JAPAN INTERNATIONAL COOPERATION AGENCY
MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES DEVELOPMENT
THE REPUBLIC OF KIRIBATI

BASIC DESIGN STUDY REPORT ON THE SMALL-SCALE FISHERIES PROMOTION PROJECT IN THE REPUBLIC OF KIRIBATI

March 1993

D & A Engineering Co., Ltd., Tokyo

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PREFACE

In response to a request from the Government of the Republic of Kiribati, the Government of Japan decided to conduct a basic design study on the Small scale Fisheries Promotion Project, and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Republic of Kiribati a study team headed by Mr. Noboru Tazoe, Chief Fisheries Officer, Office of the Overseas Fisheries Cooperation, Fisheries Agency, and constituted by members of D & A Engineering Co.,Ltd., from December 14 to December 23, 1992.

The team held discussions with the officials concerned of the Government of the Republic of Kiribati, and conducted a field study at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

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

March 1993

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency

Mr. Kensuke Yanagiya

President

Japan International Cooperation Agency

Tokyo Japan

March 1993

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Small Scale Fisheries Promotion Project in the Republic of Kiribati.

This study has been made by D & A Engineering Co.,Ltd., based on a contract with JICA, from November 5, 1992 to March 26, 1993.
Throughout the study, we have taken into full consideration of the present situation in the Republic of Kiribati, and have planned the most appropriate project in the scheme of Japan's grant aid.

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs, the Ministry of Agriculture, Forestry and Fisheries, the Fisheries Agency. We also wish to express our deep gratitude to the officials concerned of the Ministry of Environment and Natural Resources Development, the Ministry of Home Affairs and Rural Development, JICA Fiji Office and the Embassy of Japan in Fiji for their close cooperation and assistance during our study.

At last, we hope that this report will be effectively used for the promotion of the project.

Very truly yours,

M. Kondoh

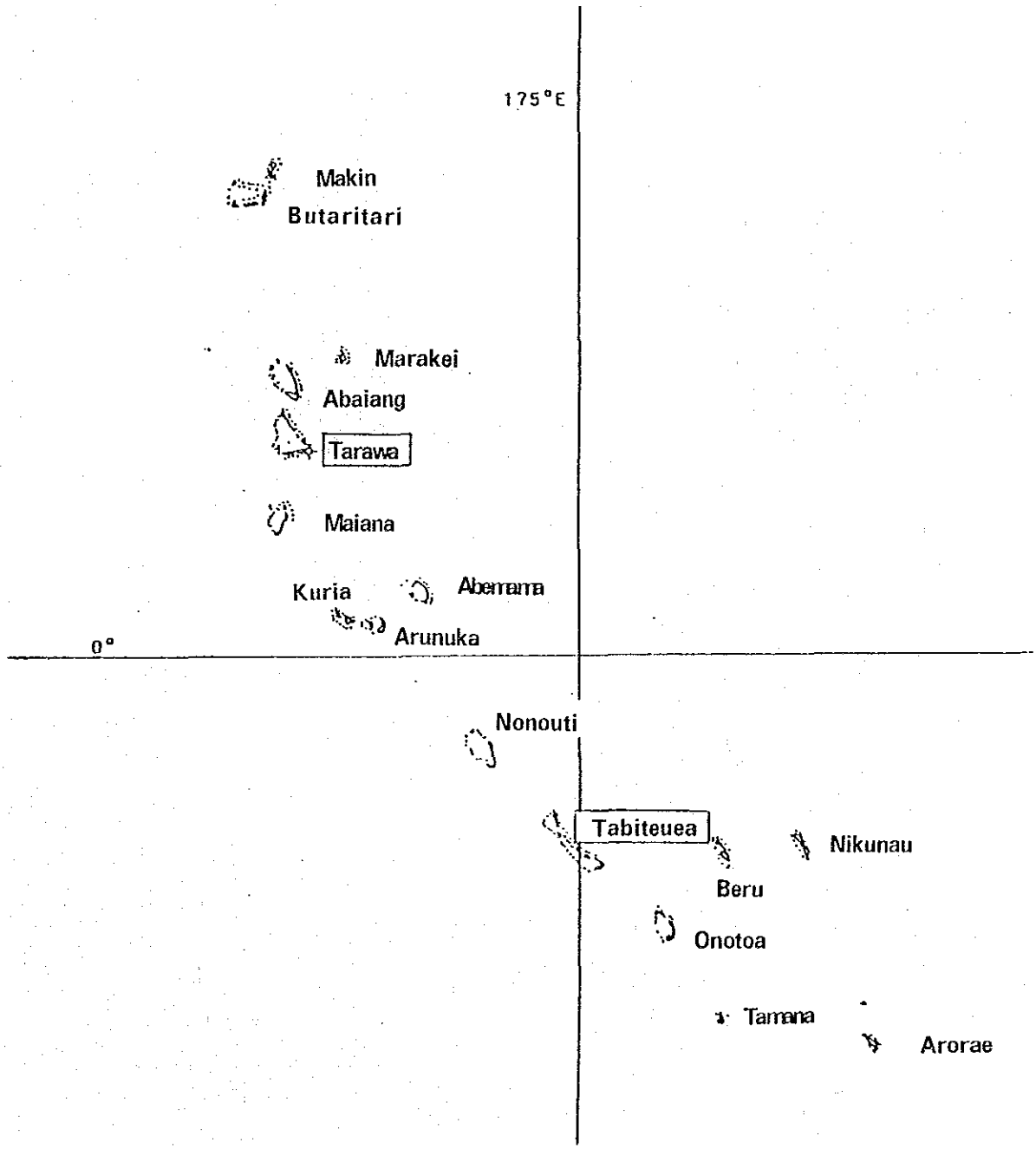
Project Manager, Mamoru Kondo

Basic design study team on
the Small Scale Fisheries
Promotion project

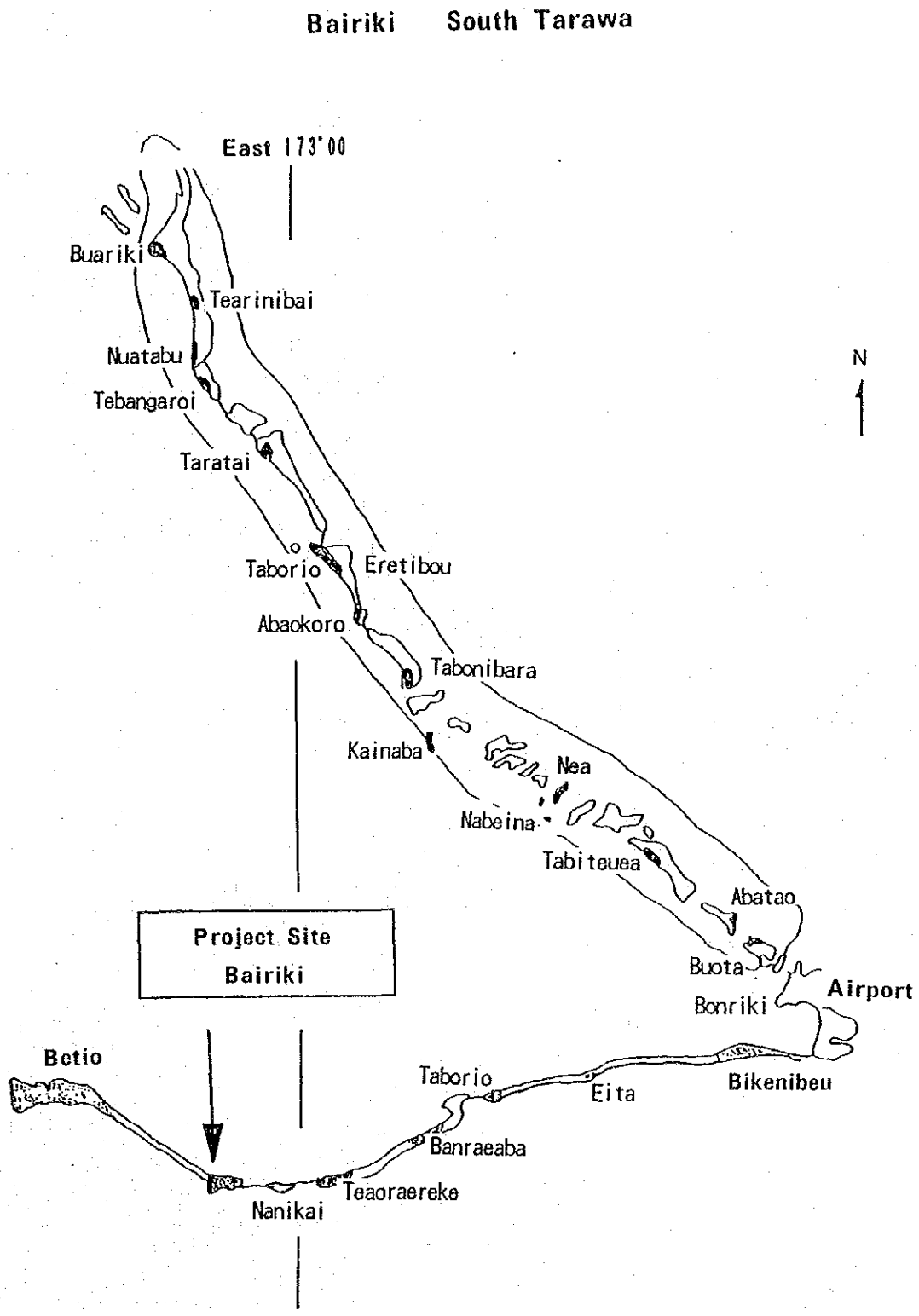
D & A Engineering Co.,Ltd.

THE REPUBLIC OF KIRIBATI

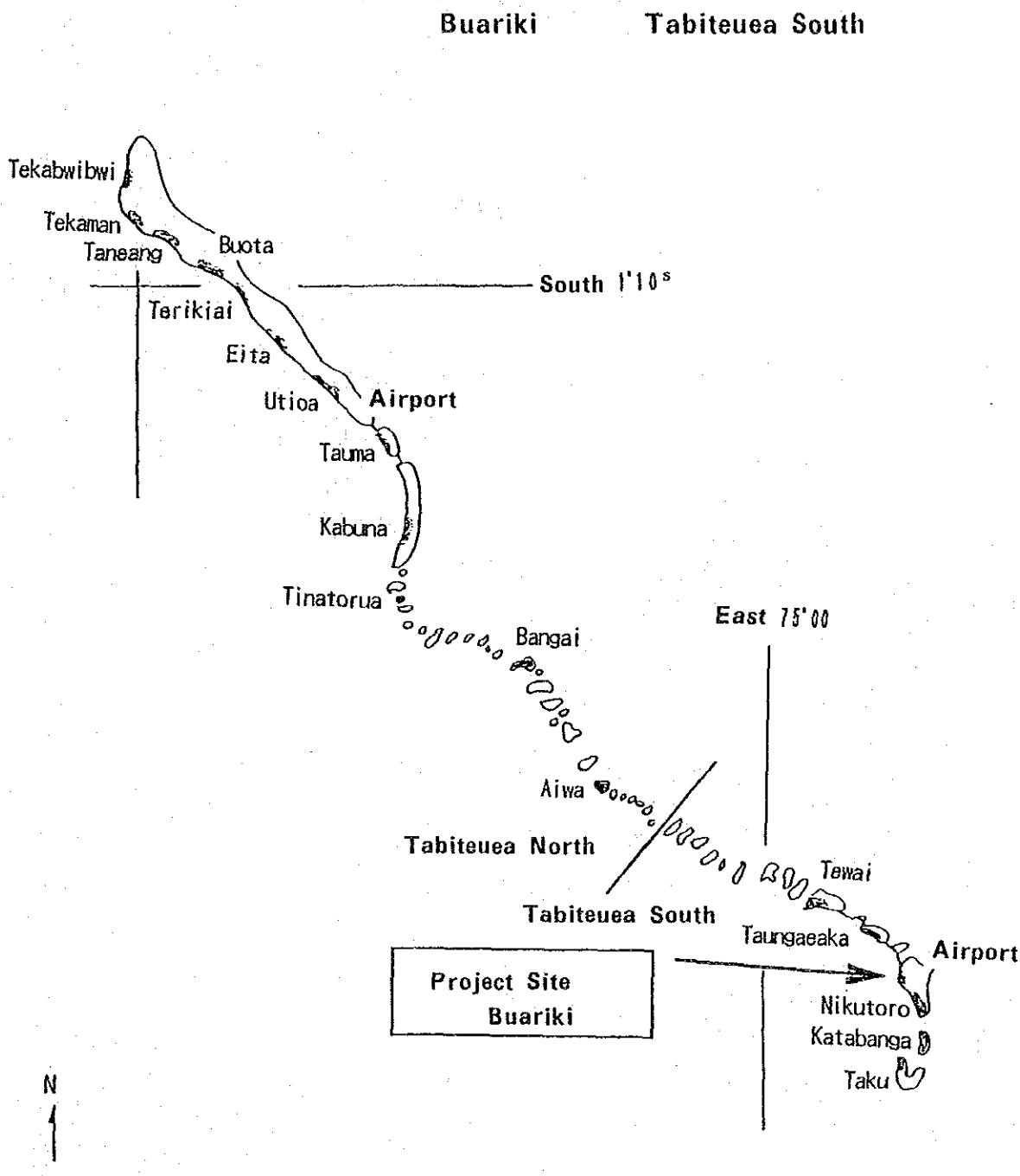
THE GILBERT ISLANDS



Project Site



Project Site



SUMMARY

Summary

The Republic of Kiribati consists of three main groups - the Gilberts, Phoenix, Northern and Southern Line Islands with Ocean Island - in the middle of the Pacific. The total land area is 762 ㎢ and the population is about 72,000.

The sea area around the country is one of the world best tuna fishing grounds due to the convergence of the Equatorial current and its countercurrent. Since there is little resources on lagoon islands, the mainstay of the country's economy is the primary industry including agriculture and fishery. Almost all outer islands are under the subsistence economy, which situation is widening the economic gap between Tarawa, the country's capital into which the drift of population continues, and outer islands. The only potential industry for the development of the country is the fishery, and efforts are being made by the Government of Kiribati to develop offshore fisheries resources, aiming at the obtaining of foreign currency, through a national company of Te Mautari Ltd (TML). On the other hand, the small scale fisheries of outer islands are playing an important role as the source of protein supply to the people as well as a footing of growth from the subsistence economy to the monetary economy.

Under these situations, to support small scale fishermen's fishing activities of South Tarawa and also improve the living conditions and economic independence in the outer island of Tabiteuea South, the Government of Kiribati formulated the Small Scale Fisheries Promotion Project consisting of two sub-projects,the Small Scale Fisheries Support Station Project and the Fishing Village Improvement Project, and requested the Government of Japan to offer a grant aid on the procurement of facility and equipment necessary for the project.

The Government of Japan, responding to the request, decided to conduct a basic design study on the project, and Japan International Cooperation Agency (JICA) sent a basic design study team to Kiribati for a period between December 14 and 23, 1992. The Team had a series of discussions about the project with the Kiribati officials concerned, carried out necessary site surveys including collecting data and materials. Based on the analysis of the results of surveys in Japan, the team prepared the present Basic Design Study Report.

The original request by the Kiribati side consisted of a prefabricated shed (housed a fish sorting place, a warehouse, an office, a toilet), an ice making

equipment, a chilled store, oil tanks, a back-up generator, fishing gear, outboard engines, cooler boxes, outboard engine spare parts, the workshop equipment, and a vehicle for the Bairiki Wharf on South Tarawa, and FAO type cones, outboard engines, fishing gear, a warehouse, a vehicle, and the safety equipment for Buariki village on Tabiteuea South. The small scale fishery of South Tarawa is an important animal protein source as well as an income source, while in Tabiteuea South almost all the islanders are engaging in the subsistence fishery which is the basis of their living. In this context, the content and scale of the request were judged to be appropriate on the whole. As for a chilled store, the necessity of chilling preservation of surplus fish caught by local small scale fishermen was judged reasonable, from the viewpoint of market control during the peak fishing season. According to the field survey, however, the distribution of fish products was based wholly on fresh fish and there was scarcely surplus necessary for chilling preservation. Based on the result, it was concluded that an insulated room plus ice cooler boxes are proper for the present situation instead of a chilled store after the discussions with the Kiribati side. The specifications however will take an increasing necessity of chilling preservation in the future into consideration.

The facility and equipment covered by the project are as follows;

• South Tarawa project

1.	Prefabricated building	1 unit
2.	Ice making plant	1 unit
3.	Insulated room (without a refrigeration system)	1 unit
4.	Fuel oil tanks	2 units
5.	Generator	1 unit
6.	Fishing gear	1 suite
7.	Outboard engines	40 units
8.	Cooler boxes	100 boxes
9.	Outboard engine spare parts	1 suite
10.	Workshop equipment and tools	1 suite
11.	Vehicle	1 unit

• Tabiteuea South Project

1.	FAO type canoes	6 units
2.	Outboard engines	12 units

3.	Fishing gear	1 suite
4.	Warehouse	1 unit
5.	Vehicle	1 unit
6.	Safety equipment	6 sets

The Ministries responsible for promoting and coordinating the project is the Ministry of Environment and Natural Resources Development (MENRD) and the Ministry of Home Affairs & Rural Development, and the agency responsible for operating the facility and equipment when they are supplied is each Council of the project site in consultation with the Fisheries Division of MENRD.

It is estimated that the work of the project will take 10 months to complete; the detail design requires 2.5 months, the preparation, manufacturing, and procurement in Japan 6 months, and the transportation 1.5 months.

The implementation of the project will accelerate the growth of the small scale fishery of South Tarawa to a semi-commercial fishery, with an increase of the supply of fish products in Tarawa, and also improve the living conditions and increase the possibility of export of fish products outside the island through the activation of fishing activities in Tabiteuea South. These expected situations will contribute greatly to the development of the small scale fisheries of Kiribati. The requested chilled store was changed to an insulated room without a refrigeration unit, but its specifications envisage the installation of a refrigeration system in the future. When landings at South Tarawa for the high fishing season, shipment to South Tarawa from outer islands, and the working ratio of the existing cold storage facilities call for a refrigerating system, the installation of it will enhance the utilization and effect of the facility and equipment provided under the project.

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CHAPTER 1

INTRODUCTION

Chapter 1 Introduction

The fisheries sector in Kiribati can be divided into two subsectors; the small scale fishery and the commercial fishery. The annual catch is about 31,000 tons, of which about 80% were harvested by the small scale fishery. The 1991 fish export was 146 tons, and fish products exports, including fish, seaweed, and shark fin, were valued at A$840,000, accounting for about 9.1% of the total exports, decreased drastically from 20.8% in 1989. Nonetheless the fishery is the only potential industry for the development, and among the objectives of the Seventh National Development Plan 1992/93 to 1996/97 are the increase of incomes and employment opportunity, and the improvement of nutritional and living conditions by means of effective utilization of the fisheries resources. On the other hand the objectives of the outer island development are to improve living conditions, strengthen the economic independence, and abolish a widening gap between the urban and rural economies and standards of living.

The Government of Kiribati formulated the Small Scale Fisheries Promotion Project to support small scale fishermen's fishing activities of South Tarawa and also improve living conditions and economic independence in the outer island of Tabiteuea South, and requested the Government of Japan to offer a grant aid on the procurement of facility and equipment necessary for the project.

On the request the Government of Japan decided to conduct a basic design study on the project and Japan International Cooperation Agency (JICA) sent a basic study team headed by Mr. Noboru Tazoe, Chief Fisheries Officer, Office of the Overseas Fisheries Cooperation, Fisheries Agency, to Kiribati for a period between December 14 and 23, 1992. The team discussed the details of the request with the Kiribati officials concerned, examined the urgency and appropriateness of the project, previous foreign assistance, implementation arrangements of the project and so forth, collected materials available, and carried out a field survey including fisheries conditions and related conditions.

Major points of the mutual agreement resulted from discussions with the Kiribati side were confirmed on the "Minutes of Discussions, Basic Design Study on the Small Scale Fisheries Promotion Project in the Republic of Kiribati"

signed mutually. And then, based on the analysis and review of the results of the field survey, the team assessed the effect of the project in developing the Kiribati fisheries, conducted a basic design on the facility and equipment for the project located in Bairiki, South Tarawa, and the project located in Buariki, Tabiteuea South, and established the most suitable scale and contents of the facility and equipment above.

The present report covers the basic design, implementation schedule, recommendations and so forth that are judged the most suitable for the implementation of the project.

The Members List of the Study Team, Study Itinerary, List of Persons concerned, and the Minutes of Discussions are shown in Appendix.

CHAPTER 2

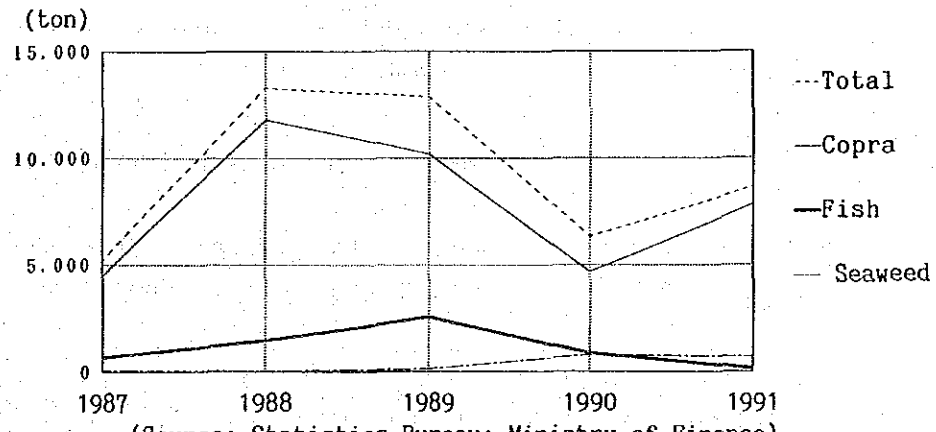
OUTLINE OF THE REQUEST

Chapter 2 Outline of the Request

2-1 Background of the Request

(1) Outline of the Republic of Kiribati

The Republic of Kiribati consists of three main groups in the middle of the Pacific; the Gilberts, Phoenix, Northern and Southern Line Islands with Ocean Island. It has a total land area of about 762 ㎢ and the population of about 72,000. The sea area surrounding the county is one of the world best tuna fishing grounds due to the convergence of the Equatorial current and its countercurrent. Having no substantial resources on lagoon islands and also having depleted phosphate resources, copra and fishery products, as shown in Figure-1 below, are the mainstays of exports among a few economic activities of the country. Almost all outer islands are under the subsistence economy and self-reliance, and a gap between the urban and rural economies and standards of living is more and more widening. Under these situations the Kiribati Government places emphasis on the redress of the economic differentials between the urban and rural areas, encouraging investment to outer islands. Among the objectives of the Seventh National Development Plan 1992/93 to 1996/97 are the development of outer islands and more effective use of marine resources. The fishery is the only potential industry, and the Government established a national fishing company, Te Mautari Ltd (TML), aiming at the development of the offshore fisheries resources and thus the obtaining of foreign currency by means of tuna exports. On the other hand, the small scale fisheries of outer islands are playing an important role as the valuable source of protein supply as well as a footing to growth from the subsistence economy to the cash economy.



(Source: Statistics Bureau; Ministry of Finance)

Figure-1 Major exports of Kiribati (1987-91)

(2) Outline of Fisheries

The fisheries sector in Kiribati can be divided into two subsectors of the commercial fishery and the small scale fishery, which is further divided into two categories consisting of the subsistence fishery and the semi-commercial fishery. The average annual production is about 31,000 tons, of which about 80% are harvested by the small scale fishery. Since 1980s the Government has taken a positive policy for the development of available marine resources. The introduction of the commercial fishery by a national fishing company of TML and Marine Exports Division (MED) contributed to the modernization of the country's fisheries and the establishment of the fish products export industry, but recently their business is stagnant due mainly to managerial problems. As a matter of fact, the 1991 export of fish was 146 tons which was less than 6% of 2,567 tons in 1989; also the export of fishery products including fish, seaweed, and shark fin in the same year was A$840,000, one third of A$2,684,000 in 1980; the proportion of the export of fishery products to the total export has drastically dropped to about 9.1% in 1991 from about 20.8% in 1989. But the situation that about 80% of the total fish production are harvested by the small scale fishery including the subsistence industry still remains; the fishery is the only potential industry. Table-1 shows an evolution of the export of fishery products.

Table-1 Export of Fishery Products (1987-91)

Unit: A$

	1987	1988	1989	1990	1991
Shark fin	1,000	1,200	2,000	1,100	1,000
Fish	658,000	1,456,000	2,567,000	867,000	146,000
Seaweed	65,000	32,000	115,000	798,000	693,000
Total	724,000	1,489,200	2,684,000	1,666,100	840,000

(Source: The Seventh National Development Plan 1992/93-1996/97)

The small scale fishery however is still employing the traditional fishing boats and fishing gear within the restricted fishing area, far from an efficient

operation. Also since the trend that the fishing boats are prone to concentrate within the lagoon when fishing is unfavorable for the management of the marine resources, the introduction of modern fishing vessels and fishing gear capable of operating offshore fishing grounds comparatively abound in marine resources is expected. As such the small scale fishery has a lot of problems despite its importance; there are no facilities necessary for landing and preparation for fishing in urban areas; the availability of the equipment and materials necessary for fishing activities is restricted due to a limited transport between outer islands. It is of urgent necessity to take measures to solve these problems for the development of the small scale fishery.

(3) National Development Plan

The objectives of the fishery sector in the Seventh National Development Plan 1992/93 to 1996/97 are as follows;

① Increase incomes by means of effective utilization of marine resources,
② Increase employment opportunity, and
③ Promote nutritional and living conditions by means of improved marine resources quality control.

Rural development objectives are:

① Improved living conditions in the outer islands,
② Emphasis on self-reliance and economic independence, and
③ Equitable distribution of services and facilities between the urban and rural areas.

The requested project is in line with the development objectives above. The project to be implemented at Bairiki on South Tarawa aims at the construction of a small scale fisheries support station, and the project to be implemented at Buariki village on Tabiteuea South aims at the procurement of the equipment and materials necessary for the improvement of living conditions and economic independence.

2-2 Objective and Contents of the Request

(1) Outline of the Request

The Government of Kiribati aims at an increase of incomes by means of

effective utilization of marine resources, an increase of employment opportunity, and the Promotion of nutritional and living conditions by means of improved marine resources quality control in the development of the fishery sector, and the improvement of living conditions in the outer islands, the promotion of self-reliance and economic independence, and an equitable distribution of services and facilities between the urban and rural areas in the development of outer islands.

At present in Tarawa with a higher density of population undersupply of fish products exists, while in Tabiteuea South Island under a typical self-reliance economy, like other outer islands, the people are living in short supply of food and other daily necessities; the fishing activities are essential to secure foodstuffs and it is not too much to say that almost all the islanders are fishermen.

The Kiribati Government, recognizing the fisheries development as one of the most important policies, established a national fishing company, TML, and Marine Exports Division (MED) to foster the commercial fishery in the country. At present, however, both companies are facing with a managerial difficulty. On the other hand, the small scale fishery is gathering weight for the development of the country's fisheries, and it is becoming necessary to strengthen the support to the small scale fishermen.

In order to overcome these situations, the Kiribati Government formulated the small scale fisheries promotion project consisting of two sub-projects, the small scale fisheries support station project located at Bairiki on South Tarawa, and the fishing village improvement project located at Buariki village on Tabiteuea South, and requested the Government of Japan to offer a grant aid on the implementation of the project.

The facility and equipment requested by the Government of Kiribati are as follows;

• South Tarawa project

① Prefabricated building	1 unit
② Ice making plant	1 unit
③ Chilled store	1 unit
④ Fuel oil tanks	2 units
⑤ Generator	1 unit
⑥ Fishing gear	1 suite

⑦ Outboard engines	40 units
⑧ Cooler boxes	100 boxes
⑨ Outboard engine spare parts	1 suite
⑩ Workshop equipment and tools	1 suite
⑪ Vehicle	1 unit

・Tabiteuea South project

① FAO type canoes	6 units
② Outboard engines	12 units
③ Fishing gear	1 suite
④ Warehouse	1 unit
⑤ Vehicle	1 unit
⑥ Safety equipment	6 sets

(2) Expected Benefits

The expected benefits from a supply of the requested facility and equipment are as follows;

・South Tarawa project

① Improvement of operation efficiency and increase of catch by means of shortening preparation time for fishing.

② Increase of catch by means of motorization through a supply of outboard engines.

③ Improvement of quality control and stable supply by means of a supply of an ice making plant, ice cooler boxes, and an insulated room.

④ Increase of incomes through items ①, ②, and ③ above.

⑤ Sufficiency of fish products at South Tarawa.

・Tabiteuea South project

① Increase of catch by means of an introduction of canoes and fishing gear.

② Stable supply of fish products, increase of consumption, and improvement of nutrition.

③ Possibility of the export of surplus to outside the island.

Trough these effects the Kiribati small scale fishery development and the rural development will go a step towards each national objective.

(3) Implementation arrangements

The authorities responsible for the project are the Ministry of Environment and Natural Resources Development and the Ministry of Home Affairs and Rural Development, and the agency in charge of operating the facility and equipment when these are supplied for the small scale fisheries support station project is Teinainano Urban Council (TUC), and Tabiteuea South Island Council (TSIC) for the fishing village improvement project at Buariki village. Also fisheries extension officers stationed at each project site are to give a lead and advice to fishermen in more effective utilization of the facility and equipment provided under the project.

CHAPTER 3

OUTLINE OF THE PROJECT

Chapter 3 Outline of the Project

3-1 Basic Policy of the Project

The basic design study team had a series of discussions about the background, content, scale, and implementation arrangements of the request with the Kiribati Government officials concerned, carried out necessary field surveys, and studied and examined the necessity and appropriateness as a Japan's grant aid project. As the result the team concluded to deal with the project in line with the following basic policy.

(1) The fishery is a mainstay of the economy of Kiribati and its development in accordance with the National Development Plan is essential to develop Kiribati.

(2) From the viewpoint of the country's speciality (many dispersing small lagoon islands and virtually subsistence economic activities except for South Tarawa), it seems best to develop gradually. A drastic investment and a sudden change of the social structure may be ruined, affecting adversely the social development.

(3) The necessity and importance of the rural development policy are understandable. But its implementation should be careful, considering the method, scope, and timing.

(4) In Tarawa, also the economic activities are under the subsistence level except the business of TML. But the commercial activities are being spreading slowly but steadily; the fisheries activities are becoming lively with the full-time fishermen and commercial fishing boats increasing. Since there is presently no facility for the small scale fishery, it is of necessity to prepare a support station.

(5) The construction of the support station will help the small scale fisheries activities, for example the daybreak preparation work for fishing being made under lighting of torch lamps or headlights. By this the improvement of the operation efficiency and an increase of the production can be expected, and the living standard of fishermen will be improved through a better understanding of the importance of the small scale fishery connected closely with the local people.

(6) Based on the above, it is judged that the project is necessary for the development of small scale fishery and has a feasibility.

(7) The basic policy of the project must be a step-by-step approach. After the completion of the first project, then proceed to the next step. It is appropriate as well as important to contribute to the development of the Kiribati fisheries through such a process.

3-2 Agreement Resulted from Discussions

The mutual agreement resulted from discussions about the original request from the Kiribati side is shown in Table-2.

Table-2 Request and Agreement

① South Tarawa project

	Request	Agreement
1	Prefabricated building about 400 ㎡ : 1 unit (with an ice making plant, a chilled store, a fish handling space, an office, a toilet, a store)	Depending on the configuration of each component, the area will be about 200 to 230 ㎡. Installation work should be included. An insulated room without a refrigeration unit is provided instead of a chilled store.
2	Ice making plant: 1 unit 1 ton/day, plate ice Ice storage: about 1 ton	Agreed as requested.
3	Chilled store: 1 unit Capacity; 7 ㎥ 0 ℃～-5℃	An insulated room without a refrigeration is provided instead of a chilled store. The specifications are to be designed in consideration of the possibility of a refrigeration system in the future.

	Request	Agreement
4	Fuel oil tanks: 2 units Capacity; 5 *kℓ* and 2 *kℓ*	Agreed as requested.
5	Generator: 1 unit Capacity; 25KVA, 415V, 50Hz	Agreed as requested.
6	Fishing gear: 1 suite Fishhook, fishline, trolling gear, etc.	Agreed as requested.
7	Outboard engines: 40 units 40PS;30 units, 4PS;10 unit	Agreed as requested.
8	Cooler boxes: 100 boxes 78 ℓ ;80 boxes,45 ℓ ;20 boxes,	Agreed as requested.
9	Outboard engine spare parts for 40PS and 4Ps engines	Agreed as requested.
10	Workshop equipment and tools for repair of outboard engines	Agreed as requested.
11	Vehicle: 1 unit Load capacity; 1 ton	Agreed as requested.

② Tabiteuea South project

	Request	Agreement
1	FAO type canoes: 6 units KIR-8 Model	Finished products are to be supplied.
2	Outboard engines: 12 units 10 PS type	Specification including the output are to be determined in consideration of local skills.
3	Fishing gear 1 suite Trolling gear, gillnet gear, etc.	Agreed as requested.
4	Warehouse: 1 unit prefabricating materials, 50㎡,	A finished product is to be supplied instead of materials.
5	Vehicle: 1 unit Pick-up truck, 4WD Load capacity; 1 ton	Agreed as requested.
6	Safety equipment: 6 sets for FAO canoes	Agreed as requested.

3-3 Project Target Area and Project Site

(1) Project target area

The project target areas are South Tarawa and Tabiteuea South. The overview of each area is as follows;

① South Tarawa

Location Capital of Kiribati, North Gilbert Islands

Population 25,154 in 1990

Land area	15.8㎢
	The project site of Bairiki is the seat of governmental offices.

① Tabiteuea South

Location	South Gilbert Islands
Population	1,325 in 1990
Land area	11.9㎢
Distance from the Capital	294 km
	The project site of Buariki village has the head office of the Island Council which governs 6 villages.

Bairiki is one of 17 villages on South Tarawa, with a population of 2,226. Each area of of South Tarawa including Betio is connected with the causeway each other, and forms an economic block. The population per square kilometer is 1,596, about 7 times 236, the average one of the Gilbert Islands at large. The number of households is 3,205 in 1987, of which 1,957, 64.7% of the all, are engaging in fishing in form of full-time, part-time, or subsistence. The number of fishing boats is estimated at 1,200 consisting of 300 full-time boats, 200 part-time boats, and 700 subsistence fishing boats. A 70% of the fleet consists of traditional canoes. The annual estimated production is about 3,500 tons.

The 1987 number of households of Tabiteuea South is 271, of which 256 are fishermen's. The fishing fleet consists of about 180 boats, almost all traditional canoes, is catching about 310 tons annually.

A daily per capita consumption of fish of the Gilbert Islands is as much as some 1.05kg, while 0.43kg at South Tarawa and 0.62 kg at Tabiteuea South. In order to raise these figures up to the one of the Gilbert Islands, such a support to the small scale fisheries as constructing a support station or providing fishing boats and fishing gear serviceable for offshore fishing is essential.

(2) Project site

Each project site is located at Bairiki on South Tarawa and at Buariki village on Tabiteuea South. The outview of each site is as follows;

① Bairiki site on South Tarawa

The Bairiki site is located only 50 m away from the trunk road of South Tarawa, a favorable location for marketing fish. Being once a landing place of a Betio-Bairili ferryboat, there is a breakwater here. The site is now used as a building materials yard by the Housing Corporation of the Kiriabti Government, who fenced the lot about 3.6 m inside the wharf due to no need to use. Also the former slipway is receiving waste, and a third of the slip is covered with sand. About 50 small scale fishing boats (40 skiffs plus 10 traditional canoes) are using two sides, northern and eastern, of the breakwater. The proposed site is located at the southern side of the breakwater; it will extend the using are of the small scale fishermen. The connection of drainage and the public sewerage system is enforced, and pollution of the lagoon by the implementation of the project will never take place. The utilization of the above-mentioned land for the project site was authorized by the Cabinet at the end of December, 1992.

② Buariki village site on Tabiteuea South

The Tabiteuea South site is situated at Buariki village at which Tabiteuea South Island Council (TSIC) is located, a western lot of the land which TSIC has the right of using. There are six villages scatteringly on the island but these are all connected with causeway, and the site occupies the most convenient place from the viewpoint of the utilization of the facility to be supplied under the project. The use of the lot for the project has already been authorized by TSIC, which submitted a certificate to the Ministry of Environment and Natural Resources Development and the Ministry of Home Affairs & Rural Development.

(3) Outline of Implementaion Arrangements

The authorities responsible for the project are the Ministry of Environment and Natural Resources Development and the Ministry of Home Affairs and Rural Development, and the agencies in charge of operating the facility and equipment are Tainainano Urban Council (TUC) for the South Tarawa project and Tabiteuea South Island Council (TSIC) for the Tabiteuea South project. The outline of each authority and agency is as follows;

• Ministry of Environment and Natural Resources Development

Personnel 213

Budget A$1,908,137 in 1992

Authorities and duties: Responsible for the development of the Kiribati's marine resources, extension services and guidance of the small scale fisheries.

- Ministry of Home Affairs and Rural Development

Personnel 207

Budget A$2,133,220 in 1992

Authorities and duties: Responsible for the land development and housing, and also governs all the Councils.

- Teinainano Urban Council (TUC)

Personnel 59

Budget A$173,463 in 1992

Authorities and duties: Governs the area except for Betio on South Tarawa.

- Tabiteuea South Island Council (TSIC)

Personnel 10

Budget A$43,667 in 1992

Authorities and duties: Controls all the affairs in Tabieuea South Island.

CHAPTER 4

BASIC DESIGN OF THE EQUIPMENT

Chapter 4 Basic Design of the Equipment

4-1 Study and Examination of the Equipment

(1) Design Criteria

The selection and determination of the facility and equipment are to be conducted based on the results of the field survey on the current situation of the fisheries and fisheries related industries, Kiribati's technological level, the purpose and operating conditions of the facility and equipment. At the same time, the particular of each equipment, necessity of accessories and spare parts, handling easiness, technical assistance to TUC and TSIC from the contractor, and after-sale service were taken into consideration to select the most suitable equipment.

All spare parts are to be delivered at the site together with the facility and equipment. Separately delivered parts are to be assembled and test-operated at the site before the delivery by the contractor who will give guidance in operation, maintenance, and inspection of the facility and equipment.

(2) Study and Examination of the Specifications

• South Tarawa project

① Prefabricated building

The purpose of a small scale fisheries support station at Bairiki, South Tarawa, is to support small scale fisheries activities and thus accelerate the growth of them to semi-commercial fisheries. There is a great demand for fish in South Tarawa, having a 34% of the country's total population, but undersupply always exists, resulting in as less consumption as 40% of the country's average. The only fisheries related facility is the TML's facility for the commercial fishing. Not having any support facility for their activities, South Tarawa small scale fishermen are at present carrying out preparation for the next day's fishing in the dawn dark with lighting of torch lamps or headlight.

In order to improve these conditions, support their activities, and accelerate the move to semi-commercial fisheries, it is at least of necessity to prepare a prefabricated building housed a fish handling space, a workshop, a fishing gear storage, an office space and so on. The fish handling space

protects fishermen and fish from the tropical sun during landing and marketing and improve quality of fish. The workshop is necessary for repairing outboard engines, and the fishing gear storage is necessary for keeping fishing equipment and fishing gear. It is obvious that the construction of the support station will alleviate short supply of fish on South Tarawa by means of improving fishing efficiency of small scale fishermen and thus increasing fish production.

As for the structure of the proposed prefabricated building, taking a comparatively vast area of the project site, car access to the main road, the existing wharf available for the project, and traffic lines of men, fish and ice into consideration, it was concluded that a one-story building is most appropriate. Even though the one-story building is applied, there remains a considerable area enough for the future extension based on a waterfront utilization plan of the Kiribati Government.

The area of the fish handling space was established as follows; The number of fishing vessels to be expected to use the proposed station is estimated at 50, the present 40 vessels plus 10 vessels to be equipped with outboard engines, one-fourth of 40 units supplied under the project. Assuming that these 50 vessels land their catch from 10 a.m. to 1 p.m., 17 vessels land during an hour with each vessel taking 30 minutes. Hence, when 2 to 3 fishermen per vessel work at landing and handling fish, the number of fishermen to use the fish handling space at the same time is 23. Since one person requires 6 ㎡ working space, the total area of the fishing handling space is some 138㎡. On the basis of the fish handling space, the office (with a fishing gear selling counter), the fishing gear storage, the workshop, the ice making plant, the insulated room, and so on are to be designed.

② Ice making plant

An ice making plant of 1 ton/day of plate ice, with an ice storage of about 7㎥ was requested. The requested kind of ice of plate ice is considered to be appropriated due to the easiness of transport and handling. Above all the plant for making plate ice is comparatively easy to operate and maintain. The daily demand of ice at South Tarawa is estimated at about 1,400 kg, that is, 1,000kg (20kg of ice a day a vessel×50 vessels) plus 400kg for the consumption other than fishing vessels. Since about 30% of the necessary

supply however is expected to be provided at the TML's ice plant and Te Maiuku Fish Firm(TFF), the ice production capacity was established to be 1 ton per day. Ten canoes from North Tarawa are to receive a service of the ice plant that is planned to move to North Tarawa from TFF, and they were not included in the demand of ice at the support station. The ice storage capable of storing 2 tons of ice, two days production of ice, is to be prepared, nearly matching to the requested space of 7㎥; its configuration is decided with due regard to the location of the water catchment tank and the access to the fish handling space.

③ Insulated room

The fish landings and consumption in Bairiki and Bonriki are estimated at about 7,452kg and 6,880 kg a day. About 70% of the difference of 572 kg, that is, some 400 kg are to be preserved in an insulated room, requiring about 7㎥ of space for twenty 78 ℓ type cooler boxes at an efficient storage rate of 35%. The necessity of chilled store for marketing control at the peak fishing season is understandable, but fish are now being distributed only at the fresh state in South Tarawa and undersupply frequently exists, and also considering the cost benefit ratio of the proposed support station, an insulated room using ice cooler boxes is to be provided instead of a chilled store initially requested by the Kiribati side. The specifications of the room however will take an increasing necessity of chilling preservation in the future into consideration.

④ Fuel oil tanks

Almost all the small scale fishermen, making a one day fishing trip, purchase their fuel oil at private oil suppliers near their dwelling quarters from noon to the evening the day before. Their preparation for the next day's fishing however is very inefficient in that they are carrying their fuel oil, outboard engines, and fishing gear by cart. The construction of two fuel oil tanks with terminals, one for gasoline and the other for diesel oil, solve the problem. Fifty fishing vessels need 50 ×80 ℓ (daily consumption of gasoline per vessel), and, assuming that one-third of the requirements are supplied by private suppliers, the daily requirements of gasoline are estimated at 2.6 kℓ. Hence a tank for two days requirements, that is 5kℓ

tank, is to be provided. Assuming that the diesel engine of the emergency generator consumes 200 g of diesel oil per PS per hour and works continuously for 24 hours at emergency, the requirements of diesel oil are 1,882 ℓ. A 2 ℓ capacity tank is to be provided as requested. From the viewpoint of effective use of the site and the safety, these two tanks are to be built in monolithic construction.

⑤ Generator

Since the electricity of South Tarawa is being improved, one generator is to be provided for backing up the ice making plant.

⑥ Fishing gear

Selling of fishing gear is one of important services to fishermen. The sales of fishing gear are to be reserved as a counterparts fund for the development of the small scale fisheries. From the standpoint of conservation of reef resources, gillnet gear are excluded from the list. Fishhooks and lines and trolling gear with the specifications similar to the current using gear are to be supplied.

⑦ Outboard engines

The growth to a semi-commercial fishery need the motorization of skiff type fishing boats. Also the motorization of traditional canoes should be considered for the development of the subsistence fishery. For the former 40 PS outboard engines and 4 PS ones for the later are to be provided. There are now about 170 skiffs in South Tarawa, of which about 90 are engaging in the full-time and part-time fisheries. One-third of these skiffs, that is 30, are to be supplied 40ps type outboard engines. Ten 4ps outboard engines are to be supplied to about 3% of 300 traditional fishing canoes engaging in the full-time and part-time fisheries, through South Tarawa has about 850 traditional canoes. The sales of these, like fishing gear, are reserved as a counterparts fund.

⑧ Cooler boxes

Cooler boxes, being used in marketing of fish with ice, are necessaries for the small scale fishery activities. These are now widespread among fishermen

but the supply seems to meet only a half of demand. Considering both the semi-commercial and subsistence fisheries, 78 ℓ type boxes for the former and 45 ℓ type boxes for the latter are to be provided. The number of cooler boxes to be supplied is 100, that is, about 20% of the 500 full-time and part-time fishing households, of which 20 boxes for traditional fishermen are small ones of 45 ℓ capacity.

⑨ Outboard engine spare parts

Outboard engines are endurable for three years on an average in South Tarawa, and a stock of spare parts will prolong the life in service. According to the interview survey, the most troubled parts included crankshaft bearings, lower unit gears, various bearings, water cooling impellers, and so on. A list of spare parts to be supplied will be prepared with reference to the results of the interview survey.

⑩ Workshop equipment and tools

The equipment and tools for mainly repair and maintenance of outboard engines are to be provided.

⑪ Vehicle

A majority of small scale fishermen of South Tarawa have no vehicle. A vehicle is to be supplied so that these fishermen can receive transport services of ice and fish. Being flat in South Tarawa, the road need not 4WD vehicle. Assuming that one round serves for four fishing boats, the load capacity of the vehicle requires 1 ton due to outboard engines, fuel oil, cooler boxes, and fishing gear for four boats plus twelve fishermen with provisions.

• Tabiteuea South project

① FAO type canoes

The type of requested canoe is KIR-8, which is one of the canoes that FAO designed to suit to the condition of each country in the South Pacific. This KIR-8 type canoe has a sailing system as a major driving system, with a supplement of an outboard engine according to the windy condition of Kiribati outer islands. A little tide and wind often prevented traditional canoes from

fishing, which take a rather long time in going to and from fishing grounds, resulting in a poor working efficiency. On the other hand, the introduction of a fishing boat driven by only an outboard engine into service is never viable financially in outer inland fisheries due to fuel expenses. The introduction of a KIR-8 type canoe solves the problem. It is 7.1 m long, 1.5 to 2 times long a traditional canoe, and has better seaworthiness capable of trolling outside the lagoon. Since there are six fishing communities in Tabiteuea South, six boats are to be provided in view of equity. Kiribati has an experience in building this type of canoe with 2 or 3 weeks of building term a canoes. For six canoes, about 3 to 4 months are enough for building.

② Outboard engines

Outboard engines are installed on board KIR-8 canoes as auxiliary driving methods. Considering the difficulty of repair on the outer island of Tabiteuea South, 12 units including one complete set are to be provided. Any engine required a repair must be sent to South Tarawa. These engines are different in type from those to be supplied under the South Tarawa project, according to the interview surveys, 15 PS type engines instead of requested 10 PS type ones are to be provided.

③ Fishing gear

A lack of fishing gear, like other outer islands, is a big problem in Tabiteuea South. A stable fishing operation requires a constant supply of fishing gear. In Kiribati only the Fisheries Division is dealing in fishing gear, and in outer islands fisheries extension officers order necessary fishing gear from it. However, it takes always long time because an inter-island vessel visits only once or twice a month. The supply of fishing gear will solve the problem. Also, of the sales of fishing gear the remainder minus the selling commission is to be reserved as a counterparts fund for the future utilization. A list of fishing gear to be supplied is to be prepared on the basis of the results of the field survey.

④ Warehouse

All the buildings in Tabiteuea South are constructed in local style. Other

outer islands, for example Tabiteuea North, have local made wooden buildings, but there is none in Tabiteuea South. The warehouse will require the space for a office and selling fishing gear of about 11㎡, the space for storing fishing gear of about 30㎡, and the space for assembling fishing gear of about 9㎡, totalling about 50㎡.

⑤ Vehicle

Six fishing communities in the island are connected with causeways each other, these causeways became obsolete and are in bad conditions. Also the vehicle supplied under the project is expected to be used to pull fishing boats and inter-island vessels inside the lagoon at low tide. The requested 4WD vehicle is appropriate.

⑥ Safety equipment

The safety equipment for the KIR-8 type canoe include the mooring equipment (anchor, rope, etc.), a magnetic compass, signals, and so on. A hand mirror, a useful instrument in an accident while fishing at sea, is to be provided. Six sets of the safety equipment are to be supplied.

4-2 Specifications

(1) Basic requirements

① (a) The facility and equipment shall be endurable for the natural conditions of Kiribati; a temperature of 22 to 32 ℃ (the average temperature between 1947 and 1988 was 28.2℃, and the average maximum temperature was 28.7℃ during the same period), and humidity of 40 to 80%. The average precipitation between 1947 and 1988 was 1,984 mm.

(b) All the equipment shall be in accordance with the existing the Kiribati regulations.

(c) All the equipment shall be manufactured in accordance with the specifications.

② Provide the service manuals and others as follows;

(a) Service manuals	3 copies for each equipment
(b) Maintenance manuals	3 copies for each equipment
(c) Parts catalog	2 copies for each equipment

(d) Tools list 1 copy for each equipment

③ Spare parts

Spare parts, equivalent of 10% to 20% of FOB-Japan price of the equipment, shall be designated among the spare parts list submitted by the contractor. All the spare parts shall be delivered together with the equipment proper.

④ Guarantee

The term of guarantee of each equipment shall be at least one year after delivery.

(2) Specifications

• South Tarawa project

① Prefabricated building

1) Structure Prefabricated one-story building

2) Exterior specifications

Roof	Vinyl chloride steel plate, or equivalent
Wall	Vinyl chloride steel plate, or equivalent
Floor	Mortar troweling finish
Furniture	Aluminium sash door and window, or equivalent

3) Interior specifications

Floor	Mortar troweling finish
	Semi-hard tile or equivalent in the office room
Plinth	Mortar troweling finish
Wall	Painted plywood finish
Ceiling	Painted plywood finish (no lining of store ceiling)

4) Areas are as follows

Office	about	29㎡
Fishing gear store	about	17㎡
Workshop	about	17㎡
Fish handling space	about	136㎡
Ice plant room	about	15㎡ (with the water tank)
Insulated room	about	7㎡
Toilet	about	3㎡
Total	about	224㎡

5) Accessories

Drainage, piping, lighting, electricity, and wiring arrangements.

② Ice making plant 1 unit

1) Ice making machine

Type	Full-automatic, air-cooling plate ice making machine
Capacity	1 ton /day
Ambient temp.	+35℃
Raw water temp.	+25℃
Refrigerant	Freon R-22
Compressor	5.5 KW
Ice crusher, pumps	1.5 KW
Machine seat	Steel frame (installed on the ice storage)

2) Ice storage

Type	Prefabricated insulated panel type
Capacity	about 2 tons
Ambient temp.	+35℃
Preservation temp.	0℃～-5℃
Refrigerant	Freon R-22
Insulation	Self-extinguishing polyurethane foam, 100 mm thick
Compressor	1.5 KW
Accessories	Upper-limit devices, insulated door, door curtain, Wooden grating, thermometers, wall sparring, etc.

3) Raw water tank

Type	Prefabricated insulated square type
Capacity	about 8 ㎥ (with a separating board between rainwater and city water)

③ Insulated room 1 unit

Type	Prefabricated insulated room
Capacity	about 7 ㎡
Accessories	Insulated door, door curtain, wooden grating, thermometers, wall sparring, etc.

④ Fuel oil tank 1 unit

Type	Semi-underground type steel tank (with terminal)

Capacity Gasoline: 5 *kℓ*, diesel oil: 2 *kℓ*
Two kinds of oil are separated in the tank.

⑤ Emergency generator 1 unit

Type Diesel engine driven self-cooling type, three-phase AC
Capacity about 25 KVA, 415 V/240 V/50 Hz
Diesel engine Rated output: 28 PS

③ Fishing gear

Fishing lines
Nylon: 0.4, 0.75, 1.0, 1.2, 1.3, 1.6, 1.8, 2.0 mm
100 m/bundle 300 bundles each

Fishhook
Trolling hook: Double hook No.3, 4, 5, 6, 7. 50 pcs/box 60 boxes each
Kirby hook: No.3, 5, 7, 8, 9, 11, 13. 1000 pcs/box 30 boxes each

Trolling line
Nylon cord: No.80 and No.120 100 m/coil 20 coils each
Tuna cord: 3 mm 4 kg/coil 20 coils
Nylon hand line: 4 mm 4 kg/coil 20 coils

Rope PP rope: 8, 10, and 12 mm 200 m/coil 25 coils each

Swivel
Heavy type: 8, 9, and 10.5 mm 1,000 pcs each
Pair type: No. 3 ×4, 5×6, 7×8 500 pcs each

Lure
Octopus type: 6.5, 5.5, 4.5, 3.5, 2.5 1,000 pcs each

Lure sinker
for Octopus type lure: 19.5, 16.5, 13.5, 10.5, 7.5 cm 500 pcs each

Trolling diving board: K-10 and K-11 50 pcs each

Trolling splash board: middle and small 50 pcs each

Trolling rod: 7 m, two parted type 20 pcs

Scissors: OKUBO type or equivalent 50 pcs

Knife: with case 50 pcs

Metal lock: No.180-200, 150-180, 80-100, 60-80 1,000 pcs each

Hand pressor: L type w/chips (No.B, C, D, 5, each 5 pcs) 10 pcs

⑦ Outboard engine 40 units

40 PS gasoline outboard engine	30 units
4 PS gasoline outboard engine	10 units

⑧ Cooler boxes 60 boxes

(a) Medium type

Dimensions	Outside: about 820(L)×540(W)×450(H) mm
	Inside: about 640(L)×360(W)×340(H) mm
Capacity	78 ℓ
Type	With a lid and grips or strings for carrying

(b) Small type

Dimensions	Outside: about 630(L)×470(W)×350(H) mm
	Inside: about 530(L)×360(W)×250(H) mm
Capacity	45 ℓ
Type	With a lid and grips or strings for carrying

⑨ Outboard engine spare parts

Twenty per cent of the cost price of 40 PS and 4 PS engines respectively, including 1 set of crank cylinder and crankcase, 5 cylinder heads, 400 plugs, 3 sets of crankshaft assembly and others.

⑩ Workshop equipment and tools

Special tools	1 suite
Measuring apparatus	1 suite
General tools	1 suite
Hydraulic press	1 unit
Chain block (1000 kg, 500 kg)	1 unit each
Air compressor	1 unit
Oils and fats	1 suite
Repairing stand	1 unit

⑪ Vehicle 1 unit

Driving method	2 WD, diesel engine
Seating capacity	3 persons (single cabin)

Total weight	about 2,500 kg
Max loading capacity	about 1,000 kg

• Tabiteuea South project

① FAO type canoes 6 units

Dimensions	about 7.1 (L) ×0.86 (B)×0.74 (D) m
Breadth overall (to the outrigger)	4.1 m
Weight	about 250 kg
Complement	3 persons
Material	Watertight plywood, projections with waterproof treatment, paint finish
Mast length	4.5 m
Beam length	4.0 m
Gaff length	4.5 m
Sail area	15 m²

② Outboard engines 12 units

Output	about 15 PS
Type	Gasoline engine
Spare parts	including 400 plugs

③ Fishing gear 1 suite

Lure	
Octopus type: 6.5, 5.5, 4.5, 3.5, 2.5	200 pcs each
Lure sinker	
for Octopus type lure: 19.5, 16.5, 13.5, 10.5, 7.5 cm	200 pcs each
Trolling diving board: K-10 and K-11	60 pcs each
Trolling splash board: middle and small	60 pcs each
Swivel	
Heavy type: 8, 9, and 10.5 mm	100 pcs each
Trolling hook: Double hook No.3, 4, 5, 6, 7. 50 pcs/box	12 boxes each
Fishing lines	
Nylon: 0.4, 0.75, 1.0, 1.2, 1.3, 1.6, 1.8, 2.0 mm, 100 m/bundle	120 bundles each
Trolling rope	
Nylon cord: No.80 and No.120 100 m/coil	10 coils each

Tuna cord: 3 mm	4 kg/coil	10 coils
Nylon hand line: 4 mm	4 kg/coil	10 coils
Swivel		
Pair type: No. 3 ×4, 5×6, 7×8		500 pcs each
Nylon netting		
No.4 2-1/4", 2-1/2", 3',	50md ×100m/75m	60 sets each
No.6 3-1/2", 4", 5",	25md ×100m/75m	60 sets each
Twine		
Nylon monofilament twine: No.6 and No.6,	1 kg/coil	50 coils each
Assembling line: 20S/30L3	1 kg/coil	100 coils
Float: buoyancy 155 g and 28 g		2,000 pcs each
Sinker: weight 37.5 g		3,000 pcs
weight 75.0 g		3,500 pcs
Rope for netting: PP cross ϕ 8 mm	200 m/coil	200 coils
Fishhook		
Kirby hook: No.3, 5, 7, 8, 9, 11, 13.	1000 pcs/box	20 boxes each
Trolling rod:	7 m, two parted type	20 pcs
Trolling rod holder:		6 units
Scissors: OKUBO type or equivalent		20 pcs
Knife: with case		20 pcs
Metal lock: No.180-200, 150-180, 80-100, 60-80		500 pcs each
Hand pressor: L type w/chips (No.B, C, D, 5, each 5 pcs)		6 pcs
Fish box: 50 ℓ		12 boxes
Basket: Plastic, No.800, 70 ℓ		24 pcs

④ Warehouse

1) Structure Prefabricated one-story building

2) Exterior specifications

Roof	Vinyl chloride steel plate, or equivalent
Wall	Vinyl chloride steel plate, or equivalent
Furniture	Aluminium sash door and window, or equivalent

3) Interior specifications

Floor	Plywood flooring or equivalent
Plinth	Painted plywood finish
Wall	Painted plywood finish

Ceiling Painted plywood finish (no lining of store ceiling)

4) Areas are as follows

Office	about	5㎡
Fishing gear counter	about	6㎡
Fishing gear store	about	30㎡
Net assembling space	about	9㎡
Total	about	50㎡

⑥ Vehicle 1 unit

Driving method	4 WD, diesel engine
Seating capacity	3 persons (single cabin)
Total weight	about 2,550 kg
Max loading capacity	about 1,000 kg

⑦ Safety equipment 6 sets each

Rocket signal, red flare, buoyant smoke signal, self-activating smoke signal, mooring apparatus (rope and anchor), life jacket, life buoy with rope, parachute signal, magnetic compass, hand mirror.

4-3 Implementaion Arrangements of the Project and the Scope of Work

(1) Implementation arrangements

The authorities responsible for the project are the Ministry of Environment and Natural Resources Development and the Ministry of Home Affairs and Rural Development, and the agencies in charge of operating the facility and equipment are Tainainano Urban Council (TUC) for the South Tarawa project and Tabiteuea South Island Council (TSIC) for the Tabiteuea South project. The Ministry of Environment and Natural Resources Development is to govern the aid money (arrangements of procedure concerning the Banking Agreement and the Authorization to Pay, receipt of the granted project, issuance of necessary certificates), and then the facility and equipment are to be delivered to TUC and TSIC. On the delivery, a Memorandum of Understanding (MOU) to ensure a proper management and operation of the facility and equipment of the project is to be concluded between the Kiribati Government and each Council.

(2) Implementation agency

Each Council, TUC and TSIC, is to operate the facility and equipment of the project in accordance with the MOU. The facility and equipment of South Tarawa are to be operated within the range of TUC's budget from the first year, and also the Tabiteuea South project will be operated under the similar system. The project is to be operated in close cooperation with the Fisheries Division or Fisheries Extension Officers. When additional actions necessary for the development of the small scale fisheries is anticipated, each Council is given guarantee for a budget for such actions.

① Staffing plan

• South Tarawa project

One manager, one engineer in charge of equipment, one mechanic, and two workers, totalling 5 persons, are to be manned the support station.

• Tabiteuea South project

One person is to be in charge of the warehouse with the equipment.

② Estimate of balance

• South Tarawa project

(a) Revenue

• Selling commission of fuel oil

80 ℓ /day × (2/3) × 50 boats × 200 days/year × A$0.05/ ℓ = A$26,667

• Sales of ice

Assuming that 50 boats use ice for 200 days during the year and the selling price of ice is A$0.15 per kg;

20kg/day × 50 boats × 200 days/year × A$0.15/ kg = A$30,000

Also assuming that the sales is 80% of the production capacity and the working ratio is 6 days a week and 50 weeks per year;

1000kg/day × 0.8 × 6 days/week × 50 weeks/year × A$0.15/ kg = A$36,000

• Repairing charges

Assuming that 40 outboard engines require repair;

40 engines/year × A$50/engine = A$2,000

(b) Expenditure

• Wages

Manager	1 person		A$ 3,000
Workers	2 persons	A$1,400/year ×2 persons	= A$ 2,800
Engineer	1 person		= A$ 2,500
Mechanic			= A$ 1,900
Subtotal			A$10,200

• Power rates:	365 days ×24 hrs×4 KWH ×A$ 0.39/KWH	= A$13,666
• Water rates:	365 days ×1.5 m³/day×A$ 1.0 /m³	= A$ 548
• Fuel oil:	250 days ×10 ℓ/day×A$ 0.77/ ℓ	= A$ 1,925
• Maintenance:	10% of the total of above costs	= A$ 2,913
• Land rent:	500 m²×A$1.0/m²/year	= A$ 500
Subtotal		A$19,552

In addition, an insurance bill of A$300 a year plus sundries of A$1,200 a year shall be calculated.

In total the estimate balance of the equipment is shown in the table below.

Table-3 Estimate of Yearly Balance

(unit: A$)

Revenue		Expenditure	
Selling commission of fuel oil	26,667	Wages (5 persons)	10,200
Sales of ice	33,000	Power rates	13,666
Repairing charges	2,000	Water rates	548
		Fuel oil	1,925
		Maintenance	2,913
		Land rent	500
		Insurance	300
		Sundries	1,200
Total	61,667	Total	31,252

• Tabiteuea South project

(a) Revenue

• Selling commission of equipment

As a selling commission of fishing boats, fishing gear, etc., a 0.8% of the cost price of each equipment shall be levied. Sales proceeds except these levies are reserved as a counterparts fund and used again for the procurement of reserve equipment.

A$145,000 ×0.008 = A$1,160

(b) Expenditure

• Wages: one person A$600 a year

• Sundries: A$30/month ×12 months = A$ 360/year

The estimate balance of the project is shown in Table-4.

Table-4 Estimate of Yearly Balance

(unit: A$)

Revenue		Expenditure	
Selling commission	1,160	Wages	600
		Sundries	360
Total	1,160	Total	960

(3) Scope of Work

Major undertakings to be taken by each Government are as follows;

① The following are covered by grant aid.

• Procurement of all necessary equipment and materials for the project and provision of sea and land transportation for the equipment and materials to the project site, including the payment of transportation insurance.

• Assistance in the preparation of the detail design and tendering, and consultancy on controlling the project.

② Responsibilities of the Kiribati side

• Maintenance of a land for stocking the equipment and materials of the project.

- Prompt unloading, tax exemption, and customs clearance of the equipment and materials of the project at the port of disembarkation in Kiribati.
- Exemption of internal taxes and other fiscal levies imposed to the Japanese nationals concerned in Kiribati for supply of goods and services for the project.
- Preparation and budgetary arrangements for the operation/maintenance expenses of the equipment provided under the grant aid.

(4) Project schedule

After the conclusion of the Exchange of Notes concerning the project between the Governments of Kiribati and Japan, a consulting firm of Japan will conclude an agreement regarding consulting services with the Government of Kiribati, on the basis of the content of the Exchange of Notes.

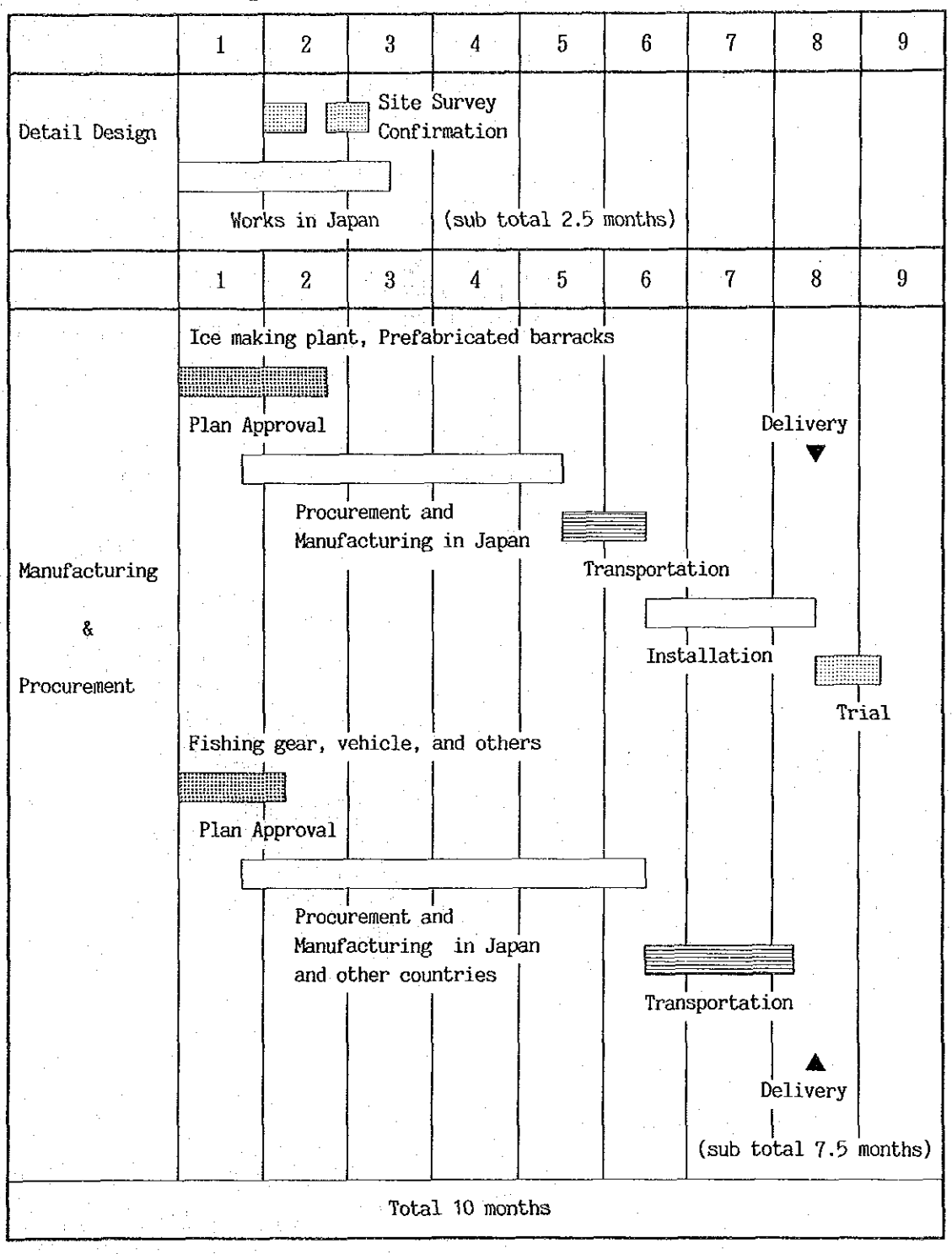
The consulting firm will prepare necessary tendering documents, which are to be authorized by the Kiribati Government, and render help to hold the tender after a necessary pre-qualification investigation. Based on the result of tender evaluation, the consulting firm will recommend a successful tenderer to the Kiribati Government.

The successful tenderer will enter the conclusion of an agreement on supply of the equipment and spare parts for the project, on the basis of the content of the tender, with the Kiribati Government, and procure and manufacture the necessary equipment and materials in accordance with the plans and drawings approved by the consulting firm. Meanwhile the consulting firm will conduct necessary inspections including test working, report the progress of the project to the Governments of Japan and Kiribati. After the completion of controlling business, the consulting firm will receive a completion certificate of the project from the Kiribati Government, when the project will be finished.

The project will require about 10 months; about 2.5 months for the detail design, about 6 months for preparation, manufacturing, and procurement, plus about 1.5 months for marine transportation.

The project schedule is shown in Figure-2.

Figure-2 Project Schedule



CHAPTER 5

EFFECTS OF THE PROJECT

AND

RECOMMENDATIONS

Chapter 5 Effects of the Project and Recommendations

On the evaluation of the project, a quantitative evaluation was tried as far as possible on the basis of the aim of the fisheries development in the national development plan, the objective of the project, and the indices on the achievement of the objective of the project. However, a qualitative evaluation was applied when statistical data and reliable indices were unavailable.

5-1 Direct Effects to small scale fishermen by the South Tarawa project

(1) Activation of small scale fisheries and improvement of their operation

The provision of fishing gear, outboard engines, and cooler boxes under the project will contribute to activation of small scale fisheries production and distribution. The construction of the small scale fisheries support station, the ice making plant, and the fuel oil tanks will provide fishermen with a base of activity, making their activity more lively along with the above-mentioned equipment and materials. In particular, the support station will improve such the current inefficient situation as fishermen prepare fuel oil, ice, and fishing gear separately at different spots, offering one place capable of preparing fishing, and resulting in a higher operation efficiency. This saved hours will become useful to prolong the fishing hours when there are sustainable fishing grounds with abundant fisheries resources, and, according to the surveys by the Fisheries Divisions, such the rich fishing grounds are around South Tarawa, and the hours are estimated at about 60 minutes for the fishermen in the TUC-governed area from Bikenibeu to Bairiki when they are going to get ice; about 30 minutes for turnaround, 10 minutes for purchasing ice, and 10 minutes for contingency. This saved hour is sure to be used for the elongation of fishing hours; the present average five hour fishing is extended to six hour fishing.

(2) Improvement of operation efficiency and increase of production through provision of outboard engines

An increase of production generated by one hour elongation of fishing hour is estimated at about 500 kg a day from an expression below.

$Q = q \times t \times n$

Where, Q: Catch

q: Catch Per Unit Effor (CPUE) = 10 kg/hour

t: Fishing hours

n: Number of fishing boats = 50 boats

Hence, $\Delta Q = 10 \times (6-5) \times 50 = 500$ kg

The production will also be increased by the introduction of outboard engines into service, but of 40 units to be supplied under the project only 10 units are to enter semi-commercial fishing, and they were included in 50 boats above.

(3) Promotion of supply of marine products in South Tarawa

The fish handling space, ice making plant and insulated room of the support station will improve the handling of catch by the small scale fisheries. Also an access to ice at the landing spot make it possible to distribute fish at good condition. These mean the improvement of marine resources management, along with the increase of production, and will contribute to the increase of incomes and the promotion of growth to semi-commercial fisheries through the establishment of reasonable prices. In South Tarawa undersupply of marine products always exists. An annual per capita consumption of fish of Kiribati is about 380 kg, while the one of South Tarawa is 157 kg, accounting for only 40% of the former. This difference may reflect a gap between the urban and rural economies, that is the monetary economy and subsistence economy. But a preference for fish is quite the same. In view of this, South Tarawa has a possibility of the best consuming center, a target town of the fisheries development of outer islands. In fact EC has been conducting a project since 1988 on Abemama and Butaritari respectively, trying to supply marine products to South Tarawa. The increase of 500 kg described in (2) in this Section is about 7 kg a person, an increase of 4.4%.

(4) Increase of fishermen's incomes and promotion of growth of subsistence fisheries to semi-commercial fisheries

Fishermen will be able to expect an increase of incomes through increasing production and preservation of freshness of fish, which situation will accelerate the growth of the subsistence fisheries to the semi-commercial fisheries because there is always a short supply of fish in South Tarawa. An

increase of incomes by about 20% is estimated as follows;

B = I - E

I = Q × p

b(annual income a person)=(B/N) ×4 weeks ×12 months

Where, B: Profit (A$) q: CPUE

I: Income (A$) p: Fish price (A$/kg)

E: Expenditure(A$) t: Fishing hours (hour)

Q: Catch (kg) d: Fishing days per week (day)

(Q = q×t ×d) N: Number of fishermen of board (person)

	q	t	d	Q	p	I=Q×p	E	B=I-E	N	b
Present situation	10	5	6	300	1.0	300	136	164	3	2,623
After completion of the project	10	6	6	360	1.0	360	163	197	3	3,152

As shown above, the annual income of A$2,623 (A$55 a week) increases to A$3,152. At present the minimum pay of a public service worker is A$1,614 a year, and about A$3,000 average. The project therefore will raise a fisherman's income to the level of public service worker. Improvement of CPUE (q), elongation of fishing hours (t) to a proper level, and maintenance of reasonable fish price (p) are also important factors to promote the growth of the subsistence fisheries to the semi-commercial fisheries. It is of importance that the Fisheries Division gives fishermen guidance in effective use of the facility and equipment to be supplied under the project towards the improvement of these factors.

5-2 Direct Effects to small scale fishermen by the Tabiteuea South project

(1) Activation of outer island fishery

The provision of fishing gear will make it possible for fishermen of Tabiteuea South, who do not have easy access to fishing gear, to get fishing gear when necessary, resulting in activation of their fishing activities.

(2) Increase of production through the activation of fishing activities

The introduction of FAO canoes with outboard engines and safety equipment into service will make it easy for fishermen to operate offshore, and thereby to increase production. An increase of production is estimated at 325 kg a day on the basis of the performance of KIR type canoes introduced to Tabiteuea North in 1986. Its estimate is as follows;

$Q = q \times t \times n$

Where, Q: Catch

q: CPUE 2.7 kg/hour increase to 5.8 kg/hour

t: Fishing hours 4.3 hours increase to 8.3 hours

n: Number of boats one boat increases to 7 boats

Hence, $Q_0 = 2.7 \times 4.3 \times 1 = 12$ kg/day

$Q_1 = 5.8 \times 8.3 \times 50 = 337$ kg/day

$\Delta Q = Q_1 - Q_0 = 337 - 12 = 325$ kg/day

(3) Increase of fish consumption

According to the 1988 statistics, an annual per capita consumption of fish of Tabiteuea South is at relatively low level of 226 kg, about 60% of 380 kg of average one in the whole Kiribati. The production is 6,021 kg/week, or 1,004 kg/day, on the above statistics. The increase of 325 kg produced by FAO type canoes will increase of fish consumption by 32%, by which an annual per capita consumption of fish of Tabiteuea South will reach 300 kg.

(4) Other effects

A shipment of 981 lbs (A$84.26) of live lobster from Tabiteuea South to South Tarawa is recorded by the Fisheries Division's after 1988. Efforts have been made by fishermen to shipment surplus products to outside the island. The possibility of the shipment of surplus products will be more increased when the supply of fish can meet the demand and its consumption level approaches to the country's level.

5-3 Conclusion and Recommendations

For Kiribati the fishery is the only potential industry for the development. Efforts have been made by the Government to develop the fishery; a national

fishing company was established to earn foreign currency by means of the export of tuna; a fishing course was instituted at the Marine Training Center by Japan's grant aid to train the crew of fishing vessel. The small scale fishery is of importance as a protein source to the people, and besides it is expected to become a foothold for the growth of the subsistence economy to the monetary economy in outer islands. The project is in line with the objectives of the fishery development and rural development in the national development plan and useful for the achievement of the objectives. At present there are few facilities for the small scale fishing activities. In South Tarawa, for instance, the fishermen are working for the preparation of the next day's fishing under lighting of torch lamps or headlights in the dark. Also in Tabiteuea South, there is no passage between the lagoon and the open sea and the fishermen must sail across on the reef at high tide, there is no public facility such as a landing jetty of a inter-island vessel carrying living necessaries, except causeways connecting with islands each other. In outer islands fishery is the only means for developing the living conditions, and, in particular essential for making sure of animal protein. Support appropriate for the condition of each outer island is linked closely with the effective use of the marine resources within the EEZ of about 3 million ㎢, activating the fishing activity in each island.

The number of people who will benefit from the South Tarawa project are about 150 fishermen on board 50 fishing boats, which are expected to utilize the support station, engaging in the semi-commercial fishery, plus some 5,000 full-time and part-time fishermen. Indirectly about 16,000 people of 2000 households, that is 70% of the total households of 3,000, will share in the benefit of the project. In Tabiteuea South all the people of about 1,600 will benefit from the project.

The ministries responsible for the project are the Ministry of Environment and Natural Resources Development and the Ministry of Home Affairs and Rural Development, and the agencies in charge of administration of the facility and equipment are the council governing each area where the project is to be implemented, and the Fisheries Division of the Ministry of Environment and Natural Resources Development will fully co-operate on the implementation of the project. Each council has a livelihood cooperative system for purchasing daily necessaries in packing and shipment of local products, and officers of the

Ministry of Home Affairs and Rural Development and the Ministry of Finance are working for administration and finance respectively. Viewed in the light of administration, each council can meet the requirements, but it is considered to be essential to give technical assistance on the operation and maintenance of the facility and equipment. The Fisheries Division is responsible in this respect, and it is recommended that extension officers should give guidance periodically in operation and maintenance of the equipment, besides the daily routine.

From the viewpoint of the expected profound effects and the contribution to the improvement of the living standard of the people as mentioned above, the project deserves to be implemented. As for the originally requested chilled store, it will be supplied when its necessity is fully recognized in view of the distribution of fish at the peak season, the shipment of fish to South Tarawa from outer islands, and performance of the existing cold storage facility.

APPENDIX

APPENDIX

Members List of Study Team

Noboru, TAZOE	Leader Chief of Section Office of the Overseas Fisheries Cooperation, Fisheries Agency
Yoshio, ISHIYAMA	Project Coordination Second Basic Design Study Division, Grant Aid Study & Design Department JICA
Mamoru, KONDO	Fisheries Promotion Planner D & A Engineering Co.,Ltd.
Harumasa, HIRAKAWA	Facilities and the Cost Estimate Planner D & A Engineering Co.,Ltd.

Study Itinerary

	December		Governmental Officials	Accommo-dation	Consultants		Accommo-dation
					Fisheries Promotion Planner	Facilities and Cost Estima-tion	
13	14	Mon.	07:00 Majuro ⇨ 09:00 Tarawa Courtesy Call on the MFA, MENRD, MHARD, PWD Discussion with MENRD	Tarawa	Same as Officials		Tarawa
14	15	Tue.	Site Survey (South Tarawa Site)	Tarawa	-ditto-		Tarawa
15	16	Wed.	Tarawa⇨Tab.S, Site Survey (Tabiteuea South Site), Tab.S ⇨S.Tarawa	Tarawa	-ditto-		Tarawa
16	17	Thu.	Site Survey (Tarawa)	Tarawa	-ditto-		Tarawa
17	18	Fri.	Discussion, Signing of Minutes of Discussions	Tarawa	-ditto-		Tarawa
18	19	Sat.	11:00 Tarawa ⇨ 14:00 Nadi	Nadi	Collection of Materials		Tarawa
19	20	Sun.	14:30 Nadi ⇨ 20:20 Tokyo		-ditto-		Tarawa
20	21	Mon.			Meeting with MENRD		Tarawa
21	22	Tue.			07:40 Tarawa⇨ 18:30(Dec/21)Honolulu, 13:10(Dec/22)Honolulu ⟶		Honolulu
22	23	Wed.			⟶ 20:20 Tokyo		

List of Persons Concerned

Ministry of Foreign Affairs

Mr. Taama Biribo	: Assistant Secretary
Ms. Dennis	

Ministry of Finance

Mr. Mikaere Baraniko	: Chief Planning Officer
Mr. Elliot Alli	: Planning Officer

Ministry of Envn't & Natural Resources Development

Mr. Nakibae Teuatabo	: Secretary
Mr. Peter Tong	: Senior Resource Economist
Mr. Tikabu Tikaai	: Chief Fisheries Officer

Fisheries Division, MENRD

Mr. Kintoba	: Senior Fisheries Officer
Mr. Johny	: Manager of T.F.F
Mr. Tukabu Teroroko	: Senior Fisheries Officer

Ministry of Home Aff's & Rural Development

Mr. Alexander Teabo	: Atoll Project Officer

Land Committee

Ms. Tooma Wiriici	: Senior Assistant, Staff Inspector

Ministry of Lands & Survey

Mr. Tiriata Betero	: Chief Lands Officer
Mr. Erene Nikora	: Lands Surveyor

TUC (Teininano Urban Council)

Mr. Tawita Teibira	: Clerk to the Council

TSIC(Tabiteuea South Island Council)

Mr. Teitintau	: Council President
Mr. Nakaebekia	: Vice President
Mr. Kabiriera	: Council Memeber
Mr. Temeeti	: -Ditto-
Mr. Tebwe	: -Ditto-
Mr. N.Angang	: -Ditto-
Mr. Toamane	: -Ditto-
Mr. Tebukeke	: -Ditto-
Mr. Teitiota	: -Ditto-
Mr. Tekaburoko	: Government Employee(Police)
Mr. Katutu	: -Ditto- (Council Clerk)
Mr. Teakai	: -Ditto- (Fish Pond Worker)
Mr. Peter	: -Ditto- (Fisheries Assist.)

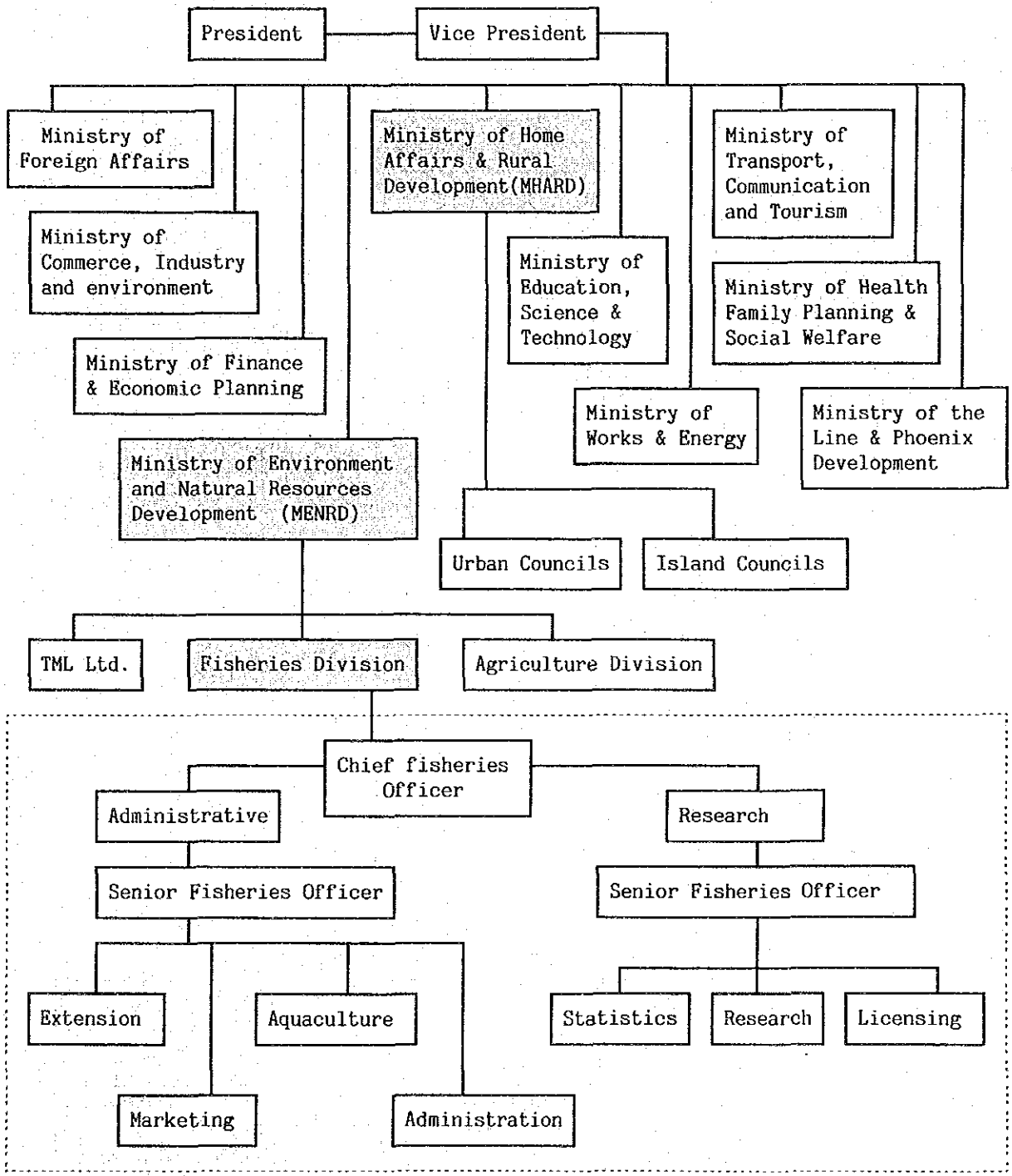
Embassy of Japan in Fiji

Mr. Y. Hori	: Ambassador
Mr. S. Nakajima	: Second Secretary
Mr. M. Yamashita	: Second Secretary
Mr. K. Tanabe	: Third Secretary

JICA Fiji Office

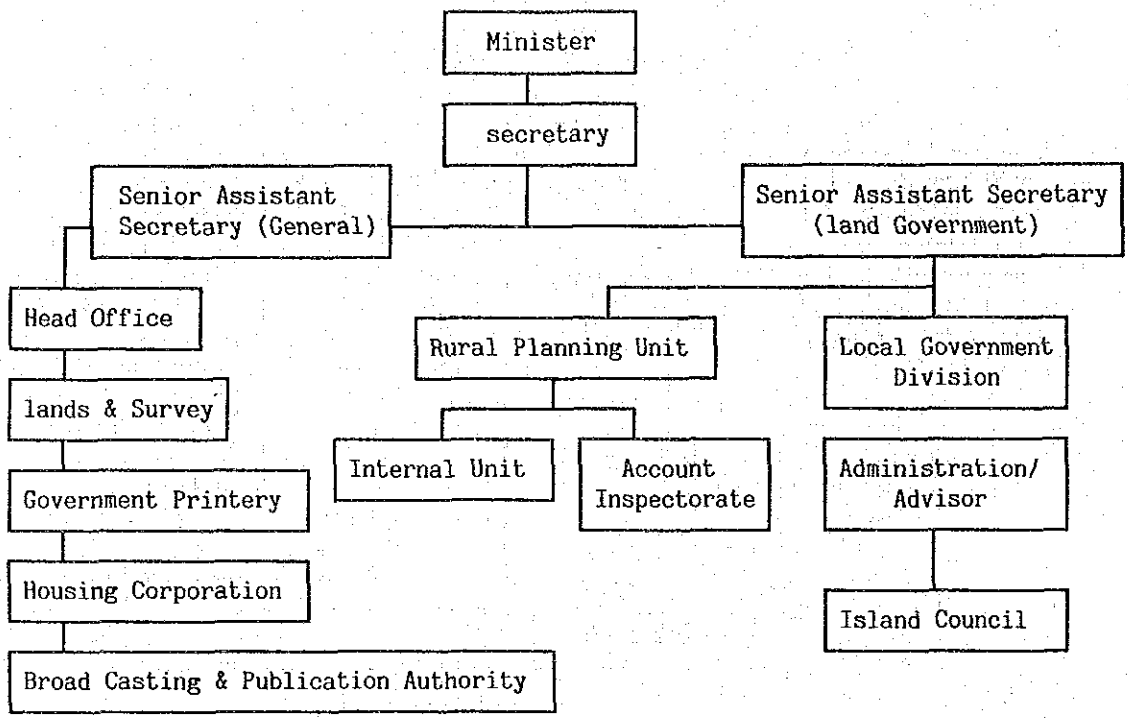
Mr. Hideaki Ito	: Director

ORGANIZATION CHART OF THE GOVERNMENT OF THE REPUBLIC OF KIRIBATI & FISHERIES DIVISION

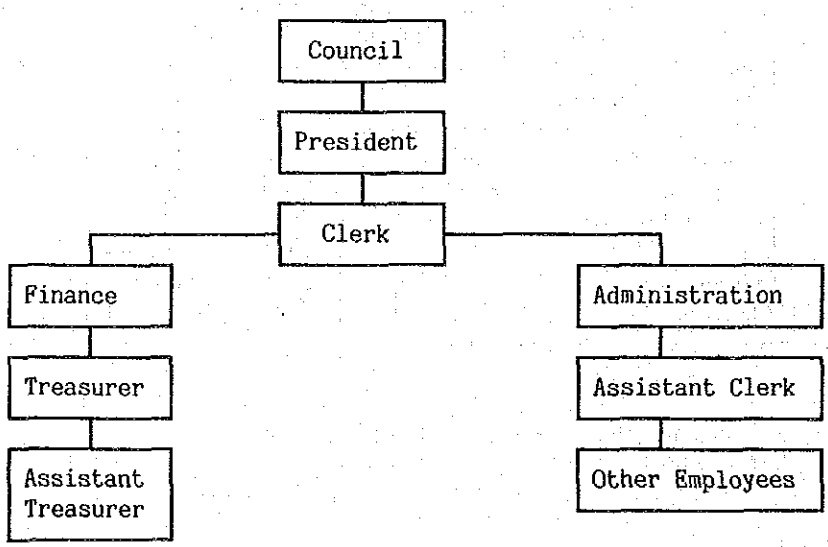


ORGANIZATION CHART OF IMPLEMENTATION AGENCIES

MINISTRY OF HOME AFFAIRS & RURAL DEVELOPMENT

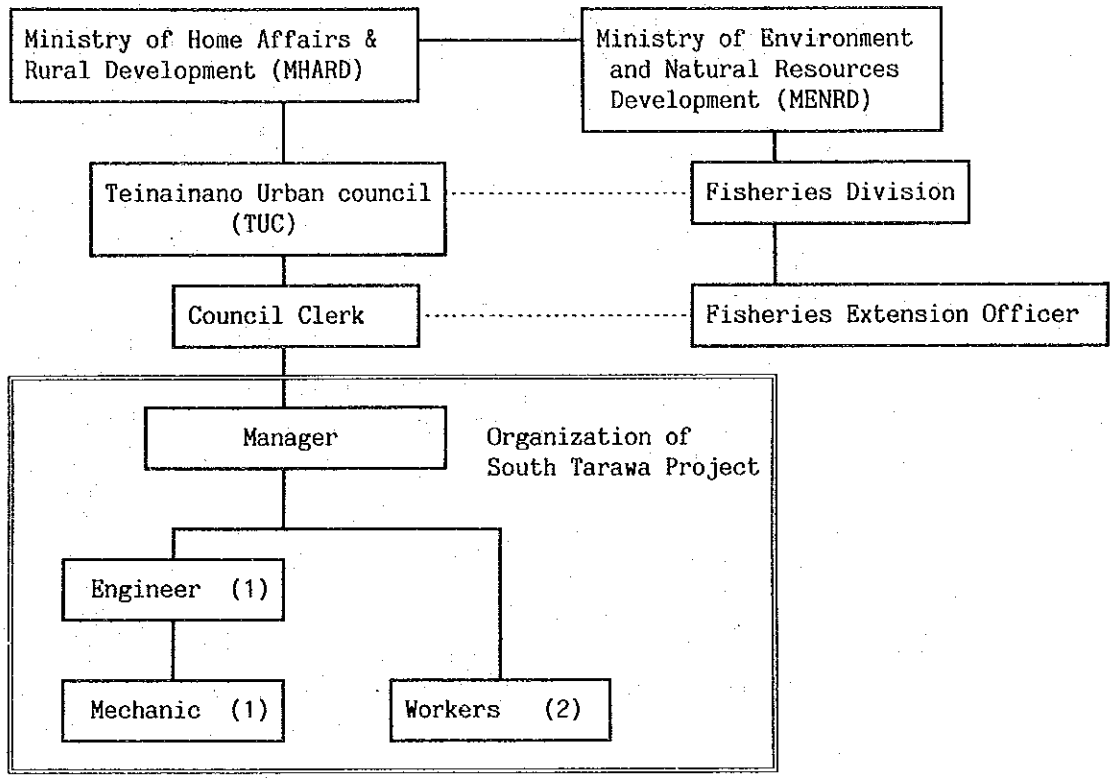


ISLAND COUNCILS

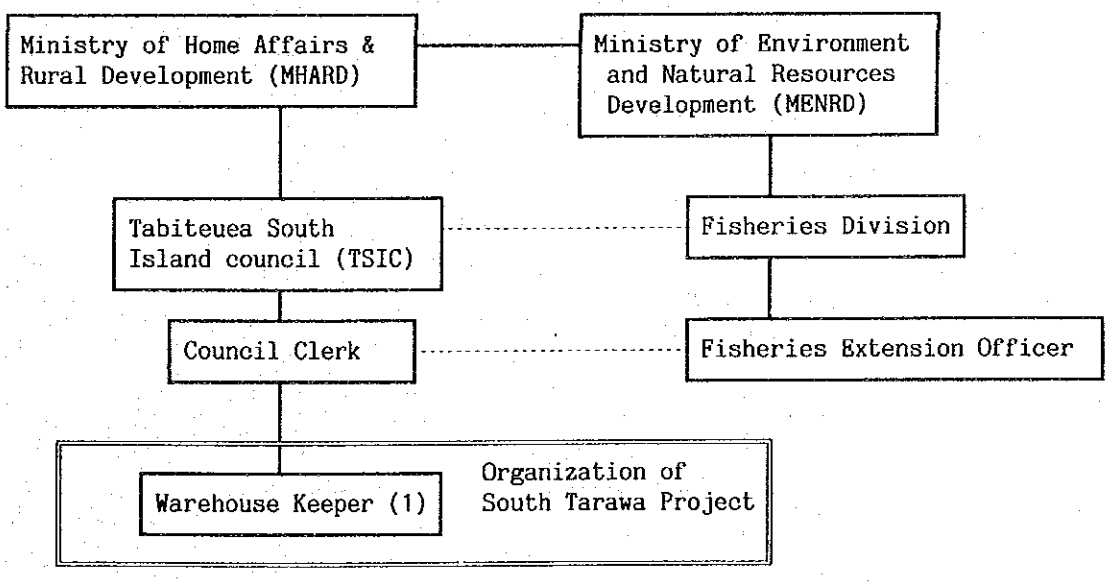


ORGANIZATION CHART OF THE PROJECT

(South Tarawa Project)



(Tabiteuea South Project)



Minutes of Discussions

MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY
ON
THE SMALL-SCALE FISHERIES
PROMOTION PROJECT
IN
THE REPUBLIC OF KIRIBATI

In response to a request from the Government of the Republic of Kiribati, the Government of Japan decided to conduct a Basic Design Study on the Small Scale Fisheries Promotion Project in the Republic of Kiribati (hereafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency(JICA).

JICA sent to Kiribati a study team, which is headed by Mr. Noboru Tazoe, Chief Fisheries Officer, Office of the Overseas Fishereis Cooperation, Fisheries Agency, and is scheduled to stay in the country from December 14 to December 19, 1992.

The team heid discussions with the officials concerned of the Government of Kiribati and conducted a field survey at the study area.

In the course of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The team will proceed to further works and prepare the Basic Design Study report.

Tarawa, December 18, 1992.

Mr. Noboru Tazoe
Leader
Basic Design Study Team
JICA

Mr.Nakibae Teuatabo
Secretary
Ministry of Environment and
Natural Resources Development

ATTACHMENT

1. Objective

The Objective of the Project is to promote small-scale fisheries by providing necessary facilities and equipment for improving living conditions.

2. Project Sites

The Project sites are ;

(1) Bairiki Wharf in South Tarawa, and

(2) Buariki Village in Tabiteuea South, as shown in "Annex Ⅰ"

3. Executing Agency

Ministry of Environment and Natural Resources Development

Ministry of Home Affairs and Rural Development

Teinainano Urban Council (TUC)

Tabiteuea South Island Council (TSIC)

4. Items requested by the Government of Kiribati

After discussions with the Basic Design Study Team, the following items were finally requested by the Government of Kiribati, as shown in "Annex Ⅱ" However, the final components of the Project will be decided after further studies.

5. Japan's Grant Aid system

(1) The Government of Kiribati has understood the system of Japan's Grant Aid explained by the Team.

(2) The Government of Kiribati will take necessary measures, described in "Annex Ⅲ" for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

6. Schedule of the Study

(1) The consultants will proceed to further studies in Kiribati until December 22, 1992.

(2) Based on the Minutes of Discussions and technical examination of the study results, JICA will complete the final report and send it to the Government of Kiribati by the end of March 1993.

7. Particular items discussed and requested to the Government of Kiribati by the Team

(1) To ensure the operation budget and staffing required for the Project

(2) To inform the Government of Japan the site preparation plan and the completion date required for the Project implementation. The access to the Project site from sea-side and also public road should be included in the site preparation.

(3) To inform the Government of Japan the securing date of land ownership and/or permit of the utilization for the Project required for the implementation.

N. T.

NJ

8. Counterpart fund

If and when the products, purchased by the grant from the Government of Japan, are sold or leased to fishermen, the Government of Republic of Kiribati shall take necessary measures to ensure the followings:

(1) to deposit, in local currency, the amount to be obtained by such sale or lease in a suitable account of the Government of Republic of Kiribati as a counterpart fund:

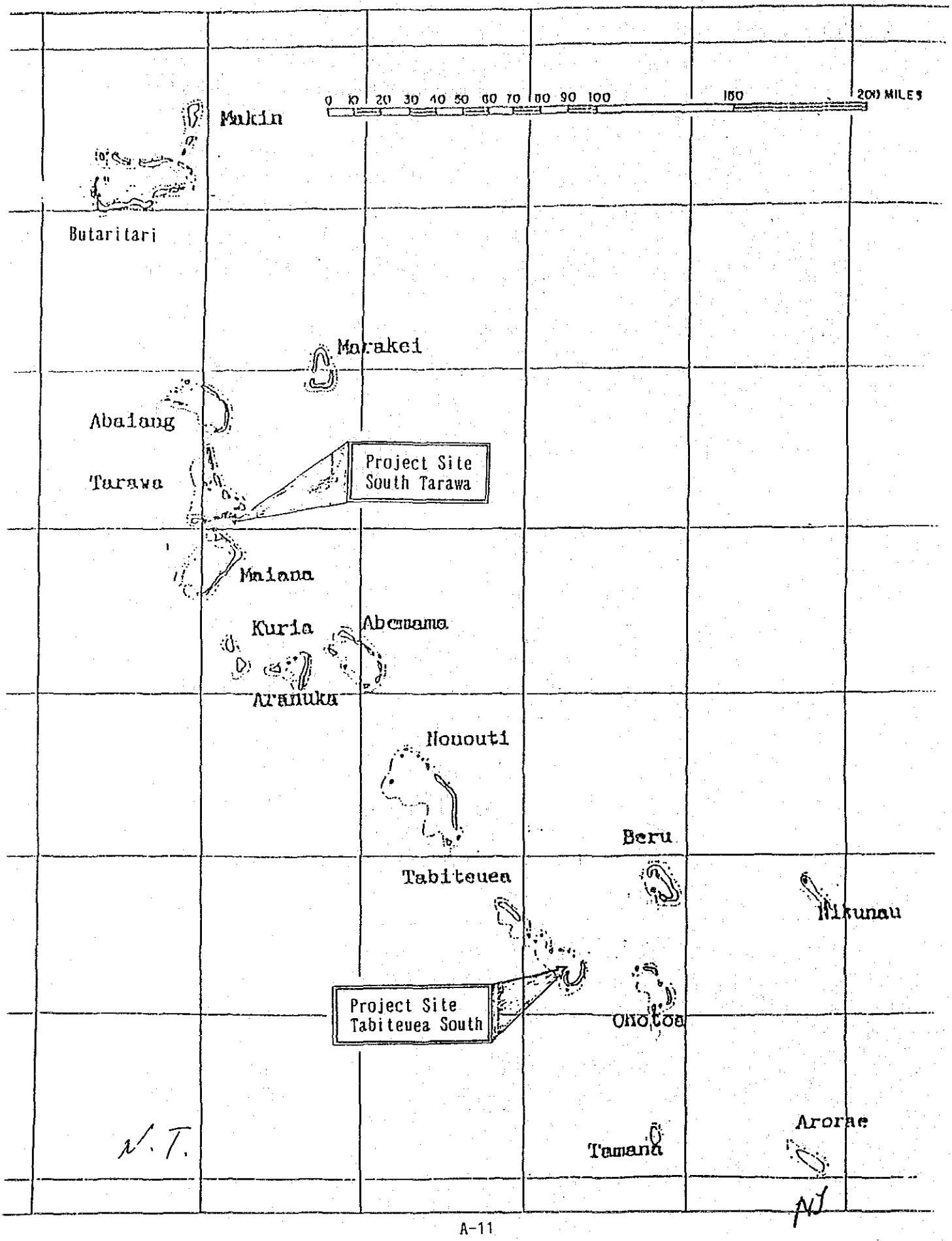
(2) to utilize the above-mentioned counterpart fund for the purpose of fishery development and maintenance of equipment purchased by the grant from the Government of Japan:

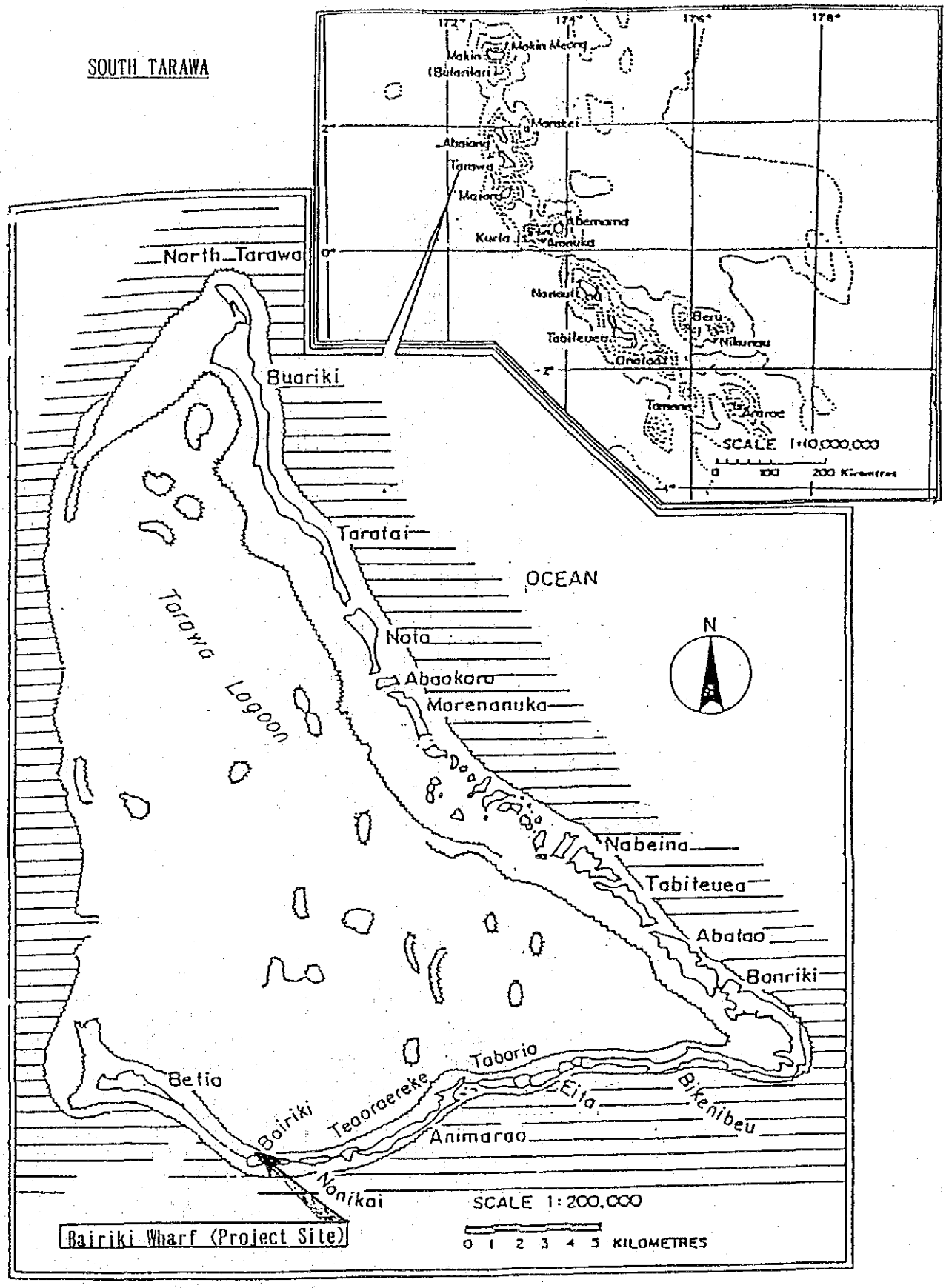
(3) to report to the Government of Japan upon the use of fund.

N.T.

N.T.

GILBERT ISLANDS

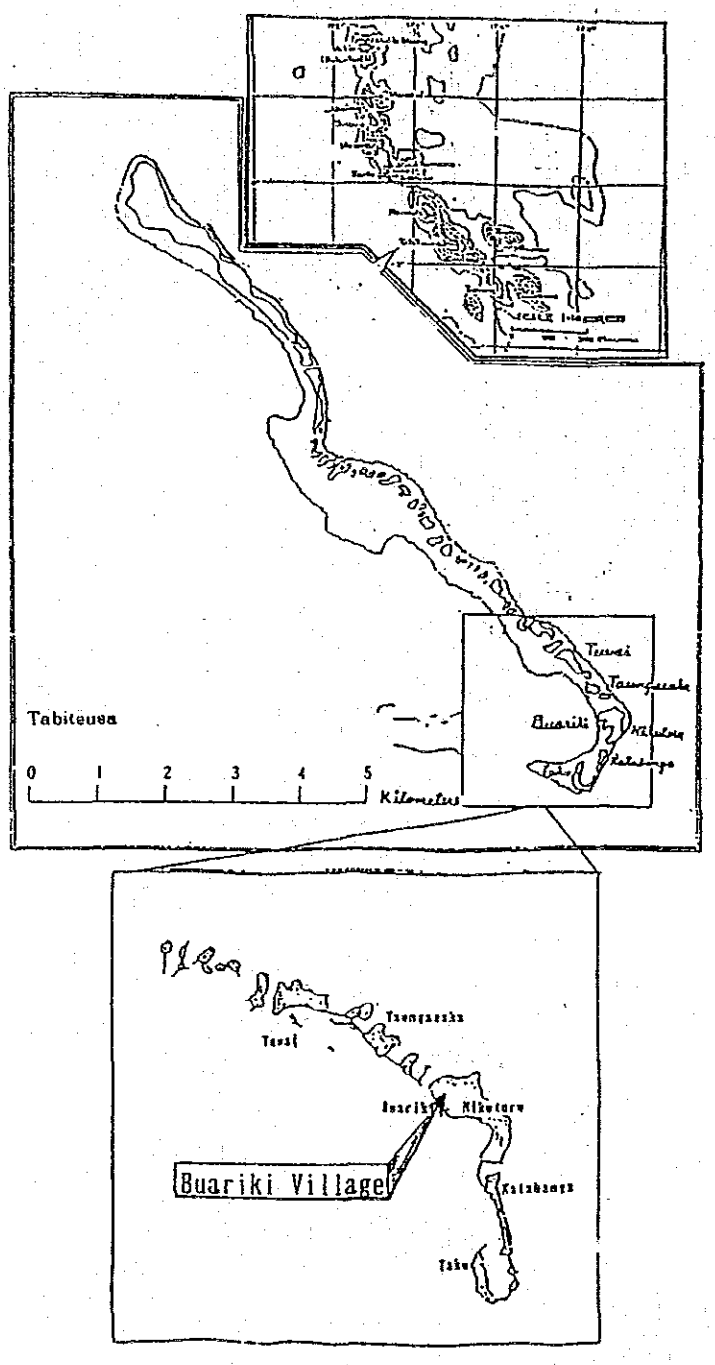



SOUTH TARAWA
North Tarawa
Buariki
Taratai
OCEAN
Taraya Lagoon
Nota
Abaokoro
Morenanuka
Nabeina
Tabiteuea
Abatao
Bonriki
Taborio
Eita
Bikenibeu
Animarao
Teaoraereke
Bairiki
Betio
Nonikai
Bairiki Wharf (Project Site)
N
SCALE 1:200,000
0 1 2 3 4 5 KILOMETRES
Makin Meang
Makin (Butaritari)
Marakei
Abaiang
Tarawa
Maiana
Abemama
Kuria
Aranuka
Nonouti
Beru
Nikunau
Tabiteuea
Onotoa
Tamana
Arorae
SCALE 1:10,000,000
0 100 200 Kilometres

N.T.

NT

TABITEUEA SOUTH



N. T.

NJ

To Betio
Hotel/Restaurant
Bairiki Wharf(Project Site)
SCALE(1/2,500)

N. T.

N1

Reef
Buariki : Project site
Village
Store
Store
Coconut shed
Maniaba
Lagoon
10m
N
CAUSEWAY
TSIC
F.O. Tankx2
Lagoon

Annex II

Items Requested by The Government of Kiribati

South Tarawa

(1) Prefabricated building

(2) Ice making plant

(3) Insulated room (without Refirigerating unit)

(4) Fuel oil tank

(5) Generator

(6) Fishing gear

(7) Outboard engine

(8) Cooler box (insulation)

(9) Outboard engine spare parts

(10) Workshop equipment and tools

(11) Vehicle

Tabiteuea South

(1) FAO type canoe

(2) Outboard engine

(3) Fishing gear

(4) Warehouse

(5) Vehicle

(6) Safety equipment

NJ

N. T.

Annex III

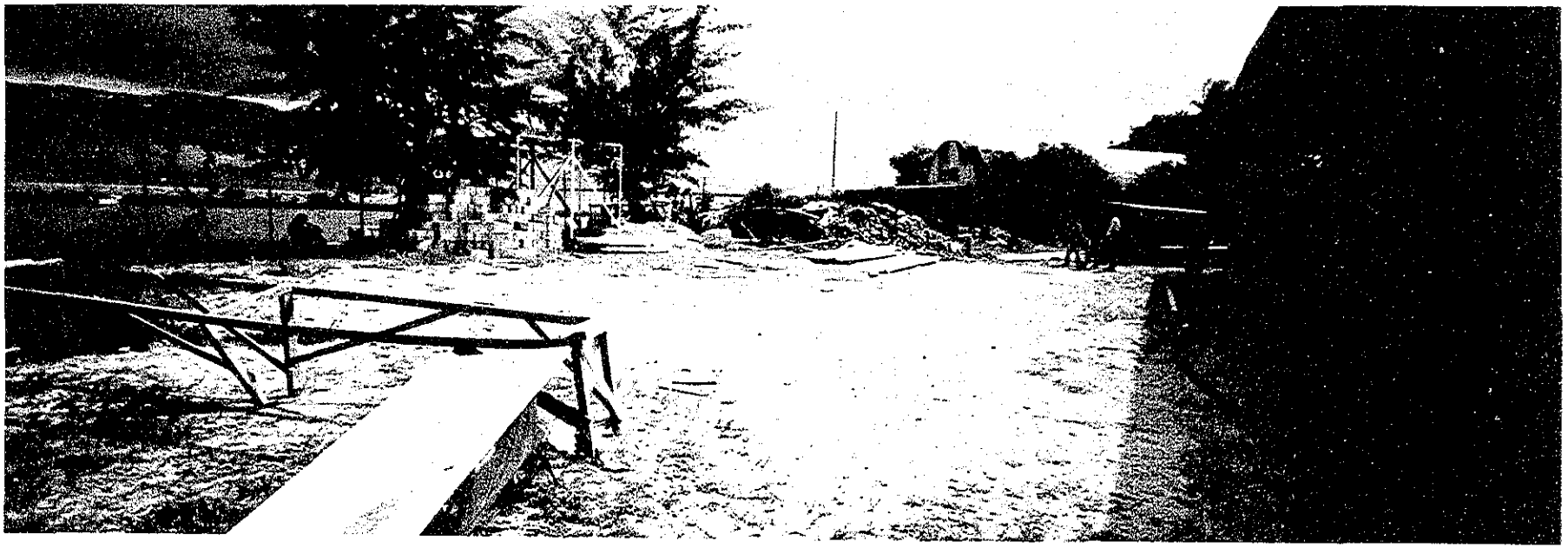
Necessary measures to be taken by the Government of the Republic of Kiribati in case Japan's Grant Aid is executed.

1. To secure the sites for the Project.
2. To clear and level the sites prior to commencement of the Project.
3. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the sites.
4. To construct the access road to the sites prior to commencement of the Project.
5. To provide facilities for distribution of electricity, water supply, telephone, drainage, sewage and other incidental facilities to the Project sites.
6. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
7. To exempt taxes and to take necessary measures for custom clearance of the materials and equipment brought for the Project at the port of disembarkation.
8. To accord Japanese Nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into the Republic of Kiribati and stay therein for the performance of their work.
9. To maintain and use properly and effectively that the facilities constructed and equipment purchased under the Grant.
10. To bear all the expenses other than those to be borne by the Grant, necessary for construction of facilities as well as for the transportation and the installation of the equipment.

Photographs

① Bairiki, South Tarawa

The proposed project site.



② Bairiki, South Tarawa

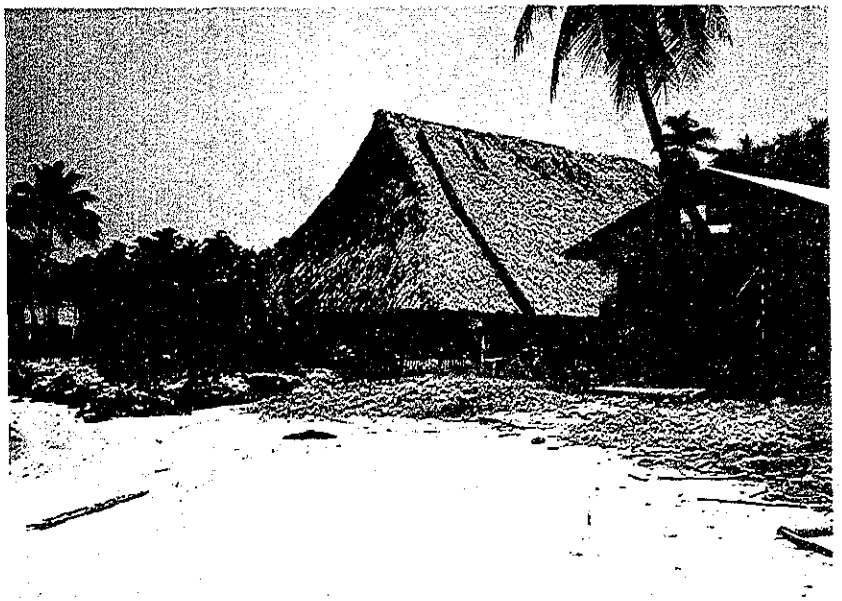
The proposed project site.

③ Buariki, South Tabiteuea

The proposed site for the fishing gear store

④ Buariki, South Tabiteuea

Buariki viewed on the causeway.



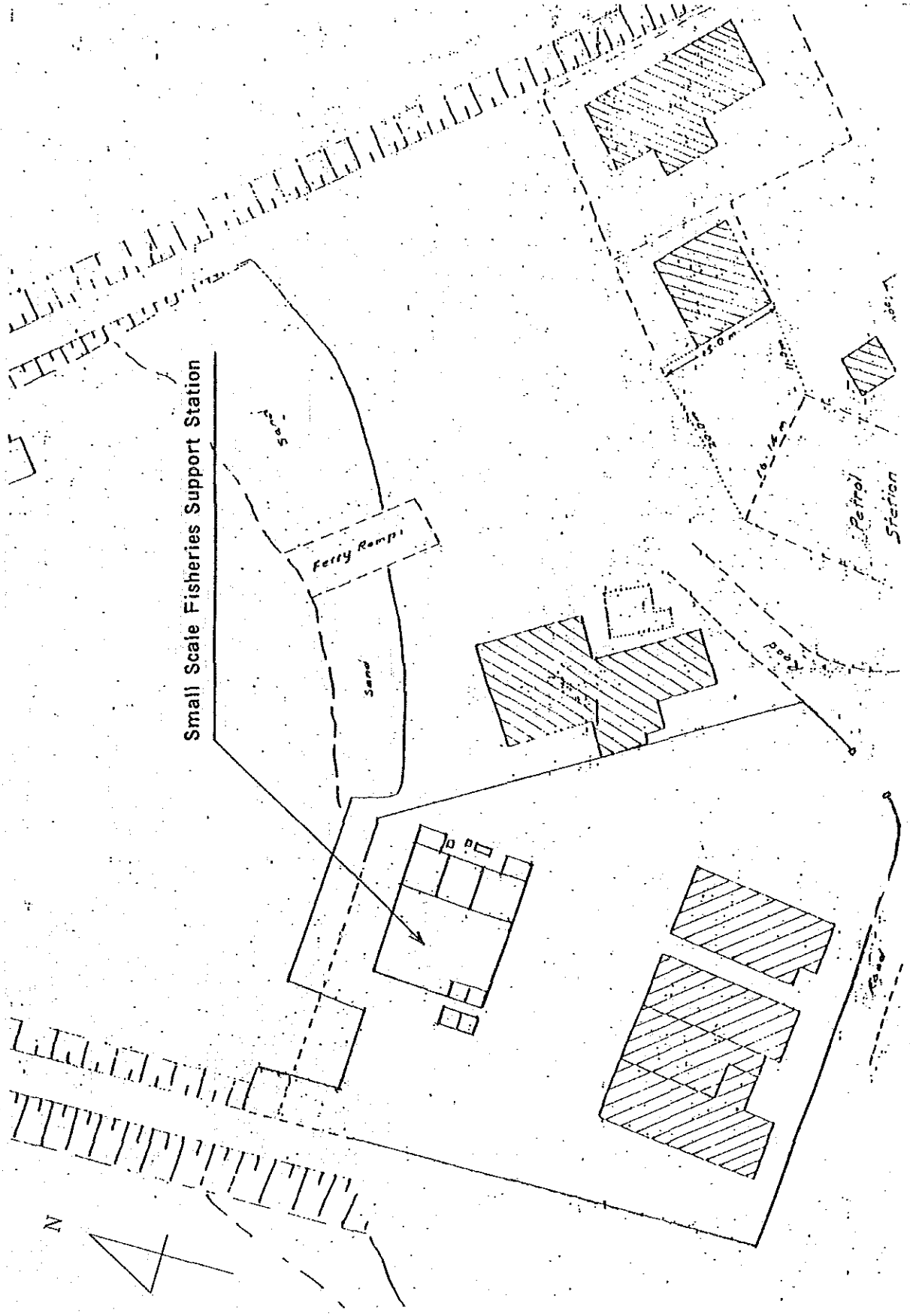
⑤ Buariki, South Tabiteuea

A meeting hall on Tabiteuea South (Maniaba)
Right is a copra shed.

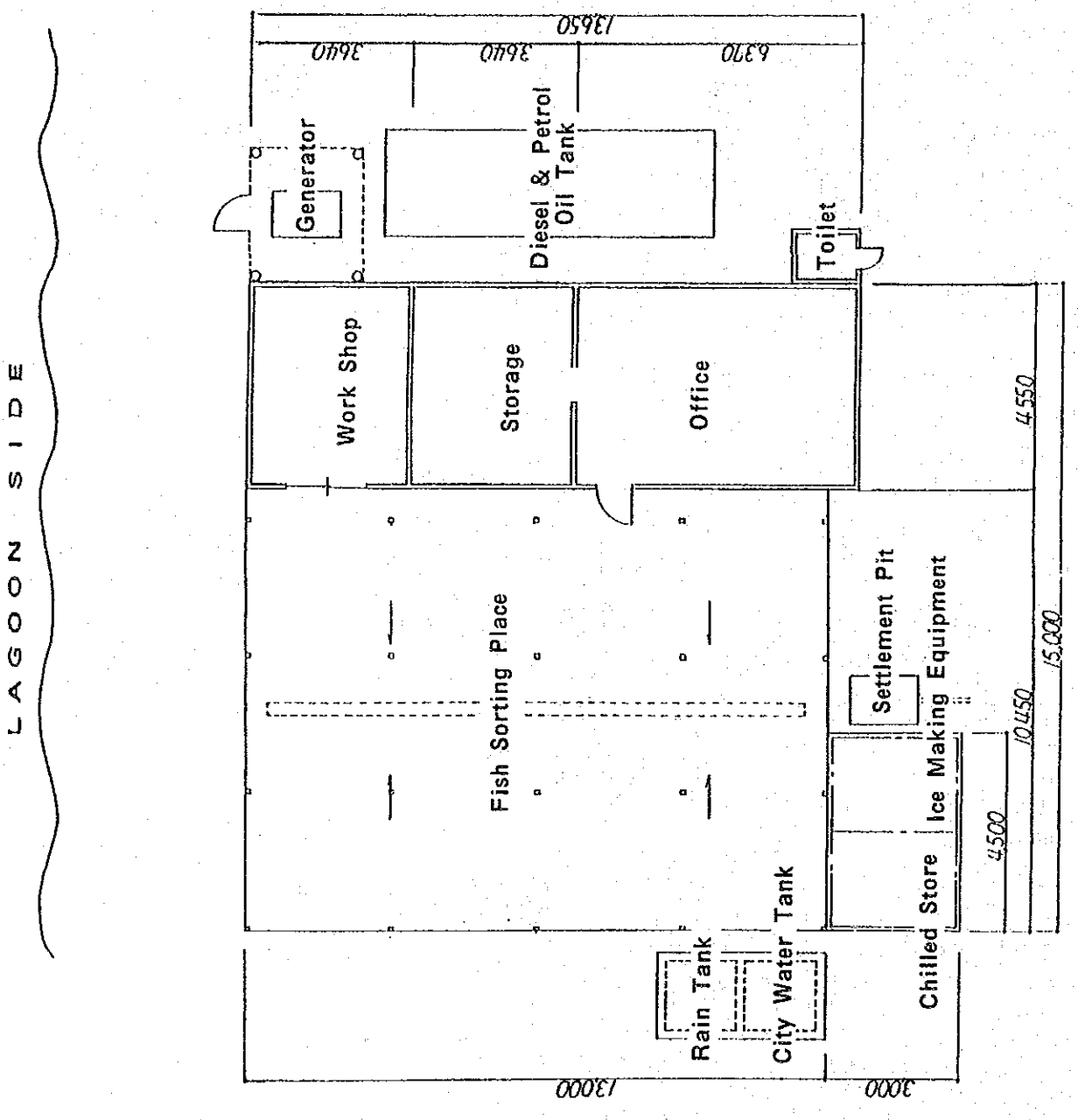
Prefabricated Building Plan

Small Scale Fisheries Support Station Site Plan

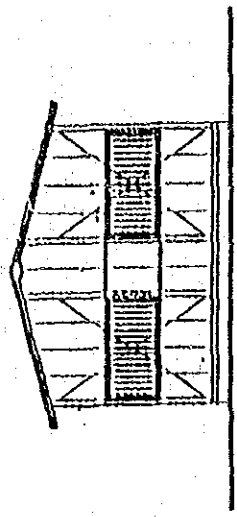
II --②-A



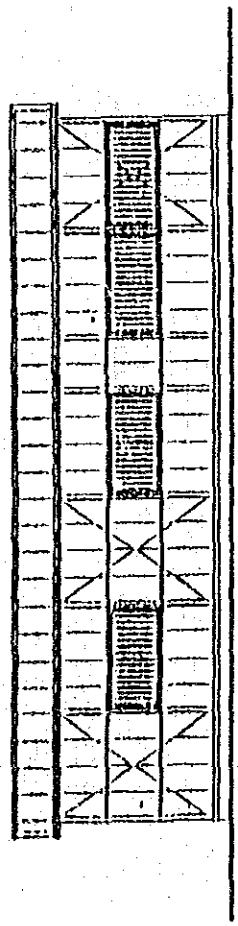
Prefabricated Building Plan



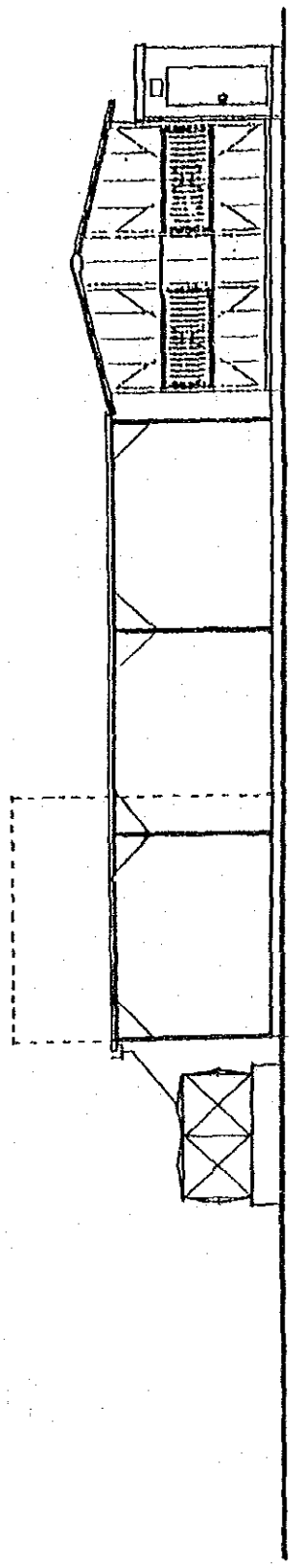
Elevation



Elevation (North)



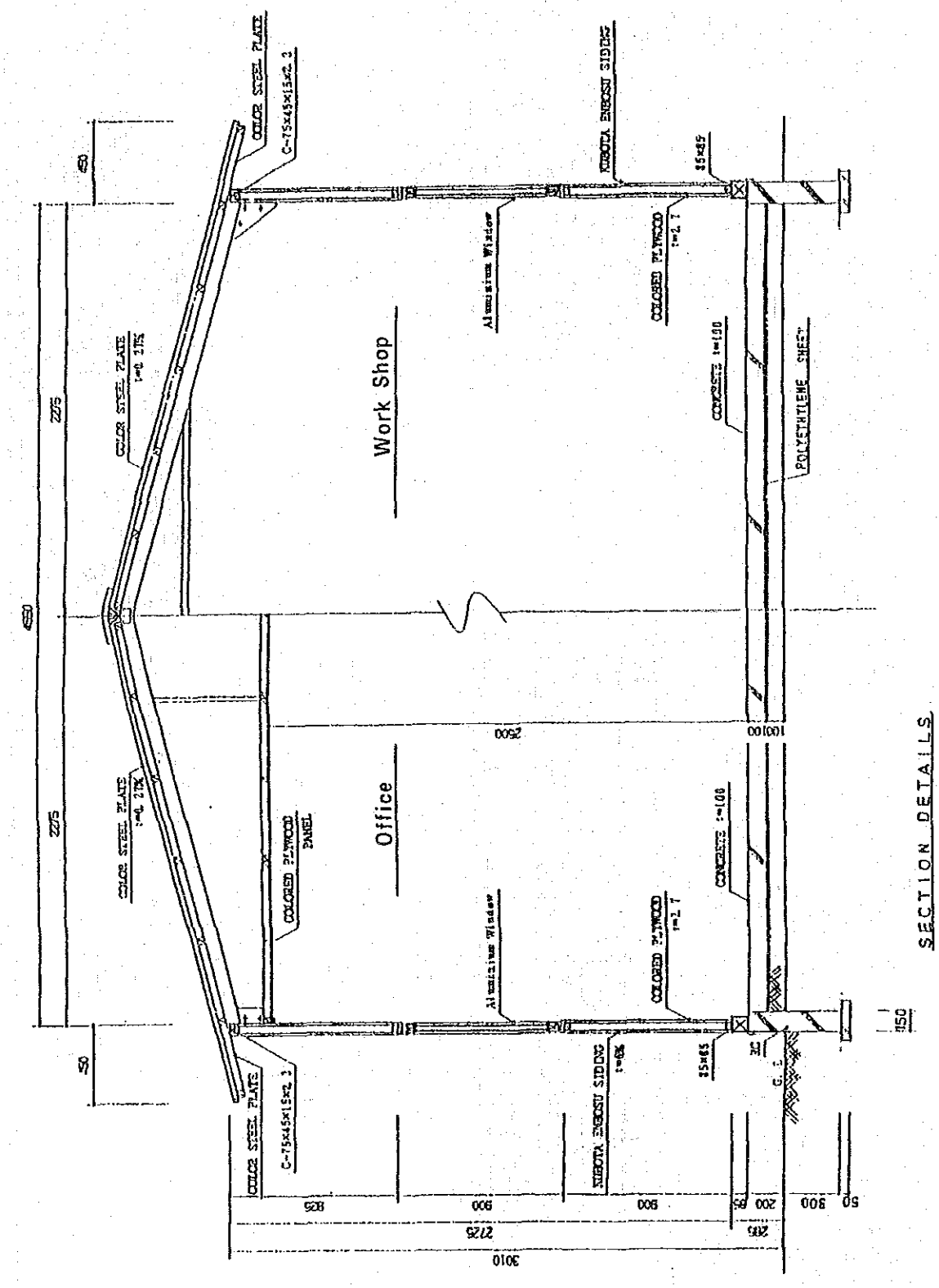
Elevation (East)



Elevation (South)

Section

II－②-D



SECTION DETAILS

Ice-making machine and ice storage bin

No.	Description	Particulars
①	Ice Making Machine	Plate Ice, 1 ton/day 5.5kw
②	Air Cooled Condenser	0.23kw
③	Surge Tank, Defrost Pump	0.25kw
④	Ice Chute	
⑤	Ice bin	1,800mm× 1,800mm×2,200mm
⑥	Level Switch for Ice Bin	
⑦	Unit Cooler for Ice Bin	
⑧	Ref. Compressor for Ice Bin	1.5kw