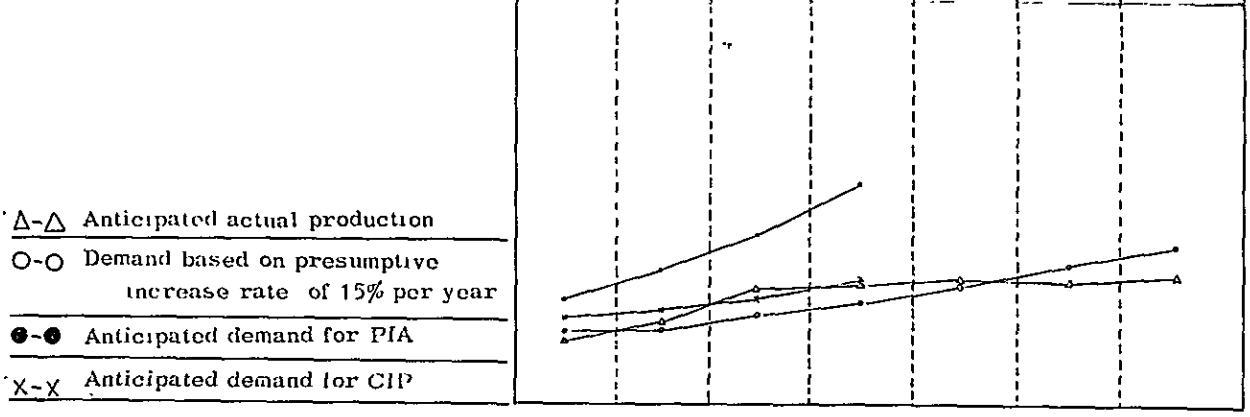
Tables 7 and 8 show the anticipated production and demand of Portland cement and the outlines of the cement works now under construction and those of the plants whose construction has been decided upon.

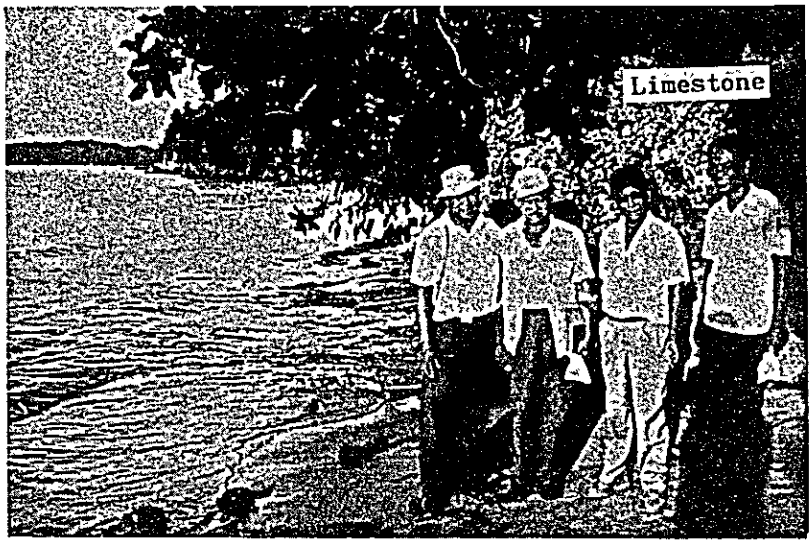
Table 7: Plants under construction and those whose construction has been decided on

No.	Proposed operation	Name of plant	Proposed plant site	Process	Capacity MT	Remarks
1	1964	Mindanao Portland Cement Corp.	Kiwalan, Iligan City	Cry	153,000	
2	1965	San Jose Cement Corp.	San Jose, Mindoro	Wet	128,000	
3	1966	Tayabas Cement Corp.	Podre Burgos, Quezon	Dry	179,000	
4	1966	Luzon Cement Corp.	San Idelfonso Bulacan	Dry	128,000	
5	1966	Pacific Cement Co.	Surigao, Surigao Del Norte	Dry	179,000	

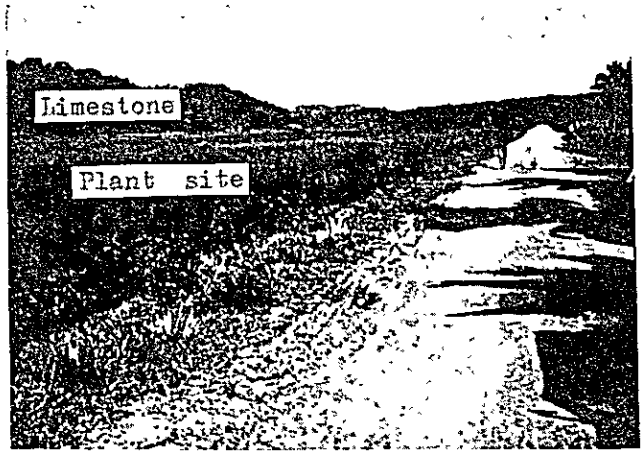
Table 8: Anticipation of production and demand of Portland cement

		Name of Plant	1964	1965	1966	1967	1968	1969	1970
Anticipated production (1000Mt)	Now in operation	Apo Cement	170.4	217.3	217.3	217.3	217.3	217.3	217.3
		Bacnotan Cement	213.0	255.6	255.6	255.6	255.6	255.6	255.6
		Phil. Portland Cement	29.8	29.8	29.8	29.8	29.8	29.8	29.8
		Republic Cement	340.8	383.4	383.4	383.4	383.4	383.4	383.4
		Rizal Cement	319.5	383.4	383.4	383.4	383.4	383.4	383.4
		Universal Cement	127.8	127.8	127.8	255.6	255.6	255.6	255.6
		Filipinas Cement	115.0	204.5	255.6	255.6	255.6	255.6	255.6
		Total	1316.3	1601.8	1652.9	1780.7	1780.7	1780.7	1780.7
	Under construction and construction decided on	Mindanao Cement		153.4	204.5	204.5	204.5	204.5	204.5
		San Jose Cement		-	127.8	127.8	127.8	127.8	127.8
		Tayabas Cement		-	178.9	178.9	178.9	178.9	178.9
		Luzon Cement		-	127.8	127.8	127.8	127.8	127.8
		Pacific Cement		-	178.9	178.9	178.9	178.9	178.9
		Total	0	153.4	817.9	817.9	817.9	817.9	817.9
	Total capacity (A)		1316.3	1755.2	2470.8	2598.6	2598.6	2598.6	2598.6
	Actual production (A)x0.8 (B)		1053°	1404°	1976°	2078°	2078°	2078°	2078°
Anticipated demand (1000Mt)	PIA		1720	2180	2820	3760			
	CIP		1460	1650	1860	2100			
	Presumptive increase rate per year (C) (1963 = 1,000)		1150	1330	1530	1750	2020	2330	2680
	(B) - (C)		(-)97	(+)74	(+)446	(+)328	(+) 58	(-)252	(-)602





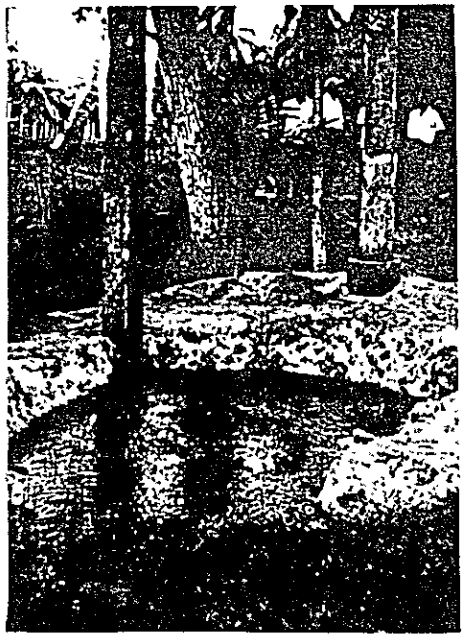
(1) Outcrops of limestone at Bolinao



(2) Lime hill (marl) and proposed plant site of Agno

(3) Outcrops of limestone at Agno

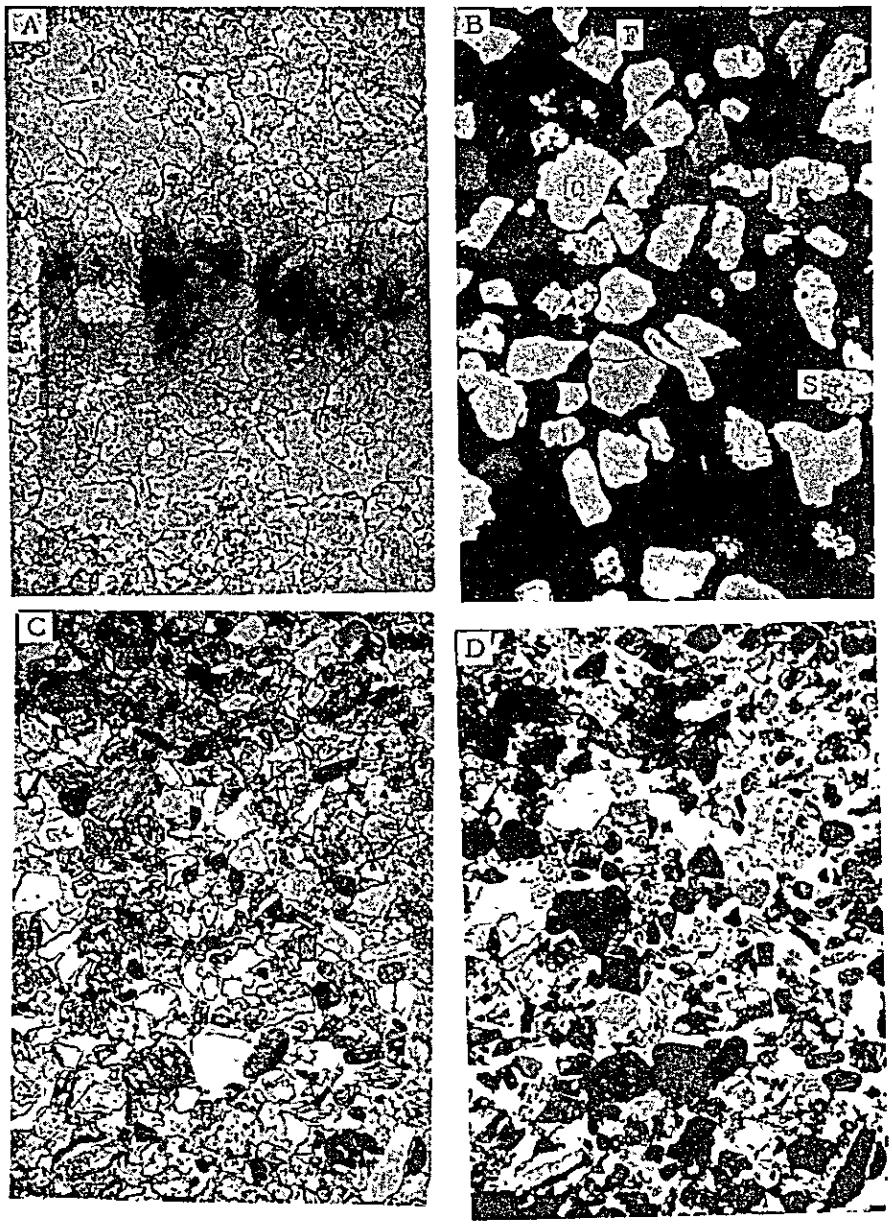
(4) Coast of Agno



(5) Fountain of Bolinao

(6) Coast of Bohinao

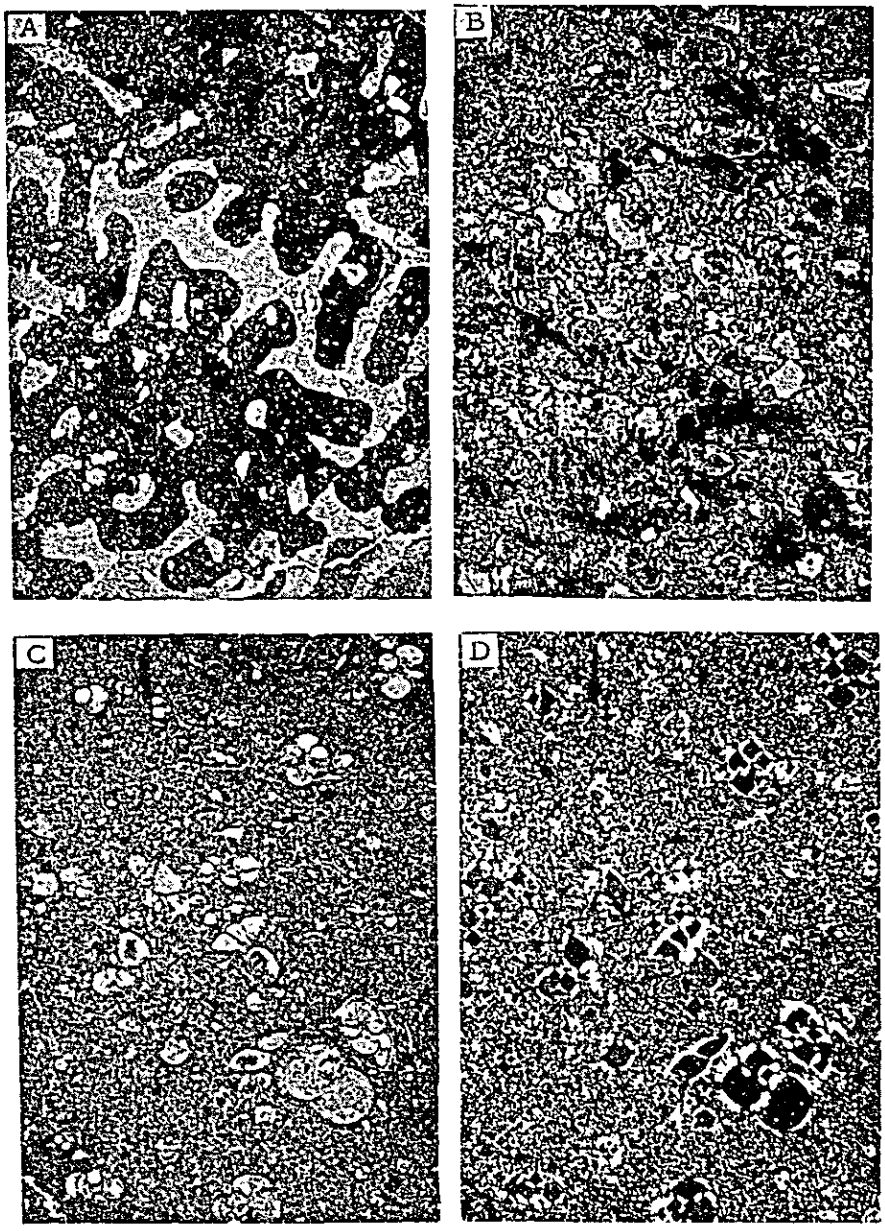
(7) River Baring Kaying in the vicinity of Agno



Explanation of Fig. 8

Photomicrographs of the thin sections of raw materials from the Pangasinan District. All figures X 30.

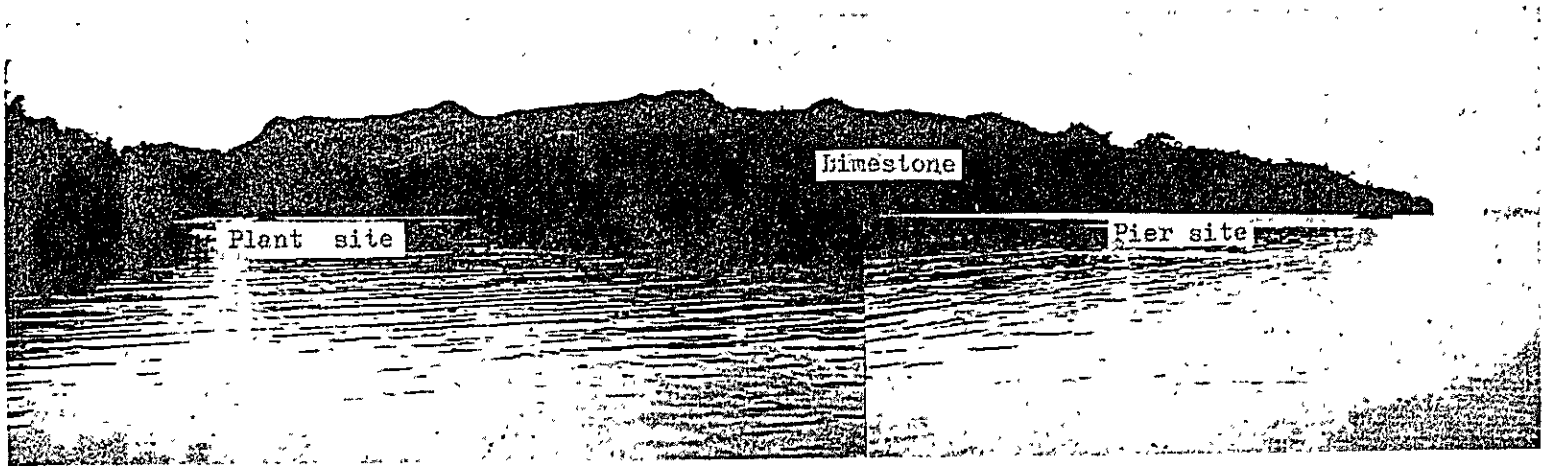
A. Limestone from the Bolinao. Sample marked 2. Open nicol.
B. Silica sand, consisting of quartz (Q), limestone (L), felspar (F), siliceous rock (S) and other minerals, from the Bolinao. Sample marked 1. Crossed nicols.
C. Calcareous sandstone from the Bolinao. Clastic particles of quartz, feldspar, chlorite, pyroxene and other minerals are cemented by cryptocrystalline calcite. Sample marked 7. Open nicol. D is crossed nicols.



Explanation of Fig. 9

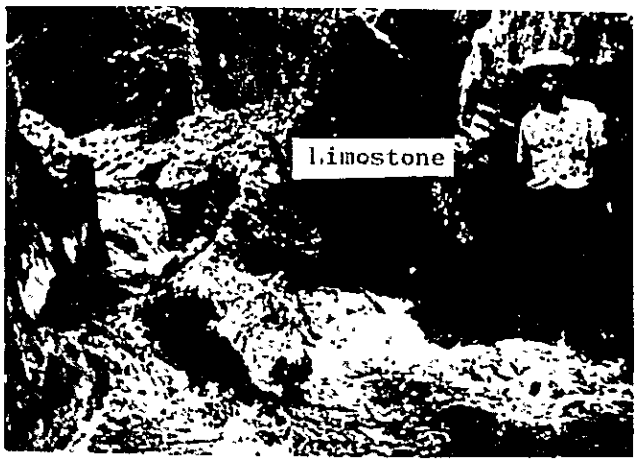
Photomicrographs of the thin sections of raw materials from the Pangasinan District. All figures X 30.

A. Coralline limestone from the Agno. Sample marked 14. Open nicol.
B. Marl from the Anapo, Agno. Quartz grains are scattered through the cryptocrystalline calcite. Sample marked 17. Open nicol.
C. Fossiliferous marl, from the Anapo, Agno. Possils are composed o of opal. Sample marked 18. Open nicol. D is crossed nicols.

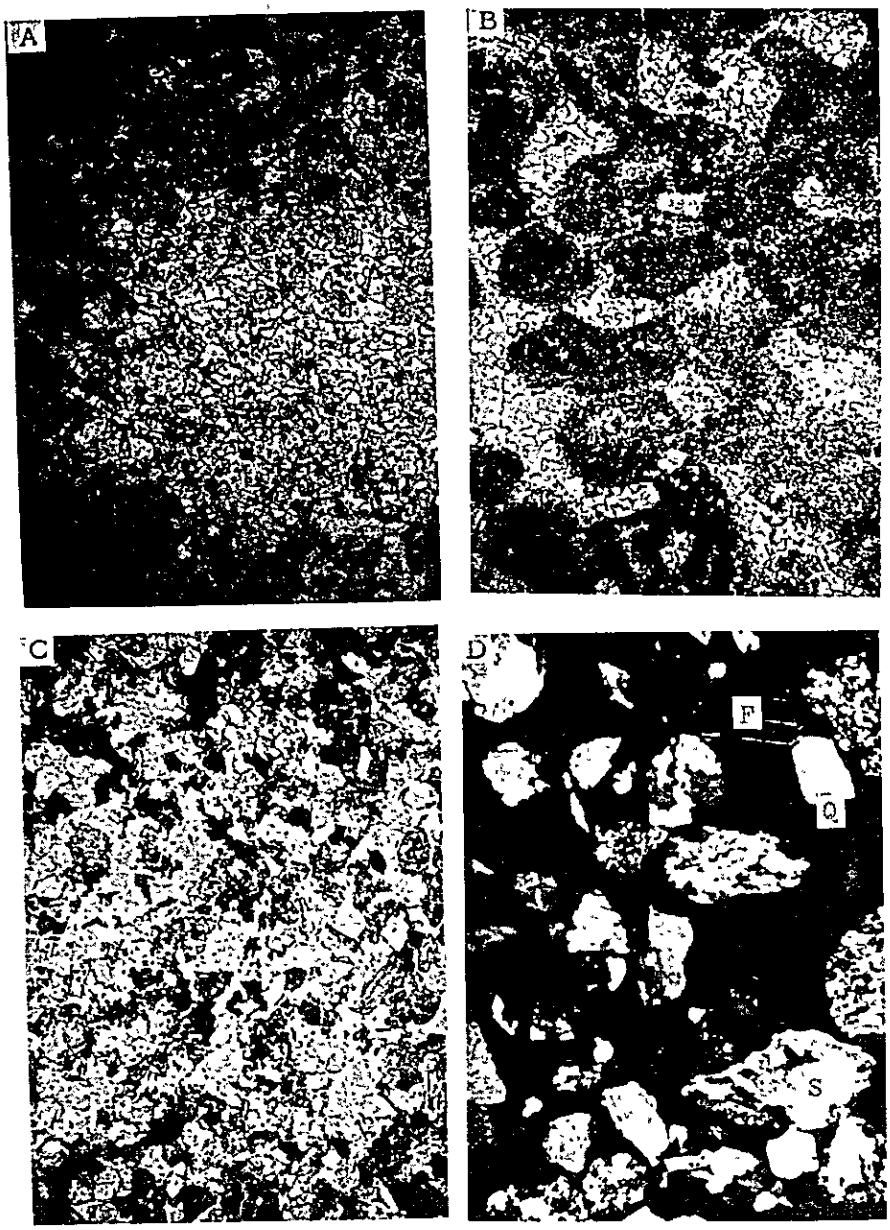


(10) Complete view of Caracan Bay

(11) Outcrops of limestone at Mancao



(12) River Caracaran

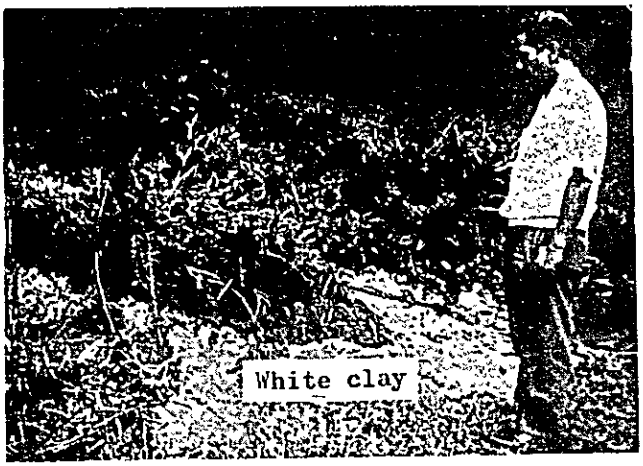


Explanation of Fig. 13

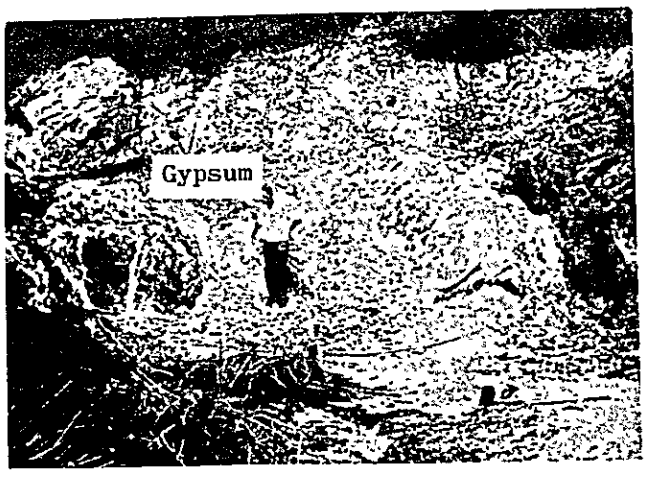
Photomicrographs of the thin sections of raw materials from the Batan Island. All figures X 30.

A. Limestone from the Caracaran Bay. Sample marked 21. Open nicol.
B. Coralline limestone from the Caracaran Bay. Sample marked 22. Open nicol.
C. Fine grained sandstone, composed of quartz, feldspar, chert, clay and other minerals, from the near the Malaboy. Sample marked 12. Open nicol.
D. Silica sand consisting of quartz (Q), feldspar (F), chert or siliceous rock (S) and other mineral, from the Caracaran Bay. Sample marked 23. Crossed nicols.

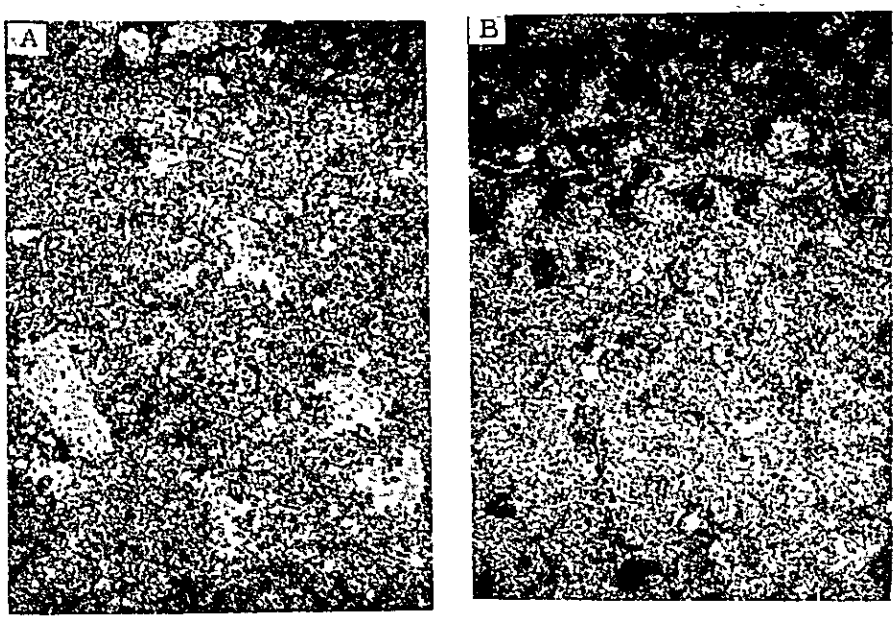
(14) Outcrops of Tapayas limestone (for white cement)



(15) Outcrops of clay near Tapayas



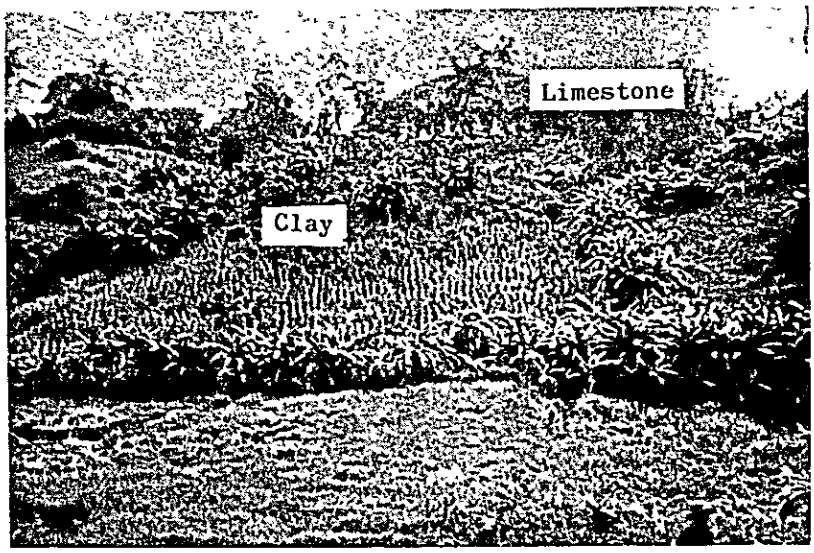
(16) Outcrops of gypsum at Cabanbanan



Explanation of Fig. 17

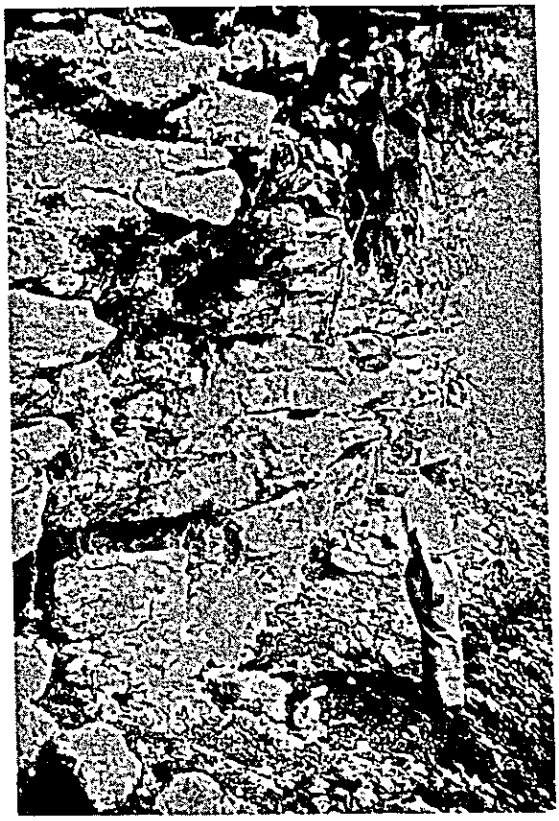
Photomicrographs of the thin section of limestone from the Balatan District. All figures X 30.

A. Limestone from near the Tapayas, Sample marked 1. Open nicol.
B. Fossiliferous limestone from near the Tapayas. Sample marked 11. Open nicol.

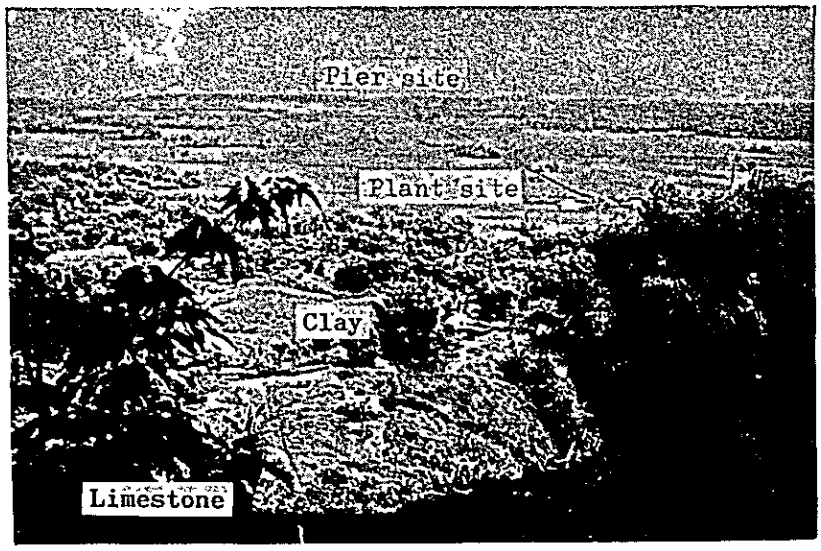


(18) Deposits of limestone and clay at Dancalan

(19) Complete view of the lime hill at Bancalan

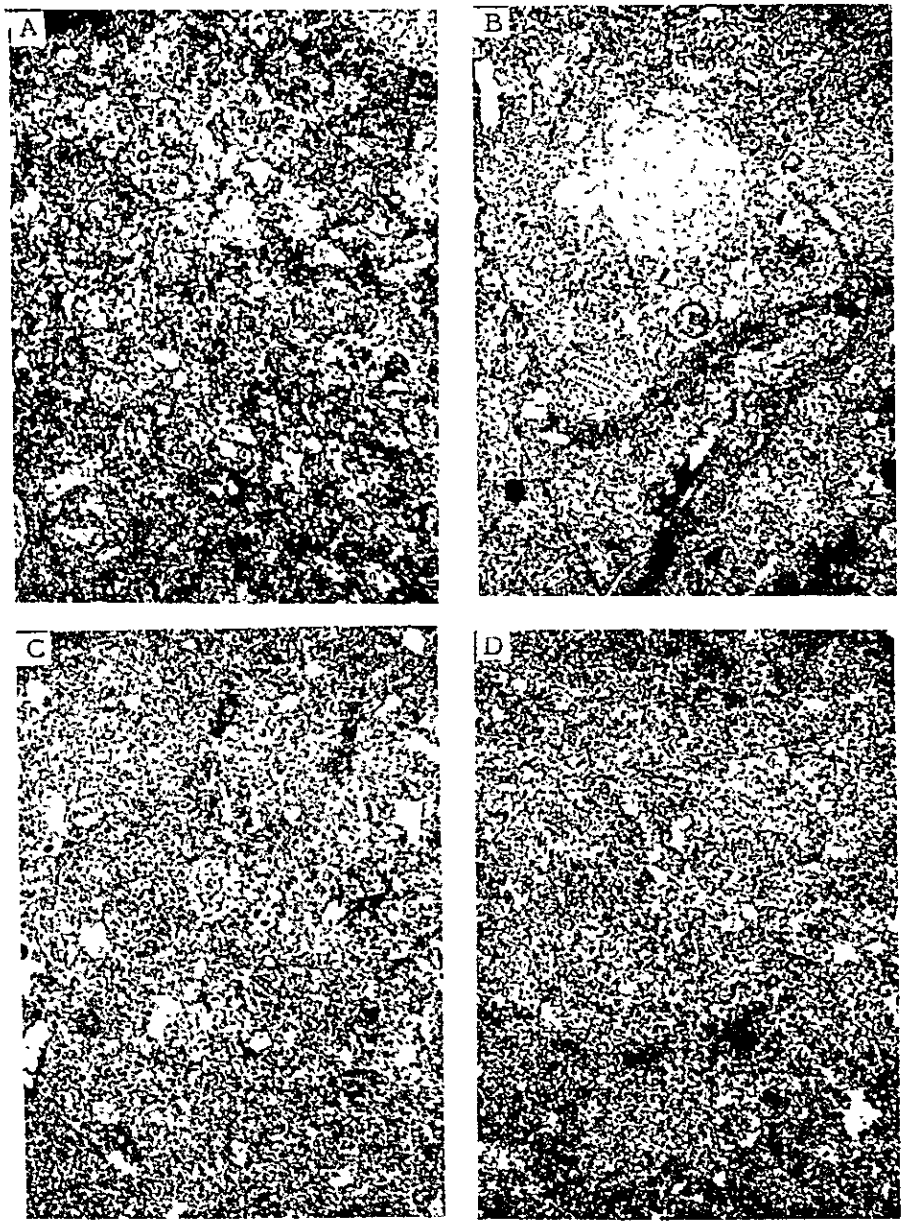


(20) Outcrops of the limestone at Dancalan



(21) Clay hill, proposed plant site and proposed pier site viewed from the lime hill.

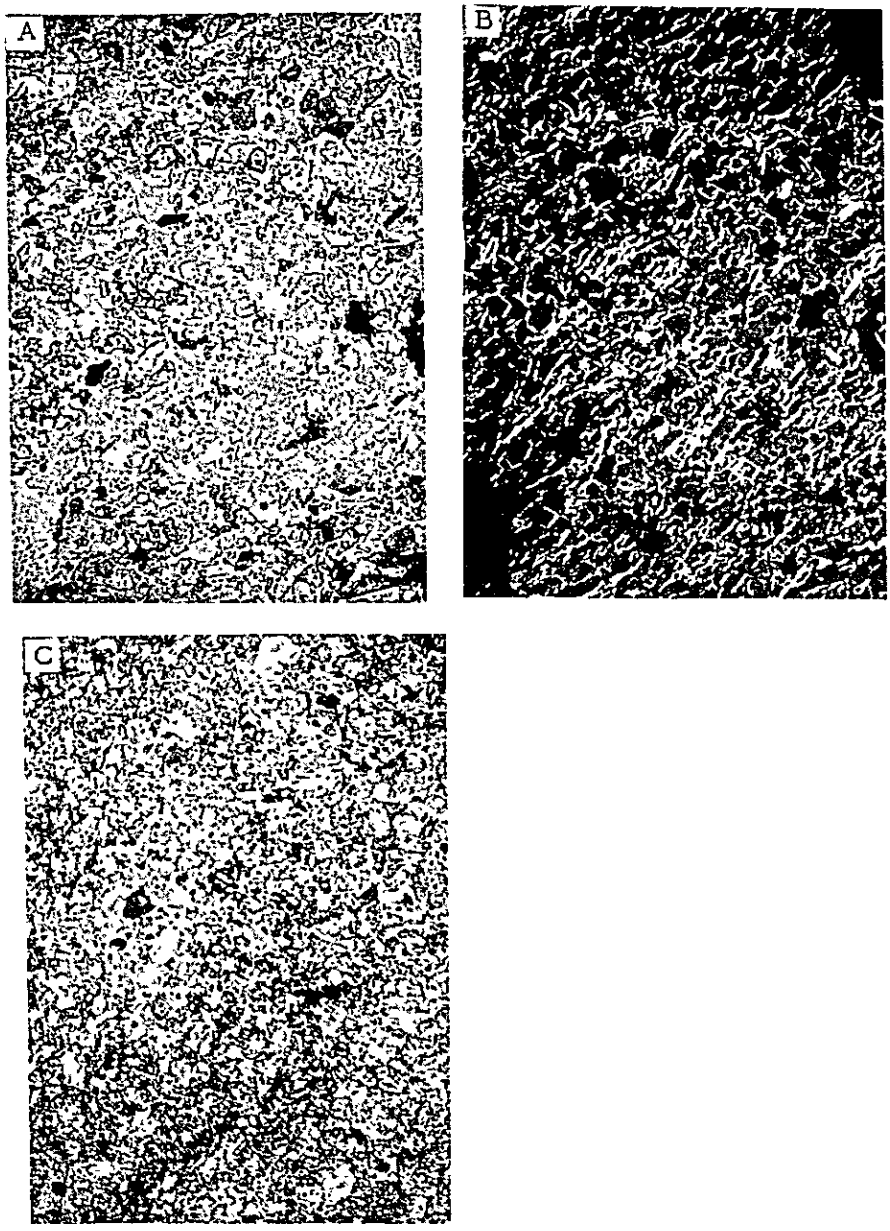
(22) River Table



Explanation of Fig. 23

Photomicrographs of the thin sections of limestone from the Dancalan.

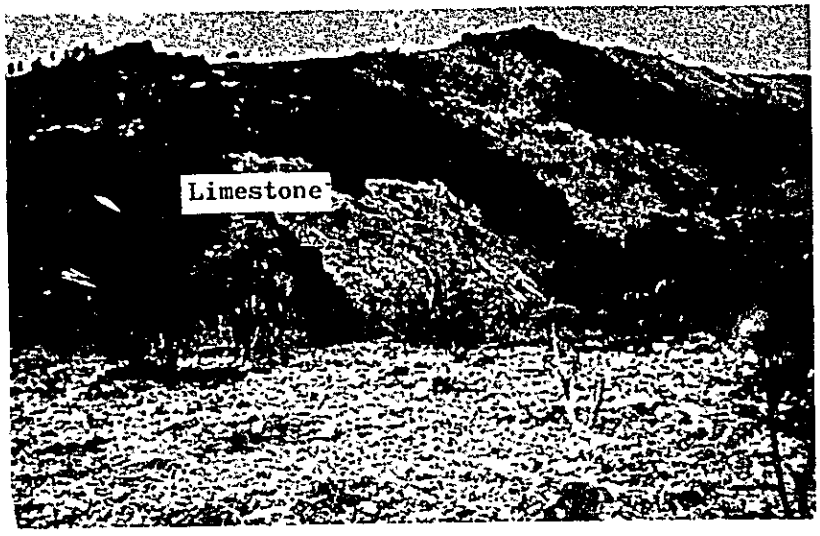
A.B.C.D. Fossiliferous limestones. Sample marked 5, 7, 8, 12, Open nicol. X 30.



Explanation of Fig. 24

Photomicrographs of the thin sections of raw materials from the Ilog District. All figures. X 30.

A. Tuff composed chiefly of glass and clay, from the Dancalan. Sample marked 2. Open nicol. B is crossed nicols.
C. Shale composed predominantly of quartz, feldspar and clay, from the Dancalan. Sample marked 17. Open nicol.



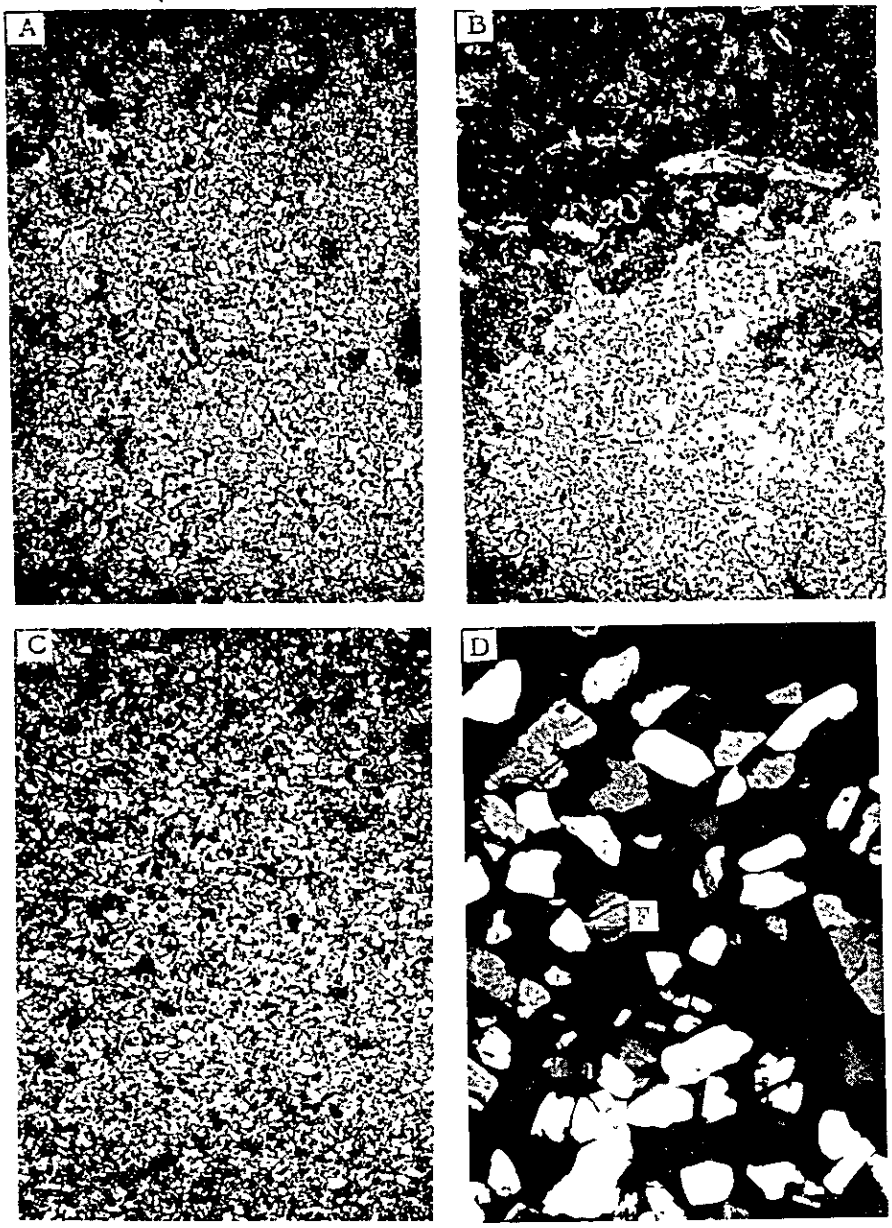
(25) Complete view of the lime hill near Remery

(26) Lime hill and the proposed plant site

(27) River Antobayan

(28) Highway and bridge near Remery

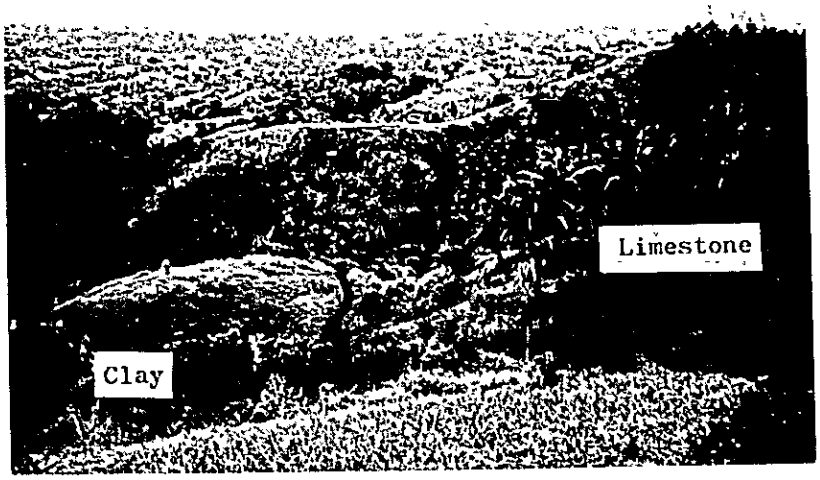
(29) Coast of Remery



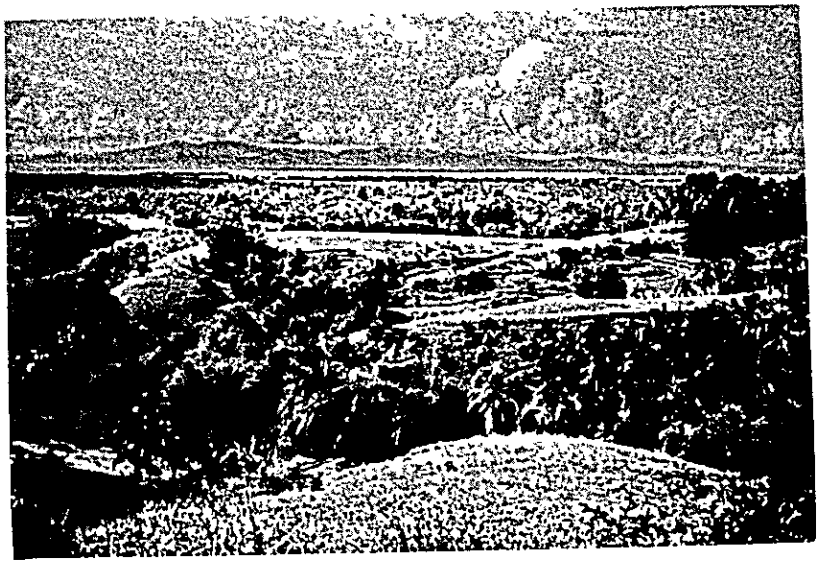
Explanation of Fig. 30

Photomicrographs of the thin sections of raw materials from the Sagay District. All figures X 30.

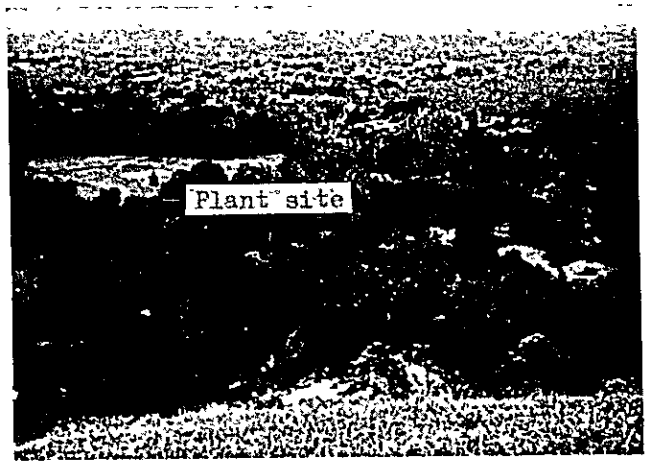
A. Limestone from the Lemery. Sample marked 3. Open nicol.
B. Fossiliferous limestone from the Lemery. Sample marked 10. Open nicol.
C. Shale composed predominantly of quartz feldspar and clay. Sample marked 40. Open nicol.
D. Silica sand consisting chiefly of quartz (Q) and feldspar (F), from the Sagay. Sample marked 30. Crossed nicols.



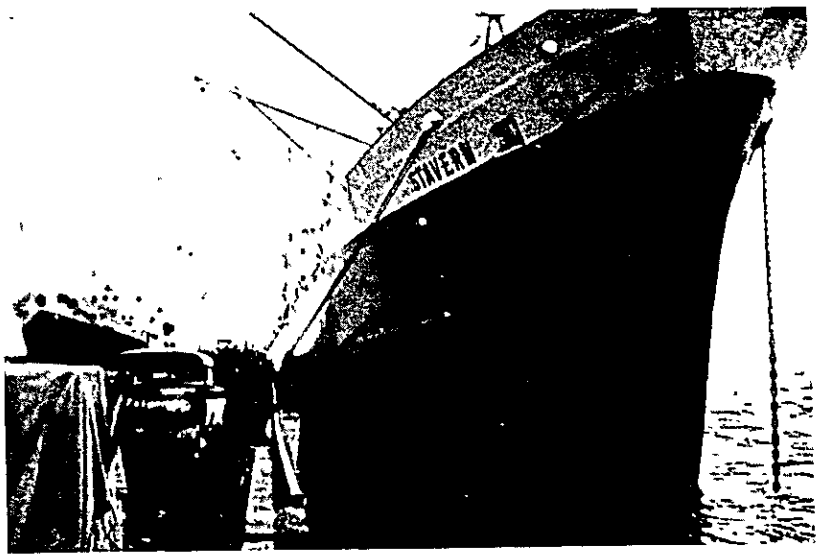
(31) Deposits of the limestone and argil near Lunsuran



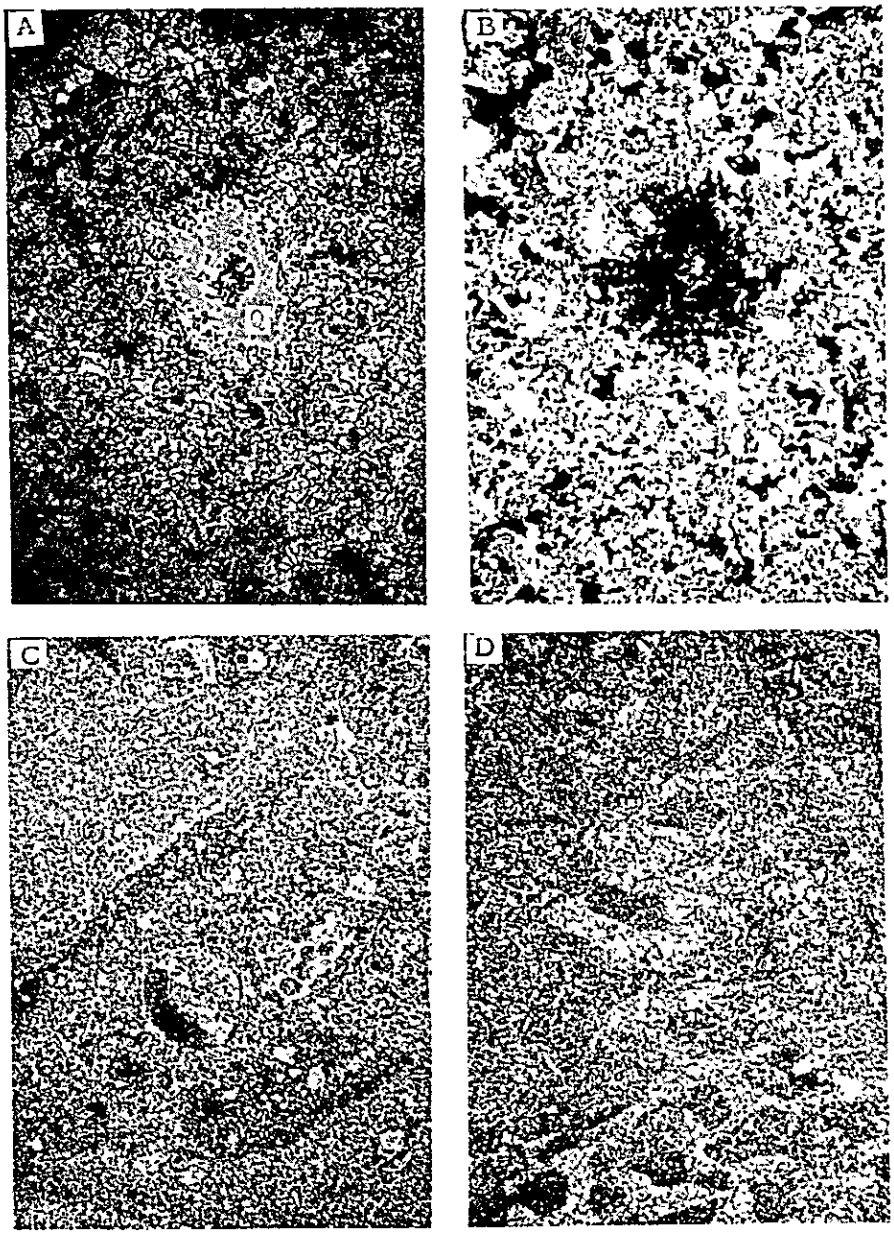
(32) Complete view of the clay hill near Lunsuran



(33) Complete view of the proposed plant site of Lunsuran



(34) Port Zamboanga



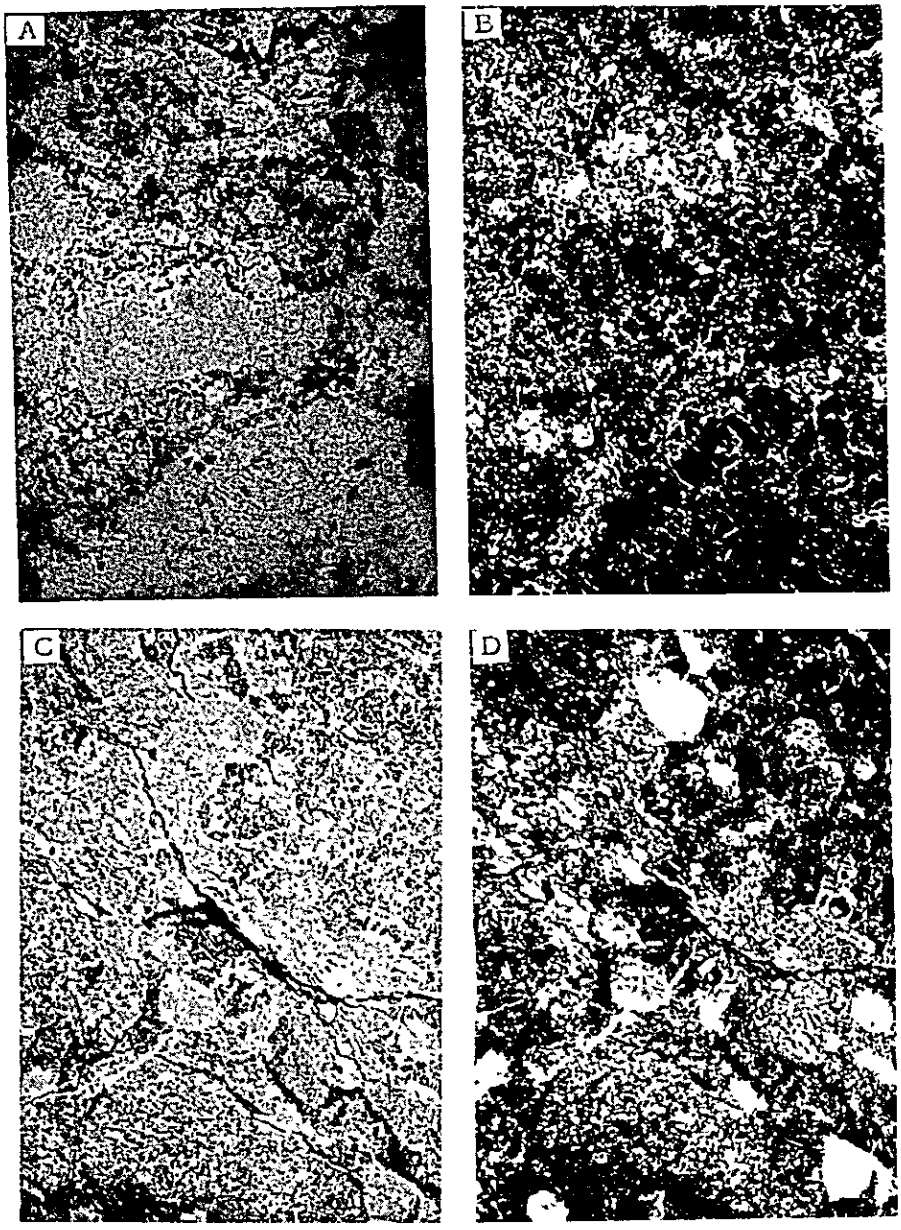
Explanation of Fig. 35

Photomicrographs of the thin sections of raw materials from the Zamboanga District. All figures X 30.

A.9 Limestone from the Lunsuran. Limestone contains aggregates of quartz grains (Q). Sample marked 2. Open nicol. B is crossed nicols.

C. Coralline limestone from the Lunsuran. Sample marked. 6. Open nicol.

D. Coralline limestone from the Manicahan. Sample marked 15. Open nicol.



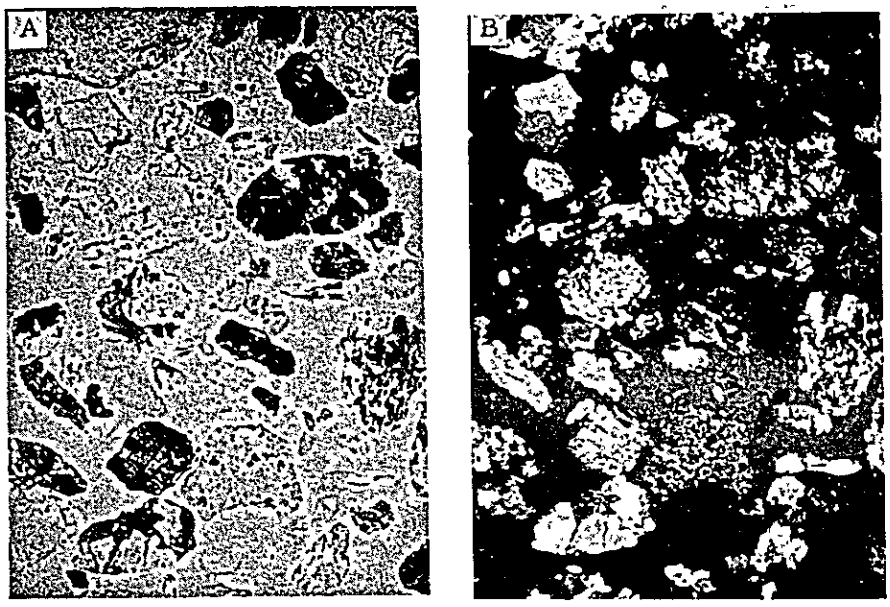
Explanation of Fig. 36

Photomicrographs of the thin sections of law materials from the Zamboanga District. All figures X 30.

A. Andesite altered to opal, clay and ferruginous minerals, from the Lunsuran. Sample marked 1. Open nicol. B is crossed nicols.

C. Agglomerate composed predominantly of glass and clay, from the Lunsuran. Sample market 5. Open nicol. D is crossed nicols.

marked



Explanation of Fig. 37

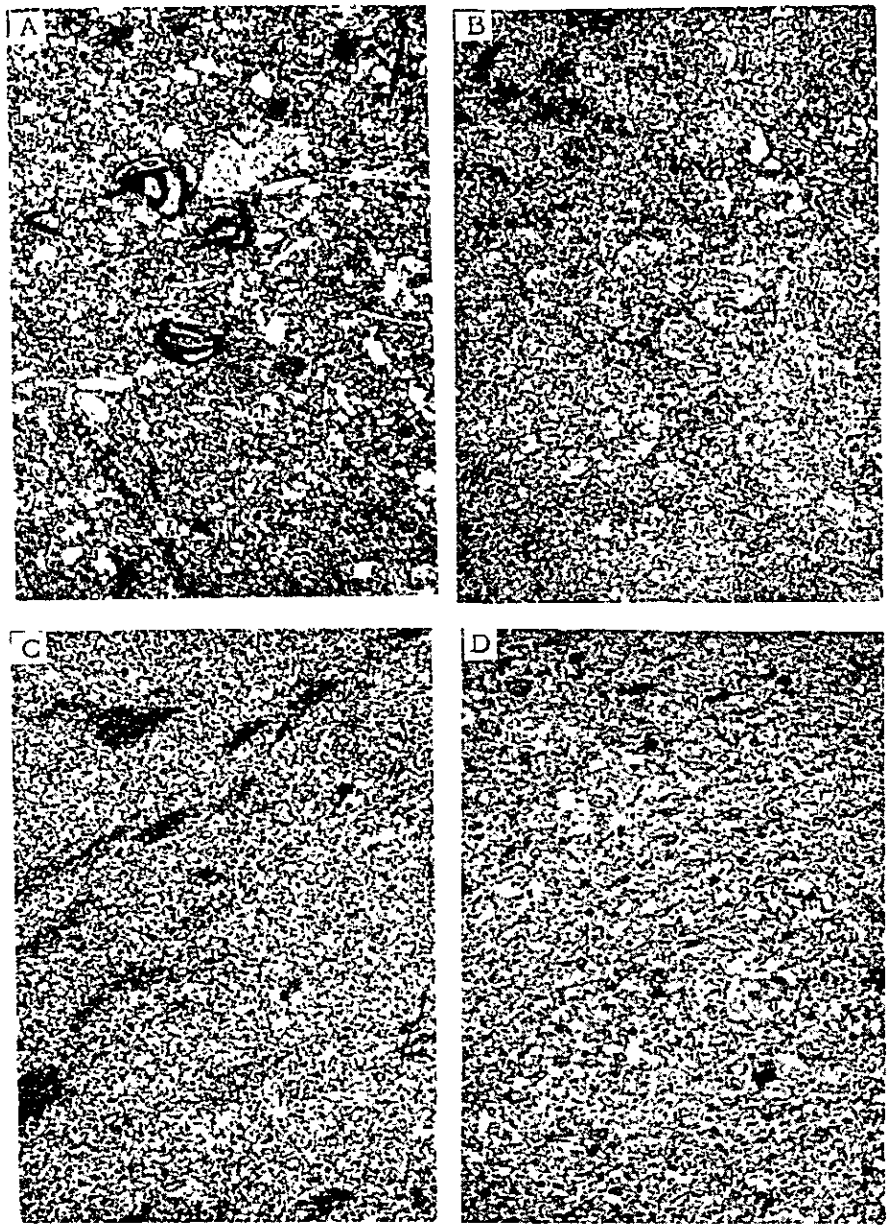
Photomicrographs of the thin sections of silica sand from the Zamboanga District.

A. Silica sand consisting chiefly of chert, quartz, andesite, feldspar and limestone, from the Manicahan. Sample marked 20. Open nicol. B is crossed nicols. X 30.

(38) Outcrop of Cortes Limestone

(39) Outcrop of Surigao Laterite

(40) Cortes Harbor



Explanation of Fig. 41

Photomicrographs of the thin sections of raw materials from the Surigao District. All figures X 30.

A. coralline limestone from the Lanuza. Sample marked 2. Open nicol.
B. Coralline limestone from the Cortes. Sample marked 30. Open nicol.
C. Shale composed of quartz, feldspar and clay, from near the Cortes. Sample marked 40. Open nicol.
D. Shale composed predominantly of quartz, feldspar and clay, from near the Cortes. Sample marked 52. Open nicol.

Chapter III

Refrigiration and Canning Industry

1 Outline of refrigiration and canning industry in the Republic of the Philippines.

1-1 Relations between turnsut of fish and demand for ice

The turnout of fish classified by the types of landing is tabulated as follows:

Type of landing	Quantity (unit: kilogramm)	Remarks
Registered fishing boat	200,000,000	Presumption for 1963
Fishpond	62,044,500	"
Other local landing	276,562,100	"
Total	538,606,600	"

Considering that the demand for ice varies with the types of landing the demand percentage may be assumed as follows:-

Type of landing	Percentage %	Quantity unit: kg
Registered fishing boat	100	200,000,000
Fishpond	60	37,223,940
Others	30	82,968,630
Total		320,192,570

NOTES:

a. The demand percentage of fishing boats is considered 100, for they make use of ice for the whole distance from fishing-grounds to places of consumption.

b. In the case of landing from fishponds the percentage is considered 60, for ice is either necessary or not subject to the time required for transport which is determined by the distance to the market.

c. As for other types of landing the percentage is considered 0, 30, for in the case of local landing the greater part of fish are consumed at the same locality.

30% of them being assumed to be transported to other districts.

d. The weight ratio of fish to ice is considered 100: 100 because of the high temperature and poor heat resistance of the fish containers.

1-2 Existing demand and supply of ice for fisheries

The number of ice plants in the Republic is said to be 256, and part of their production is appropriated for fisheries; that is, the daily output of those ice plants amounts to 4,690 tons, 15 percent of which is considered for use in the marine product industry. This is rather a small quantity of consumption, which, we suppose, is due to the extremely high price of ice.

If we figure out the amount of ice available for the fisheries from the daily capacity of all ice plants in operation by assuming the yearly operation days to be 275, we get the following result:-

4,690 (ton) × 275(day) × 15% = 192,637 ..... (ton)

This means that: while the yearly demand for ice on the part of the fisheries amounts to 320,193 t., the supply is 192,637 t., the difference of 127,556 t. showing the deficit.

1-3 Ice manufacturing capacity necessary for covering the deficit.

In case that the whole output of the newly established ice plants is appropriated solely for fishery use and the yearly operation days of those plants are 275, we get.

126,866 t. ÷ 275 d. = 459 t/d

Thus we can make up for the above deficit in a way by means of constructing, taking a conceivable increase of demand for ice into consideration, ice plants with daily capacity of 500t. The programme is as follows:-

Main base	50t. × 4(plant) = 200t.
Second base	25t. × 6(plant) = 150t.
Others	10t. × 15(plant) = 150t.

These plants which are 25 in number and in different sizes will be able to solve the urgent question of ice deficiency.

1-4 Existing ice-storage equipments

The existing freezer equipments are 41 in number with cubic capacity of 1,665,558 cft., 20 percent of which being considered for fishery use: 1,665,558 cft. × 20% = 333,112 cft. This means that the use of refrigirators by fisheries is insignificant.

Let us consider the measure of cubic capacity necessary for the fisheries by the following figuring:-

In the case of registered fishing boats whose amount of catch can be grasped with comparative exactitude;

assuming 20% of their yearly catch to be cold-stored: 200,000 t. × 20% = 40,000 t.,

assuming the average period of storage to be one month: 40,000 to. × 1/12 = 3,333 t. and

assuming the density of storage to be 80%, we get

3,333 t. ÷ 80 % = 4,166,667 cft.

This result indicates the minimum capacity of refrigirators desirable as well as necessary for the fisheries. If we consider one section of a refrigirator as consisting of 25,000 cft, we get 4,166,667 cft ÷ 25,000 cft = 167 (chamber).

Thus we can meet the pressing shortage of the cold-storage equipments by means of proper combinations of the above-said ice plants with 167 ice chambers.

1-5 Existing situation of canning industry

VISPAC of Bacolod, which we have referred to above, is the sole canning plant of marine products now in operation in the Republic. The greatest majority of canned provisions are now being imported; their principal kinds are those of sardine, pampano and mackerel canned with tomato.

According to our survey of the leading fishing bases, it seems pretty difficult at present to manufacture canned goods of the above-said varieties of fish. The

important reasons are as follows:- the industry can hardly secure the supply of one kind of fish in a quantity large enough for its material of manufacture: even when the material fish is possible to be supplied, the price is comparatively high. If these two problems can be brought to a settle in future by means of an increased catch of the fish together with an improved structure of circulation, the plan of canning industry of these fishes will be materialized.

On the other hand, there is a possibility of materializing the plan of canning tuna. In this case the most suitable plant site is Zamboanga, which is favourable to the location because of the prospective fishing-grounds nearby, convenience of navigation and labour of comparatively low wages.

2 Problems concerning the production and circulation of marine products and their countermeasures.

2-1 Problems at the fishing bases.

As a result of our field survey in various fishing bases they are enumerated as follows:-

A. High price of fish and ice.

B. Deficiency of ice supply and insufficient equipments of ice manufacture.

C. Deterioration of fish due to insufficient use of ice together with indifference of the general consumers toward the freshness of fish.

D. Catch of fish as material of canned provisions falling short of the quantity enough for manufacture.

E. Size of school as well as that of each individual fish in the inland sea are getting reduced, which means a drain of resources.

F. Illegal fishery by means of explosives is causing damage to the fishing-grounds.

G. Low efficiency of operation due to shortage of skilled fishermen.

H. Inconvenient means of transport are hampering the progress of fishery.

I. Imperfect equipments necessary for the circulation of marine products.

J. Absence of measures to deal with or control the price.

K. A great deal of requests for the equipments and funds for running expenses.

L. Great difference of figures between statistics and reality.

The above facts are the points of issue which, we believe, require consideration

2-2 *Countermeasures*

We consider that the following are the urgent countermeasures:-

A. Reduction of ice price by means of its smooth supply will increase its use in general, which will enable to prevent the deterioration of fish. Unless facilitating the transport of fish, its smooth circulation will be impossible. For this purpose rapid construction of ice plants must be expedited.

B. *In order to prevent the drain of natural resources in the inland sea it is* necessary to exercise a strict oversight, accompanied with infliction of a severe punishment, on explosives. It is also necessary to place a certain sea area (inland sea) under some restrictions for the use of large-sized fishing implements; guidance and encouragement must be given to such implements to be employed at the open sea.

C. It is considered necessary to adopt some new ways and means of fishery, *other than the existing ones, which aim at new fishing-grounds. In this case facili*ties will be needed to enable the skilled fishermen to learn new technik of fishery. If attention is given to these points, we believe that the production will make great strides.

As we are all aware, financing of funds has much to do with the circulation of goods; therefore, the establishment of a special bank for the promotion of fisheries *together with the strengthening of producer's associations are considered urgent.*

As for circulation, improvement on the public market, increase of the equipment on shore including refrigirators, reinforcement of transport means and encouragement of the organization of producer's associations will realize smooth circulation of marine products.

Statistics which are the foundation of every planning must be prepared by more enlarged organs in charge of the data.

2-3 *Measures to increase production*

We consider that the measures are as follows:-

(1) Increase of catch by means of bagnets and trawls.

The relative importance of the bagnet and trawl. in the total fisheries of this country is extremely great, which is indicated by the statistics of 1962 (Table 1):

Amount of catch (registered boats only) 81.6%

Number of complement (") 64.8%

Table 1: Relative importance of bagnet and trawl fishery in the total fisheries of the Republic of the Philippines (1962)

Classification		BAGNET		OTTER TRAWL		OTHERS		TOTAL	
		Number	%	Number	%	Number	%	Number	%
Number of boats		742	43.7	490	28.8	469	27.5	1,701	100
Amount of catch (M/T)		58,145	38.6	64,464	43.0	27,327	18.4	150,036	100
Presumption Complement	Motorized	person 16,500	59.8	person 4,900	17.6	person 5,984	22.6	person 27,364	100
	Non-motorized	657	18.7	-	-	4,098	86.3	4,755	100
	Total	17,159	53.3	4,900	11.5	10,082	31.2	32,139	100

Table 2-1: Average catch per bagnet boat classified by tonnage

Classification by Tonnage	Number of licensed boat	Amount of catch M/T	Average catch per boat M/T	Remarks
3-10(A)	373	9,582	26.0	(1) Licensed boats are presumed to be in operation
10-15(B)	179	5,887	35.0	(2) Type E is of high efficiency
15-20(C)	49	2,917	59.0	
20-30(D)	14	1,009	72.0	
30-50(E)	5	2,008	402.0	
50-70(F)	28	8,001	288,0	
70 - 100 (G)	74	22,214	900,0	
over 100 (H)	20	6,526	326,0	
Total	742	58,145	78,6	

Table 2-2: Average catch per trawl boat classified by tonnage

Classification of tonnage	Number of licensed boats	Amount of catch M/T	Average catch per boat M/T	Remarks
3-10 (a)	38	3,089	81.0	Licensed boats are presumed to be in operation
10-15 (b)	52	2,924	56.0	Type H is high efficiency
15-20 (c)	18	1,517	89.0	
20-30 (d)	97	7,342	75.0	
30-50 (e)	130	16,305	125.0	
50-70 (f)	66	8,283	126.0	
70-100 (g)	77	16,543	216.0	
over 100 (h)	12	8,457	705.0	
Total	490	64,464	131.6	

The average catch per fishing boat classified by tonnage (Table 2) shows that in the case of bagnet fishery large-sized boats are not always operating with high efficiency but boats of 30-100 tons(E) are conducting the most efficient operation. This means that such boats as excessively large-sized for the purpose are engaged in this kind of fishery; therefore, measures must be taken to limit the bagnet fishery to the boats of approximately (E) size and to allow the large-sized boats to convert into the purse seine fishery in the open sea. As to (H) type immediate measures* of conversion must be considered, and the same holds true with the greater part of (G). By so doing development of new resources in the open sea as well as the preservation of those in the inland sea will be realized. In case of such conversion the important fishing bases of such large-sized boats will be Palawan and Mindanao districts, where land equipments for fisheries will have to be rapidly constructed. For instance, an ice plant built in Palawan will be able to supply ice to Zamboanga and its vicinity.

In the case of trawling large-sized boats are achieving very good results (Table 3); results of (H) type boats, whose tonnage is a hundred and upwards, are fairly remarkable, that is, they are operating in the new fishing grounds of the open

*Convert into the purse seine fishery in the open sea. As to (H) type immediate

sea. Type (G) is considered to be operating both in the inland and open seas. Fishing boats which are smaller than (F) type are jammed in the narrow fishing-grounds near the inland sea. Judging from the above, trawling is a highly prospective way of fishery to increase the catch, if the size of the boat is made larger in order to conduct deep-sea operation. Therefore, such positive measures are desirable as to make larger the size of (D) and (E) type boats to enable them to conduct fishery in the open sea.

In other words, bagnet fishery will be limited to small-sized boats not only to preserve the resources in the inland sea but also to increase their catch, while those boats whose size exceeds a certain standard will have to be gradually reduced in number and led to conduct large-sized purse seine fishery.

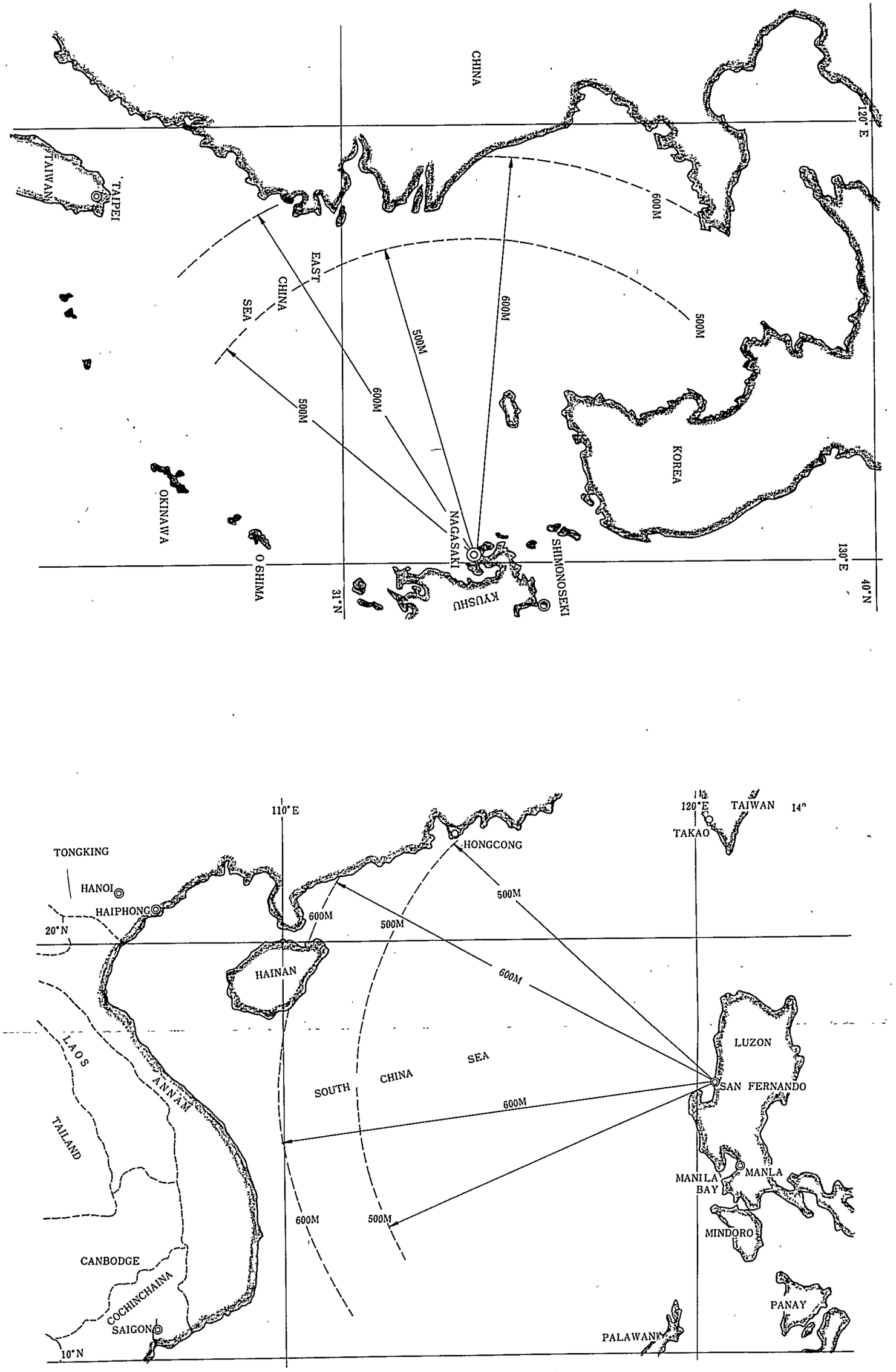
As for trawling prevention of the drain of the resources in the inland sea as well as increase of catch will be realized by means of making the medium-sized trawlers larger in size and at the same reducing them in number; increase is also expected by enlarging the area of towing nets of small-sized boats.

(2) Increase of catch by introduction of new ways of fishery.

One is the introduction of two-boat trawl and the other is rod and line fishery of bonito and tuna.

The former is an efficient way of fishery in a sphere within 700-800 sea miles from the base. As past records show that the catch in the South China Sea has been over 150% of that in the East China Sea, the fishery here of Philippine trawlers are very prospective.

Experimental fishery of the latter is now being conducted by tuna boats sailing from the base of Bacolod, but increase of boats is impossible due to the shortage of skilled fishermen. Although it is well-known that the farther southward one sails from the Philippines the more abundant will be in the fish in view, the resources in this area still remain almost neglected. This is indeed a matter for regret when we think of the decrease in the resourses of the inland sea. In this connection, if a base of large-sized ocean trawlers can be selected in Mindanao, it will make a favourable condition not only to the trawling in the South China Sea but also to the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COCHINCHAINA
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PALAWAN
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possibility of materializing a canning industry making use of tuna as material.

(3) Increase of production in the inland water (fishponds)

The rate of the catch in the inland sea to the total one of the whole country is 12.7%, that is, 61,436 tons, which correspond to the 42% of the catch of all registered boats; these figures indicate the relative importance, which is fairly great, of this fishery. (Table 3,4) The area of the fishponds already developed amounts to 129,062 ha, with 557,192 ha. more waiting to be developed. As the productivity is high in this district, production is expected to show a remarkable increase, if strenuous efforts are made in the development of fishery keeping pace with those in the lines of agriculture, forestry and linestock industry.

At the same time development of inland lakes is also to be promoted; in an actual case Lake Ladao (342 km^2) is most worthy of the efforts of development.

Table 3: Composition of total fish catch of the Philippines in 1962

Type of fishery	Quantity	Sum (pesos)	Percentage
Licensed boats	150,036,140	138,033,620	31.1%
Fishponds	61,436,050	108,212,560	12.7
Others	272,475,000	299,722,500	56.2%
Total	483,947,590	540,968,680	100%

Table 4: Outline of fishponds in the Philippines

	1958	1959	1960	1961	1962
Area (hectares)	116,546	119,582	123,251	125,810	129,062
Investment (pesos)	233,092,000	239,164,000	246,503,800	251,620,000	258,124,000
Number of employees	116,546	119,582	123,252	125,810	129,062
Turnout (kg)	57,624,385	58,090,000	60;119,561	60,824,556	61,436,052
Sale amount(pesos)	91,046,448	92,944,420	96,191,298	99,144,026	108,212,560

(4) Improvement on circulation

Improvement on the circulation of products is at the present moment one of the most difficult problems, which presuppose the reinforcement of transport means, as the greater part of the places of consumption is limited to Central Luzon and Visayan districts. Increase of transport boats are the prerequisites to the connection with islands across the sea.

Favourable conditions due to the reinforcement of ice and refrigiration plants are expected as follows:-

A. Smooth transport and supply of highly fresh fish will be enabled.

B. Low rate of operation of fishing boats due to shortage of ice will be improved.

C. Deep-sea fishery in the favourable ocean fishing-grounds will be promoted.

D. Fish which are now treated into dried ones will be supplied to the consumer either as fresh or frozen fish.

E. Material of canned fish will be added to.

3 Refrigiration and canning industry

3-1 Aim and idea of practical plan

In connection with the urgent countermeasures which we stated in Paragraph 2 we propose a plan laying stress on the refrigiration and canning industry.

Such measures as the administrative guidance and encouragement of fishery by the Government, financial aid, management of public markets, etc. are outside the scope of our investigation. However, it is impossible, in our opinion, to treat of the refrigiration and canning industry entirely independent of the practical side of fishery; therefore, special attention has been paid to matters concerning production

(1) Ice manufacture

If we make a conservative estimate for the time being by making reference to Table 5, the situation of ice in 1966 will be as follows:-

Amount of catch

registered fishing boats 200,000 t. x 1.15 = 230,000 t.

fishponds	62,000 t. x 1.05 = 66,000 t.
other localities	276,500 t. x 1.10 = 304,000 t.
total	600,000 t.

Amount of necessary ice

registered fishing boats	230,000 t. (fish) x 1.0 = 230,000 t. (ice)
fishponds	66,000 t. (fish) x 0.6 = 37,600 t. (ice)
other localities	304,000 t. (fish) x 0.4 = 121,600 t. (ice)
transport by land and others	8,800 t. (ice)
total	400,000 t. (ice)

Supply of ice

present ice plants	193,225 t.
plants to be constructed	6,775 t.
supply in 1966	200,000 t.

Deficit of ice

400,000 - 200,000 = 200,000 t.

Necessary capacity of ice-making

200,000 t. × 1/275 d. = 727 t. (for fishery use only)

This means the daily output of ice, which, added to the conceivable increase in demand, will be 750 t. per day.

The distribution of this daily output will be as follows:-

1.	Type A plant	daily output	50 t. × 5 = 250 t.
2.	Type B	"	40 t. × 3 = 120 t.
3.	Type C	"	20 t. × 9 = 180 t.
4.	Type D	"	10 t. × 20 = 200 t.
	total	"	27 plants 750 t.

Out of the above estimate our practical plan aims at the construction of 3 Type A, 2 Type C and 1 Type D, that is, six plants in all with daily output of 200 t.

(2) Refrigiration

Amount of fish to be cold-stored

registered boats	230,000 t. x 0.25 =	57,500 t.
fishponds	66,000 t. x 0.15 =	9,900 t.
other localities	275,000 t. x 0.2 =	55,000 t.
total	fish	122,400 t.

Items of frozen fish and fresh fish

frozen fish	57,500 t. x 0.3 =	17,250 t.
fresh fish (1)	57,500 t. x 0.7 =	40,250 t.
(2)		9,900 t.
(3)		55,000 t.
total of fresh fish		105,150 t.

Necessary refrigirator (60 days' storage) for frozen fish

17,250 t. x 2/12 (month) = 2,875 t. (refrigiration capacity)

Considering the overlapping of cargo due to catch, transport, etc. the refrigirator must have some extra capacity in reserve; therefore, the total capacity will be 3,000 t.

Refrigirator for fresh fish (5 days' storage)

105,150 t. x 5/365 (day) = 1,440 t.

In consideration of the overlapping of cargo due to catch, transport, sale, handling, etc. some extra capacity in reserve must be added to: therefore the total capacity will be 1,500 t.

The distribution of the above refrigirators in various parts will be as follows:-

Refrigirator for frozen fish

1. Type A	capacity	300 t. x 3 =	900 t.
2. Type B	"	200 t. x 5 =	1,000 t.
3. Type C	"	100 t. x 8 =	800 t.
4. Type D	"	50 t. x 6 =	300 t.
total		22 plants	3,000 t.

Out of the above estimate our practical plan aims at the construction of 1 A type, 1 B type and 3 C type, which will be 5 plants in all with capacity of 800 t.

Refrigirator for fresh fish

1. Type A' capacity 100 t. x 2 = 200 t.
2. Type B' " 70 t. x 3 = 210 t.
3. Type C' " 40 t. x 3 = 120 t.
4. Type D' " 30 t. x 6 = 180 t.
5. Type E' " 20 t. x 7 = 140 t.
6. Type F' " 10 t. x 55= 550 t.

total : 76 plants with capacity of 1,500 t.

Out of the above estimate our practical plan aims at the construction of 1 A' type, 2 B' type, 2 C' type and 1 D' type which will be 6 plants in all with capacity of 350t.

(3) Canning industry

In view of the present situation and in anticipation of the near future of the Philippines fishery the most suitable type of canning industry of the country will be that of tuna and bonito, and the most suitable plant site will be Zamboanga.

The supply of the material is anticipated as follows:-

tuna boat 180 G. T. type x 2

catch per boat 80 t. per month

total catch 80 t. x 10 (month) x 2 = 1,600 t.

items of treatment and processing of the catch

frozen fish 50% = 800 t.

canning 20% = 320 t.

fresh fish (other than yellow-fin) 30% = 480 t.

In the case of 4 tuna boats the items are:

frozen fish (large-sized one only) 30% = 960 t.

canning 60% = 1,920 t.

fresh fish 10% = 320 t.

If 500 t. of yellowfin which are landed at localities are added to the canning material, total canning material will be 2,740 t.

(Capacity of treating material)

Assuming the operation days per month to be 23, the number of yearly operation

days of the plant are 276; hence, 2,740 t. x 1/276 = 10 t. This is the capacity per day of treating the material.

(Capacity of finished products)

Yellow-fin canned in oil	per year	20,000 (case)
Bonito boiled in water	"	80,000 (")
total		100,000 (")

(4) Refrigirator boat

It is necessary to effect a smooth circulation of the products by means of two refrigirator boats; one assigned for the route between Manila and Zamboanga via Cadiz and the other for the route between Manila and Cuyo of Palawan.

1) Zamboanga route

Estimate of cargo

tuna	frozen	800 t. x 0.8 = 640 t.	
"	fresh	480 t. x 0.5 = 240 t.	
bonito	frozen	960 t. x 0.7 = 670 t.	
"	fresh	320 t. x 0.3 = 100 t.	
chanus chanos		30% of fishpond catch	1,800 t.
red fish		50% of rod and line catch	200 t.
shrimp		30% of fishpond catch	200 t.
total			3,800 t.

Furthermore, if we assume that 80% of the above amount are shipped toward Central Luzon, it will be about 3,000 t., which are transported by navigation conducted 30 times a year; 3,000 t. = 30 (number of times of navigation) x 100 t. Thus a refgirator boat of 250 G.T. type will be necessary.

2) Palawan route

The cargo from Palawan is estimated to be one-third of the above-said 3,000 t., and a refrigirator boat of 150 G.T. type will be assigned to Cuyo where the cargo will be gathered.

3-2 Plan and equipments

In order to realize an ample catch and satisfactory circulation of products by

means of developing new resources through introduction of new ways of fishery as well as conversion to ocean fishery from coasted or inland sea fishing it is necessary to equip such initial facilities as are urgently needed. In this connection it is considerable to locate them as shown in the detailed list (Table 5) which follows:

Table 5

Practical plan Details of equipments and capacity

Name of place / Equipments	S. Fernando	Zamboanga	Parawan Cuyo	Mindanao Cotabato	Negros Cadiz	Luzon Peal
Equipments of refrigiration plant						
1. Ice manufacture ton per day	50	50	50	20	20	10
Item — Pillar ice	30	30	30	10	10	-
Item — Flake ice	20	20	20	10	10	10
2. Storehouse of ice	200	200	200	50	50	30
Item — Pillar ice	120	120	120	30	30	-
Item — Flake ice	80	80	80	20	20	30
3. Refrigiration ton per day	5	20	10	5	5	-
4. Ice-storage of frozen fish ton	100	300	200	100	100	-
5. Ice-storage of fresh fish ton	100	70	70	40	40	20
6. Dynamo or generator	For emergency(use) 200 KVA	For emergency(use) 200 KVA	All independent generator 400 KVA	For emergency(use) 100 KVA	For emergency(use) 100 KVA	All independent generator 50 KVA
Capacity of canning plant(case per year)	-	tuna 20,000 bonito 80,000	-	-	-	-
Refrigirator boat G.T.	-	250	150	-	-	-
Fishing boat						
1. Trawler G.T.	(boats) 125x20	-	-	-	-	-
2. Tuna boat, G.T.	-	(boats) 180x2	-	-	-	-
3. Bonito, G.T.	-	(boats) 50x4	-	-	-	-

(1) San Fernando Base

The greatest majority of the fish landed in the Republic is consumed in Central Luzon with Manila as its centre. In addition to Manila, San Fernando is considered the most suitable auxiliary base of landing fish in view of the port condition, road to the place of consumption, distance to the fishing-grounds, etc. It is more favourably situated than Manila in view of the convenience of supplying to the mountainous as well as to the granary district of the country. The catch is very prospective because of the small number of fishing boats operating in the continental coast or the South China Sea, lying within 600 sea miles, whose value as a fishing-bank is more than 150% of that of the East China Sea, judging from the past records.

It is advisable, as we have stated above, to reduce in number the medium-sized boats now operating in the narrow fishing-bank of the inland sea in order to appropriate the hands thus spared for the fishing in the South China Sea. There is no fishing season here, but the operation of boats is possible all the year round except the period of their maintenance and repair work; this means the possibility of a constant and mean supply of fish throughout the year.

Such perfect equipments on shore as ice, refrigiration and cold-storage plants will enable the smooth supply of fish to the granary in the north of Manila and mountainnous districts as well, playing an important role in the circulation of fish.

These are the reasons for our adoption of San Fernando as the first item of our plan considering that it will make an important place to be developed as a synthetic base of production and refrigiration equipments.

(2) Zamboanga Base

Tuna is the kind of fish to be developed in future in the sea area around the Philippines. However, in the opinion of the officials related to NDC who accompanied us in the present field survey, fishery of long navigation is unsuitable to the Philippine poeple. This cannot be always true judging from the case of experimental operation now being conducted by VYSPAC (Bacolod). If young people from the fishery high schools are trained and given technical guidance, it will be possible enough

for them in near future to operate ocean fishery.

Zamboanga can be the most prospective fishery base of tuna in connection with the fishing-bank, as it is situated at the southwestern tip of Mindanao, facing the two important fishing-grounds of Sulu Sea and Celebes Sea. It is also favourable to the fishing boats, as Port Zamboanga was opened of old times for the transport of various goods, being a port of call for the vessels both of ocean and coastwise navigation.

As the sole canning plant (fish material) of the Republic is now operating in Bacolod as one line of the many-sided equipments, the establishment of a fishery base in Zamboanga will add to its favourable conditions, for it will help toward the operation of the canning plant.

(3) Cadiz Refrigiration plant

An ice plant is necessary in Northern Negros to make up for the deficiency of ice in the district. Cadiz is an important town in the northern part of the island and favourably situated in connection with the fishery in the Visayas and transport to Central Luzon. The equipment of a refrigirator here will bring about a smooth circulation of fish in the central part of the Philippines. If a refrigirator is equipped in Cadiz where dried fish are being produced, the making will decrease in quantit

(4) Cotabat Refrigiration Plant

This is a zone where ice is extremely scarce and its price is so high that there is little use of it.

Cotabat, being a principal place of producing chanus chanos and shrimps in the fishponds, is playing an important rôle as a supplying base to Luzon. Moreover, there is a vast area of swamp there; construction work of a fishpond is being conducted little by little in this swamp. Such being the case ice is indispensable in Cotabat.

Transport of fish packed with ice by aeroplane will cost much, but, if they are sold at high prices, it will be able to cover the price differentials due to the costly transport. This is better than to be obliged to sell dirt-cheap because of the dete-

rioration of fish. In our actual market research in Manila it was learned that the chanus chanos of Cotabat did not sell well due to its deterioration.

It is expected that the increase in the demand for ice at the time of completion of the fishpond and enlargement of fishery in the open sea will be met by the daily output of ice amounting to over 100 t.

(5) Real Refrigiration Plant

This district is now purchasing a very small quantity of very costly ice from Laguna which is far away over the mountain. The use of the ice is not in fishery but in a few restaurants. As it is desirable to supply, as soon as possible, ice for sale for general use as well as for use in fishery, we have made a plan of a small scale ice plant here. When the swamp in the vicinity has been developed into a fishpond, a larger scale ice plant will be needed for the circulation of the fish raised in the pond.

(6) Cuyo Refrigiration Plant

More than 46% of the total catch of fish is conducted at present in the Sulu Sea and especially at the fishing-bank of the Sulu Sea near Palawan, and 94% of the catch is landed in Central Luzon. The catch in the fishing-ground near Palawan has been on the rapid increase of late years.

The greater part of the fishing boats operating in the above-said sea area are being supplied with ice at Manila where its quantity is so scarce that they have to wait in the port usually for 3-4 days and in midsummer even as long as two weeks until it is delivered according to priority.

If satisfactory supply of ice is effected in Palawan district, we can expect the efficiency of the boats, now plying between Manila and Palawan like the stroke of a piston, will be naturally improved together with an increase in the catch by small-sized boats.

A comparatively large scale ice plant is necessary in order to supply to Central Luzon which is a place of great consumption such fish as preserved in fresh condition.

If raw water is unavailable in Cuyo, Taytay or Roxas is considered as a second proposed site of the ice plant.

(7) Refrigirator Boat

As we have mentioned above, the operation of refrigirator boats is urgently needed for the satisfactory supply of fish to Central Luzon which is a place of great consumption. It is presumed that there is cargo enough for the service of such boats which are expected to play an important rôle in the improvement of the fishery on a small scale in Palawan and Zamboanga districts.

4 Investigation in future

Although the plans described in the present report have been made on the basis of the data collected on the spot as well as the existing situation clarified by our fact-finding, the report is still in the pale of a preliminary investigation. Therefore, when making a regular plan, the following items are necessary in addition to the above:-

A. Detailed examination of the economic conditions of each district.

B. Preparation and examination of detailed technological data of each district.

C. Detailed designing of the equipments.

D. Estimate of construction cost and program of construction work.

As a matter of fact, accordingly, it is necessary to perform a re-investigation, upon the detailed data of which the basis of exact planning will have to be made.

Chapter IV

Small-sized ships

1 Present situation of shipbuilding industry and its correlated industries.

The centre of the shipbuilding industry of this Republic may be roughly divided into three: Manila and its environs, Port Cebu and Port Iloilo. The greater part of the shipgards gather at Manila and its environs of which those located in Navotas Malabon specilize in fishing boats. As for the scale such large shipyard is found as Bataan National Shipyard of NASSCO which is equipped with a dry dock of 7,500 G.T. and a shipbuilding berth of 2,300 G.T. There are also a number of shipyards where small-sized boats are built.

As for the operation of the shipyards in connection with new ships a ferryboat of about 250 G.T., three fishing boats of about 100 G.T. and two ships of 20 - 30 G.T. for miscellaneous purposes are being built. No new ship has been built on the shipway of 2,300 G.T. in the Bataan Shipyard of NASSCO for the past two years. On the other hand ship, repairs are going on briskly in almost all shipyards, whose shipways are nearly all filled with vessels under repair.

2 Present operation of ships and prospect of future demand for them

The present operation of ships in this country may be considered in three rough divisions:

A. large-sized oceans vessels consisting of cargo ships of over 5,000 G.T.

B. Inter-island vessels of 500 - 5,000 G.T. operated as means of communication in this archipelago composed of over 7,000 islands.

C. fishing boats operating for the development of abundant fishery resources.

A is placed outside the scope of our investigation, as they are made up of a very small number of vessels, while our greatest interest is concentrated on B and

C which are inseparably connected with the shipbuilding industry of this country in future. The future of this industry is forecast by the grasp of the present situation of B and C.

1. Present situation and future of inter-island vessels

Judging from Table 1 which indicates the inter-island vessels classified by gross tonnage and ports of registry, and Table 2 which indicates the number and gross tonnage of such vessels classified by this ports of registry, we consider as follows:

Table 1: Inter-island vessels classified by gross tonnage and ports of registry

Gross tonnage	Manila	Cebu	Iloilo	Total
100 - 500	32	54	6	92
501-1,000	34	34	2	70
1,001 - 1,500	3	1	1	5
1,501 - 2,000	3	0	0	3
2,001 - 2,500	3	0	0	3
2,501 - 3,000	4	0	0	4
3,001 - 3,500	1	0	0	1
3,501 - 4,000	2	0	0	2
4,000 - 4,500	1	0	0	1
	83	89	9	171

* Based on data 1955 - 1963, Bureau of Customs

Table 2: Number and gross tonnage of inter-island vessels classified by ports of registry

	Number of boats	Gross tonnage
Manila	83	71,678,68
Cebu	89	36,054,01
Iloilo	9	3,880.45
Total		111,613.14

A The operation scale of the inter-island vessels is very small as they are 181 in number (more than 100 G.T.) and 111,613 G.T. in total gross tonnage.

B Of the 181 vessels about 50% are of 100 - 500 G.T. type and 92 in number, and about 40% are of 500 - 1,000 G.T. type and 70 in number; that means, 90% of all vessels are small-sized ones.

C The items of the ports of registry are indicated in Table 3 (distribution of vessels now in operation classified by their numbers and gross tonnage). Their registry belongs to the three ports of Manila, Cebu and Iloilo, and especially it gathers at Manila and Cebu in most of the cases.

Judging from the above points we forecast the future of the inter-island vessels and consider their bases as follows:-

a. The scale of the operation of the inter-island vessels will have to be enlarged in order to realize the present 5-year plan.

b. At least half of such small-sized vessels as less than 1,000 in gross tonnage and amounting to 90% of all this category will have to be replaced by large-sized ones.

c. The bases of building and repairing inter-island vessels ought to be centered around Manila, Cebu and Iloilo in future, too; and so ought to be the correlated industries.

2. Present situation of fishing boats

The data available for the present situation of fishing boats are as follows:-

(As of 1962)

total number	1,701	total gross tonnage	47,303 G.T.	(27.8 G.T./boat)
power-driven	1,440	"	45,405 "	
non-motorized	249	"	1,898 "	
(registry less by	12	"		7.6 G.T./boat)

3. 95% of all fishing boats are such small-sized vessels as less than 100 G.T. and more than 60% of them are such coastwire boats as less than 15 G.T. Therefore, it is desirable that such coastal fishery will be discarded by means of improving on the boats. (Table 3.)

Table 3: Distribution of vessels now in operation classified by number and gross tonnage

G/T	Number of boats
3 - 10	692
10 - 15	324
15 - 20	83
20 - 30	121
30 - 50	143
50 - 70	101
70 - 100	171
over 100	54
Registry less	12

3 Outline of establishment plan of a new shipyard

3-1 New equipments and enlargement of existing ones.

Considering the conditions of location the best way conceivable at present of realizing this plan will be the construction of new shipbuilding equipments as well as the improvement on the existing ones by making use of the site of the National Bataan Shipyard. The outline is as follows:-

A. The first stage of the plan consists in the full-time operation of the existing 3,000 G.T. shipway. In this case the yearly shipbuilding will be effecting the construction of 4 cargo-passenger ship of 2,500 G.T. type, which is a work of normally 5,000 tons in terms of steel materials.

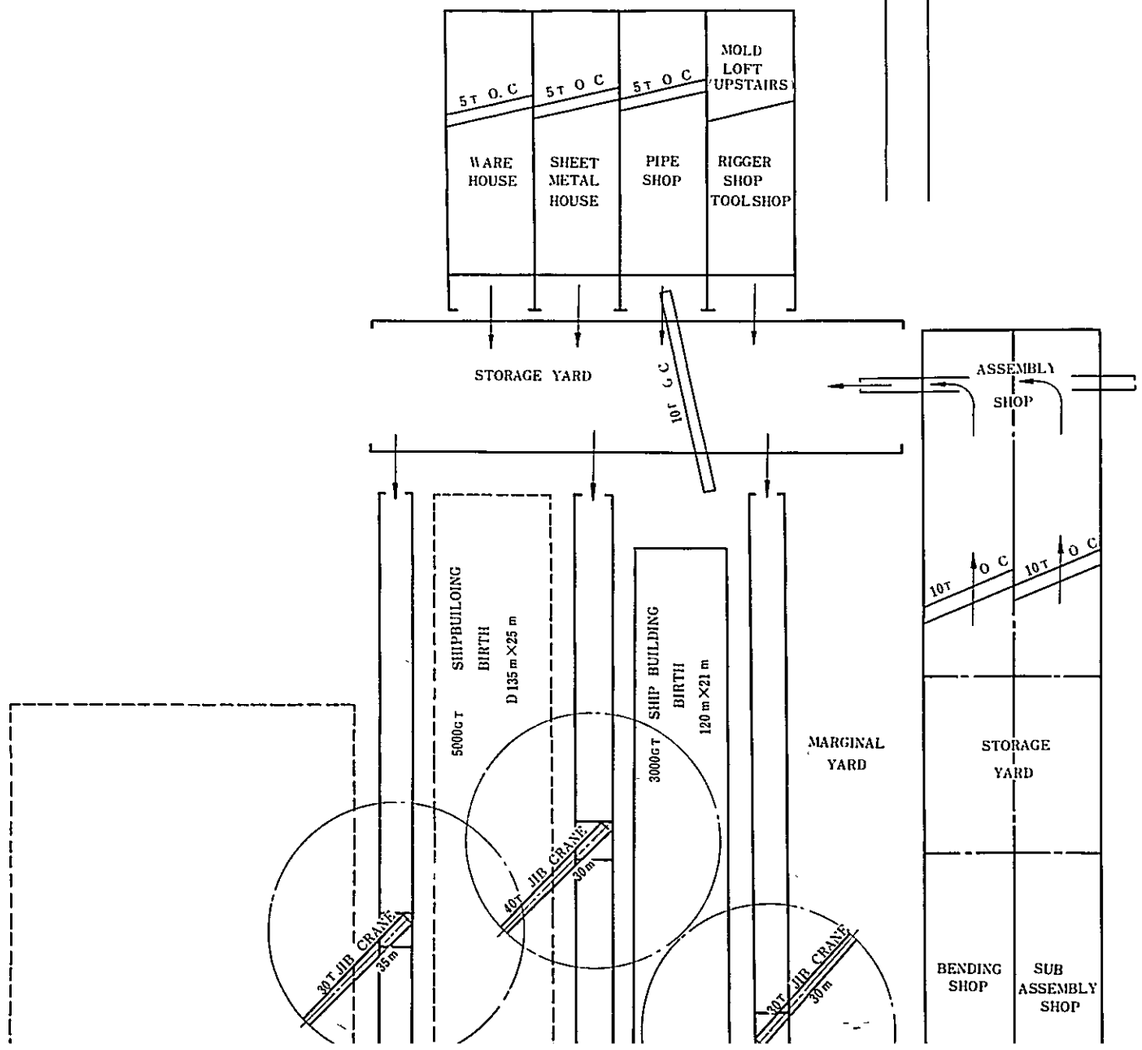
B. The second stage involves the equipment of a new shipway of 5,000 G.T. upon completion of this plan the increased capacity will be able to build yearly three more cargo-passenger ship of 4,000 G.T. type, which is a work of normally 10,000 - 12,000 tons in total in terms of steel materials.

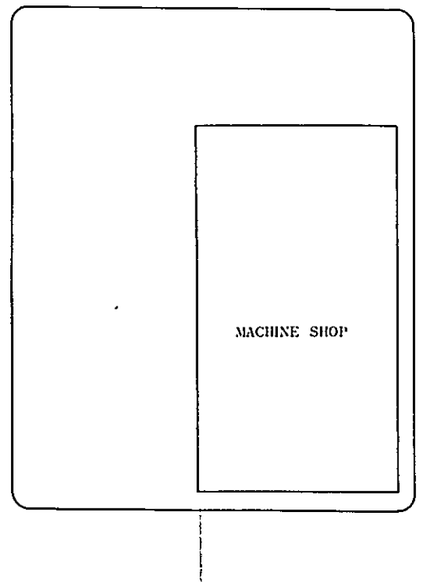
C. The existing dry dock of 7,500 G.T. will be employed for repairing

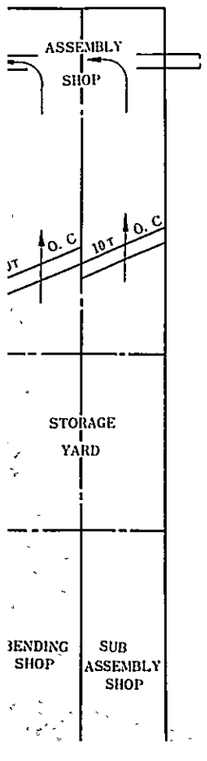
ships and such plate angle shop, foundry shop, machine shop, etc. as attached to the dry dock will be utilized, without any alteration of their existing equipments, for ship repairs, working of small boats and iron and steel frameworks on shore; the foundry and machine shops are also utilized in the building of new ships involved in the first and second plans.

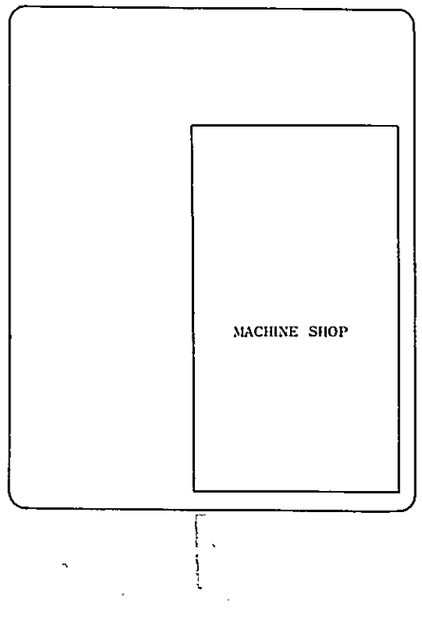
The layout of the new shipyard based on A, B, and C above is shown in Chart 1 which follows. In addition to the above a plant of producing compressed oxygen will be newly constructed, an electric power plant (about 2,000 KVA) will be built in the existing one. The existing warehouses for general use, tool shop, offices, docks, etc. will be put to use when materializing the new plan.

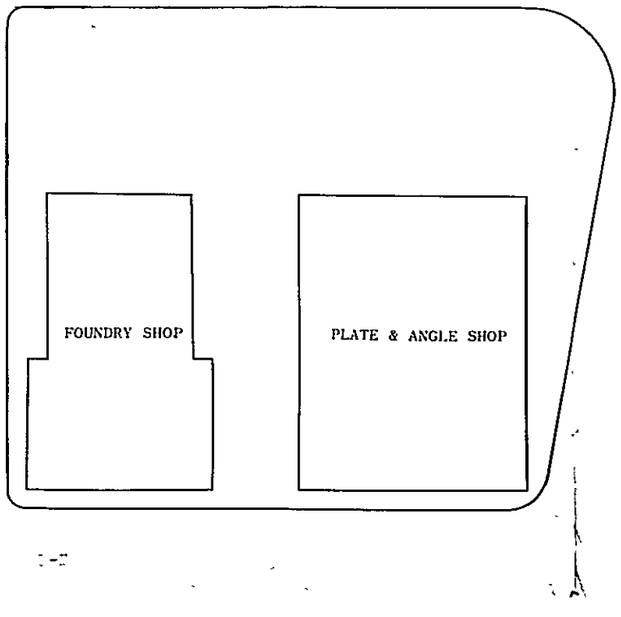
AVENUE

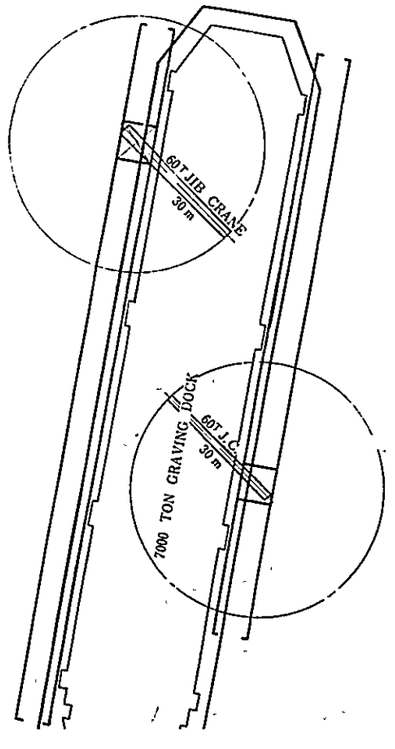

5T O.C
5T O C
5T O C
MOLD LOFT UPSTAIRS
WARE HOUSE
SHEET METAL HOUSE
PIPE SHOP
RIGGER SHOP TOOLSHOP
STORAGE YARD
10T C C
ASSEMBLY SHOP
SHIPBUILOING BIRTH
D 135 m × 25 m
5000GT
SHIP BUILDING BIRTH
120 m × 21 m
3000GT
MARGINAL YARD
10T O C
10T O C
STORAGE YARD
30T JIB CRANE
35m
40T JIB CRANE
30m
30T JIB CRANE
30m
BENDING SHOP
SUB ASSEMBLY SHOP

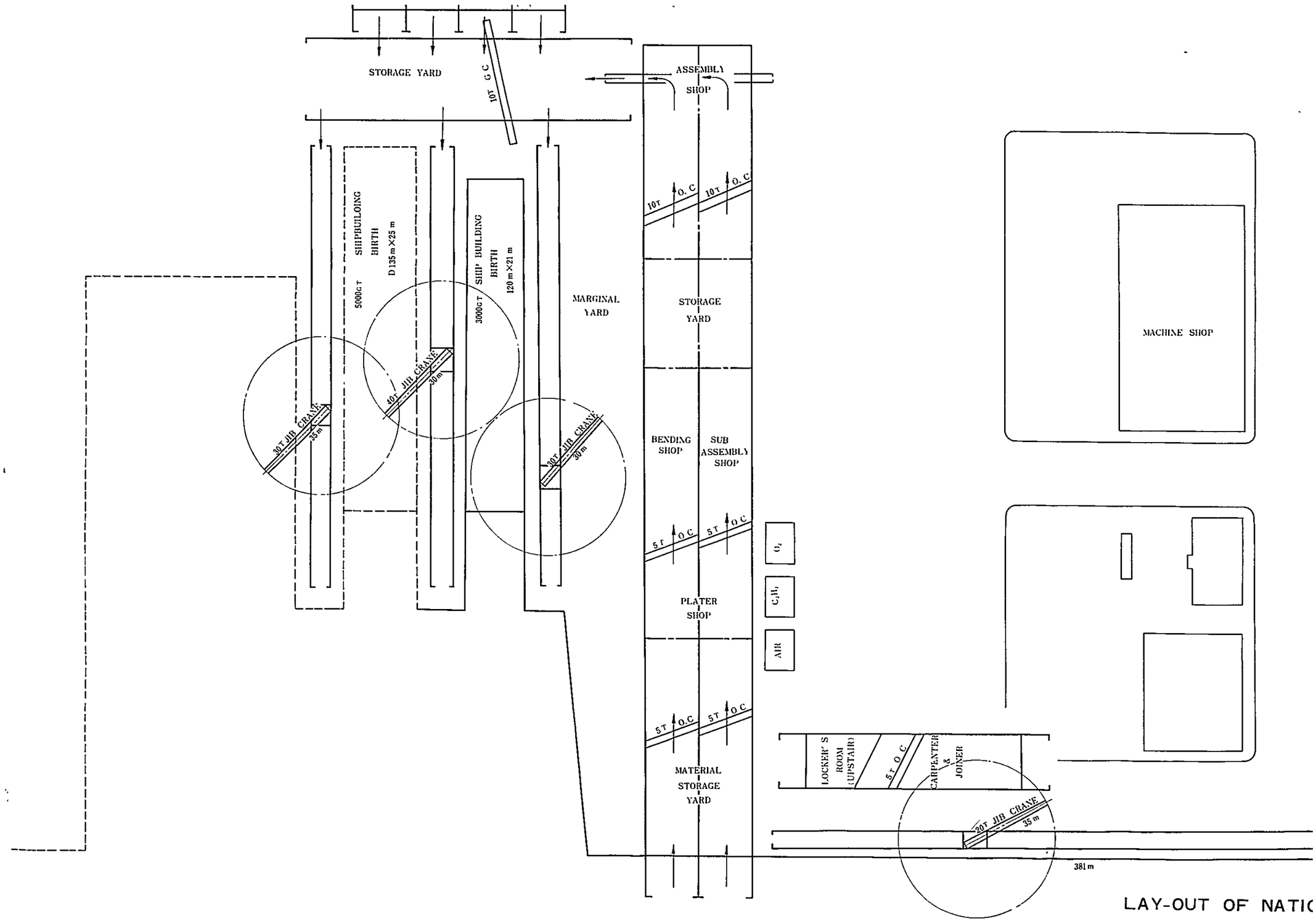

MACHINE SHOP


ASSEMBLY
SHOP
O. C
10T
O. C
STORAGE
YARD
SUB
ASSEMBLY
SHOP


MACHINE SHOP

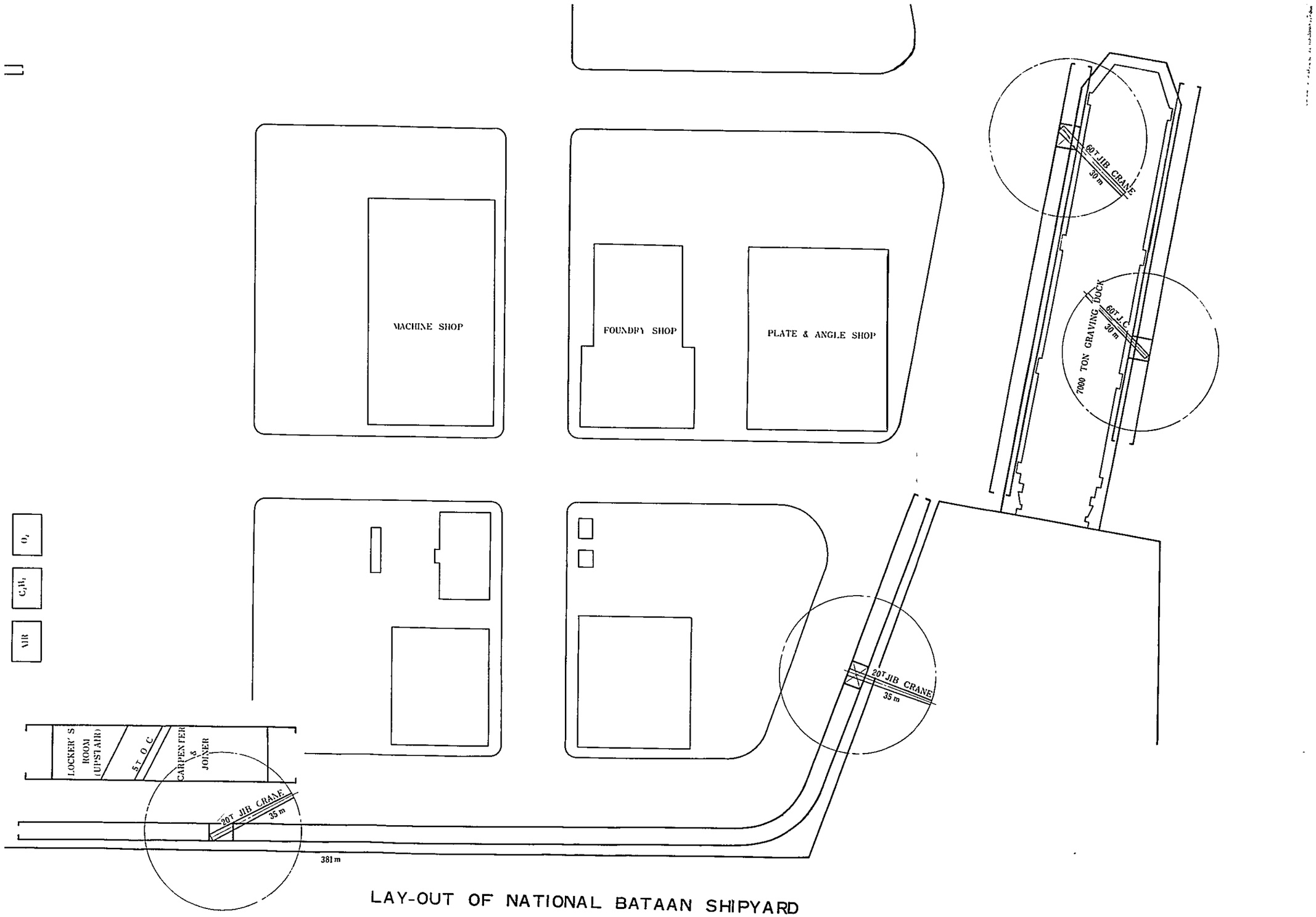

FOUNDRY SHOP
PLATE & ANGLE SHOP


60T JIB CRANE
30m
7000 TON GRAVING DOCK
60T J.C
30m



LAY-OUT OF NATIC

SCALE



LAY-OUT OF NATIONAL BATAAN SHIPYARD

SCALE 0 10m 20m

Chapter V

Diesel Engines

1 Outline of diesel engine manufacturing industry in the Republic of the Philippines.

Diesel engines as sources of motive power are being put to use in wide fields of work in this country and the percentage of their use principally in the following lines is over-whelmingly great:-

A. land engine

1. abaca stripper
2. household generator
3. various kinds of agricultural machinery
4. rice-cleaning machine
5. irrigation pump

B. Marine engine

1. small-sized boat
2. fishing boat
3. cargo-passenger ships

In proposing a plan of establishing plants of diesel engine manufacture it is advisable to strongly promote the domestic production of parts so that in future necessary materials may be procured at home. It is considered appropriate for the industry to begin with the assembly of imported parts at the initial stage and then gradually shift to the regular production of these parts at home.

In our inspection of the plants in Manila, the capital, and its environs where the highest standard of the manufacturing industry of the country has been attained, we have found the following ones which have excellent equipments to conduct the assembly and manufacture of products with superior quality.

1-1 The plants we inspected

(1) Philippine Engineering Co.

This plant which has about 120 workmen is equipped with approximately 30

machine tools of various sizes and manufacturing monthly two or three large-sized ri rice-polishing machines and, in addition, doing sectional repairs of diesel engines.

(2) Gregorio Araneta Machine Inc.

This plant, under technical cooperation with Komatsu Seisakusho of Japan, is conducting monthly assembly of 30 motor-tractors and about 60 trucks, and manufacturing the parts of mixers, compressors, sprayers and gearings by means of about 60 machine tools and 350 workmen. The equipments are well arranged. It belongs to the excellent class for its scale.

(3) Bernabe Jose & Co., Inc.

This plant, equipped with two cupolas with capacity of 0.8 t. and 0.2 t. respectively, is assembling and manufacturing rice-cleaning machines and threshers by means of about 30 machine tools and 30 workmen.

(4) International Harvester Co.

This plant specializes in the assembly of large-sized motor-tractors (monthly 100). Its warehouse merits attention.

(5) U.S. Industries (Philippines) Inc.

This plant is equipped with about 30 machine tools and mainly doing repairs of caterpillars; it is also manufacturing the parts of refrigirators.

In consideration of the situation mentioned above and the 5-year plan. which will be described later, aiming at the domestic production of 50% of the parts. we have outlined a plan of plants manufacturing and processing the parts as well as assembling small-sized diesel engines. In order to materialize this plan it will be necessary for the Government of the Republic to take some protective measures for domestic products for the purpose of preventing competition with imported ones. while promoting the development of correlated engineering and processing industries, realizing their cost reduction by means of mass production.

2 Demand for diesel engines and their market

Demand for diesel engines and their market in the Republic may be roughly classified into agricultural, fishery and general industrial uses.

2-1 Agricultural use

The staple crops are rice, maize and sugar. The Government, being quite earnest for the realization of intensive and mechanized agriculture, has been increasing every year its budget appropriated for the improvement of efficiency of agriculture by means of promoting its mechanization. The shift of the agricultural policy to mechanization by the combined efforts of the Government and people is resulting in the introduction of agricultural machines. This means that the demand for small-sized diesel engines, whcih are indispensable to the above machines, is expected to increase more and more every year.

2-2 Fishery use

This country, consisting of more than 7,000 islands of various sizes with their vast length of coast line, is blessed with abundant fish resources with possibilities of exploitation. In this connection the improvement of shipbuilding industry together with its technology and replenishment of the source of motive power in fishery are urgently needed in order to realize the planned and organized development of the marine product industry. However, the greater part of the fishing boats now in operation need immediate replacement including their engines, while the ways and means of fishing are so numerous that even such one by means of dynamite, which should be prohibited, is being conducted, resulting in the rapid devastation and drain of marine resources of the shore and adjacent waters.

The proper authorities of the Government are intent on the increased production of fisheries as well as the preservation of marine resources as one of their food policies, for the realization of which at the initial stage they aim at the immediate improvement of the equipments of fishing boats, which will result in an ever-increasing demand for diesel engines.

2-3 General industrial use

In connection with about 900 villages in the vicinity of Manila a project titled - Rural Electrification Program is being discussed, which aims at the improvement of the household use of electric power by means of equipping every village with an independent electric power plant driven by diesel engines.

A large demand for diesel engines as sources of electric power is anticipated in connection with the equipments for long storage of fish to be newly constructed around each fishing base of refrigirators and refrigiration machines of making frozen fish in order to meet the expected increase in supply of fish as the result of the promotion of fishery by the Government as one of its food policies.

In addition to the above diesel engines attached to such machines can be enumerated as lumber collectors and portable sawing machines in view of the development of the abundant forest resources of the country; diesel engines of machinery for construction work will be demanded, too.

The future task of the industry in general consists in the development of resources still lying unexploited by means of improving the existing equipments and especially speeding their operation. In this connection motorization of industrial machinery principally by means of diesel engines is the proper course in future of the industry of the Republic which will determine the market for the engines.

3 Present situation of correlated industries

The greatest majority of the general engineering industry of the Republic centers around Manida; which means, an inspection of the plants in the Capital and its environs can give an idea of the industry in general. From this viewpoint we have inspected the following plants:- NASSCO (National Shipyards & Steel Corporation) and NDC (National Development Corporation) which are state-owned: such private plants as Honolulu Iron Works, Atlantic Gulf & Gulf Inc., etc.

The supply of electric power, conditions of service and industrial water and transport facilities of the industrial zone in and around Manila are considered satisfactory at this stage of the industrial scale. However, it is advisable to push forward now the study of the location plan of plants in anticipation of the future development of the manufacturing industry in this zone.

4 Establishment of assembly plants of small-sized diesel engines

In view of the demand for diesel engines and their maket their domestic production is being considered now. After deliberate study of the matter we propose a plan, according to which it is recommended, instead of complete and vertical manufacture, to begin with the knock-down system which is most commonly performed (domestic assembly of imported parts) and then, after technical study and training, gradually shift to the home production system.

4-1 Composition of capital: Joint stock company shared by the Government and private persons.

4-2 Plant site and building: Area proposed is approximately 6,000 m^2 making use of part of 100,000 m^2 land belonging to NDC (National Development Corporation) and lying idle; size of building is approximately 1,885 m^2 making, as much as possible, use of part of the existing shed of the warehouse of manure.

4-3 Assembly and production plan: Term of plan, extending over five years and consisting of five annual divisions, is divided into two periods. The first period which corresponds to the first, second and third annual divisions is appropriated for the preparatory equipment and training of personnel for domestic production. During the second period the arrangement of equipments and personnel are materialized for home production of engine parts.

4-4 Domestic production plan of parts: Upon completion of the five year plan 50% of the parts of land diesel engines and 30% of those of marine ones will be manufactured at home; nearly all of such parts will consist of castings whose machining will have been made possible by that time. Efforts will have to be made to enable as much as possible the procurment at home of the material of casting.

4-5 Scale of assembly and production: The number of engines, both land and marine, will be monthly 400, their total horsepower amounting to 3,865 HP.

4-6 Electric power and industrial water: In view of the location of the plant which is within the site of NDC the supply of electric is supposed sufficient; therefore, an equipment receiving electric power with a capacity of 100 KVA will be in-

stalled at the first period and another of the same capacity will be added to at the second period. As for the water supply equipment, the existing one will do and, if need be, sinking of wells is conceivable.

1-7 Machinery equipments and consumable tools: jigs and tools; special machinery and instruments for construction, assembly, delivery of products, etc.; machinery and instruments for test run and testing including dynamometers and measuring apparatus; transport equipments including cranes, etc. These items will amount to approximately $97,220. The cost of similar items of the second period, consisting principally of the supplement of universal machine tools and other inadequate machinery and instruments which will be needed at this period will amount to approximately to $388,890, which, added to the above some, will make about $500; this means the total cost of the equipments to be installed during the two periods.

1-8 Net working hours and personnel: the personnel of the first period based on the eight-hour (net working hours) day and 25 working days per month system will be as follows:

construction and assembly	8 (person)
paintaing and delivery	6 (")
test run	6 (")
testing	1 (")
warehouse of parts	1 (")
transport and others	1 (")
total	23 (")

At the second period the personnel will be increased as follows:-

machining	25 (person)
constructionand assembly	12 (")
painting and delivery	12 (")
test run	8 (")
testing	2 (")
warehouse of parts	2 (")
transport and others	2 (")

receiver-board of electricity	1 (person)
total	60 (")

1-9 Experts to be dispatched

At least 4 experts will have to be dispatched for giving technical guidance; the length of their term of dispatch will depend on the skill of the experts belonging to the plants. The time of dispatch will be not only at the initial stage of the first period but also at that of the second period, because it is considered necessary to do so,.

1-10 Payability as an enterprise

Judging from the current market price of diesel engines and other conditions in the Republic the payability of this enterprise throughout the first and second periods will be as follows: as the market sale price per horsepower is supposed to be about $ 97 and the total horsepower of the yearly products being 46,380 the yearly gross proceeds will amount to $4,500,000. Turning to the estimate of the expenditure, the so-called knock-down import price of parts from Japan is supposed to be $ 70 per horsepower, including the import duties; therefore, $ 70×46,380 (HP) ≒ $ 3,250,000 will be yearly cost of material; labour cost of the first period is $ 110 × 23 (person) × 12 (month) ≒ $ 30,000. Running expesnses of the plant is 200% of the labour cost or $ 61,000; sales expenses are 15% of the gross proceeds or about $ 70,000. Even of all these items are summed up, total expenditure is less than $3,300,000; that is, a rough profit of nearly $ 1,100,000 can be expected.

In the case of the second period the increased labour cost due to the increased personnel together with the other increased expenses are expected to be offset by the import price of the parts which will be unnecessary due to the replacement by home-made ones, 40 - 50 % of the necessary parts being manufactured at home. This means that the rough profit of this period will be nearly the same as that of the preceeding period.

However, this rough profit does not include the price for the equipments in-

cluding the interest on it, interest on the loan of money, depreciation of the land, building and equipments, while it includes such elements beyond our presumption as the exact net profit, payment to the executives, dividend to the stockholders.

Nevertheless, we believe that this enterprise will be fairly paying.

Table 1: Production scale plan

Use	Type	PS per unit	Scale of production						Percentage of domestic production				
			per year			per month							
			Number of product	Number of cylinder	P.S.	Number of product	Number of cylinder	P.S.	1st	2nd	3rd	4th	5th division
land	small	2.5-8.5	3,600	3,600	30,600	300	300	2,550	10	20	30	40	50
	"	8.5	600	600	5,100	50	50	425	0	0	10	20	30
marine	"	15	360	720	5,400	30	60	450	0	0	10	20	30
	"	22	240	720	5,280	20	60	440	0	0	10	20	30
		total	4,800	5,640	46,380	400	470	3,865					

Data donated by the Philippines authorities concerned

	Data	Author or Editor
1.	A Geological Investigation of Toboso, Occidental Negros For Cement Raw Materials and Location of Plant Site (1963)	Amable J. Cruz Jose P. Taboada
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13. Annual Report of the Commissioner of Fisheries for the Fisical Year 1962 - 1963

14. Chart No. 4200, No. 4226: Philippine Coast & Geodetic Survey

15. Chart No. (Nippon to East Indian Archipelago)

16. Illustrated diagrams of the distribution of the fresh-water fish in the Philippines

17. Illustrated diagrams of the varieties of the sea-water fish in the Philippines.