JAPAN INTERNATIONAL COOPERATION AGENCY

MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES DEVELOPMENT
REPUBLIC OF KIRIBATI

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR OUTER ISLANDS FISHERIES DEVELOPMENT
IN
THE REPUBLIC OF KIRIBATI
(PHASE II)

JANUARY 1995

Fisheries Engineering Co., Ltd.

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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 Project for Outer Islands Fisheries Development in the Republic of Kiribati (Phase II) and entrusted the study to the Japan International Cooperation Agency (JICA).

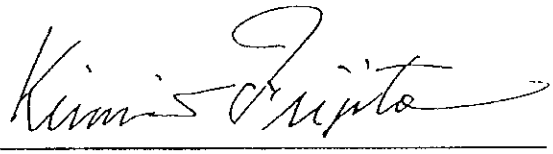
JICA sent to Kiribati a study team headed by Mr. Akihiro Mae, Assistant Director, Office of Overseas Fisheries Cooperation, Fisheries Agency, and constituted by members of Fisheries Engineering Co.,Ltd., from September 17 to October 7, 1994.

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

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.

January, 1995



Kimio Fujita
President
Japan International Cooperation Agency

January 31st, 1995

Mr. Kimio Fujita,
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

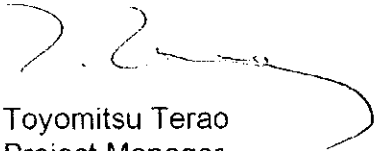
We are pleased to submit to you the basic design study report on the Project for Outer Islands Fisheries Development in the Republic of Kiribati (Phase II).

This study was conducted by Fisheries Engineering Co.,Ltd., under a contract to JICA, during the period September 9, 1994 to January 31, 1995. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Kiribati and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

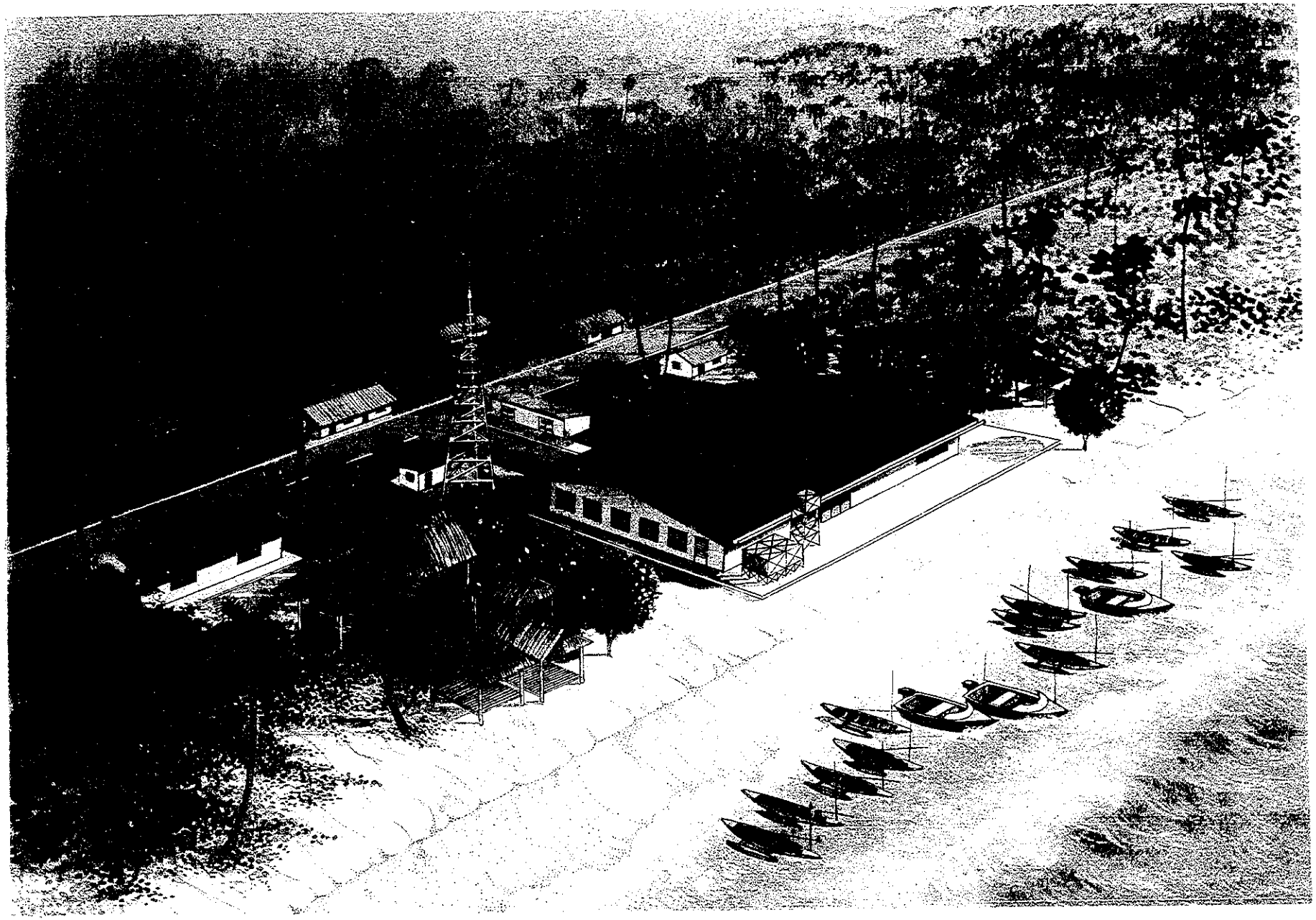
We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, Ministry of Foreign Affairs, and Fisheries Agency of Ministry of Agriculture, Forestry and Fisheries. We would also like to express our gratitude to the officials concerned of Ministry of Environment and Natural Resource Development, Island Council in Kuria, Aranuka, and Maiana, and Embassy of Japan in Fiji for their cooperation and assistance throughout our field survey.

Finally, we hope that this report will contribute to further promotion of the project.

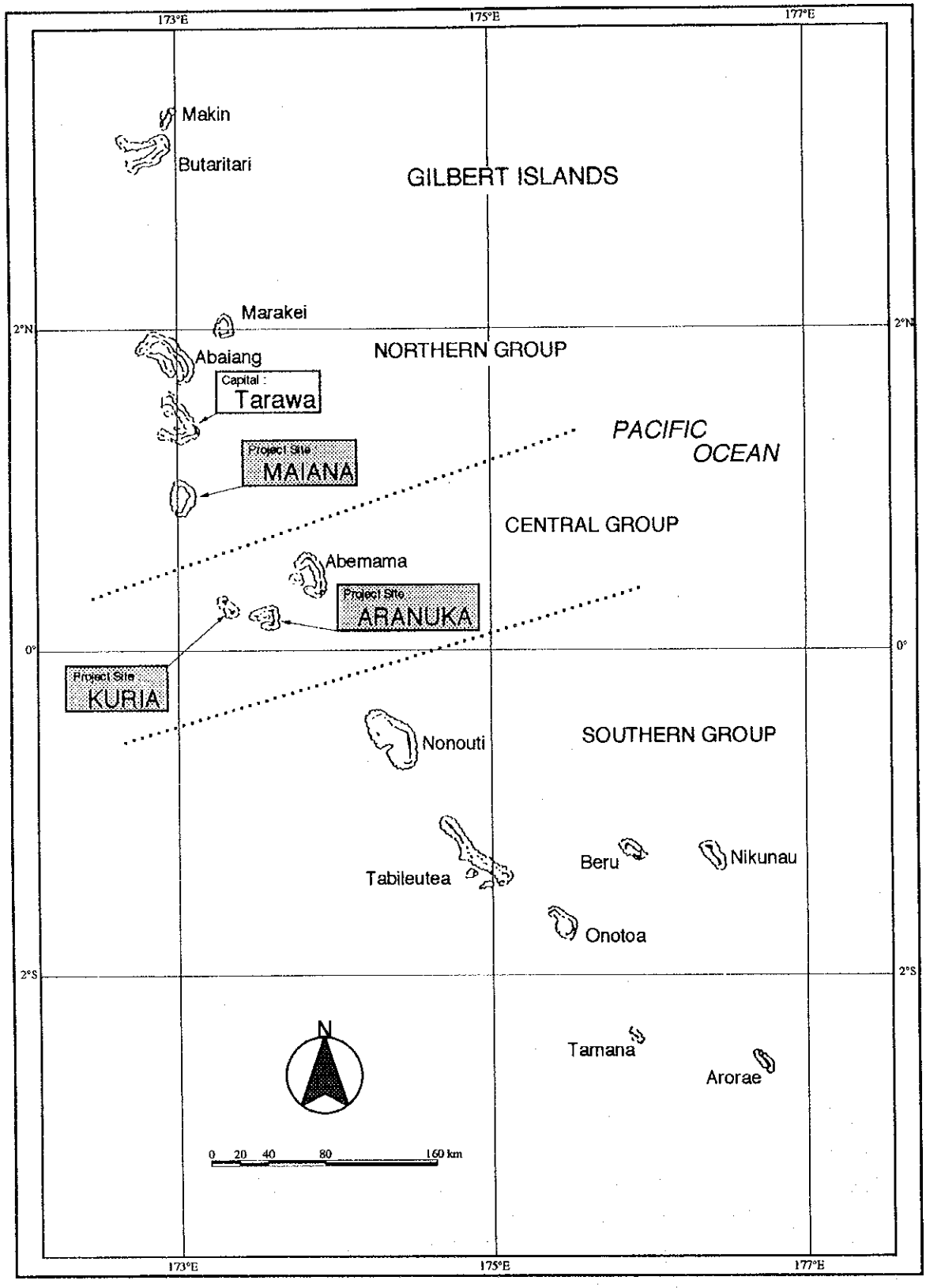
Very truly yours,



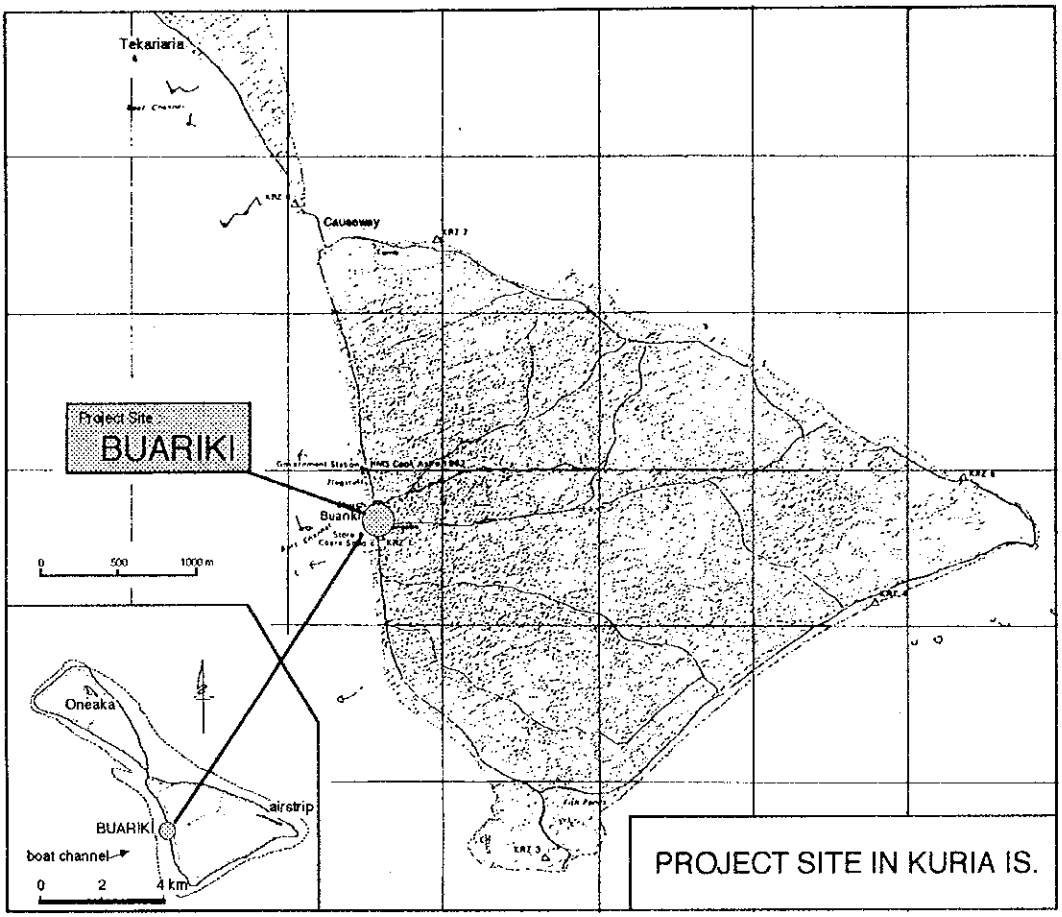
Toyomitsu Terao
Project Manager,
Basic Design Study Team on
the Project for Outer Islands Fisheries
Development in the Republic of Kiribati
(Phase II)
Fisheries Engineering Co.,Ltd.

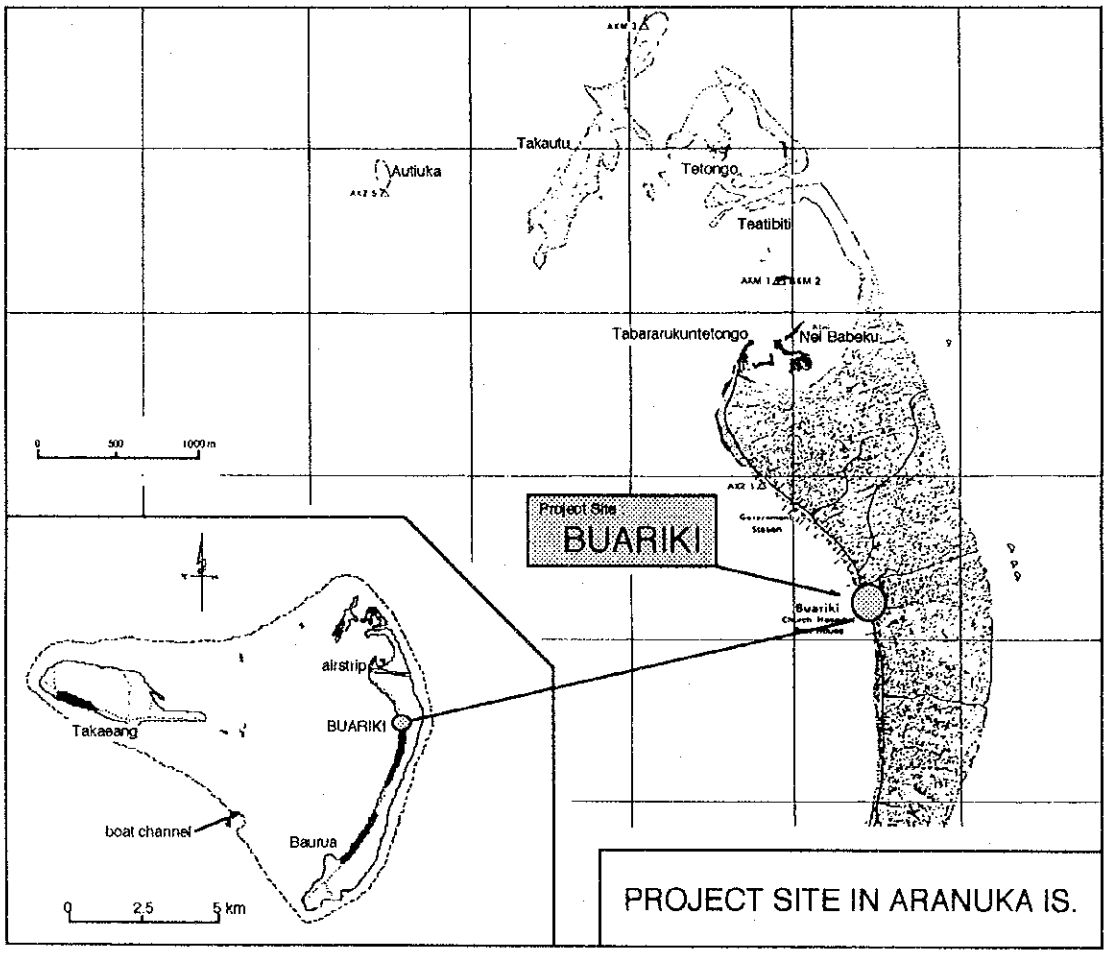


PERSPECTIVE OF THE FACILITIES



REPUBLIC OF KIRIBATI


Tekariaria
Causeway
Project Site
BUARIKI
Buariki
0 500 1000 m
Oneaka
airstrip
BUARIKI
boat channel
0 2 4 km
PROJECT SITE IN KURIA IS.


Takautu
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Tetongo
Teatibiti
Tabararukuntetongo
Nei Babeku
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Project Site
BUARIKI
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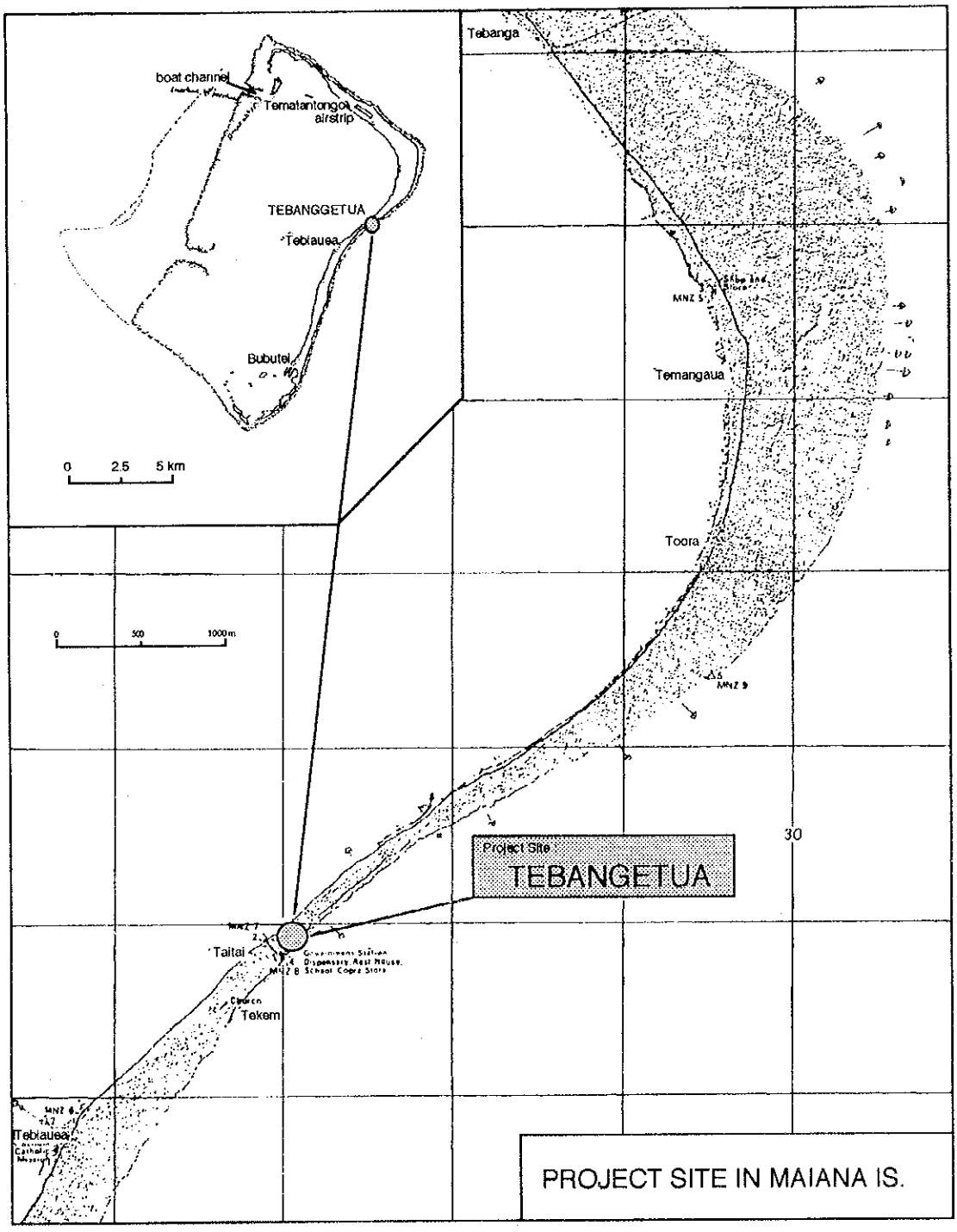
airstrip
BUARIKI
Takaeang
boat channel
Bauroa
0 2.5 5 km
PROJECT SITE IN ARANUKA IS.


Tebanga
boat channel
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TEBANGGETUA
Tebiauea
Bubutel
0 2.5 5 km
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Temangaua
Toora
MNZ 9
30
Project Site
TEBANGETUA
Taitai
Tekem
Tebiauea
PROJECT SITE IN MAIANA IS.

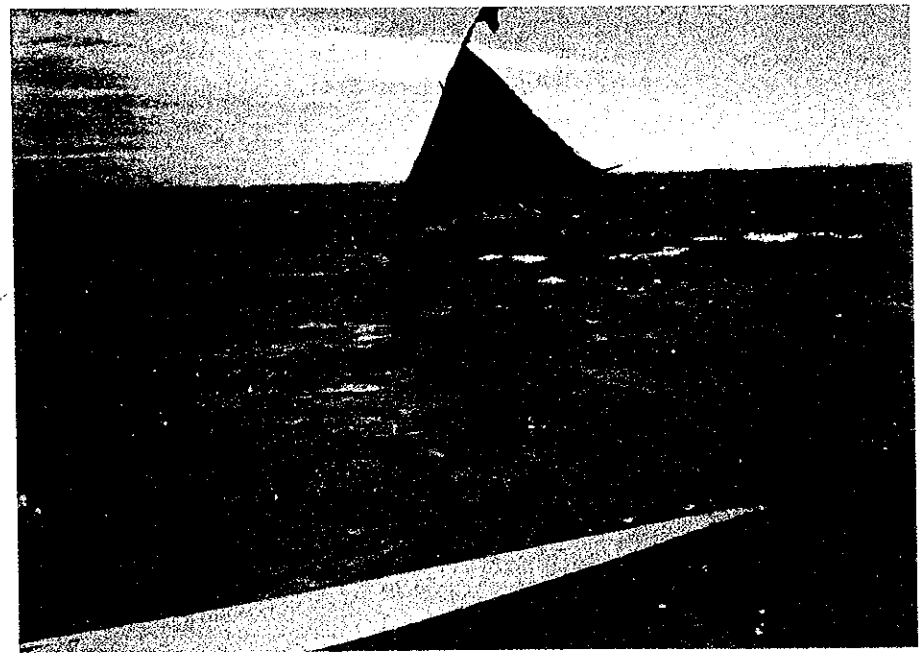
Construction site in Kuria Island

Construction site in Aranuka Island

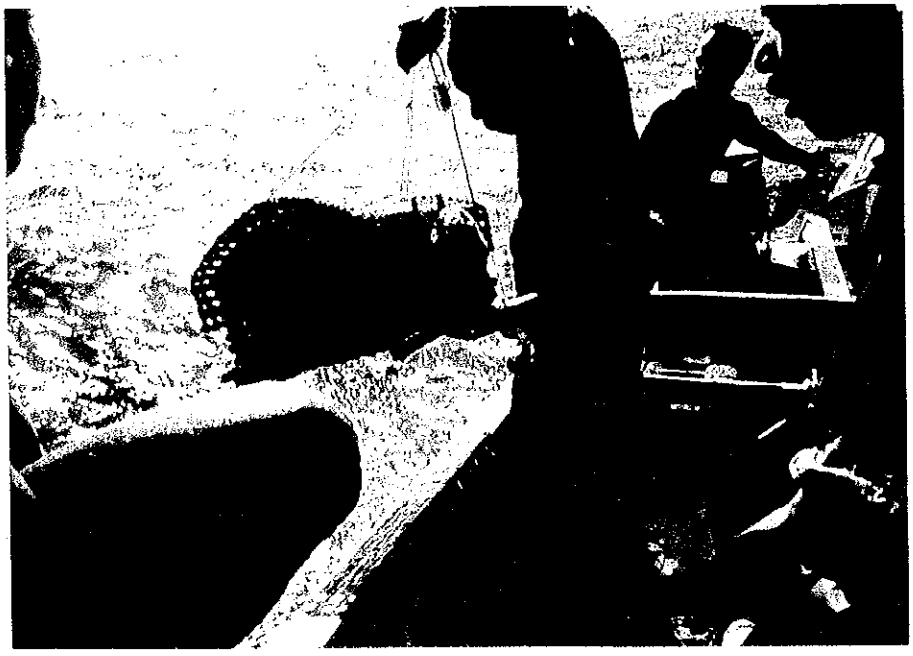
Construction site in Maiana Island

- Fisheries in Outer Islands -

Gillnet fishing at lagoon. Usually practised by paired men.



Trolling by a small canoe.



Eel fishing by traps

- Construction in Outer Islands ① -

Typical island village with water facilities

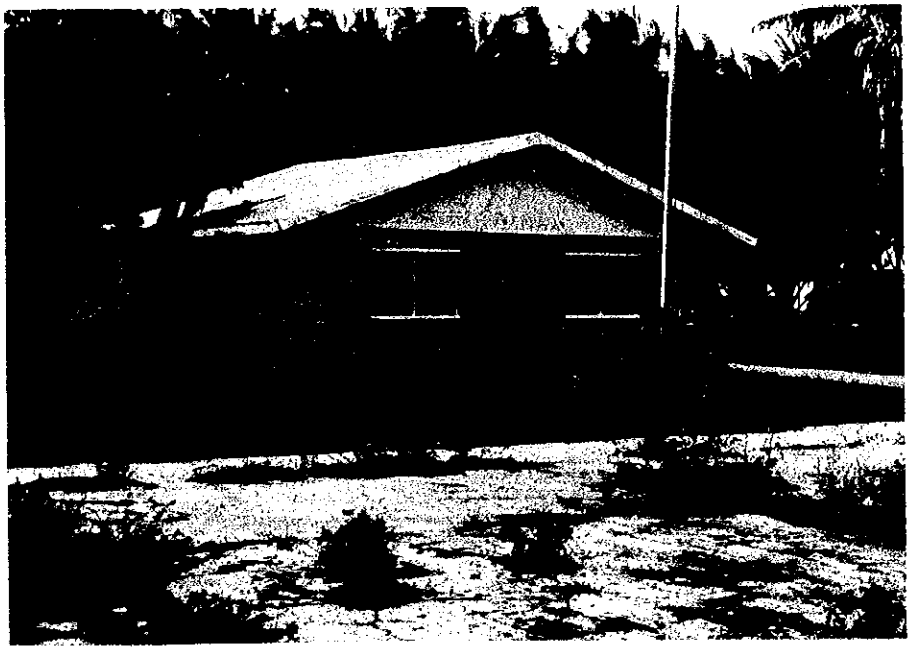
Village at lagoon side

Main road connecting villages

- Construction in Outer Islands ② -

Pandanus leaves used for roofing

Maneaba: Traditional meeting place for community use



A warehouse of an Island Council. Concrete block construction is usually rare in outer islands.

SUMMARY

The Republic of Kiribati is located in the Central Pacific, scattered across an area of some 3,000,000 Km and surrounded by a vast Exclusive Economic Zone. The country is composed of three groups of small islands: the Gilbert, Line, and Phoenix Islands. The land area is very small, totaling only 810 Km2 and, owing to its coral origins, is seriously deficient in organic matter, which seriously limits agricultural development. According to the 1990 Census, the population was about 72,000, of which roughly 93% live in the Gilbert Islands, with approximately 25,000 - 35% of the entire population - concentrated on South Tarawa, seat of the central government.

One of the core developmental policies steadfastly maintained by the Kiribati government relates to the economic development of the outer islands. Several fisheries development projects have been carried out since the 1970s, directed at the artisanal fisheries on these outer islands, based on aid from the U.K., Japan and certain other countries, which have involved the development of shore support facilities and procurement of fishery equipment and gear.

In addition to these aid-related projects, the Ministry of Environment and Natural Resources Development has been implementing its own fisheries extension program, focused primarily on the Gilbert Islands, which has incorporated the distribution of fishing gear and materials along with the diffusion of fishing and aquaculture technology. As one key phase of its policy to promote fisheries development on the outer islands, the Kiribati government has drafted a Project for Outer Islands Fisheries Development in the Republic of Kiribati (Phase II), targeted at the islands of Kuria, Aranuka, and Maiana in the Gilbert group, which is intended to strengthen the production structure of artisanal fisheries and improve freshness control and other distribution conditions for island catches. A request has been submitted to the Government of Japan for a grant-aid to implement the subject Plan.

Pursuant to this Request, the Government of Japan decided to conduct a Basic Design Study, which was initiated by the Japan International Cooperation Agency (JICA) in September, 1994. Based on a field survey and the analysis of findings, it became clear that the following aspects must be carefully considered in bringing this Plan to fruition:

(1) The populations on the three target islands of Kuria, Aranuka, and Maiana are extremely small, only 990, 1,200, and 2,180 respectively. The land area is limited on all islands, and, owing to poor soil conditions, except for coconuts, useful agricultural products are few and far between. The islands must rely on private vessels for transporting cargoes to and from South Tarawa, with the service frequency at 2-3 trips per month. The bulk of this service is unscheduled, keyed to cargo and passenger demand, resulting in occasional shortages in the supply of essential commodities. There is no significant infrastructure on the Plan islands, such as power, water supply, or transportation, to support industrial development or public welfare services. The main opportunities for cash income are limited to employment at the Island Councils, which correspond to the local government, copra trade, fisheries, real estate leasing, and overseas remittances. Although the traditional self-sufficient economy is gradually giving way to a consumption economy, island incomes remain at a low level.

(2) Fish consumption is brisk on all 3 islands, with the majority of households engaged in subsistence fishing. In addition, the number of full-time or part-time commercial fishermen is on the rise, and, in certain cases, fish business is on a par with South Tarawa. Thus, while the degree of development varies by island, commercial distribution channels are clearly evolving. However, apart from small and sporadic shipments of salt-dried and other processed products, commercial fish shipments to the thriving consumer markets on South Tarawa have not yet really begun. And so organized shipments of fresh fish from the Plan islands will have to await the development of a suitable receiving structure on South Tarawa.

With the Copra industry now approaching a ceiling, the marine products industry, which offers notable developmental potential in both the fishing and aquaculture sectors, is destined to play a major role in the economic development of the outer islands. However, at the present stage, catch preservation facilities are non-existent, while powered fishing vessels, fishing gear, and fuel are both expensive and in short supply, placing serious constraints on fisheries development.

(3) The original Request from the Kiribati government assumed that each of the Island Councils on the Plan islands would operate its own fish carrier vessel (for a total of 3 vessels in all). However, owing to qualification problems under the country's maritime system as well as budgetary constraints, it was determined

that the Councils would find it difficult to secure qualified vessel operators within a short period of time. In order then to sustain Plan operations, it is essential that a transport structure be put in place to move fuel and other items between South Tarawa and the Plan sites. Accordingly, consideration was then given to an alternate possibility of having this transport function carried out by the Nei Tewenei, a vessel that is operated by the Fisheries Division of the Ministry of Environment and Natural Resources Development in connection with its fisheries extension program. But this vessel is already 15 years old and so considerably superannuated, making it highly unlikely that it can maintain scheduled operations very much longer.

In view, therefore, of the critical importance to the outer islands fisheries development projects in Kiribati of supporting operations under the subject Plan as well as continuing the existing extension activities on a long-term basis, consideration must now be given to incorporating the construction of a replacement vessel for the Nei Tewenei into the subject Plan.

Based on the Basic Design Survey, it has been determined that the following facilities and equipment will be required to accomplish the Plan objectives:

1. Facilities :
(to be constructed on each of the 3 islands, with the following floor areas)

		Floor Area
Main Building (single-story, steel- frame construction)		300.0 m2
Ice-making room and handling area	75.0 m2	
Workshop	25.0	
Materials storage area	33.5	
Conference room	37.5	
Office	25.0	
Machinery room	12.5	
Toilet / shower facilities	12.5	
Interior corridors	75.0	
Utility room	4.0	
Drum storage area (single-story, concrete block construction)		16.0 m2

2. Small Carrier Vessel : 1 vessel

Total length	about 15.50 m
Mold width	" 4.80 m
Mold depth	" 1.90 m

Plan draft under full load		" 1.10 m
Gross tonnage		" 39.0 tons
Cruising speed		" 8.0 knots
Complements		7 persons
	(deck passengers:	15 persons)
Main engine	300 HP / 2,000 rpm	1 unit
Deck equipment, navigating and electronic instruments		1 set

3. Equipment :

(Figures show total Plan quantities for the 3 islands combined.)

Ice-makers	220 Kg /cycle, block ice		6 units
Ice storage chests	1.8 m x 1.8 m		3 units
Generators	10 KVA, diesel engines		6 units
Water intake tanks	10 m3, FRP tanks		3 units
Small fishing boats	Canoes :	about 7.1 m	25 units
	Skiffs :	about 7.0 m	7 units
	(wood construction, with safety equipment)		
Outboard motors	15 PS		33 units
	40 PS		10 units
	(gasoline-powered, with replacement parts)		
Repair tools for outboard			
	General-purpose and specialized tools		1 lot
Fishing gear and materials			
Gillnet materials	Netting length 100 m		1 lot
Hand-line gear	Lead lines, fish hooks, sinkers, other		1 lot
Trolling gear	Lure heads, hooks, other		1 lot
Underwater gear	Masks, snorkels, flashlights		1 lot
Fish handling equipment			
	90 ltr. insulated boxes, platform scales		1 lot
SSB transceivers	150 W		3 units
Pickup trucks	equipped with crane (500 Kg)		3 units

Allowing sufficient time to produce and ship the structural components and other items which are to be procured in Japan, and taking into account the fact the construction areas are spread over 3 islands, we estimate that construction of the Plan building facilities will consume approximately 10 months, including preparations within Japan as well as actual construction time in Kiribati. In addition, the period required to construct the small carrier vessel has been estimated at about 5 months, while a maximum of 5 months will also be required to procure the Plan equipment.

The Island Councils on the 3 islands will administer and operate the Plan facilities and fishing equipment. The Councils presently employ between 30 and 60 persons each, with their operating budgets for fiscal 1994 ranging from A$ 40,000 ~ 100,000.

The Plan fishing boats will be leased, with outboard motors installed, to the fishermen on the target islands, with this income to be used to defray facility operating expenses. The fishing gear and materials will be sold directly to fishermen meeting prescribed qualifications, with the proceeds to be deposited in a revolving fund. In addition to collecting taxes, issuing licenses, and other administrative functions, the Island Councils on the Plan islands are already engaged in leasing vehicles, houses, canoes, and other property as well as in purchasing fuel and fishing gear, though the exact nature of these operations differs slightly from island to island. It has been concluded, therefore, that the Councils should face no problems in taking on the Plan activities related to the small fishing boats and fishing gear.

The projected ratio of operating income from the Plan facilities to total annual Council revenues is expected to run between 10% ~ 30%. As to the balance between operating income and outgo, during the first few years, while interest income from the revolving fund is still small, a slight deficit, in the order of a few hundred Australian dollars per year, will be incurred, but the accounts are expected to be in balance thereafter.

The small carrier vessel, which is to replace the Nei Tewenei, will also be operated by the Fisheries Division. Based at Betio, in South Tarawa, it will be engaged in transporting cargoes and technical support personnel to the outer islands, including the Plan areas. The Fisheries Division has already secured the crews and operating and maintenance budgets required to operate the Nei Tewenei and, judging by its past sailing frequencies and route structure, it should be quite feasible, in our opinion, for the new vessel to initiate the movement of fuel and other fishery-support cargoes to each of the 3 Plan islands without disrupting the fishery extension program that has been carried out to date on other outer islands. It has also been estimated that no supplementary budgets will be needed in connection with the introduction of the replacement vessel.

Based on implementation of the subject Plan, it will become possible to preserve the freshness of fish catches and stabilize fish supplies on the 3 Plan islands,

while at the same time permitting fishing boats to extend the length of their trips, which have hitherto been severely limited by the lack of on-board fish preservation facilities. It is also anticipated that fish production efficiency in the target area will rise to some extent as a result of a more intensive production structure. Thus, the Plan can be expected to provide effective support, on both the production and distribution level, for local fisheries, which occupy so strategic a position in the economies of the three Plan islands. It has, accordingly, been concluded that there would be considerable significance in implementing this Plan under a grant aid from the Government of Japan.

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SECTION ONE : INTRODUCTION

1 . 1 Background of the Request

(1) History

Economic development of the outer islands that are scattered over the exclusive economic zone of the Republic of Kiribati, covering some 3 million Km, has been one of the key development policies of the Kiribati government, which it has been the focus of continuing effort since the country became independent in 1979. Since the islands of Kiribati have typically a small land area, while the soil is principally lime, with low organic content, there are only limited possibilities for agricultural development. Thus, fishery resource development in surrounding waters has been made a high priority economic target.

Although the capital, South Tarawa, is located in an area with similar natural conditions, its social infrastructure is far better developed than that on the outer islands, while there are many more employment opportunities, contributing to an active consumer economy. According to the 1990 Census, 35% of the total Kiribati population (some 25,000 persons) lives on South Tarawa, and so the densely populated capital area stands in sharp contrast to the extremely sparse populations of the outer islands. In terms, therefore, of achieving balanced national development, the economic development of the outer islands is an essential and most pressing task.

To achieve this goal, the Kiribati government has been implementing several projects aimed at developing the outer island fisheries. From 1980 to 1992, examples of these programs include: a distribution and processing project on Tarawa Island, a pilot commercial fishery project on Abemama and Butaritari Islands (based on aid from the U.K.), an outer island fishery development plan for Nonouti and Nikunau (with assistance from Japan), and a small scale fishery development plan for South Tabiteuea Island (also with Japanese aid). In connection with these projects, the Ministry of Environment and Natural Resource Development has been actively supporting outer island fishery development via fishery extension and artisanal fishery research programs, involving the distribution of fishing gear and supplies, dissemination of fishing and aquaculture

technology, assistance with fish shipments, and technical assistance in connection with maintenance of fishery-related facilities on the outer islands.

As part of the above outer island fishery development programs, the Kiribati government has drawn up a Project for Outer Islands Fisheries Development, Small Fishing Boats and Fishing Supplies, with a target area comprising Kuria and Aranuka Islands, in the center of the Kiribati archipelago, and Maiana Island, just south of Tarawa. This project is intended to strengthen the outer island production structure and improve freshness retention for catches through the provision of small fishing boats and fishing gear and supplies and the construction of ice-making and other shore-based support facilities. A request has been made to the Government of Japan for a grant-aid with which to implement this project.

(2) Outline of the original Request

Based on the Request document, the subject Outer Islands Fisheries Development Project, targeted at fishermen residing on the Plan islands, will involve the distribution of ice for fisheries use as well as fishing gear and materials, with the project to be conducted by the Island Councils that have been established on the three islands as local government organizations. The facilities and equipment requested by the Kiribati government in connection with Plan implementation comprised the following items:

---- Ice-making plants, ice storage units, generators
---- Buildings:
offices, storage areas, fish handling areas, meeting rooms, fuel oil tanks, toilets ,showers, and related facilities.
---- Water tanks
---- Canoes and small boats
---- Outboard engines and spare parts
---- Fishing gear and materials
---- Insulated fish boxes
---- Fish transport vessels
---- Safety equipment
---- Pickup trucks
---- Slipways for landing and launching small boats

1 . 2 Outline of the Studies on the Plan

A preliminary study on the subject Plan was conducted by the Overseas Fisheries Cooperation Foundation of Japan (OFCF) during November, 1994, and the findings from this survey, as summarized in the study report on the Fisheries Development in the Republic of Kiribati (PF-94-1-37), were reflected in the contents of the Request document submitted by the Kiribati government.

Upon receipt of the Kiribati Request, the Government of Japan instructed the Japan International Cooperation Agency (JICA) to carry out a Basic Design Survey on the subject Plan. JICA then dispatched a Basic Design Study Team (BDST) to Kiribati, from September 17 to October 7, 1994, under the leadership of Mr. Akihiro Mae, Assistant Director of the Office of Overseas Fisheries Cooperation, within the Marine Fisheries Division of the Fisheries Agency. This Team validated the Request contents, assessed the nature and appropriateness of the Plan, and evaluated the present status of outer island fisheries, catch distribution facilities, suitability of the Plan sites, and the Plan implementation structure. The basic understandings reached in the course of discussions between representatives of the Kiribati government and the Survey Team were compiled into a Memorandum of Discussions, which was signed by and exchanged between the parties. After completing its survey and returning to Japan, the Team analyzed and assessed the survey findings, evaluated the requirement for the Request facilities and equipment, and prepared a Basic Design on the composition, technical specifications, and quantities of the facilities and materials to be provided under the Plan.

Based on the above survey and subsequent evaluation, the BDST compiled this Report, presenting the Basic Design of the facilities, equipment, and materials that have been deemed optimum for Plan implementation, along with a project Implementation plan and project evaluation. The composition of the Survey Team, field itinerary, names of discussants, and Minutes of Discussions are included in the Annex at the back of the Report.

SECTION TWO: BACKGROUND OF THE REQUEST

2 . 1 Overview of Kiribati

2.1.1 General conditions

The Republic of Kiribati is an archipelago composed of the Gilbert, Line, and Phoenix Islands, scattered in the Pacific Ocean around the point at which the International Date Line crosses the Equator. According to the 1990 Census, total population was about 72,000, of which some 93% live on the Gilbert Islands. About 25,000 persons, roughly 35% of total population, are concentrated in the southern portion of the capital island, Tarawa. As a result of overpopulation resulting from an influx of people from the outer islands, serious infrastructure deficiencies have developed in such areas as water, power, land, and housing, compounded by various environmental problems. The country's land area is made up of low-lying atolls whose soil is primarily of lime composition as a result of the marine biology, with low organic content. Thus, apart from copra, there are virtually no agricultural products that offer prospects for foreign exchange income. On the other hand, in comparison with the country's total land area of only 810 Km2, its Exclusive Economic Zone (200 mile zone) covers an expanse of 3,000,000 Km2 . Thus, the nation is endowed with a huge marine area, standing in sharp contrast to its confined land area, which offers an abundant treasure chest of fish resources. But this vast water area is, at the same time, a divisive wall separating the many scattered islands and discouraging intercourse between them.

2.1.2 Socioeconomic Conditions

(1) Domestic GDP and Balance of Payments

Over the 10-year period of 1984-1993, the Gross Domestic Product (GDP) of Kiribati grew at a nominal average rate of about 4.5% per year. The breakdown of GDP by industrial sector shows agriculture at about 8%, fisheries at 11%, commerce at 16 - 17%, and transport and communications at 17%. But government services represent far and away the largest sector, accounting for

about 30% of GDP each year, indicating the absence of a significant industrial base for economic development.

The nation's trade balance has shown a chronic import surplus since 1980, the year following independence, a pattern which has intensified during the 1990s, with the value of imports having reached a level more than 7-8 times exports and food imports alone accounting consistently for close to 30% of total imports. However, the trade deficit is more than offset by drawing down the Revenue Equalization Reserve Fund (RERF), which was established in 1956 with revenues from the phosphate ore industry; overseas remittances; fishing fees from U.S., Japanese, and South Korean fishing vessels; transfer income, principally on economic aid account; and service accounts. Thus, the balance of payments on current account has turned favorable.

(2) Principal Industries :

The phosphate ore industry on Banaba Island formerly accounted for half of state revenues and was also the major source of foreign exchange. But, just when Kiribati achieved its independence in 1979, this resource was depleted, forcing a cessation of mining operations and causing a sudden massive 90% drop in exports, from A$ 22 million in 1979 to only A$ 2,600,000 in 1980.

In place of phosphate, the copra and fishing industries emerged as the major new props of the country's economy, with fishing activity largely centered in pole and line skipjack operations conducted by the Te Mautari fishing company, financed by the Kiribati government. However, as shown in Table 2 - 1, export earnings from these two industries are quite erratic from year to year and so do not yet constitute a stable source of foreign exchange.

Table 2 - 1 Principal Export Industries and Their Receipts
(In A$ 000)

	1987	1988	1989	1990	1991
Copra	1,173	4,203	3,127	1,023	1,625
Te Mautari Co	237	1,356	2,386	646	120
Total Exports	2,869	6,671	6,435	3,681	3,698

Source : 7th National Development Plan,
International Trade: Exports and Imports (1992)

The copra industry has consistently maintained an important position on Kiribati's outer islands as a prime source of cash income. . In fact, it is said that it was the copra trade which introduced a monetary economy on these islands. Nevertheless, in view of the annual fluctuations in both production and market prices of this commodity, it is felt that the degree of dependency on copra will now have to be reduced.

The Te Mautari Company produces skipjack and yellowfin tuna for the export market from a base at Betio on Tarawa Atoll. Throughout the 1980s, a number of aid projects were carried out by Japan and the U.K., involving the provision of a freezer and fishing vessels together with technical cooperation. As may be seen in Table 2-1 above, Te Mautari's exports at one point had grown to rival those of copra. However, as a result mainly of a slump in international prices for both skipjack and yellowfin, poor weather, and the reduced operating efficiency of company vessels, catch volume has declined sharply in recent years.

(3) National Accounts :

The changeover in core industries has also had a major impact on the country's fiscal situation. In the wake of the demise of the phosphate industry, government revenues dropped by half from 1979 to 1980, from A$ 17,500,000 to A$ 8.500,000. However, as shown in Table 2 - 2, at the present time, withdrawals from the RERF and non-tax revenues, primarily fishing fees, account for the bulk of budgeted income. In 1993, for example, fishing fees hit a new high at A$ 14,120.000, and so have become a major source of revenue for the country. In response to the increase of non-tax receipts, national revenues grew at an annual rate of 15% between 1989 and 1993, while expenditures (mainly current expenses) were held to an annual increase of only 6%, indicating that the retrenchment policy, to which the government has scrupulously adhered since independence, is still being continued.

Table 2 - 2 National Finances (in A$000)

	1989	1990	1991	1992	1993
Expenditures	22,434	22,361	25,290	26,314	27,901
Current (operating)	22,068	22,035	24,754	25,512	26,432
Developm't invest.	179	351	535	736	1,332
Loans	187	-25	1	66	137
Revenues	20,266	23,074	28,065	33,118	32,491
Taxes	8,331	9,220	10,282	10,179	11,698
Non-tax revenues	11,935	13,836	17,771	22,929	20,770
Others	-	18	12	10	23

Source : Statistical office, Ministry of Finance (1994)

2.1.3 Status of Inter-island Transport

With the exception of hand baggage shipped by air, cargoes from South Tarawa to Kuria, Aranuka, and Maiana Islands (comprising the target area for the subject Plan) are almost entirely shipped by sea. The farthest destination, Aranuka, is located about 145 Km from Tarawa Atoll.

Domestic marine transport in Kiribati is operated by the government-owned Kiribati Shipping Service, Ltd. and by such private companies as W.K.K. Enterprises and MAT Shipping Line, Ltd. As of 1991, a total of 11 passenger cargo vessels were reportedly being operated, chiefly in inter-island service, by the above companies. The information we were able to obtain on the principal specifications and destinations of these vessels is summarized in Table 2-3 below.

Table 2 - 3 Examples of Typical Inter-island Passenger/Cargo Vessels

Name of Vessels	Overall Length (m)	Main Engine (PS)	Passenger Capacity(No)	Main Destinations	Owner
Nei Moanaroi	60	750	114	Gilbert, Line	KSS
Nei Momi	42	750	56	"	"
Nei Mataburo	42	650	56	"	"
LC Tituabine	23	104x2	30	Gilbert	"
LC Nimanoa	22	104x2	30	"	"
Teitinraoi	17	300x3	100	Gilbert	WKK
MAT I	-	-	120	"	MAT

Table 2-4 shows the number of trips made during 1993 by KSS vessels to the Plan islands: Kuria, Aranuka, and Maiana.

Table 2-4: KSS Sailings

Plan Area	No. of Trips in 1993	Vessels
Kuria	16	Moanaraoi, Momi, Mataburo
Aranuka	16	Same
Maiana	16	2 LC vessels

Source: KSS (1994)

While it is estimated that all of the domestic copra and 40% of domestic general cargo are transported by private companies, no figures are available on the condition of domestic carrier vessels operated by these firms. Based on the case of the Teitinraoi, operated by WKK, their vessels offer tramp service to the Gilbert Islands: Butaritari and Makin Islands in the northern section; Marakei and Abaiang Islands, bordering the north coast of Tarawa; and Abemama, Kuria, Aranuka, and Maiana, south of Tarawa. During August and September, 1994, the number of trips by the Teitinraoi to the above islands was as shown in Table 2-5 following.

Table 2-5 Sailings of WKK Vessels
(August / September, 1994)

Name of Islands	No. of Trips
Makin	2
Butaritari	2
Abaiang	2
Marakei	3
Maiana	2
Kuria	4
Aranuka	2
Abemama	5

Source : WKK (1994)

Thus, marine transport linking the 3 Plan islands is estimated to comprise 2-3 trips a month for KSS and the private companies combined. Since the service is mainly by tramp (unscheduled) vessels to meet passenger or cargo demand, it cannot cope with shipments of fresh fish. In the case of salted and dried fish, cargo are generally flown by Air Tungaru, though volume is limited by the premium air rates, with service frequency limited accordingly.

2.1.4 The Economy of the Plan Area

Apart from copra growing, there are no industries worth mentioning on the islands of Kuria, Aranuka, and Maiana, which form the target area for this Plan. As on the other outer islands, the people on these 3 islands lead lives based on self-sufficiency, and their dietary staples are berries from breadfruit trees and taros. Since the soil poor, taro cultivation is done by digging deep enough to tap underground water (known as the BABAI cultivation method). With farming utensils inadequate and soil conditions poor, taro farming is not actively pursued. As a result, the main food sources tend to be coconuts, Pandanus nuts, and breadfruit berries, products which are suited to the natural environment.

Sources of cash income for households on the 3 target islands include employment offered by the Island Councils organized on each island, agriculture,

fishing, land leasing, and overseas remittances, with the latter said to comprise a considerable portion of cash incomes, though there are no detailed figures on incomes by source. Table 2-6 shows the number of households on each island, classified by source of income, as reported in the 1990 census. On all islands, copra trading is the main income source for most households, followed by fishing.

Table 2-6 Sources of Cash Income
(No. and % of households)

Sources	Kuria	Aranuka	Maiana
Copra	168(90)	150(89)	342(90)
Agriculture	3(2)	2(1)	10(3)
Fishing	65(35)	102(60)	145(38)
Employment	50(27)	73(43)	93(25)
Overseas Remittances			
- Nauru	10(5)	13(8)	23(6)
- Seaman	23(12)	23(14)	49(13)
No. of Households	187	169	378

Source: Report on the 1990 Census of Population (1993)

The Kiribati government, with assistance from UNDP, conducted a socioeconomic survey on the outer islands in 1990 and 1991. Based on the findings, the number of retail establishments on the 3 target islands were 8 stores on Kuria, 11 on Aranuka, and 25 on Maiana. Cooperative societies, funded by their members, are active on the outer islands. Their main business is collecting copra cargoes and the sale of basic commodities, principally food. Based on this survey, annual purchases by these coops totaled A$ 89,705 on Kuria (1990), A$ 84,662 on Aranuka (1990), and A$ 80,448 on Maiana (1991). In the case of Kuria and Aranuka, where necessities from outside are distributed principally through the coops, these coop purchases may be taken as a indication of local consumption levels. On this basis, it may be estimated that average annual purchases by household in these two islands of off-island necessities run just under A$ 500. This total excludes goods that do not pass through the coop, such as consumer durables bought mainly in South Tarawa and locally produced farm produce and fish. Of course, consumption patterns can be expected to differ between

households using their cash incomes chiefly for primary products and the families of salaried employees, such as those employed by the Island Councils, with annual earnings ranging from A$940 ~ 1,300. Nevertheless, the data show that the economies on these islands support avenge annual cash expenditures of at least A$500 per household.

2. 2 Profile of the Fishing Industry

2.2.1 Fishing Grounds Environment

Kiribati waters lie in an area where the South Equatorial Current exhibits the most stable force; they are under the influence of a westward flowing surface layer, which flows at a speed of about 1 ~ 1.5 Knots throughout the year. Surface temperatures are in a range of 28℃~ 30℃; they are lowest in February and March and highest between August and October. The central waters of the Gilbert Islands group create excellent fishing grounds for bonito (skipjack) and tuna, as can be confirmed by the operating experience to date of foreign fishing vessels.

The artisanal fisheries on the outer islands operate mainly close to shore; their primary fishing grounds are in the lagoons formed in the center of the atoll and in offshore waters close to the lagoon perimeter. In the northern hemisphere, the weather is generally stable during the summer but, in winter, particularly from about October to February, the weather is often rough, making fishing impossible, we were told, even close to shore, owing to strong winds and waves.

2. 2. 2 Fish Production

(1) Nationwide:

According to FAO catch statistics, the total fish catch in Kiribati from 1986 to 1991 ranged between 24,000 and 37,000 tons. The commercial fishery directed at bonito (skipjack) and tuna, as exemplified by the Te Mautari Company, has been depressed in recent years, and so most of the catch said to be taken by the artisanal fishery. The production of milkfish has been growing rapidly since the late 1980s, with landings in the order of 4,700 tons in 1991. In recent years, aquaculture of Kirinsai (Euchema alverezii) has been spreading in the shallow

outer lagoons, and this species is attracting attention as a promising new source of foreign exchange. Total exports of Kirinsai totaled A$ 723,000 in 1990 and A$ 676,000 in 1991 and have already surpassed those of depressed skipjack and tuna.

(2) On the 3 Plan Islands:

On the 3 islands of Kuria, Aranuka, and Maiana, which comprise the target area for this Plan, as on the other outer islands, the bulk of households are engaged in fishing. These households may be divided broadly into two groups: those that rely on subsistence fishing for their own consumption; and those that earn income from either full-time or part-time fishing activity. According to the findings of a recent survey on artisanal fishing conducted by the Outer Islands Department of the Fisheries Division, as shown in Table 2-7, the total number of households engaged in fishing activity in some form represented 84% of all households on Aranuka, 86% on Kuria, and 97% on Maiana, indicating conclusively that fishing forms an integral part of life on the outer islands. The proportion of fishing households fishing on a commercial basis (either full-or part-time) was 65% on Aranuka, 50% on Kuria, and 16% on Maiana. Thus, while subsistence fishing thrives on all islands, a considerable number of fishermen fish on a commercial basis, either full- or part-time, from which we may presume that fish distribution channels have developed to some extent on these islands.

Table 2-7 Profile of Fishing Households

Plan Site	Kuria	Aranuka	Maiana
Artisanal Fishing Survey: (Statistical Year)	1994	1994	1993
Total Households (No.)	197	185	399
Fishing Households	169	156	386
Fishing /total households	86%	84%	97%
in full-time	19%	38%	6%
in part-time	29%	27%	10%
in subsistence	50%	35%	84%

Population Census: (Statistical Year)	1990	1990	1990
No. of Households			
Total households	187	169	378
Households w/canoe or small boat	85	120	178
No. of Canoes/Boats			
Traditional canoes	85	144	186
Improved canoes	1	0	1
Canoes/boats with outboard motors	9	9	10
Total Boats	95	153	197

Source: Fisheries Division (1994) ; Census (1990)

The disparity in fishing conditions is also apparent in the Population Census, conducted in 1990. The proportion of fishing households owning one or more canoes or small boats was 71% in Aranuka, 45% in Kuria, and 47% in Maiana, while the motorization ratio was 6%, 9%, and 5% respectively. As the traditional type of wooden vessel, canoes are widely used in these islands but, with a total length typically of only about 4 m, they are extremely limited in the amount of gear and crews that they can carry. In addition, excluding Aranuka, half of the households on the other two islands do not yet own a fishing boat, while the low motorization rate on all 3 islands indicates that fishing effort is confined to already established fishing grounds, leaving fishermen very little leeway to develop, expand, or even select their grounds.

On Kuria, Aranuka, and Maiana Islands, we conducted a field survey on the present state of their fisheries, including interviews with fishing families. There were very few differences in fishing methods on these islands.

In Table 2-8, we have summarized the main fishing methods and grounds used, as revealed through our survey.

Table 2-8 Principal Fishing Methods and Grounds in the Plan Area

Fishing Methods	Target Species	Fishing Ground	Comments
Hand line	Reef fish	Lagoon	Most common method
Trolling line	Tuna/skipjack	Open sea	Mainly full-time fishermen
Surrounding gillnet	Reef/surface fish	Lagoon	Subsistence fishing
Underwater (spear gig)	Octopus/lobster	Reef barrier	Mostly young fishermen
Trap fishing	Sea eel	Open sea toward shore	Unique device observed

The hand-line method is most generally used, principally on the reef or near its edge, with the main grounds selected through experience. Depths do not exceed 100m, while target species comprise mainly long-nose emperor, grouper, and other reef fish.

Troll fishing is accomplished in two ways: by manipulating the sail of a small canoe and directed at small pelagic species inside the lagoon; or using outboard-powered vessels directed at somewhat larger tuna and skipjack. Full-time fishermen operate in the open sea and so their catches, even from the inner island, have good commercial value.

While the drift gillnet fishery may sometimes use canoes, the most general method is to fish in pairs (2 fishermen without boat) in distant shallow lagoons, then proceed directly to the sea and take the fish in round nets.

With the underwater method, the fisherman dons underwater goggles and flippers and spears the fish with a fish spear (gaff). This technique has taken firm root among South Seas island countries as the most efficient fishing method. In the Plan islands, it is mainly directed at octopus near the reef barrier .

Trapping is presumably a traditional fishing method, and considerable skill is said to be required to build the traps and set the bait properly. The traps are made of hardwood branches, called ironwood, a tree of the goosefoot family. This wood, though small in size, can also be used as framing in walls, roofs, and windows in one-family houses. Traditional building and bait-setting techniques are handed down within each family and considered family secrets. It is seen as a breach of manners for an outsider to look at the trap, particularly the place where the bait is

attached. The fishing grounds for this method are near the edge of the reef. When set, the trap is normally marked with a piece of wood; it is left in the water for one day and retrieved the next. In Kiribati, trap-caught sea eel and cultured milkfish (based on extensive aquaculture) are highly prized as exceptional fish.

2.2.3 Fish Distribution

(1) Catches and Distribution in Islands

Almost all of the fish landed on the outer islands are for the fishermen's own consumption or for sale within the island. Expect for small amounts of pork and poultry eaten on festive days, fish is the most valuable source of animal protein in the islanders' diet. As already discussed, subsistence fishing is very active, pursued by the bulk of the island population, though the number of full- and part-time commercial fishermen operating in ocean waters is also relatively large. Catches are distributed on the commercial market, so that fishing is well established as one of the few occupations available on the islands. Table 2-9 presents data on the volume of fish catches and sales on the 3 Plan islands.

Table 2-9 Fish Catches and Sales

Plan Site	Kuria	Aranuka	Maiana
Catch volume (tons/week)	6.1(1983) 8.8(1991) 13.7(1994)	6.6(1984) 5.2(1994)	37.3(1986) 8.0(1993)
Average volume (t/w)	9.5	5.9	37.3
Average % of sold fish	49.5%	28%	3.5%
Average sales vol.(kg/day)	671	235	186
Incomes of full-time fishing households (A$/week)	56.7(1994)	57(1994)	22.1(1993)

Note: Applicable years shown in parentheses.

Source Small Scale Fisheries in the Gilbert Group of the Republic of Kiribati (1986) ,Statistics of the Fisheries Division (1990, 1994), Socio-Economic Profile of Kuria (1991)

The above table indicate a sharp drop in the catch volume on Maiana from 1986 to 1993. However, considering the high proportion of subsistence catches on this island, the lack of alternative supplies of animal proteins, and the relatively stable population, these figures may not necessarily reflect true conditions on Maiana.

While it was difficult to secure on accurate grasp of catch levels on these islands, in view of seasonal variations and changes in daily weather conditions, judging from the findings of our field interviews and historical data from the Fisheries Division, the sales figures shown in Table 2-10 may be considered fairly close to actual conditions. If the above estimates are correct, among the 3 Plan islands, Kuria has the highest proportion of commercial fish sales. This may be attributed to the almost total lack of lagoons on the island, making it difficult to satisfy needs via small-scale subsistence fishing, as well as the penetration of a relatively well-developed money economy based on such factors as land sales to outsiders and overseas remittances to Kuria residents. In Maiana, on the other hand, the volume of fish distribution is lowest among the 3 islands, indicating that the proportion of subsistence consumption is quite high, reflecting the large lagoon areas, a shallow, gently sloping shelf that is relatively conducive to fishing, and the weak economy in comparison with the other 2 islands. Conditions on Aranuka may be considered midway between Kuria and Maiana.

(2) Fish Shipments to South Tarawa:

There are, at present, only sporadic shipments of fish products from the 3 Plan islands to South Tarawa. There are, however periodic fish shipments to Tarawa from Abemama Island, adjacent to the northeastern corner of Aranuka, which totaled some 25 tons from 1992 through July, 1994. On the other islands, including the 3 Plan islands, a few fishermen ship surplus fish catches, such as processed salt-dried products and crustaceans, off the island on an irregular basis, via scheduled air services and inter-island vessels, for sale through the Fisheries Division or relatives or friends living in the target markets. However, fish shipments of this sort to South Tarawa are exceedingly small and unstable at best, and so this business has not yet developed into a secure source of income on the outer islands.

(3) Fish Demand on South Tarawa:

According to an earlier Fisheries-Related Market Study of South Tarawa (1984), conducted by the Fisheries Division, it is estimated that, subject to some annual variation, 60-100 tons of fish per week are landed on South Tarawa. This study reveals that, despite the high proportion of subsistence fishing households on South Tarawa, as on other islands, about 80% of all households on South Tarawa are estimated to buy fish products on the commercial market to some extent, subject to variations in the volume and frequency of purchases. We gathered that the local fish market is quite active, reflecting the large number of salaried workers in this area.

Although only about 16% of the fishermen on South Tarawa are full-time or part-time commercial fishermen, they account for 44% of total landings. The bulk of these catches are either consumed by fishermen households or sold to consumers through family members. Sales are made almost exclusively in fresh form, with consumers evidencing a decided preference for freshness. Ice use is limited at all distribution stages, including landing, and, with the exception of sales outlets on Betio under the Outer Islands Fishery Project, ice is rarely seen at the 100 or so outdoor stalls, where fish is typically sold along the road out of fish boxes, using scales.

Apart from the Te Mautari company, which sells frozen skipjack at A$44,00 / kg (A$0.20 / lb), prices at OIFP outlets and open stalls are virtually standard, at about A$0.80 / lb, with only slight variation in terms of freshness or species.

According to the annual Survey of Small Scale Fisheries by the Fisheries Division, catch volume has shown little change over the past 10 years, with only minor variances from year to year. Several estimates exist for total fish consumption in Kiribati, but the figure given in the 1984 market study on South Tarawa, showing per-capita fish consumption of 0.45 Kg / day (164 Kg / year), is believed to be quite close to present consumption levels. On this basis, with the current population on South Tarawa at 25,280, annual fish demand may be estimated at about 4,000 tons.

Considering the fact that fresh fish prices are stable at a high level, with little variation in terms of freshness or retail outlet, as well as the brisk sales of frozen skipjack at low prices, it seems clear that, apart perhaps from prime fishing seasons, fish demand in South Tarawa is running ahead of supply. However, it

must also be noted that, as shown above, fish distribution methods on this island remain at relatively primitive levels, as indicated by the heavy reliance on outdoor stalls, which, according to the 1984 market survey, presently account for 53% of fish purchases, followed by 35% bought directly from fishermen and only 5% from proper stores. Thus, organized distribution networks have not yet been established. Under the OIFP, there is a movement to develop distribution channels for fish catches from the islands, but only about 700 ~ 1,000 Kg / week are actually sold though these OIFP channels.

Under the Small Scale Fisheries Development Plan, implemented during fiscal 1992 with economic cooperation from Japan, a Fisheries Center has been established in the Bairiki area of South Tarawa as a new fish distribution base, along the lines of OIFP. While high hopes are held for this facility, the Center had only just been opened in October, 1994, and so no performance data were yet available. In light of the present conditions, it has been determined that the development of fish shipments from outer islands to South Tarawa must now enter a pilot stage, geared to the expansion of distribution channels in this market.

2 . 3 Development Plans

2.3.1 National Development Plans

In the course of six National Development Plans, the Kiribati government has striven to provide an essential minimum of public services to its people, mainly in the following areas : socioeconomic programs to attain economic self-sufficiency, improvement of government services, development of marine resources, tourist development, infrastructure improvements, family planning programs, promoting development on the outer islands, a broader range of educational and training programs, and expansion of energy and water supply. However, it has not yet succeeded in closing the widening gap in living conditions between urban areas and the outer islands.

Under the 7th National Development Plan, prepared for the period 1992 - 1995, the key to a self-supporting economy in Kiribati is seen to lie in the organized development of natural resources with which the country has been endowed. In the fisheries sector, therefore, the Plan clearly sets its basic objective as establishing sustainable production of these fishery resources by both

commercial and artisanal fisheries, with commercial fisheries seen as the main prop of the Kiribati economy. This development is geared toward providing the people with edible fish while satisfying their nutritional needs, and development policy places a priority on commercialization of the fisheries, cultivation of export markets for fish products, fishery training, improvement of fishing techniques, fishery administration, resource conservation, and increased investment in related infrastructure.

2.3.2 Development Plan for the Outer Islands

Island Development Plans were drafted in 1991, also with the assistance of UNDP (which supported the socioeconomic study stated in section 2.1.4), as development programs for the outer islands, including the 3 target islands for this project. The Plan points out various problems in the target islands in such sectors as agriculture, fisheries, public health and welfare, education, transportation, and energy. Establishment of various types of facilities and introduction of technology have been set as development objectives over the Plan period: 1991 - 1995. In the agriculture sector, it is specifically planned to create seed farms, kitchen (home) gardens, and pig raising facilities while upgrading poultry farms. In the fishery sector, the plan is to establish revolving funds for procuring gear and materials, improve fishing techniques, develop milk fish aquaculture, establish pelagic fish-breeding grounds, and introduce ice-making and cold storage facilities.

These Island Development Plans were prepared with the cooperation of the Island Councils on the various islands. While each island was shown to have its own peculiar problems, certain socioeconomic constraints were found to be common to all islands. The specific problem areas in the economies of the 3 Plan islands are summarized in Table 2-10 below.

Table 2-10 Constraints on Economic Development

Sector	Problem Areas
Agriculture	- Growing dependence on foodstuffs procured from outside the island - Lack of interest in cultivating new crops beyond the traditional ones - Shortage of seeds - The alkaline soil derived from coral is not suitable for agriculture - Lack of cultivation technology
Fisheries	- Shortage of gear and materials - Improvement needed in fishing technology for high-value species - High prices of fishing vessels, engines, gear, and materials - Deficiency of fish processing technology - Lack of cold storage facilities for catches - Lack of a fish market
Transportation	- Lack of fishing port facilities (jetties, lighthouses) - Breakdowns frequent owing to a lack of skills and facilities for vehicle maintenance - High price of vehicle replacement parts - Danger of canoe transport (in Aranuka) - Irregularity of transport causes shortages in everyday products.
Energy	- Lack of public lighting facilities impairs activity in local communities. - Fuel is high-priced and in short supply.

Source: Island Development Plans for Kuria and Aranuka (1991);
Maiana Island Development Plan (Draft)

On all of the outer islands, including the three Plan islands, infrastructure is still primitive in terms of power, water supply, and transport, as required for industrial development and public welfare services, placing major constraints on socioeconomic development.

Although the subsistence economy is breaking down in response to the penetration of a money economy, commercial distribution channels for copra, fish products, and other primary products remain limited, while employment opportunities are in short supply, keeping islanders incomes at a low level. In order to promote regional development, there is nothing more vital than infrastructure improvement, but this is no easy task in view of the large public investment required.

2.3.3 Related Plans

Shown below are representative examples of the principal operating plans that have been implemented by the Kiribati government, based on economic cooperation from other countries, in connection with fisheries development on the outer islands. While these programs are not directly related to the parameters of the subject plan, they can be positioned as similar precedents. In addition, considering the fact that, among the fisheries extension programs presently being conducted by the Fisheries Division, assistance on catch shipments has been concentrated on the outer islands shown below, the subject Plan has been positioned parallel to these projects.

Table 2-11: Related Plans

(1)	**Project Title:**	**Fisheries Development Plan**
	Year of Implementation:	1979
	Target Islands:	Tarawa (Betio)
	Project Cost:	¥500 Million
	Supporting Country:	Japan
	Plan Contents:	Training vessel, ice-making and cold storage facilities, equipment and materials

Remarks: Although the ice-making and cold storage facilities, after 14 years of use, are now superannuated, the buildings and other facilities are now being used as fish sales outlets for the OIFP. Two ice-makers, with a capacity of 250 Kg / 10 hours, processing equipment, and fish boxes are being sourced out of the national budget. While this is one of only a few public organizations receiving catches from the outer islands, transaction volume is still limited.

(2)	**Project Title:**	**Pilot Project for Commercial Fisheries**
	Year of Implementation:	Since 1987
	Target Islands:	Abemama, Butaritari, Abaiang
	Project Cost::	Unknown
	Supporting Country:	U.K.
	Plan Contents:	Quick-freezing equipment, freezer, ice-making equipment, generator, fishing materials, and other items

Remarks: The original objective of this project was to commercialize island fisheries, but this has not been achieved. A reappraisal was done in 1990 but, since Abemama Island is the most active location for the Fisheries Division's assistance program on fish shipments, the operation continues under a different form.

(3)	**Project Title:**	**Outer Islands Fisheries Development Plan**
	Year of Implementation:	1990
	Target Islands:	Nikunau, Nonouti
	Project Cost: •	¥145 million
	Supporting Country:	Japan
	Plan Contents:	Ice-making facility, canoes, outboard motors, other items

Remarks: These facilities were completed in March, 1990, and full operation has been started since mid of the year. By fish shipping records to South Tarawa, though some fluctuations were observed, it was shown that, at the largest, fresh fish of 2 to 3 tons was shipped to OIFP.

(4)	**Project Title:**	**Development Plan for Small-scale Fisheries**
	Year of Implementation:	1992
	Target Islands:	South Tarawa, South Tabiteuea
	Project Cost::	¥211 million
	Supporting Country:	Japan
	Plan Contents:	On South Tarawa: -- Ice-making plant and other items On South Tabiteuea -- Warehouse, Canoes, outboard motors, fishing gear, and other items for both islands

Remarks: The facilities on South Tarawa started operating in October, 1994 after the completion of construction work in March, 1994. As the operating organization, a fishery cooperative was formed, being funded by individual dues of A$ 50.00, and as of mid-October, the cooperative had 120 registered members and anticipates a future rise to 500 members. As one of the distribution bases for fish products in South Tarawa, high expectations are held for this new organization, but whether it will have any reserve capacity for receiving outer island catches will presumably depend on supply and demand conditions in South Tarawa.

2.3.4 Outer Islands Fishery Development Operations

The Ministry of Environment and Natural Resource Development has been conducting fishery extension programs as a means of assisting small scale fisheries on the outer islands. According to the Draft Report from the Fisheries Division for 1993, the main contents of these programs are as follows :

1) Fisheries assistants are dispatched to various islands to arrange operations between the Fisheries Division and the Island Councils. As of November, 1993, these Assistants had been sent to a total of 17 islands. Vacancies exist on 3 islands : Kuria, Tamana, and Banana, with 9 assistants currently undergoing training to fill these openings.

2) Construction of pelagic breeding grounds.

3) Sale of fishing gear to Island Councils, employing a revolving fund set up to provide gear and other fishing materials. This fund was set up during the 1980s with A$20,000, under a grant from the Canadian government, and has evolved into a revolving fund for the sale of fishing gear, mainly to fishermen on the outer islands. The gear inventory in this fund, as of the end of 1993, totaled A$28,378.

4) Conduct pilot aquaculture for seaweed (kirinsai).

5) Conduct studies on milkfish fry.

6) Gather fishery statistics for the outer islands. Statistics have been collected for 19 islands, including the number of fishing households, number of fishing vessels, and catch volume at 5 year intervals.

7) Assistance with fish shipments to South Tarawa.

8) Assisting Island councils in their fishery-related activities.

In addition to the above, assistance has been provided to the Island Councils on such islands as Abemama and Nikunau in connection with the maintenance of ice-making and generating facilities operated by these Councils.

To carry out these programs, the Fisheries Division operates the vessel, Nei Tewenei, for transporting and marketing catches and moving personnel to and from their stations. The assistance program in connection with shipping catches to South Tarawa, which is being implemented as part of these fisheries extension activities, is run on a basis very similar to a consignment sales program, with shipments made by air or via the Nei Tewenei and cash settlement made mainly through [sales of] fishing gear.

Sales of catches consigned to the Fisheries Division in South Tarawa are made principally through OIFP outlets or by the Te Mautari Company. Although the scale of operations is still small, while a distribution system from shipment through sale has not yet been developed, this activity is regarded as one of the few public businesses currently supporting fish shipments from the outer islands.

Nikunau and Nonouti islands provide examples of this type of fishery support. The facilities on these islands were constructed with economic cooperation from Japan during fiscal 1990 and opened in 1992. The principal facilities include ice-making plants, with a daily production capacity of 1 ton, powered by a 20 KVA generator. The installations on both islands are reported to be run by the local Island Councils, though, on Nonouti, no evidence was found in the Council ledgers of any ice plant operation. Transport of fishery products to South Tarawa through these facilities is supported by the Fisheries Division as one of its OIFP activities. The volume of shipments in 1992 is shown in Table 2-12.

Table 2-12 Shipments of Fish Products to South Tarawa in 1992 (Unit:Kg)

Facility	Period of Shipments	Volume of Shipments/Sales
Ice plant at Nikunau	June	2,100
	July	910
	August	810
	September	1,100
	October	3,300
Ice plant at Nonouti	June	1,106
	August	1,300
	August	1,203

Source : Fisheries Division (1994)

No figures are available for 1993 on these facilities. In 1994, one shipment of 1,532 Kg from the Nonouti ice Plant was reported for June. The other islands which the Fisheries Division has been assisting since the 1980s with fish shipments include: North and South Tabiteuea, Abemama, Butaritari, and Tamana.

Following is a profile of the Fisheries Division vessel, Nei Tewenei:

(1) Principal specifications :

Steel vessel, 16 years old, built in Australia in 1979--
Total length: 15.4 m
Total width: 4.8 m
Depth: 2.1 m

Main engine: Cummins 200 PS (refitted, along with navigational instruments, in 1992 with aid from OFCF.)
Speed: 9 knots
Crew: 7 persons

(2) Cruising record:

1992: 21 trips in 11 months
1993: 20 trips
1994: January~ July : 12 trips

In September, the vessel took on water after an accident at Betio Port and is presently undergoing dry-dock repairs at a Betio Shipyard.

(3) Operating objectives :

---- Resource studies (shellfish, seaweed)
---- Pilot operations and training with longline and bottom fishing gear
---- Construction of a pelagic breeding area
---- Transport of fish from Nikunau, Nonouti, Butaritari, and Abemama
---- Outer island fisheries surveys
---- Movement of Fisheries Assistants
---- Distribution of fishing gear

The flooding accident occurred at around 10 AM on September 15, 1994. The area that took on water is just below the crew's quarters. The exterior hull plates had become thin, owing to rusting, which caused a hole to develop, with a diameter of about 2 cm, through which the crew quarters and engine room were flooded. The subject vessel is presently anchored in Betio Port. Because of the shallow depth, the vessel touched bottom quickly, minimizing the seriousness of the accident. The repairs will take about 6 weeks, and the cost is expected to run about A$30,000, including a regular inspection.

2 . 4 Situation of the Plan Sites

2.4.1 Natural conditions

(1) Meteorological Condition's

The three islands comprising the Plan area ---Kuria, Aranuka, and Maiana --- belong to the Gilbert Island group, the westernmost of the three island groups making up Kiribati. Kuria and Aranuka are in the Central Gilberts, lying just below the equator, while Maiana, like the Tarawa Atoll, belongs to the North Gilbert group.

Kiribati is dominated by a marine tropical climate. Since there are no weather stations on any of the 3 Plan islands, detailed climatic data are not available, and

so we have applied the observations from the weather observatory (station) at Betio, in South Tarawa, which is relatively close to the Plan sites.

a) Precipitation:

Monthly rainfall data, for 1992 and 1993 as obtained from the Betio weather station, are shown in Appendix II. Annual rainfall to totaled 2,792 mm in 1992 and 4,363 mm in 1993. While this would seem to indicate a considerable difference from year to year, according to the Station chief, 1993 was an unusually wet year. And, based on our interviews on the Plan islands, we gather that rainfall is less there than on South Tarawa.

b) Temperature and Humidity:

Monthly date from the Betio station for the same two years on average, high, and low temperatures as well as average relative humidity are also presented in Appendix V. Average monthly temperatures are constant throughout the year at about 28℃, with a daily temperature variation of about 10℃ at most. Relative humidity is high, at 70 ~80%.

c) Winds:

Kiribati is close to the equator and is dominated by trade winds. While wind patterns vary by year, in South Tarawa, generally speaking, the prevailing winds throughout the year are from the NE and SE, mainly from the east. From October to February, in particular, owing to atmospheric disturbances, gale winds occasionally develop, accompanied by rain, which may have an impact on fishing activity.

(2) Oceanographic Conditions :

There is a tidal monitoring station at the connecting bridge in Betio port (South Tarawa), equipped with a self-registering tide gauge, which was installed with the assistance of the University of South Australia. Tidal observation data from this facility can be used but, as no such equipment is installed on the Plan islands, comparable data are not available. Although detailed figures on tidal levels are not required to design the Plan facilities, during our field study, we validated the beach lines at high tide, comparing tidal levels in each island with the tidal tables

for Tarawa. While the visual observations covered only a short period, we believe that there are no significant tidal differences between the Plan sites and Tarawa.

2.4.2 Infrastructure

There is no commercial power supply on any of the Plan islands. The power source for telecommunication equipment for liaison with South Tarawa is solar generators, with light cells of about 1.2 m x 1.2 m. On Aranuka, solar generators are in use with light cells of about 0.5 m x 1.0 m to power the water pumps for wells built under a UNDP aid program (Outer Island Community Water Supply Project). Small portable generators are employed for lighting and the pumps for water tanks in toilets and showers in the public dormitories operated by the Island Councils. Private homes generally use kerosene lamps for lighting purposes.

Water mains do net exist on the Plan islands. Although small tanks for collecting rainwater were seen on the galvanized iron roofs of some homes and public buildings , the general practice is to rely on well water, fed by natural water about 2 m below the foundation surface. The water quality is generally highest the closer the well is to the center of the island, with saline content increasing with proximity to shore.

2.4.3 Profile of the Plan Sites

(1) Kuria Island

Kuria Island, situated about 134 Km SSE of Tarawa and about 26 Km NWW of Aranuka, is composed of 2 islands: Buariki and Oneke. These two islands are very close to one another and were, in fact, formerly connected by a causeway but, presently, they are joined by a 10 m bridge. The total length of the two islands combined is about 9 Km . The total land area is 15.48 Km2, with somewhat greater depth than other outer islands. There are 4 villages on Kuria, with the total population reported to be 990.

The annual average rainfall is recorded at 1,352 mm, but some months are totally dry, with periods of drought also experienced. Cargoes and passengers from South Tarawa are carried by Tungaru Air, which offers 1-2 flights per week, while Kiribati Shipping and privates lines provide 1-2 sailings per month. In view of the

small number of aircraft, Tungaru Air often flies only once a week, and so scheduled service cannot be expected. In terms of shipping services, Kuria has virtually no lagoons, with promontories of 200 ~ 300 m forming the boundary of the outer reef. Thus, relatively large cargo vessels must wait at the edge of the outer reef, without shutting down their engines, moving cargoes to and from land via skiffs or canoes.

The Plan site on Kuria is located at Buariki, the island's largest village, which is the center of administrative services and other activities, such as Council offices, inn (hotel), clinic, tennis court, and telecommunications facilities. There is a channel in the outer reef about 500m west of the site, with carrier vessels from outside the island either entering this channel or heaving to near its entrance.

We also investigated, as a candidate Plan site, an area in Tanginimake, some 1.5 Km north of Buariki, close to the bridge to Oneke Island. But the bridge was just completed in June, 1994, replacing the former causeway. Thus, the waters east and west of the causeway have now been joined, raising concern over a possible future change in topography resulting from currents flowing under the new bridge. In addition, this alternate site is detached from the village, causing logistical concerns over the smoothness of Plan operations after completion. For the preceding reasons, the aforementioned Buariki location was deemed more appropriate.

The Plan site has a area of 55 m x 75 m, sandwiched between the west bank and Kuria's main road, with the parcel confirmed to be under Council administration. The shoreline in front of the property is sandy beach, but, with a height differential of about 1 m between the beach line and shore, and considering the presence of normal vegetation at the shoreline, no erosion danger is anticipated.

(2) Aranuka Island

Aranuka is located some 145 Km SSE of Tarawa and is composed of 2 main islands and 7~8 tiny uninhabited islands. The island area is only 11.61 Km, with a lagoon area of 35 Km2, making it the fourth smallest island in the Gilbert group. There are 3 villages, with a total population of 1,002, but some 60% of the islanders live in Buariki. Annual rainfall is about 1,200 mm, with particularly high precipitation between February and June. There is an airport on the island, with

planned service of 2 flights per week, but, owning to a shortage of aircraft, flights to this island as well are mostly on a once a week basis. Shipping service is offered by Kiribati Shipping and private carriers, with schedules of about 1 ~ 2 calls per month, but service is generally uneven, in response to variations in passenger and cargo demand. Although port facilities are undeveloped, since the lagoon is relatively deep, boats are able to drop anchor about 50 m from shore during high tide.

The Plan site is situated at Buariki, the most thickly settled area on Aranuka, which is at the heart of island administration and activity, containing the Council office, clinic, police station, inn, and telecommunications facilities. A channel has been opened in the lagoon some 4 Km from the site, enabling small carrier vessels to enter the channel and drop anchor just offshore. The Plan site has an area of 40m x 48m, compressed between the main island highway and the lagoon shoreline, with the entire neighborhood owned by the Island Council.

Buariki has a maximum elevation of about 6m above sea level, making the foundation rather high at places, and the Plan site too evidences a slight downward slope from the road to the lagoon, with a height differential of about 1 m at the beach line. There is presently a local-style lodging on the site, used by fisheries extension staff and others connected with the Council, but we have received assurances that this structure will be removed in the course of Plan implementation.

(3) Maiana Island

Maiana is located some 45 km south of Tarawa and is, therefore, the closest of the 3 Plan islands to Tarawa. The atoll has a long, narrow bow shape, running 31 km from north to south, with a total area of 16.72 km2.

On the west side of the island is a large lagoon with an area of 122 km2. The island comprises a total of 13 villages; with the exception of one at the southern tip, all are on the mainland. Population is 2,180, with 529 in Bubutei, the largest village. In accordance with the 1989 North Line Islands resettlement policy, 46 inhabitants of Maiana were moved to Tabuaeran (Fanning) and Teraina (Washington) Islands. Annual rainfall on Maiana runs about 1,200 mm, with a dry season extending from July to September.

As in the case of the other two islands, cargo and passenger service between Maiana and South Tarawa is offered by both Tungaru Air and marine carriers. Scheduled air service is not likely in the foreseeable future. Kiribati Shipping makes 16 trips a year and private companies 1-2 per month. The airport runway is paved with gravel, with a length of only 220 m, and so must be improved. With mooring facilities undeveloped, vessels drop anchor in the lagoon at least 500 m from shore, transporting cargoes back and forth via non-powered skiffs and canoes.

The Plan site is located in the virtual dead center of the island at Tebanngetua, which is the center of administration and services, containing Council offices, offices for fishery extension workers, a clinic, telecommunications facilities, and lodgings. The Council leases the entire property. Beacons are installed on the lagoon side of Tebanngetua, at a distance of about 500 m from shore, . Carrier vessels from Tarawa anchor in this area, making it the transport base for the island.

Two candidate Plan sites were offered, separated by about 100 m on the north and south by a small cluster of private residences. While there was little to choose from between them in terms of natural topography, the southern site appeared to have been leveled in the past, with an outcropping of rocks and a tree cover, including mangroves, and so was judged to be undesirable as a building site. We, therefore, selected the northern parcel, lying between the main road and the lagoon, with an area of 45 m x 25 m. At the lagoon shore in front of the site, during ebb (neap) tide, the beach line recedes some 100 m from shore, leaving a sandy beach on which one can walk a considerable distance offshore, but, at high tide, the beach line encroaches upon the site.

Since it would be difficult to obtain large retaining rocks, while , with a mere leveling operation, coral sand could be washed away at low tide, it will be necessary, for the Maiana phase of the Plan, to do simple embankment work to secure (protect) a portion of the site.

2 . 5 Environmental Conditions

Laws and regulations in Kiribati relating to environmental preservation and development are primarily contained in the following acts and ordinances: Plants

Ordinance (1976), Kiribati Port Authority Act (1990), Foreshore and Land Reclamation Ordinance (1969), Public Utilities Act (1983) and Fisheries Ordinance (1977). Thus, no single piece of legislation yet governs the area of environmental protection. In 1991, the Kiribati government established an Environmental Unit within the Ministry of Environment and Natural Resource Development, which is preparing an administrative organization and is reviewing the existing related laws and ordinances listed above (cf., Preliminary Report on Environmental Law in 1992, issued by this office.). All permits and licenses for ground preparation, construction, and sanitary equipment work, as provided for in the above ordinances, are issued by the Island Councils.

Buildings already exist in the vicinity of the Plan sites on all 3 islands, and, with the exception of Maiana, coconut palm trees are found on the parcels. On Aranuka, large breadfruit trees are seen in the north central part of the site, but environmental standards can be fully met by locating the access road and drum storage area on the south side of the property. Private homes are found in the vicinity of the Plan sites, and so, when determining the construction sites for sewage soaking pits at the Plan facilities, it will be necessary to obtain advance approval from the Island Councils with respect to such factors as distances from wells and the shoreline.

SECTION THREE: CONTENTS OF THE PLAN

3 . 1 Basic Concepts of Plan

3.1.1 Need and Appropriateness of the Plan

(1) Socioeconomic Conditions on the Outer Islands

According to the 1990 Census, the population of the three islands forming the target area for this Plan were : 990 for Kuria, 1,002 for Aranuka, and 2,180 for Maiana. Since all of these islands have only a small land area, with poor soil quality, apart from coconuts, they yield few useful agricultural products. While a subsistence life-style has prevailed for many years, at the present time, opportunities to earn cash income are increasing, such as through employment on the Island Councils, agriculture, fisheries, land rental, and overseas remittances, and this consumption economy is increasingly dominating island life. Among the sources of cash income, the major activity, involving the most households, is copra sales, followed by fishing. Copra production has traditionally occupied an important position as an industry providing a cash commodity, but coconut growing is heavily affected by rainfall, while the copra trade is easily influenced by international commodity markets, with market prices in recent years quite sluggish. As a result, dependence on copra sales in family budgets has been inevitably declining from former years.

Although statistics shedding light on the islanders' standard of living are not available, judging by the value of purchases of consumer staples from outside, it may be estimated that potential cash expenditures average about A$500 per household per year. And judging by the price level in 1993, this amount would allow the purchase of 1,280 Lb (582 Kg) of rice (at A$0.39 / Lb) or 1,315 Lb (597 Kg) of flour (at A$0.38 / Lb) [these are both South Tarawa prices]. Considering that average household size runs 5.7 persons, cereals are just about the only products that island families can buy with this income, meaning that it would be well nigh impossible for them to purchase any other items that are not grown on the island, such as dairy products, sugar, oil, or other food or non-food staples.

The reality is that the average level of island incomes is still quite low and so still far below that required to cope with the consumption life-style that is developing with the penetration of a money economy.

(2) Economic Development and the Role of Fisheries on the Outer Islands:

Infrastructure on the 3 Plan islands is still undeveloped, with electricity, water, and transport inadequate to support industrial development or public welfare, and this situation places serious constraints on social and economic development. For purposes of outer island development, along with improvements in agricultural and fishery production techniques and the supply of related materials, there is also a need for seed farms and home vegetable gardens, the development of ponds for milkfish cultivation, and the establishment of ice-making and cold storage facilities. Given the ever increasing dependence on foodstuffs and general merchandise procured off-island, these islands are hard pressed to find ways to restore former levels of self-sufficiency, while increasing incomes from agriculture and fisheries by providing the above facilities and materials.

Life divorced from fishing is inconceivable on the outer islands, with subsistence fishing active on all islands. While the bulk of households on the 3 Plan islands are engaged in fishing activity, there has been a substantial growth in the ranks of commercial fishermen --- both full- and part-time --, and it is worthy of mention to note that, in certain islands, the ratio of cash catches is already equivalent to that on South Tarawa. With copra production now close to peaking out, expectations are running high on these islands for developing fisheries, whose resource base will support growth in both the fishing and aquaculture sectors.

Surrounded on all sides by the sea, the country's fishery potential is vast, particularly in terms of developing ocean fisheries, but, under present conditions, the outlook is tempered by a lack of preservation facilities for coordinating supply and demand for fish catches, along with the high cost and short supply of fishing vessels, outboard motors, fishing gear and materials, and fuel.

In the absence of commercial power, there is an immediate need for generators. This and many other infrastructure deficiencies on the Plan islands are expected to impose a variety of constraints on the operation of related support facilities, which in turn will require careful consideration in facility design and operational planning.

Nevertheless, implementation of the subject Plan, which is intended to develop outer island fisheries through the establishment of ice-making and other facilities as well as the supply of fishing materials, is deemed to be all the more essential in light of the above conditions.

(3) Fiscal Circumstances:

The national budget of the Kiribati government has been consistently balanced, showing a surplus of revenues over expenditures, thanks to a policy of fiscal stringency, as evidenced by a supreme effort to control wage costs. Since the depletion of phosphate ore resources at the end of the 1970s, withdrawals from the Revenue Equalization Reserve Fund, fishing fees, and other non-tax income have been the prime sources of national revenue, exceeding tax receipts. However, we gather that the government has tried its best not to rely on these resources, which can be termed heteronomous in nature (i.e., subject to outside forces), holding instead to a policy of achieving a self-supporting economy through promotion of domestic industries.

Developmental investments have been kept under tight control and, though the level of such investments in 1993 was double that of 1992, they remained nonetheless under A$ 2,000,000. According to the original Request, the cost of the facility construction and material supply programs under the Plan was estimated at 350 million yen (about A$ 4,600,000 at an exchange rate of ¥76/A$). However, in view of the difficulty of securing the implementing funds under the fiscal circumstances already described, it would be difficult to secure funding for project implementation.

(4) Appropriateness of Grant Aid Cooperation:

The direct beneficiaries under this project will be artisanal fishermen in the sparsely populated target area. Including subsistence fishing, virtually all residents of the Plan islands have a life-style that is deeply involved with fishing, and so this Plan may be seen as having substantial public service overtones. One of the most pressing tasks in connection with the economic development of the outer islands is that of eliminating the disparities in living conditions between South Tarawa and the outer islands, and the subject Plan will contribute significantly to this end. Based on the above considerations, we have concluded that it would be appropriate to implement the Plan on the basis of grant aid

cooperation from Japan. Accordingly, we have prepared the Basic Design on the assumption that such a grant aid will be forthcoming, based on the following assessment of the Plan outline and implementation structure.

3.1.2 Partial Amendment of the Original Request

As a result of the discussions during the field survey with local organizations, certain modifications were made in the original Request submitted by the Kiribati government from the standpoint of both need and operating convenience. The oil tanks included in the original Request document were changed to drum storage areas, while the 10m wide slipways for landing small boats were eliminated. In addition, a new request was made for SSB transceivers as shore stations for communicating with the transport boats. It was also decided that consideration would be given to the need for incorporating a fixed anchor and other protective facilities for the transport boats for use during periods of bad weather.

In the original Request, 3 fish carrier vessels were included on the presumption that each of the Island Councils on the Plan islands would operate its own vessel. However, to economize on manpower costs, the plan was to have regular staff members of each Council undergo training as vessel operators, but it later became clear that, under the existing maritime system in Kiribati, at least 40 months would probably be needed to qualify novice trainees. In addition, it would be a heavy burden on the Councils, in terms of labor cost, to recruit already qualified operators from outside, making this a very difficult option from a budgetary stand point. Accordingly, considering the fact that, based on economic cooperation from the Japanese government, the Plan facilities and equipment would be delivered at a fairly early stage, we were forced to the reluctant conclusion that it would be impossible, in practice, for the individual Councils to develop their own transport capabilities in time.

In order to maintain Plan operations, a vital requirement will be the ability to transport oil and fish products on a regular sailing schedule (of whatever frequency). At this juncture, we begun to consider, as an alternative public agency to the Council for transport services, the Fisheries Division in the Ministry of Environment and Natural Resource Development, which presently operates the Nei Tewenei as an adjunct of its fishery extensive programs and already assists in transporting catches from various outer islands to South Tarawa. One major

advantage of putting the transport phase of Plan operations in their hands would be that the Island Councils would thereby be relieved of the financial burden of operating and maintaining their own captive vessels. On the other hand, care would have to be given to the need to prevent disruptions in the present schedules of the Nei Tewenei, if the Fisheries Division were to launch the new transport services to the 3 Plan islands, as required for this project. The Nei Tewenei is already superannuated and so reaching the end of its useful life, meaning that it will not be feasible for this vessel to maintain regular sailing schedules much longer.

As a counter plan, we could consider having the Fisheries Division operate a separate carrier vessel that would be of sufficient size to devote itself exclusively to making the requisite number of trips to and from the 3 Plan islands. However, under present conditions, it would simply not be possible, from a budgetary standpoint, for the Division to operate two vessels simultaneously, since it is felt that unreasonable pressure should not be placed on either its budget or staff and that the long-term viability of the fishery extension program for the 3 Plan and other islands is of prime importance to the country's Outer Islands Fishery Development Program. As a result of the above considerations, as a substitute for the original Request, we are examining the possibility of incorporating the construction of a replacement vessel for the Nei Tewenei into the subject Plan/

In Table 3-1 following, a comparison has been drawn between the option of delegating the transport function under the subject Plan to the Fisheries Division, as opposed to the 3-vessel Island Council system proposed in the original Request.

If the Fisheries Division is selected for this project, the home port for the carrier can be shifted from the outer islands to Betio, thereby eliminating the requirement for special bad weather mooring facilities.

Table 3 - 1 Comparison of Operating Conditions for the Transport Vessel Options

	Using Council vessels	Using Fisheries Division Vessel
1. Suitability for Plan :	Can provide controlled transport services in response to fish collection conditions on the various islands	Since its present vessel (Nei Tewenei) is already engaged in fishery extension programs, apart from catch collection, it cannot provide a carrier service dedicated solely to the 3 Plan islands.
2. Fish shipping method:	Would buy a limited range of species and offer the requisite transport services	Consignment sales.
3. Operation structure:		
Personnel	Required personnel will be difficult to recruit.	Qualified personnel are already deployed.
Budget	Apart from wages, fuel and other miscellaneous expenses can be covered for a tramp (irregular) operating schedule. No operating subsidies can be expected.	Budgets have been obtained in the past for an operating year of some 200 days/vessel, though the budget is unlikely to defray simultaneous operation of 2 vessels. There is no requirement for this operation to break even (i.e., cover costs).
Operating days	Maximum trip length is about 3 days.	The existing vessel is capable of making trips of up to 2 weeks' duration.
4. Home base:	There are no port facilities in the Plan islands, so that all vessel inspections must be performed at Betio. Mooring conditions are particularly poor at Kuria, and so a sheltered mooring would have to be provided during inclement weather.	Since the home port of the Fisheries Department Vessel is already at Betio, no new port facilities would be required.

3 . 2 Objectives

Economic development of the Outer Islands has consistently been one of the key development policies of the Kiribati government since the country gained its independence in 1979, and, over the years, various high-priority projects have been carried out, aimed particularly at fisheries development. In recent years,

with assistance from Japan, shore facilities to support the fisheries have been built and fishing materials supplied on such outer islands as Abemama, Butaritari, Nonouti, Nikunau, and South Tabiteuea.

Implementation of these projects has also involved the distribution of fishing gear and materials, diffusion of fishing and aquaculture technology, assistance in fish shipments, and various fishery extension programs, such as technical assistance in maintaining fishery-related facilities. The subject Plan, which has been drafted as part of these outer island fishery development policies, is targeted at the three islands of Kuria, Aranuka, and Maiana. It involves the construction of ice-making and other shore support facilities as well as the provision of small fishing vessels and fishing materials, with a view toward improving distribution conditions, such as maintaining the freshness of catches and strengthening the production structure of outer island fisheries.

3 . 3 Consideration of the Request

3.3.1 Review of the Requested Facilities and Equipment

In this section, we shall assess the need for the facilities and related equipment, as shown in the Plan Request received from the Kiribati government.

(1) Ice- making Facilities:

No ice-making facilities have yet been established on any of the 3 Plan islands, though such plants have been introduced successively on other islands in the Gilbert group, such as Nikunau, Nonouti, Abemama, and Abaiang, where distribution facilities already exist and ice demand is high for shipping surplus catches to South Tarawa. The need for ice is fully recognized by fishermen on the 3 Plan islands, but, since ice is not yet available, fishing grounds and operating times are being limited to avoid a loss of freshness.

In order to sustain lengthy operations, fishermen have had no alternative but to process catches on board their vessels into salt-dried products, despite the resulting loss of commercial value. Thus, ice-making facilities are clearly necessary to permit ice packing for both on-vessel and landed catches. In

addition, it is of prime importance that a generator be included in the Plan to operate the ice plant along with an ice storage unit to store ice as required.

(2) Buildings and Incidental Facilities:

In the Request, the building facilities deemed necessary for the subject Plan included an ice-making room, handling area, workshop, materials storage area, conference room, office, machinery room, toilet / shower room, and a draw storage area.

1) Ice-making rooms:

As the Plan sites are all situated on the shore, with a view to preventing rust and maintaining production efficiency, the ice-making facilities should preferably be installed indoors. We are, therefore, planning an ice-making room to house each installation.

2) Handling areas:

Space must be allowed for building the ice storage area, ice movements into and out of the storage area, ice sales, fish sorting by fishermen, weighing, packing catches in fish boxes, and ice repacking operations. These areas will also be used, as required, to wash fish and fish boxes.

3) Workshops:

There are no repair facilities for outboard motors on the Plan islands. While this situation is due to the current low penetration of outboard motors, the number in use will increase as result of Plan implementation, creating a need for repair facilities. Anticipating also spot repairs on ice-making equipment and other items, a workshop should be included in the Plan facilities.

4) Materials storage areas:

This area will be used to store mainly fishing gear and materials, outboard motors, and fish boxes.

5) Conference rooms:

On all 3 Plan islands, assembly halls (known as Maneaba) already exist for meetings and other functions However, in these traditional structures, it is difficult to keep out wind and rain, white lighting facilities are also lacking. We are, therefore, planning to provide a multi-use conference room on each island as a meeting place for Council committeemen and staff, community functions, and extension activities conducted by the Fisheries Division of the MENRD, such as training courses in fishing gear and methods and in pilot seaweed cultivation.

6) Offices:

An office is planned at each facility to provide space for gear and ice sales, leasing of small fishing boats and outboard motors, and employees concerned with facility administration.

7) Machinery rooms:

A machinery room is required on each island to house mainly a standard generator, which will power the ice-making equipment as well as oil tanks.

8) Toilet/shower rooms :

According to the 1990 Census, flush toilets were installed in only 6 private homes on Kuria, 3 on Aranuka, and 11 on Maiana. In addition, flush toilets are found in public dormitories and other facilities. We plan to install flush toilets and showers for users of the Plan facilities.

9) Drum storage areas :

Gasoline and light oil are both shipped in from South Tarawa in drums. Since light oil is not sold at controlled prices, depending on distribution conditions, prices on the outer islands can run considerably higher than in South Tarawa. It will be necessary to source the light oil for the Plan pickup truck and generator by direct shipment via a carrier vessel. Although a small fuel tank has already been installed on each of the 3 Plan islands and is operated by the Island Council, since the fuel is shipped in drums, these tanks would be inconvenient to use. At the present time, drums are stored in the open air, which causes rusting, and the resulting deterioration in fuel quality would have an adverse effect on the

generators. We plan, therefore, to provide a drum storage area, completely enclosed with a roof, as a fuel storage facility on each island.

10) Exterior and other facilities:

Space will be provided for the various operations connected with the loading and unloading of catches and general merchandise on the shore side of the facilities as well as an unfloored concrete area for storing the Plan canoes and small boats, when beaching is required. And, on Maiana, an embankment will have to be built to secure space for foundation work and protect part of the Plan site. The lack of port facilities on all three islands creates various problems in loading and unloading cargo as well as in boarding and debarking passengers from cargo vessels of the Kiribati Shipping Company (KSS) and other lines presently offering inter-island transport services. At Aranuka and Maiana, cargo ships are anchored in deep water within the lagoon, while, on Kuria, which has no lagoons and so directly faces the sea beyond the outer reef, the vessels anchor at sea. As result, canoes must be used to carry goods and passengers back and forth between the moored cargo vessels and shore. In the case of the small carrier vessel as well, which is to be included in the subject Plan, since mooring jetties will not be built, loading and unloading operations will follow established patterns.

(3) Small Carrier Vessel:

As shown in Section 3.1.2 (" Partial Amendment of the Original Request "), the Plan will provide for the construction of a replacement vessel for the Nei Tewenei, which is currently operated by the Fisheries Division, based on the alternative plan in the Request. Considering the fact that KSS and private shipping companies offer only unscheduled services at present, it is essential to future Plan operations that an independent (captive) means of transport be secured, particularly for fuel shipments.

(4) Equipment:

1) Water intake tank:

There is no municipal water service on any of the 3 Plan islands. Accordingly, a water intake tank and an elevated water tank must be provided for water storage

and distribution, to be supplied from existing wells and rainwater, in order to secure water for the ice-making facilities as well as miscellaneous uses.

2) Small fishing boats:

Canoes and skiffs are included in the Request. Ownership of fishing vessels is still low on the 3 islands; on Kuria and Aranuka, in particular, half of all households do not own a boat. It is, therefore, indispensable, for purposes of supporting fish production, that the diffusion of fishing vessels be stimulated.

3) Outboard motors:

Gasoline-powered outboard motors have been requested to power canoes and skiffs. Motorization on the three islands is still below 10%. Although motors are strongly desired by local fishermen, they cannot afford them because of their high cost.

4) Fishing gear and materials:

Fishing gear is in short supply not only on the outer islands but even in South Tarawa, and so it is considered very meaningful to include gear in this Plan. It is desirable that a system be established to make gear and other expendable supplies available locally, so that fishermen do not have to travel to Tarawa to obtain them.

5) Fish boxes:

Fish boxes have been included for sorting catches, packing ice, and transport. On South Tarawa, which has an active consumer economy, fish is not generally sold in stores; the practice is sell fish individually, by measure, at roadside directly from fish boxes mounted on bicycle-drawn carts. Demand for fish boxes is understood to be strong even on the outer islands but, based on the 1990 Census, their penetration is still quite low, with 2 boxes reported on Kuria, 3 on Aranuka, and 10 on Maiana.

6) Safety equipment:

When rigging the small fishing boats to be provided under this plan, we intend to include such safety equipment as lifejackets and sun mirrors in case of unexpected accidents.

7) SSB equipment:

These items have been included in the Plan to permit communication between the 3 islands and the Fisheries Division in Tarawa as well as the carrier vessel. After completion of the facilities, this equipment will also be indispensable in connection with placing orders for and shipping fuel, exchanging information on catch shipments, coordinating extension programs run by the Fisheries Department, and making arrangements for facility and equipment maintenance.

8) Pickup truck:

A pickup will be required to move gear and ice from the Plan facilities to island villages and carry catches back from the villages, as well as to move personnel.

3.3.2 Scope and Quantities of Plan Facilities and Equipment

(1) Ice-making Facilities:

1) Ice-making Units:

Ice demand on the various islands has been estimated on the basis of fish sales volume and the ability of fishermen to purchase the ice. Daily fish sales volume, combining both full-and part-time fishermen, is highest on Kuria (671 Kg) and lowest on Maiana (186 Kg). Even assuming that the entire fish catch would use ice for freshness retention in a volume equal to that of the catch, based on Japan's previous experience with similar projects in Kiribati, such as those on Nonouti and Nikunau Islands, the scale of the ice plants on the 3 Plan islands would still fall below the 1 ton/day production capacity of the ice-making units previously installed.

The sales value of fish landed by full-time fishermen runs A$ 8.10 per day on Kuria and Aranuka, vs. about A$ 3.20 on Maiana. Ice selling prices on other islands, including South Tarawa, are understood to range from A$ 0.20~0.25 / Kg, except at the aquaculture facilities belonging to the Fisheries Division and on

Nonouti Island, where prices are only A$ 0.10 / Kg. Based on these figures, it is clear that ice is a high-priced commodity for local fishermen. In our interviews with fishermen during our field survey, it was established that monthly cash expenditures by full-time fishing households, in almost all cases, were in the order of only A$ 20~30. And, in response to our question as to how much they could afford to spend on ice supplies, while explicit replies were not forthcoming, we got the impression that current spending levels could not be greatly exceeded.

Considering, then, the purchasing power levels on the islands, and setting the daily amount that fishing facilities can disburse for ice at 5 ~ 10% of fishing income, while assuming an ice price of A$ 0.2/Kg, the amount each household can afford to spend on ice may be projected at 2.0~4.1 Kg /day on Kuria and Aranuka and 0.8~1.6 Kg on Maiana. Table 3-2 projects fish sales, affordable purchases of ice for fish use, and general ice demand, by island, assuming a demand of 1 Kg/ month per household for non-fish use.

Table 3-2 Projected Ice Demand, by Plan Island

Plan Site	Kuria	Aranuka	Maiana
Total Households (No.)	197	185	399
Fishing Households (No.)	81	101	62
a) Fish Sales (Kg/day)	671	235	186
b) Affordable Ice Purchases for fish use (Kg/day)	247	308	74
c) General Ice Demand (Kg/day)	10	10	20

Taking the lower of the above figures for (a) fish sales volume and (b) affordable purchases of ice for fish use, we have estimated total potential ice demand in the Plan area. On this basis, ice demand works out to about 260 Kg/day on Kuria, 250 Kg /day on Aranuka, and 100 Kg /day on Maiana.

Turning next to the shape of the ice to be produced, the options include block ice, flake ice, ice cubes, and plate ice. For this Plan, we will specify block ice, since it is slow to melt and easy to preserve, with a wide range of applications. And, given the absence of water supply in the Plan areas, which makes fresh water a precious commodity, and the need to make equipment specifications as simple as

possible, in view of the lack of skilled technicians, we have deemed it optimum to specify a block ice-maker, since water use is relatively low, while, structurally, it is the simplest of all possibilities and does not require automatic water feed equipment, like other types. Although the production process using a block ice unit is relatively time-consuming, since the ice cans most be filled and thawed manually, the other advantages more than outweigh this inconvenience, making the block type equipment the clear favorite.

The block ice-makers generally in use have production capacities of at least several tons per day, but smaller models of a few hundred Kg/day are also available. The smallest standard ice block weighs 11 Kg, with production capacity determined by the number of cans in the ice-making tank. In the case of the smallest standard block ice unit, the capacity is 20/ 11-Kg cans.

While it is possible to obtain ice-makers with a tank size below this level, if the ice tank capacities, and thus the freezer capacities, are set strictly on the basis of the above demand estimates, the possibility arises that pump and compressor specifications will differ from island to island. In the subject Plan, in the interest of maintenance convenience, priority will be given to standardizing equipment specifications as much as possible, and so we feel that the best way to cope with the different demand levels is to adjust the number of operating days for the ice-making units.

We have, accordingly, decided to use the 11 Kg / 20 can ice-maker on all Plan islands, with a planned production volume of 220 Kg per ice-making cycle. As will be seen below, a generator will have to be installed to operate each ice-maker, and since the Plan sites are located inside the villages, consideration must naturally be given to noise pollution. Thus, the plan is to operate the ice-makers only during daylight hours, shutting them down at night.

In order to respond to temporary increases in ice demand during peak fishing periods and to allow for unforeseen breakdowns and maintenance, we will install two ice-makers of identical capacity to permit either alternate or simultaneous operation.

2) Ice Chests:

The capacity of the ice chests will be sufficient to store several days' production. The maximum storage capacity will be 1~2 tons, and this need can be met with the smallest available prefabricated unit (1.8 m x 1.8 m). The Plan is to in install ice chests of identical capacity at each site. An adequate insulation thickness of 100 mm will be provided. A coolant (refrigerant) will not be installed.

3) Generators:

We plan to specify 2 generators for each ice-making facility so as to assure a power supply when one unit is out of service, owing to a breakdown or repairs. Thus, the generators will be used primarily for ice-making use. Diesel engines will be specified so as to hold fuel costs to an absolute minimum. The rated generating capacity will be about 10 KVA, the minimum size for a diesel unit.

(2) Buildings and Incidental Facilities:

1) Ice-making rooms:

As already noted, we plan to install two block ice-making units at each Plan site, with a daily production capacity of 220 Kg each. In order to simplify the insertion and removal of ice cans into and from the ice tank, a high wooden floor will be required around the tank. Size specifications for a 220 Kg block ice-maker vary by manufacturer; in some models, the refrigerator and ice-making tank form an integrated unit while, in others, they are detached. But, in either case, we are estimating the surface dimensions at about 3.0 m x 1.3 m, with additional space to be provided for deploying ice-making cans during ice removal operations. For this purpose, a drain board will be installed in this space to facilitate floor washing. Combining the installation area with the space for inserting and removing ice cans, the total floor area requirement has been set at 32.76 m2.

2) Handling areas:

This space will house one 1.8m x 1.8m ice chest for storing ice and will be used for ice entries, removals, and sales, sorting of catches, weighing, and repacking fish boxes with fish and ice. As discussed in the previous section, maximum daily fish flow, while varying by island, can be projected in the range of 200~600 Kg. With the fish boxes planned at 90 liters, and taking into account fish sizes and ice weights that are capable of being carried manually, the approximate handling

requirement will be equivalent to 7~20 boxes. The required floor space, then, will be at least 54.06 m2.

3) Workshops:

The operations to be performed at the workshops will include dismantling and repair of outboard motors and partial repairs on the ice-making facilities. Both specialized and general-purpose tools will be provided for outboard repairs. An operating table and 3 platforms for mounting outboard motors will be placed in this area, along with shelves for storing tools and parts. After allowing suitable operating space around the outboard platforms and placement of the above fixtures, the floor space requirement will be set at about 23.46 m2.

4) Materials storage areas:

These areas will be used principally to store fishing gear and materials, outboard motors, and fish boxes, with the gear and boxes to be kept on shelves. A crossbar, securely mounted, will be installed to store the outboards. Allowing for the shelves, outboard storage space, and work space for hauling operations, the total floor area should be about 40.5 m2.

5) Conference rooms:

These rooms will be designed to accommodate Council committeemen on the 3 Plan islands (6-13 persons), along with related staff members, as well as for holding general meetings.
Figuring on a conference table and chairs capable of seating
25~30, the required floor space at each Plan site will be about
37.49 m2

6) Offices:

Office space should be sufficient to accommodate sales, leasing and related operations as well as 2 facility managers at each location. Desks, chairs, file cabinets, and book shelves will be provided. SSB radio equipment will be installed in the office for use in communicating with South Tarawa and the carrier vessel. The total floor space requirement has been set at 28.08 m2.

7) Machinery rooms:

Each of these rooms will house 2 standard generators and 1 fuel tank at each site. Allowing space for generator checks and for convenience in fuel supply operations, the floor space requirement works out to about 12.50 m2.

8) Lavatory and shower rooms:

The toilets are planned to serve persons utilizing the facilities. One western-style stool and one urinal will be provided for men and one stool for women, with a common washbasin. A shower room will placed alongside each lavatory.

9) Corridors; common areas:

A corridor will be provided as a common area for moving people and goods between the individual building units. And since the Plan areas are limited in size, a corridor is also planned to provide access from the road to the shore. While vehicles will be moving among the buildings for this purpose, this is not felt to pose any particular traffic problem, since, even with the addition of the new Plan vehicle to supplement the 2 ton truck already owned by each Council, there will still be only two Council vehicles at each location. In addition, this corridor may also be used to hold training courses on fishing gear and fishing methods, for which the conference room would be too confining. The standard width of a 2-ton truck is 2.2 m. Allowing for doors opening on both sides, plus a safety margin, the width of the corridor has been set at 5 m.

10) Drum storage areas:

A drum storage area will be provided as a storage facility for fuel oil on each island. While light oil consumption will vary according to Plan area and fishing period, we can estimate a range of about 3~5 drums per month. The gasoline for the outboard motors to be mounted on the small boats is to be sold at controlled prices, with no usage planned at the project facilities. Thus, there is only a small requirement for gasoline storage at the Plan sites. It is anticipated that, as in the case of outboard motors and motorbikes already in use, gasoline for the outboards included in this Plan will be procured through existing channels.

Combining the space needs for both spare and empty drums, we anticipate a maximum storage requirement of 15 drums, for which about 16 m2 should be adequate.

Cumulating the above floor areas, Table 3-3 provides a composite view of the component areas of the Plan facilities to be installed at each location.

Table 3-3 Size of Component Areas at Each Plan Site

Area Designation	Required Area (m2)
Main Building	
Ice-making room	32.76
Handling area	54.06
Workshop	23.46
Materials storage	40.50
Conference room	37.49
Office	28.08
Machinery room	12.00
Toilets/ showers	12.00
Corridors and other common areas	(to be considered in connection with the surface plan)
Sub-total	240.35
Drum storage area	16.00
Total	256.35

(3) Small Carrier Vessel:

The small carrier vessel to be provided under this Plan is intended to transport fuel oil and catches in conformance with Plan objectives, while also serving as a replacement for the research and training vessel, Nei Tewenei, which is currently being operated by the Fisheries Divisions.

The design considerations for the new vessel will include such aspects as passenger capacity, maximum cruising range, types of cargo to be carried, and carrying capacity for Plan purposes.

1) Hull:

Port facilities and lighthouses are totally non-existent at the outer island ports to be served by this vessel. While the new vessel will utilize natural or man-made channels to navigate from the ocean to the lagoons, these channels contain several shallow and narrow passages.

Routes have been selected with sufficient depth at low tide to anchor in the lagoons without touching bottom, but, when carrying cargo, the vessel should obviously come as close to the shore as possible. Ocean swells almost never penetrate the lagoons. Although wind and sea may rise some 50 cm, depending on wind direction, the waters are by and large calm, thus minimizing damage should a vessel touch sea bottom or collide with the reef. A steel vessel is planned to permit utilization of the existing repair facilities at South Tarawa.

2) Applicable Regulations:

The South Pacific Maritime Code (1986) and the Ship Safety Rules of the Japanese government will be applied.

3) Passenger Capacity:

The Nei Tewenei is equipped with seven permanent bunks (berths) and presently carries a 7- man crew. The vessel also transports up to 5 extra passengers, such as fishery extension workers and research personnel. Also, under the subject Plan, consideration would have to be given to extending island residents the courtesy of passage to and from South Tarawa as deck passengers.
Including these courtesy passengers, the new vessel should be designed to accommodate a total of special 15 passengers, in addition to the regular crew. In the organization plan for the Fisheries Division, the rated passenger capacity of this vessel is shown as 9 persons, including two navigators whose positions are presently vacant. However, even after these posits are filled, by using a system of rotating night watches, the number of berths can be left at the present total of 7.

We plan to provide lifesaving gear for 22 persons which complies with the above ship safety laws and rules.

4) Maximum Cruising Range:

The maximum cruising range for the existing vessel has been set at 1,600 nautical miles. Its principal cruising waters, based on its home port of Betio in South Tarawa, are the Gilbert Islands, and the maximum range for a single island call is to Arorae Island in the extreme south of the Gilbert group. The distance from South Tarawa to Arorae is about 360 nautical miles, for a round trip journey of 720 miles. But, judging from the cruising pattern of the existing vessel, the usual practice is to call at multiple islands, and so allowance must be made in our design for a longer cruising range than that to Arorae alone. Based on the vessel's 18th 1993 cruise (departing on November 16 and returning on November 28, covering 13 days), stops were made at Aranuka, Abemama, Nikunau, Arorae, and Tamana, with a total estimated [round-trip] cruising distance of about 800 nautical miles. But this vessel may also be dispatched on rescue missions in connection with fishing boat disasters and, at times, may also be called on to participate in survey or other operations in the Line Islands. Thus, in planning the cruising range, a generous leeway must be allowed. Based on the above considerations, in addition to the operating requirements of the existing vessel, we plan to install a fuel tank on the new Plan vessel sufficient to permit a maximum cruising range of 1,600 nautical miles, though the tank capacity may have to be reduced, depending on the configuration of the engine room in which it is to be installed.

5) Plan Speed and Output of Main Engine:

The farthest islands in the Plan area from South Tarawa are Kuria and Aranuka, some 90 nautical miles away. Tidal patterns in Kiribati waters change twice a day; thus, the cycle between high tides runs about 12 hours. Since constraints exist with respect to beacons and channels, sailing and arrival times are necessarily influenced by tides. With a one-way sailing time of 12 hours between South Tarawa and these two islands, the above constraints can be somewhat alleviated. On this basis, we plan to set the Plan speed at 8 knots. In order to generate 8 knots at 85% output, while allowing a safety margin for oceanographic conditions and hull changes due to aging, we will set the main engine output at 300 PS. When circumstances make it necessary to arrive at port at a particular

time, as on voyages to the more remote southern Gilbert islands, when night-time entry must be avoided and the vessel must wait for the tide to come in, it will also be possible to maintain an economical speed by reducing both engine revolutions and speed, while adjusting cruising time accordingly.

6) Carrying Capacity:

The principal loads will be fuel drums and fish boxes. The supply of light oil to the 3 Plan islands is a prime requirement in Plan operations. On the other hand, catch shipments to South Tarawa, for the time being, will be largely of a pilot nature.

Fuel--

- transported in drums, f.a.s.
- maximum number of drums for a single island :
  6 drums of light oil
- maximum load per voyage (for 2 islands): 12 drums

Fish boxes--

- 840 x 440 x 440 mm (90-liter capacity)
- maximum load for a single island :
  300 Kg of fish ~ about 10 boxes.
  (30 Kg of fish and 30 Kg of ice per box)
- maximum load (for 2 islands): 20 boxes

In the case of fish shipments originating on islands lacking a supply of insulated fish boxes, the fish will have to be loaded in ordinary boxes or in bulk. In anticipation of such circumstances, the new vessel, like the existing one, will be equipped with a refrigerated hold. When there is no bulk cargo, fish boxes can be placed in the hold to minimize ice melt.

(4) Equipment :

1) Water intake tank

The ice-maker will consume the largest volume of water among the Plan facilities. However, since ice will be produced in a block shape, an equal volume of ice and raw water will be used. Thus, water consumption, even combined with that

required for ice removal from cans, will not exceed 0.3 m3 per day. Water will also be required for such purposes as cleaning catches and sanitary facilities, but it should be ample to project total average daily consumption for all Plan uses combined at 0.5 m3.

Annual rainfall in the Plan area is estimated at about 1,200 mm, with the year divided into a wet and dry season, though the boundaries between the two are somewhat unclear. Even in the rainy season, precipitation is not continuous, with rain falling only every other day or at intervals of several days. Rainwater is the purest and safest type of water and so is treated as a precious resource on the islands, even for drinking purposes. However, as local-style housing uses mostly thatched roofs made out of palm leaves, the majority of structures are unable to capture rainwater. Since the Plan facilities will be given a roof design that will permit collection of this precious water, the water can be captured not just for use in the Plan facilities, but also for distribution to residents in the immediate vicinity. For this purpose, the intake facility would have to be large enough to serve these dual outlets. We deem it appropriate, therefore, that the rainwater intake be set at a capacity of about 10 m3. In addition, we shall provide an elevated water tank, of 2 m3 capacity, to distribute water to the various consuming facilities.

During the dry season, water, particularly for the ice-making equipment, will be brought in via a pipe laid to an existing well near the construction site, from which the requisite volume should be obtainable. However, in view of the shallow level of wells in the Plan vicinity and the danger that excessive intake could cause serious harm to the water source, such as from an inflow of sea water, the requirement for this well water will be held to an absolute minimum.

2) Small Fishing Boats

Canoes and skiffs (including similar vessel types), built at the shipyard in Betio, South Tarawa, are widely used in Kiribati. As shown in Table 3-4, previous aid projects, including those from Japan, have incorporated canoes from this yard.

Table 3-4 Utilization of Canoes and Skiffs from Betio Shipyard in Previous Overseas Aid Projects

Fiscal Year	Project and Target Islands	Number (No)	Canoe Type	Outboard Output
1987	**U.K.: Pilot Commercial Fishery Project**			(HP)
	Butaritari Island:			
	outrigger canoes	10	KIR-4	15
	skiffs	5	OAL 5.5m	25
	Abemama Island:			
	outrigger canoes	10	KIR-4	15
	skiffs	5	OAL 5.5m	25
1990	**Japan: Outer Island Fisheries Development Plan**			
	Nonouti Island:			
	outrigger canoes	5	KIR-8	15
	Nikunau Island:			
	outrigger canoes	5	KIR-8	15
1992	**Japan: Small-scale Fisheries Development Plan**			
	South Tabiteuea Island:			
	outrigger canoes	6	KIR-8	15

In the subject Plan, the donated canoes and skiffs will be procured locally. The number of boats requested by the various Island Councils is shown in Table 3-5 below:

Table 3-5 Request for Small Fishing Boats (Number of Boats)

Plan Area	Canoes (KIR-8)	Skiffs (KIR-10)
Kuria	6	3
Aranuka	6	2
Maiana	13	2
Total	25	7

As previously noted,, the present fleet of canoes and skiffs in service on Kuria totals 95 boats, on Aranuka 153, and on Maiana 197, while the number of households fishing on a full-time, part-time, or subsistence basis is 169 on Kuria, 156 on Aranuka, and 385 on Maiana. The proportion of requested boats in the total fishing fleets on each island is 9.5% on Kuria, 5.2% on Aranuka, and 7.6% on Maiana, while the ratio to total fishing households is 5.3%, 5.1%, and 3.9%, respectively. Considering these relationships, we feel that the size of the Request is not unreasonable.

Furthermore, the penetration of skiffs of the KIR-10 or similar classes is still quite low on the Plan islands, relative to South Tarawa. The KIR-10 is superior even to improved canoes in terms of cruising range and load capacity but, owing to the large size of its outboard motor, fuel consumption is high. And, while an increase in catch efficiency may be expected as a result of its more extensive access to fishing grounds, operating costs will have to be closely watched. It is felt, therefore, that, as reflected in the number of small boats requested by the Councils, it would be prudent to introduce these large boats on a limited scale.

The specifications of the KIR 8 canoes and the KIR 10 skiffs are shown below:

KIR-8 Canoe:

Hull (mainly watertight plywood)	9 mm
Total length	7.1 m
Total width (including outrigger)	4.1 m
Beam width	0.86 m
Depth	0.74 m
Hull weight (including sail and outboard)	250 kg
Load capacity (including gear and crew)	270 kg
Size of crew	3 persons

Rigging:

Mast	Height: 5.5 m, 75 mm dia.		
Sail areas:	Main sail 15 m2		
	Jib sail 4 m2		
Outboard motor carried	4 ~ 15 PS		
Speed:			
under 14 kt wind velocity		Crosshold:	5 kt
		Running	5 kt
with a 4 HP outboard motor			7 kt

KIR 10 Skiff:

Hull (mainly watertight plywood)	9 mm
Total length	7.0 m

Total width	1.8 m
Depth	0.7 m
Vessel weight (including outboard)	400 kg
Load capacity (including gear and crew)	400 kg
Size of crew	3 persons
Outboard motor carried	25~40 PS
Speed:	
when fitted with a 25 HP outboard	about 15 kt

3) Outboard Motors :

As the power source for the canoes and skiffs under this Plan, we have specified gasoline outboard motors, which are widely used in Kiribati. The output and quantities of these motors, in conformity with the Plan boats, will be as follows :

Canoes (KIR - 8): 15 PS	No. of Plan boats (25) + extra units
Skiffs (KIR - 10) : 40 PS	No. of Plan boats (7) + extra units

For reference purposes, exports of Japanese-made outboard motors to Kiribati over the 11-year period 1983-1993 totaled 1,951 units, broken down: less than 5 PS: 586 units, 5~15 PS: 515 units; 15~30 PS: 375 units, 30~45 PS: 448 units, and 45 PS and over: 27 units.

Motors 15 PS or less account for about half of total shipments, while high-powered units over 45 PS represent only a tiny share. In recent years, the Kiribati market has been demanding stronger motors, centered in the 25 PS and 40 PS classes, and the Betio Shipyard, in response to this demand shift, has changed the thickness of the hull panels of the KIR-8 model from the original 6 mm to 9 mm, while also reinforcing the transom for fitting the outboards. In light of these developments, we are planning to provide 33 /15 PS outboard motors for use in the KIR - 8 canoes (including 8 spare units) and 10/40 PS outboards for use with the KIR-10 skiffs (including 3 spares).

4) Fishing Gear :

Fishing gear and materials will comprise gillnet, hand-line, trolling, and underwater (spear) fishing gear. In this section, we will give an indication of the composite Plan totals for the 3 islands combined.

a) Gillnets

This fishing method is employed mainly inside the lagoons, using canoes. The fisherman usually enters the sea directly and, holding both ends of the net with his hands, uses it in shallow water to jump the target fish. This is an important fishery in Kiribati, with catches consumed mainly by the fisherman's family.
Net thread is nylon monofilament, in lengths of 100 m, with a net height of 16~18 mesh.. As recommended by the Kiribati Fisheries Division, we shall provide 3 mesh sizes: 3.5 ", 4.0 ", and 5.0", along with other gear needed for gillnet operations, such as floats, sinkers, and rope. 50 rolls each of netting in these 3 mesh sizes will be given to each of the 3 Islands Councils, totaling:

50 rolls x 3 mesh sizes x 3 islands = 450 rolls.

b) Hand-line gear :

This fishing method is mainly conducted with canoes, either in relatively deep waters in the lagoon or near the sea bottom sloping toward the ocean at the edge of the outer reef, with operations directed at reef fish. As this is a relatively simple method, it attracts many fishermen. The gear in the area generally consists of a lead lines, hooks, sinkers, swivels, and hook wires (wire leaders).

Quantities have been planned on the basis of the expected rates of wear and tear, with emphasis on lead lines, which are presently in rather short supply :

Lead lines	(8 sizes)	100m /roll	300 rolls each
Kirby	(9 sizes)		5,000 pcs. each
Mutsu	(8 sizes)		1,000 pcs. each
Sinkers			5,000 pcs.
Swivels	(3 types)		1,000 pcs. each
Hook wires	(3 sizes)		

c) Trolling gear :

This fishing method is directed at small to medium-sized tunas and other pelagic species in the ocean, with the fishery conducted mostly by full-time fishermen. Catches command high prices, enjoying great popularity among Kiribati consumers. The requisite gear includes lead wire, fish hooks, lure heads, and boards.

Trolling lines (nylon)	(1 sizes)	100m /roll	90 rolls each
Double troll hooks	(5 sizes)		1,000 pcs. each
Lure heads	(3 sizes)		300 units each
Splashing board	(2 sizes)		90 units each
Diving board	(2 sizes)		90 units each

d) Underwater gear:

This method is employed near the edge of the outer reef, using snorkels and flippers, and is suitable for catching small reef fish, octopus, lobsters, and other species. Since it is necessary to fish relatively effectively within a short period of time, while keeping a steady eye on the tide, this fishery tends to attracts mainly young fishermen. We plan to distribute 30 sets of gear, with each set containing a mask, snorkel, flippers, and a watertight flashlight.

5) Insulated fish boxes :

These insulated boxes can be used for fish storage immediately after catching, intra-island transport and sale, as well as transport to South Tarawa. We have selected structurally solid boxes of 90 liter capacity, which are light enough to be handled manually. 40 boxes will be distributed to each island for use at Plan facilities, with additional units to be deployed at retail outlets for the Outer Island Fisheries Development Plan and at the Fisheries Division on South Tarawa.

6) Safety equipment :

This safety equipment will be used by the small fishing boats that are to be provided under this Plan. A total of 25 kits will be allocated to the canoes and 7 to the skiffs, for a total of 32 kits, which will be adequate to protect all crew members (2 ~ 3 persons each on the KIR-8 model and 3 persons on the KIR-10), totaling 96 persons in all.

Lifejackets	96 units
Daylight signal mirrors	32
Buoyant smoke signals	32
Hand light flares	32

Whistles	32
Parachute flares	32
Waterproof electric torches	32
Bailers	32
Compasses	32

7) SSB transceivers :

This equipment will be used for communication between the Plan islands and the Fisheries Division in Tarawa as well as the carrier vessel. Various outputs are available for commercial use but, considering the short distances involved, an antenna power of about 150w should be sufficient. Accessories will include antenna masts plus insulation and wiring materials. One unit will be provided for each island, for a total of 3 in all.

8) Pickup trucks :

The Plan vehicles will be used to transport fishing gear, drums, and other items between the Plan facilities, landing areas for imported materials, and individual villages, well as for personnel movements among these locations . A small crane will be installed on the loading platform for ease in loading and unloading drums, fish boxes, and other heavy items. Since the island roads are unpaved, and the vehicle will sometimes operate in the lagoon during ebb tide periods, 4-wheel drive has been specified. One vehicle will be given to each island (for total of 3 units).

3 . 4 Implementation of the Plan

3.4.1 Implementing Organization

The Ministry of Environment and Natural Resource Development (MENRD) will assume responsibility for both implementation and ongoing operations of the Plan project. It has also been confirmed that the Councils set up on the 3 Plan islands will also play a role in Plan implementation

(1) Ministry of Environment and Natural Resource Development:

This Ministry is organized into 7 Divisions : Fisheries, Agriculture, Meteorology, Operations, Minerals, Environment, and Administration, with a total staff of 209 persons in 1994.
The Fisheries Division, lodged in this Ministry, is made up of 5 Departments : Dissemination (Extension Services) and Administration, Research and Development, Development of the Line-Phoenix Islands, Accounting, and Technical Services, with a total staff of 85 persons. The final government budget for 1993 set revenues at A$ 32,491,000 and disbursements at A$ 27,901,000, of which the portion allocated to the Ministry of Environment and Natural Resource Development was A$ 6,540,220 and A$ 2,112,555, respectively. The overall budget for this Ministry for 1994 is as shown in Table 3-6.

Table 3-6 Budget of the Implementing Organs for Fiscal 1994

	MENRD	Fisheries Division
Revenues	A$10,460,461	-
Expenditures	2,284,182	A$767,237

Source : Ministry of Environment and Natural Resources Development (MENERD)

Of the total fiscal 1994 budget for the Fisheries Division (A$ 767,237), the implementation budget for fishery extension activities comprises A$ 12,000 for the training of extension personnel and A$ 11,250 for direct outlays (excluding personnel). In addition, appropriations for operation of the Nei Tewenei include A$ 65,000 for fuel and crew provisions and A$ 30,000 for maintenance.

(2) Island Councils:

Staff size and the 1994 budget for revenues and expenditures for the Councils on the Plan islands are shown in Table 3-7. In the case of the Maiana Council, which has the largest budget, revenues are set at A$ 88,548. In light of the size of this budget, it is, we feel, not realistic to suddenly expand present Council budgets by 2-3 times.

Table 3-7 Fiscal 1994 Budget for the Island Councils

Expense Category	Kuria	Aranuka	Maiana
No. of staff	29	35	60
Revenues :	44,220	65,350	98,022
Taxes	13,200	10,100	9,530
Assessments	2,895	3,190	6,300
State subsidies	16,700	16,700	38,800
Interest income	1,200	1,150	1,500
Business income	6,996	32,510	33,820
Other receipts	900	1,200	350
Transfer income	2,329	500	7,722
Expenditures :	42,763	65,123	88,548
Salaries	15,089	14,021	44,426
Allowances	3,779	5,912	9,162
Administration	9,216	7,510	12,060
Facility maintenance	10,620	10,050	16,900
Develop't investment	0	40	0
Business outlays	2,500	20,900	0
Transfer outlays	1,559	6,690	6,000

Source : Ministry of Home Affairs and Rural Development (MHARD), 1994

Looking at the composition of the revenue and expenditure categories, the major items under " taxes " are copra taxes and airport use fees, while those under " assessments " are registration and license fees for stores, motorbikes, and bicycles. "State subsidies " represent almost entirely taxes returned by the Treasury, plus donations from postal and broadcast operations. "Business income " sources vary slightly by island, but the Island Councils earn income from leasing such property as vehicles, real estate, and canoes as well as from the sale of fuel and fishing gear . Among the expenditure categories, "allowances" are paid to Council members and committeemen, while "administration" items include travel, communications, and rentals for land and buildings. "Maintenance" outlays apply to offices, vehicles, schools, clinics, and other facilities owned and managed by the Island Councils.

In connection with Council operations, the Kiribati government, as part of its assistance programs for local administration, pays personnel costs out of the national budget and also dispatches clerks, treasurers, police officers, nurses teachers, and other specialists to the various Councils. The Councils also employ their own staff, as shown in Table 3-7, but these figures exclude personnel dispatched from the national government. Table 3-8 shows the deployment of the permanent Council staffs, with activities covering both administrative and field services. Their occupational range is quite diverse, with particular emphasis on public health, child care, and other public welfare services.

Table 3-8 Deployment of Regular Island Council Personnel
(No. of Employees)

Occupation	Kuria	Aranuka	Maiana
Assistant Clerk	1	0	1
Assistant Treasurer	0	1	0
Typist	1	1	1
Carpenters / foremen	1	2	1
Drivers	2	1	2
Couriers	0	0	2
Police support (warden)	6	4	12
Nurses aids	2	3	13
Sanitation	1	1	1
Community services	1	1	1
Messengers	1	0	1
Mechanics	1	1	3
Woman's education	0	0	1
Handicraft guidance	1	0	0
Official lodgings	1	1	0
Airport maintenance	1	1	1
Fuel sales	0	1	1
Postal workers	1	0	0
Road maintenance	0	3	2
Wireless operators	1	1	1
Nursery schools	3	4	13
Workshop Support	0	0	1
Ferries	0	3	0
Guards	0	1	1
Hog yards	0	1	0
Other	4	4	1
Total	29	35	60

Source : MHARD (1994)

3.4.2 Operating Structure

(1) Purchase and Leasing Operations:

We shall next consider the operating structure for the requested facilities and equipment. The Island Councils will administer the shore facilities and the distribution of equipment and materials. As discussed in Section 3.4.1 ("Implementing Organization"), the Councils on the Plan islands, quite apart from their administrative role, are already engaged in various types of purchasing and leasing operations. Ice production and sales, as well as the leasing of fishing vessels and the sale of fishing gear and materials, are all included in the subject Plan. Thus, the vessel leasing and gear sales can all be made through the existing system.

Ice manufacture will, in any case, be a totally new activity for any implementing body but, in order to keep ice selling prices at the lowest possible level, while not imposing a financial burden on the Councils, it would be desirable, at least until the end of the initial stage, by which time the outlook for income and outgo should become clearer, that no new full-time staff be added, with existing personnel taking on the Plan duties concurrently with their other tasks.

If technical support is provided by the Fisheries Division, Council employees should be fully capable of performing daily maintenance on the ice plant, generator, and other equipment items.

The canoes, skiffs, and outboard motors will also be owned by the Councils and leased to fishermen. Some of the Councils on the 3 islands already have improved canoe models, albeit in small numbers, which are presently being leased to islanders, and so the present rates can be used as a point of reference when setting charges for the Plan equipment. Fishing gear, being an expendable, will be sold outright. The Fisheries Division sells gear to the outer islands under a revolving fund, and these prices become a benchmark for those set by the Councils in their own selling operations. In connection with the distribution of the small fishing boats and gear included in this Plan, we recommend that the following guidelines be applied .

1) Fishermen selection criteria:

If, sometime in the future, a decision is made to sell the small boats and outboard motors, as opposed to the initial leasing program, these sales should be limited to fishermen on the Plan islands, based on consideration of the following selection criteria:

--- that the recipients demonstrate actual fishing performance;
--- that they are able to pay for the distributed items; and
--- that they agree to comply with a ban on resale of these items.

2) Handling of project income:

As confirmed in the Minutes of Discussion signed with the Ministry of Environment and Natural Resource Development, which has been designated as the implementing body for this Plan, the following guidelines must be followed in connection with the handling of leasing and sales revenues. In the cases of the Island Councils, which are already receiving income from similar activities, we feel that realistic measures should be instituted, such as using an identical accounting system for the control of ledgers and bank accounts. It has been determined that, through confirmation of the balances carried forward at of the start of Plan operations, confusion in receipts and disbursements can be prevented.

--- A new fund is to be established, with Plan receipts to be segregated from other income sources in a separate account.

--- This fund is to be used solely to promote fisheries in Kiribati.

--- The Japanese government must be consulted prior to using these funds.

--- Upon request from the Japanese government, a report must be submitted showing how the funds were deployed, along with current balances.

(2) Transport Structure:

The small carrier vessel to be provided in this Plan will be a replacement for the Nei Tewenei, which is presently in service, and so will be operated by the

Fisheries Division. The Nei Tewenei currently carries a crew of 7, with an operating budget for fiscal 1994 of A$ 65,000 and a maintenance budget of A$ 30,000. There will be no need for additional personnel or appropriations for the replacement vessel.

As a direct replacement for the Nei Tewenei, the new carrier vessel will continue to provide fisheries support for the outer islands. However, in addition to these duties, it will be obliged to provide support as well for fisheries on the 3 Plan Islands. A key assumption is that the new vessel will transport light oil from South Tarawa to the Plan islands for generator use. The price of light oil on the outer islands is quite high, running, for example, 80 cents/ liter on Maiana, as opposed to only 55 cents on South Tarawa. By bringing in these low-priced supplies, the plan is to reduce the financial burden of ice-making operations for the responsible organization.

The operating performance of the Nei Tewenei during 1992 - 1993 is summarized in Table 3-9. The vessel recorded 11 trips in both years to waters south of Tarawa, where the 3 Plan islands are located.

Table 3-9: Operations of the Nei Tewenei

(unit: No. of trips)

Destination	1993	1994
Gilbert Islands	21	18
North of Tarawa	10	6
South of Tarawa	10	10
Both directions	1	1
Rescue mission	0	1
Banaba Island	1	1
Total	22	19

Source : Fisheries Division (1994)

The largest consumption of light oil for the Plan facilities will be on Kuria and Aranuka, with annual requirements projected at 60-70 200-liter drums. Accordingly, if the vessel can make 10-11 trips to these islands, the need for light oil will be met. On the return voyage after these deliveries, the vessel could carry, as required, pilot fish catches to South Tarawa. From a logistical standpoint as

well, since the Plan islands lie directly on the regular southern course to Tabiteuea and Nikunau Islands, stopovers can easily be made without disrupting the vessel's existing cruising pattern, and so we are confident that the Plan objectives can be amply met.

(3) Involvement in Fish Distribution:

Fish distribution on the islands will continue to be carried out directly between producers and consumers. Excluding Maiana, the Island Councils are not actively involved in intra-island distribution, and this policy will not change even after the Plan facilities are inaugurated. In other words, the purchase and sale of fish, including consignment sales, will not take place at the Plan facilities, though the setup will presumably allow fishermen to utilize the handling area for weighing their catches, washing fish boxes, and related operations. The Councils may charge a fee for using the Plan facilities, but this will be left strictly to their discretion.

(4) Fish Shipments to South Tarawa:

At the present time, apart from scattered air shipments of salt-dried fish and crustaceans, fish shipments from the Plan islands to South Tarawa are not yet on a commercial scale. As seen in Section 2.3.4. ("Outer Islands Fisheries Development Operations"), the Fisheries Division is offering transport support for fish catches, geared primarily at islands already equipped with ice-making facilities, but no such assistance has yet been provided to the 3 Plan islands.

Market prices on South Tarawa for fresh fish have been firm and high, with demand outstripping supply, except during good fishing seasons. While the latent demand is believed to be sufficient to absorb receipts from the outer islands, organized distribution channels are as yet undeveloped, and so it has been determined that catch shipments from the Plan islands will have to pass through a pilot stage.

Under the circumstances, despite the fact that fish boxes are to be provided under the Plan to permit iced shipments, for the time being at least, we feel that it would be inappropriate to base Plan finances on the assumption of continuing fish shipments to South Tarawa.

3.4.3 Maintenance Plan

(1) Maintenance Structure

1) Shore Facilities :

The ice-making facilities will operate 200 days a year at Kuria and Aranuka, and 100 days at Maiana. They will be shut down on Saturdays, Sundays, and holidays, as well as for maintenance checks. To meet ice demand on non-operating days and cope with increases in demand during good fishing periods, ice inventories can be adjusted, or the two ice-makers can be run simultaneously.

The decision to limit the number of operating days reflects a determination that, considering the size of existing budgets for the Island Councils, it would be advisable, at least for the time being, to launch Plan operations on a small scale. On the other hand, in order to avoid fuel waste in the initial freezing of the ice-making tank, and as a means of adjusting ice inventories on the basis of weekly forecasts, rather than operate the facilities on an intermittent schedule (e.g., every other day), it would be preferable to institute continuous operations-- for example, 4 days a week on Kuria and Aranuka and 2 days a week on Maiana. However, rental operations for the small fishing boats and gear sales will be conducted on all regular working days, excluding days when Council offices are closed, as is presently the case with similar activities. In any event, since the Plan facilities will be situated close to the Council offices on all 3 islands, Council employees dividing their time between the two locations should suffer no logistical inconvenience.

2) Small Carrier Vessel :

As is presently the case with the Nei Tewenei, the home port for the new carrier vessel will be Betio, South Tarawa, and so resupply operations for fuel and provisions as well as crew R&R (rest and recreation) will be based on this port. As with its predecessor, all inspections and dry-dock repairs on the new vessel will be made at the Betio Shipyard.

(2) Operating Income and Outgo

1) Shore Facilities :

a) Ice Sale Prices

It is expected that ice will be sold at between 10~25 ¢ / Kg. Looking at ice-making facilities on other outer islands, the installation at Nonouti charges 10 ¢ / Kg and that at Nikunau 20 ¢ / Kg, while Abemama and Abaiang are at 25 ¢ / Kg. It would be acceptable if prices at the Plan facilities could be set within this range at a level sufficient to cover direct costs.

b) Leasing income:

Current Council leasing fees for KIR-8 canoes, fitted with outboard motors, run A$10 per 24-hour period at Aranuka, while, at Maiana, the rate is A$7.00 for the first 5 hours and A$2.00 for each additional hour. On Kuria, where the Island Council owns no rental canoes, the intent is to set a charge of A$15~20 per 12 hour period for boats furnished under this Plan.

The KIR-8 and KIR-10 models can carry larger crews than traditional canoes and so are conducive to joint fishing operations, and the above fee structures, which are clearly high in relation to fisherman incomes, presumably anticipate this pattern of collective use. However, while rentals under the subject Plan may be predicated on joint use by 3 fishermen, they should also take into account the economic circumstances of individual fishermen.

Accordingly, our revenue projections will be based on charges of A$4.20 per boat for a 24 hour period on Kuria and Aranuka and A$3.30 on Maiana.

c) Selling prices for Fishing Gear:

Selling prices for fishing gear will be based on those currently being charged by the Fisheries Division. This gear is imported from Japan and the Republic of Korea, and the Division offers no price discounts when distributing them to fishermen. The gear income is deposited in a revolving fund, which yields interest income.

d) Personnel costs:

We assume that business operations at the Plan facilities will be handled by regular Council employees. For the time being, two persons can handle the bulk of the ice-making, purchasing, and leasing activities. Thus, no personnel charges need be made against revenues.

Income projections, as calculated on the above basis, are summarized in Table 3-10.

Table 3 - 10 Projected Operating Income

1) At Kuria:

Income	Amount (A$)	Cost	Amount (A$)
a) Ice sales	8,800	a) Fuel for generators	7,000
b) Fishing boat rentals	3,780	(*)	
c) Interest from revolving fund	680	b) Maintenance:	1,900
(starting in 6th year)		facilities	3,500
		equipment	(2,250)
		c) Wages	
Total	13,260	Total (excluding wages)	12,400

2) At Aranuka:

Income	Amount (A$)	Cost	Amount (A$)
a) Ice sales	8,800	a) Fuel for generators	7,000
b) Fishing boat rentals	3,360	(*)	
c) Interest from revolving fund	680	b) Maintenance:	1,900
(starting in 6th year)		facilities	3,500
		equipment	(2,250)
		c) Wages	
Total	12,840	Total (excluding wages)	12,400

3. At Maiana:

Income	Amount (A$)	Cost	Amount (A$)
a) Ice sales	4,000	a) Fuel for generators	3,560
b) Fishing boat rentals	4,950	(*)	
c) Interest from revolving fund	680	b) Maintenance:	1,900
(starting in 6th year)		facilities	3,700
		equipment	(2,250)
		c) Wages	
Total	9,630	Total (excluding wages)	9,160

A detailed breakdown of revenues and expenses is given in Appendix V. Since fuel costs alone come to over 14 cents per kg of ice, after allowing for proper maintenance, it would difficult to set the ice sales price at much less than 20 ¢/kg. Lease income from the small fishing boats has been set on the low side, though charges could be raised slightly in response to an improvement in the financial circumstances of fishing families. However, based on the above estimates of income and outgo, it is highly unlikely that leasing revenues can be deposited in the revolving fund.

As shown in Table 3-10, the inclusion of wage costs would result in a deficit. In addition, during the initial two years of operation, which will produce no interest income, Aranuka and Maiana are expected to incur deficits of A$ 100-200. However, operations should break even in the third year, with the revenue projections shown in Table 3-10 expected to take effect in the sixth year.

2) Small Carrier Vessel:

The Plan carrier vessel will be operated by the Fisheries Division as a replacement for its existing research and training vessel. Since budgets have already been appropriated for operations of this vessel, no provisions need be made in this connection by the Island Councils, which are to be the implementing bodies for the subject Plan. Operating costs for the carrier vessel are estimated as follows:

Table 3-11 Operating Costs for the Small Carrier Vessel

Item	Annual Cost (A$)
Fuel	58,800
Provisions	10,000
Maintenance	20,000
Total	88,800

The operating budget for the Nei Tewenei for fiscal 1994 was set at A$95,000, with A$111,000 anticipated for fiscal 1995. It may, accordingly, be assumed that, even after the replacement vessel is put into service, an operating plan comparable to that of 1993 can be amply achieved.