Japan International Cooperation Agency

No. 1

Republic of Kiribati
Ministry of Health, Family Planning and Social Welfare

BASIC DESIGN STUDY REPORT ON THE PROJECT FOR UPGRADING OF WATER SUPPLY SYSTEM IN THE REPUBLIC OF KIRIBATI IN TUNGARU CENTRAL HOSPITAL

OCTOBER, 1992

RAYMOND ARCHITECTURAL DESIGN OFFICE, INC

JICA
BASIC DESIGN STUDY REPORT ON THE PROJECT FOR UPGRADING OF WATER SUPPLY SYSTEM IN TUNGARU CENTRAL HOSPITAL IN THE REPUBLIC OF KIRIBATI
OCTOBER, 1992
GRF

Japan International Cooperation Agency

Republic of Kiribati
Ministry of Health, Family Planning and Social Welfare

BASIC DESIGN STUDY REPORT ON THE PROJECT FOR UPGRADING OF WATER SUPPLY SYSTEM IN THE REPUBLIC OF KIRIBATI IN TUNGARU CENTRAL HOSPITAL

OCTOBER, 1992

RAYMOND ARCHITECTURAL DESIGN OFFICE, INC

PREFACE

In response to a request of the Government of the Republic of Kiribati, the Government of Japan decided to conduct a basic design study on the Project for Upgrading of Water Supply System in Tungaru Central Hospital and entrusted the study to the Japan Intentional Cooperation Agency (JICA).

JICA conducted the basic design study making a contract with Raymond Architectural Design Office, Inc. from August 17 to October 15, 1992 and the present report was prepared.

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

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

October, 1992

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

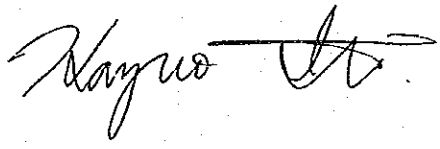
We are pleased to submit to you the basic design study report on the Project for Upgrading Water Supply System Tungaru Central Hospital in the Republic of Kiribati.

This study has been made by Raymond Architectural Design Office, Inc. based on a contract with JICA, from August 17, 1992 to October 15, 1992. Throughout the study, we have taken into full consideration the present situation in the Republic of Kiribati and have planned the most appropriate project in the scheme of Japan's grant aid.

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs, and the Ministry of Health and Welfare. We also wish to express our deep gratitude to the officials concerned of the Ministry of Health, Family Planning and Social Welfare of Kiribati, JICA Fiji office, and Japanese Embassy in Fiji for their close cooperation and assistance during our study.

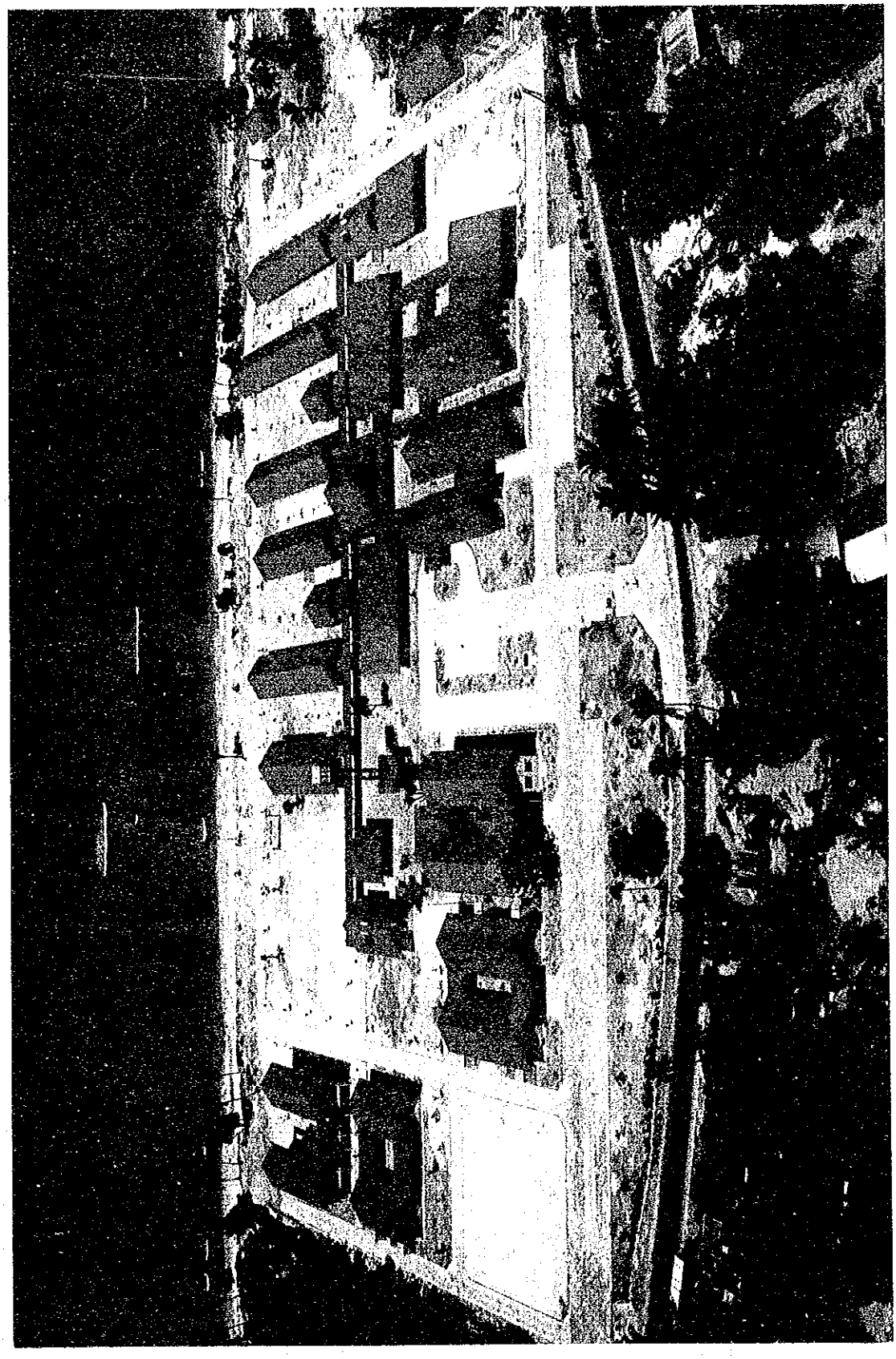
At last, we hope that this report will be effectively used for the promotion of the project.

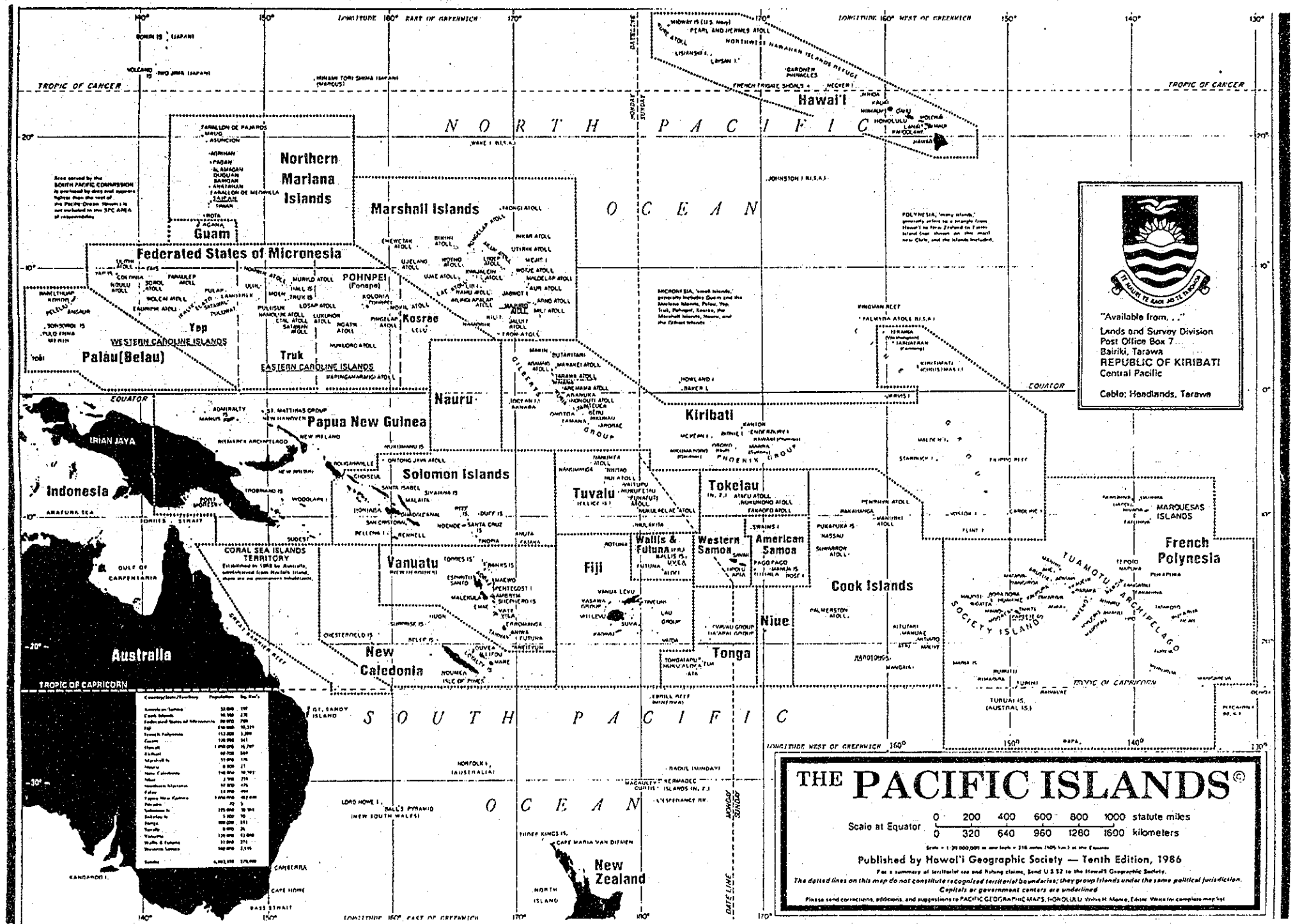
October, 1992



Project Manager, Kazuo Ito
Basic design study team on The Project for
Upgrading Water Supply System in Tungaru
Central Hospital Water Supply Upgrading

Raymond Architectural Design Office, Inc.





THE PACIFIC ISLANDS©

Scale at Equator 0 200 400 600 800 1000 statute miles
0 320 640 960 1280 1600 kilometers

Published by Hawai'i Geographic Society — Tenth Edition, 1986

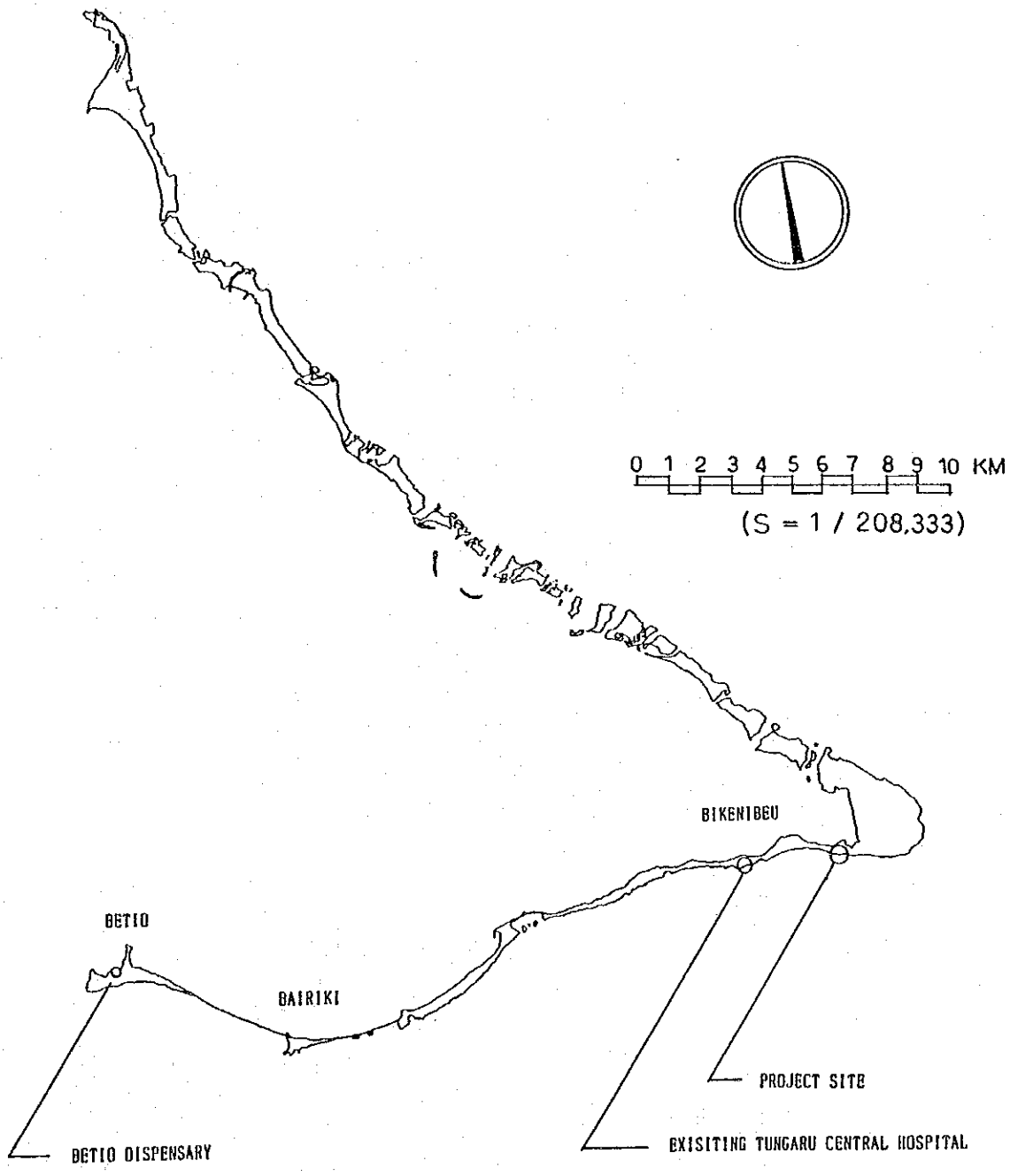
For a summary of territorial sea and fishing claims, send U.S.$2 to the Hawai'i Geographic Society.

The dotted lines on this map do not constitute recognized territorial boundaries; they group islands under the same political jurisdiction.

Capitals or government centers are underlined

Please send corrections, additions, and suggestions to PACIFIC GEOGRAPHIC MAPS, HONOLULU. Write for complete map list

Tarawa Atoll



Guide Map

ABBREVIATION

AMAK	:	Aia Maea Aineni Kiribati (Kiribati Women's Association)
A/P	:	Authorization to Pay
A$	:	Australian Dollar
AS	:	Australian Standards
B/A	:	Banking Arrangement
BS	:	British Standards
BTC	:	Betio Town Council
CPMEB	:	Central Planning Monitoring & Evaluation Body
F$	:	Fijian Dollar
H/A	:	Health Aide
MA	:	Medical Assistant
MHAD	:	Ministry of Home Affair & Decentralization
MHFP	:	Ministry of Health & Family Planning
MWE	:	Ministry of Works and Energy
NO	:	Nursing Officer
NA	:	Nurse Aide
P/H	:	Public Health
PHC	:	Primary Health Care
PHN	:	Public Health Nurse
PMO	:	Principal Medical Officer
PNO	:	Principal Nursing Officer
PUB	:	Public Utility Board
PVU	:	Plant & Vehicle Unit
PWD	:	Public Works Division
Q/S	:	Quantity Surveyor
SCF	:	Save Children's Fund
SNO	:	Senior Nursing Officer
SPEC	:	South Pacific Bureau for Economic Co-operation
TCH	:	Tungaru Central Hospital
TTFC	:	Technical Task Force Committee
TTI	:	Tarawa Technical Institute
TUC	:	Tarawa Urban Council
U$	:	U.S. Dollar
VWG	:	Village Welfare Group
WHO	:	World Health Organization

SUMMARY

The Republic of Kiribati (hereinafter referred to as Kiribati) is an island country consisting of 33 atolls, including the Gilbert Islands, Phoenix Islands and Line Islands, which are scattered in the South Seas directly below the equator. The population of Kiribati is approximately 74,000, of which some 40% is concentrated on Tarawa Island where the capital of Kiribati is located.

While the economy of Kiribati was primarily dependent on the export of phosphate rock until independence in 1979, the depletion of phosphate rock resources in the same year has since forced Kiribati to face a severe economic environment. Although attempts have been made to utilize fishery resources as a new export commodity to replace phosphate rock, the level of fish exports is still far below the export level previously enjoyed by the latter. Because of the severe economic reality, Kiribati has been receiving both bilateral and international economic assistance. Assistance from Japan in the form of technical cooperation in various fields began before independence and grant aid, assistance has been added to the technical cooperation since 1980.

Kiribati has successfully completed its Sixth National Development Plan (for the period from 1987 to 1991) and is currently in the middle of preparing the Seventh Plan. The Third National Health Plan has been prepared in the field of health and medical care, aiming at the provision of a sound social environment with emphasis on the primary health care policy.

The health and medical care system in Kiribati consists of (i) village welfare groups responsible for primary health care, (ii) health centers which are higher than the village welfare groups and which provide diagnosis and treatment as well as health guidance for people within a radius of approximately 5km and (iii) dispensaries established in each medical district, i.e. on each island. The Tungaru Central Hospital (hereinafter referred to as the TCH) plays a central role among these medical institutions.

The TCH is the only general hospital in Kiribati capable of providing tertiary medical treatment and it accepts referral patients from the primary and secondary medical institutions throughout the country. Those patients who cannot be treated by the TCH are transferred to hospitals in New Zealand or Hawaii. The old TCH had a total floor area of approximately 4,600m^2 with some 300 staff members treating more than 10,000 patients/year while also accepting some 520 referral patients (actual number of referrals accepted in 1987).

While serving as an active general hospital, the TCH fulfilled and continues to fulfill the role of a medical institution attached to the Ministry of Health and Family Planning. It is involved in the running of a nursing school, the provision of health education, public health inspection and laboratory testing and the procurement, dispensing and shipping of drugs and medical supplies to lower ranking medical institutions in the country. In this sense, the TCH bears a great responsibility in regard to improving Kiribati's public health and medical care standards. However, the medical and health service activities of the old TCH were seriously hindered by the deterioration of various facilities which were more than 30 years old, together with breakdowns and a shortage of necessary medical equipment.

In order to solve these problems, the Government of Kiribati planned a reconstruction project for the TCH, including rebuilding to house essential facilities and the provision of essential medical equipment, and requested the Government of Japan's provision of grant aid for the implementation of the project. In response to this request, the Government of Japan commissioned JICA to dispatch a Basic Design Study Team which subsequently visited Kiribati from September 21 to October 22, 1988.

The Exchange of Notes (E/N) between the two governments for the provision of Japanese grant aid for the project was concluded on July 13, 1989. Actual construction work commenced on January 15, 1990 and the completed buildings and equipment were handed over to the Kiribati side some 15 months later on April 18, 1991.

The new TCH buildings are outlined below.

(1) Facilities

Size:

Buildings		Floor Area (m^2)
One-Story	diagnostic and treatment buildings, ward buildings, operating theater building, service building, education building, etc.	3,668.2
Two-Stories	administration building, dormitory for nursing school students	968.8
Total: (30 Buildings)		4,637.0

With an additional 1,796.7m^2 to cover connecting corridors, etc., the total floor area is 6,433.7m^2.

Structure : reinforced concrete blocks
Ancillary Building Services : electricity, air-conditioning and ventilation, water supply and drainage, sanitary facilities

(2) Equipment

Outpatient Departments	:	general, emergency and special medical equipment
Central Diagnostic and	:	equipment for Radiology Department, Clinical
Therapeutic Department	:	Laboratory and Blood Bank
Department of Surgery	:	equipment for Operating Theaters and Central Supply and Sterilization Department
Wards	:	equipment for Private Wards, Men's Wards, Women's Wards, Pediatric Ward, Surgical Ward, Obstetric Ward and Tuberculosis Ward
Service Departments	:	equipment for Kitchen and Laundry
Nursing School	:	educational equipment

The rebuilding of the TCH and the provision of the necessary medical equipment has substantially improved the health and medical care services of the TCH. However, one difficulty still faces Tarawa Island and most of the other islands, i.e. the risk of a water shortage. The rainfall statistics for Tarawa Island indicate a dry year regular return of 5-6 years. Moreover, the upgraded and extended services of the TCH have meant an increase of water consumption and the daily municipal water supply of 35m^3 on average is not sufficient to meet all total demand of the TCH. While a stable supply of service water is essential for the smooth running of the TCH, the municipal authority has increasingly been restricting the water supply on Tarawa Island in recent years due to an ever growing water demand and increased leakage from deteriorated water mains. Restrictions have also been imposed to protect water supply sources. Greatly concerned with this situation, the Government of Kiribati prepared the Project for Upgrading of Water Supply System in Tungaru Central Hospital, mainly aiming at the collection of rainwater from the roofs of TCH buildings to boost and maintain the hospital's water supply, and requested the Government of Japan's provision of grant aid for the Project.

In response to this request, the Government of Japan decided to conduct a Basic Design Study for the Project. Commissioned by the Government of Japan, JICA conducted the relevant domestic work and identified the possibility of establishing a new water supply source and associated problems, the TCH's water demand and problems relating to the possible supply volume. Based on the findings of the domestic work, JICA judged that an improved water supply for the TCH is both essential and urgent.

The Basic Design Study has concluded the optimum contents and sizes of the new facilities for the Project. While it is judged that the collection of rainwater from the roof area of the TCH is feasible, the collection of rainwater from all the buildings appears difficult due to the shape of the site and the building layout. Consequently, it has been decided to use some 56% (approximately 5,400m^2) of the entire roof area from which the collection of rainwater appears reasonably easy. Well water obtainable on the premises will also be actively used as it is judged suitable for use for miscellaneous purposes.

The current daily water consumption and the planned consumption following the completion of the Project are given in the table below.

	Current	Planned
Municipal Water	35m^3	25m^3
Well Water	40m^3	50m^3
Rainwater	less than 1m^3	25m^3
Total	approx. 75m^3	100m^3

The new facilities planned under the Project are as follows.

Water Tanks	Rainwater (10)	approx. 1,200m^3
	Well Water (1)	90m^3
Water Supply Pumps		12
Generator (50KVA)		1

The project implementation period will consist of approximately 2 months from the signing of the consultancy agreement upon the conclusion of the E/N and an additional 5 months for the actual construction work.

It is believed that the Project will substantially improve the present medical services of the TCH which are often hampered by water shortages and will greatly contribute to the prevention of infection and other aspects of general health care and hygiene at the hospital. As any surplus water can be distributed to people living nearby, the Project is

beneficial in a wider area than only the TCH premises. In view of these benefits, the Project is judged to be suitable for Japanese grant aid.

Although the Project is only designed to improve the water supply situation at the TCH, it is desirable that the Government of Kiribati prepare a water supply master plan covering the entire Tarawa Island because of the permanent water shortage problem which is an unfortunate reality of island countries in general.

CONTENTS

CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

The Tungaru Central Hospital (TCH), the only general hospital in Kiribati and the central facility for the country's medical activities, has some 300 staff members and provides medical services for not only the 27,000 inhabitants of Tarawa Island but also for referral patients from other islands.

Constructed some 33 years ago, the buildings of the TCH had strongly deteriorated, necessitating various improvements in view of the smooth functioning of the medical service system. In addition, the shortage of medical equipment had caused a decline of the medical service level. Improvement of the facilities and the provision of medical equipment were both urgent and essential tasks for the consolidation of health and medical care in the country. Nevertheless, the state of finance did not allow a rapid expansion of the national budget and, therefore, the prospect of increased appropriation for the Ministry of Health and Family Planning was limited. Against this background, the Government of Kiribati made a request to the Government of Japan for the provision of grant aid for a project envisaging the replacement of all TCH buildings and the supply of medical equipment.

In response to this request, the Government of Japan decided to conduct a Basic Design Study for the project and commissioned JICA to conduct the Study. A Basic Design Study Team formed by JICA was sent to Kiribati for the period between September 21 and October 22, 1988.

Upon its return to Japan, the Basic Design Study Team analyzed the findings of the field surveys, examined the suitability of the project, prepared the basic design in relation to facilities and equipment and conducted a project evaluation. It also compiled the results of these analyzes into a Draft Final Report and a Draft Final Report Explanation Team was then dispatched to Kiribati for the period between January 26 and February 7, 1989.

Following the signing of the Exchange of Notes (E/N) for the provision of Japanese grant aid for the implementation of the project by the two governments on July 13, 1989, the actual construction work commenced on January 15, 1990 and the new facilities and equipment were handed over to the Kiribati side on April 18, 1991 with the new TCH beginning operation in May, 1991. The medical service activities of the new TCH are far more vigorous than those of the old TCH and the Ministry of Health and Family Planning has newly assumed the social welfare function. Consequently, the budget of the Ministry and the number of staff have both increased to ensure the proper management and maintenance of the new facilities.

Recent emphasis on primary health care by the Ministry has stimulated increased water consumption on the part of the inhabitants of Tarawa Island. However, the increased demand for water to support the high level of the TCH's medical activities and the increased leakage due to aging of the water supply system have led to the frequent introduction of restricted water supply, particularly during the dry season. As the water source supply capacity is limited, water shortages are expected to increase in severity in the future. In order to alleviate the problem of securing the necessary water supply for the TCH, the Government of Kiribati has prepared a new project to improve the water supply situation of the TCH by means of mainly using rainwater collected from hospital buildings, the roof area of which is one of the largest in the country, as service water and has requested the Government of Japan's provision of grant aid for the Project.

In response to this new request, the Government of Japan decided to conduct a Basic Design Study and, commissioned by the Government of Japan, JICA conducted the domestic study to confirm the contents of the request and to investigate both the scope of the current activities and the state of the buildings of the TCH. Based on the confirmed contents of the Project, the identified project implementation system and the present conditions of the local construction industry, etc., the suitability of the Project was examined and the basic design of the facilities was conducted.

The present report compiles the results of these various aspects of the Basic Design Study.

CHAPTER 2

PROJECT BACKGROUND

CHAPTER 2 PROJECT BACKGROUND

2-1 Outline of the Republic of Kiribati

The republic of Kiribati is an equatorial island country which consists of a total of 33 atolls including the Gilbert Islands, the Phoenix Islands and the Line Islands. It extends over a sea area of 3,870 km in the east-west direction and 2,050 km in the north-south direction covering an area of some 5 million km^2 on both sides of the international date line.

The country became independent from Great Britain in July, 1979. It has a land area of 810 km^2 and a population of around 74,000 people. The major portion of the population (72,298) lives within the country (according to a census held in 1990). Only the three islands of Washington, Fanning and Christmas islands in the Gilbert and Line Group islands have permanent settlements. About 96% of the total population is concentrated to the Gilbert Island which is 40% of the total land area and 40% of this population live on Tarawa Island where the capital is. The population density on Tarawa is 1,522 people per km^2 while that of the Line islands is 11 people per km^2. Micronesians account for 98% of the population and the rest is Polynesian and European. The official languages are Kiribati and English.

Table 2-1 Distribution of population in Kiribati

Islands & Abroad Ships		Area	Population		Population density/km^2	
		km^2	1985	1990	1985	1990
With Resident Population	Gilbert Islands (South Tarawa)	285.5	61,023	67,471	214	236
		(15.8)	(21,190)	(24,051)	(1,341)	(1,522)
	Line Islands	431.7	2,633	4,827	6	11
	Phoenix Islands	9.1	24	–	3	
	Abroad Ships	–	203	–		
	Sub-total	726.3	63,883	72,298	88	100
Without Resident Population	Line Islands	19.5	–	–	0	0
	Phoenix Islands	64.9	–	–	0	0
	Sub-total	84.4	–	–	0	0
Total		810.7	63,833	72,298	79	100

Source: TCH Statistics

2-1-1 Political System and Administration

Kiribati is a republic and elects in a plebiscite a president who is also the prime minister and the head of the central government.

The National Assembly of the republic is unicameral and its 37 members are elected from 23 constituencies. Local administration is managed by 17 Island Councils and 2 Town Councils. The elected members of the National Assembly are responsible for regional government, starting and executing projects, repairing roads, etc.

The central governement consists of the President's office and the following ministries: the Ministry of Foreign Affairs, the Ministry of Finance and Economic Planning, the Ministry of Trade, Industry and Labor, the Ministry of Natural Resource Development, the Ministry of Education, the Ministry of Home Affairs and Decentralization, the Ministry of Works and Energy, the Ministry of Transport and Communication, the Ministry of Health and Family Planning and the Ministry of Line and Phoenix Groups. The members of the National Assembly elect the ministers who will head the ten ministries and become members of the cabinet.

State finances has taken a turn for the worse since 1979 when the country started running out of phosphate rock, a major source of income. In order to provide against the shortfall, the Republic of Kiribati established a revenue equalization reserve fund of A$75 million in 1979, which earns an annual interest of around A$5 million. Revenue and expenditure in the 1992 budget were A$ 25.23 million. The budget was distributed as follows: A$5.08 million was allocated to the Ministry of Education, A$ 3.88 million to the Ministry of Health and Family Planning, A$2.13 million to the Ministry of Finance and Economic Planning, A$2.13 million to the Ministry of Home Affairs and Decentralization. These were followed by smaller amounts to public safety (the President's office), the Ministry of Works and Energy, the Ministry of Natural Resource Development, the Ministry of Line and Phoenix Groups and the Ministry of Transport and Communication.

The government of the Republic of Kiribati is now carrying out its 7th national development plan (for the period 1992 to 1996). The objectives of the plan are: the preservation of culture and economic development to attain self-sufficiency, population containment and the abatement of population concentration in the capital city (Tarawa), decentralization of authority and promotion of outer island development, expansion and improvement of education and development of infrastructure.

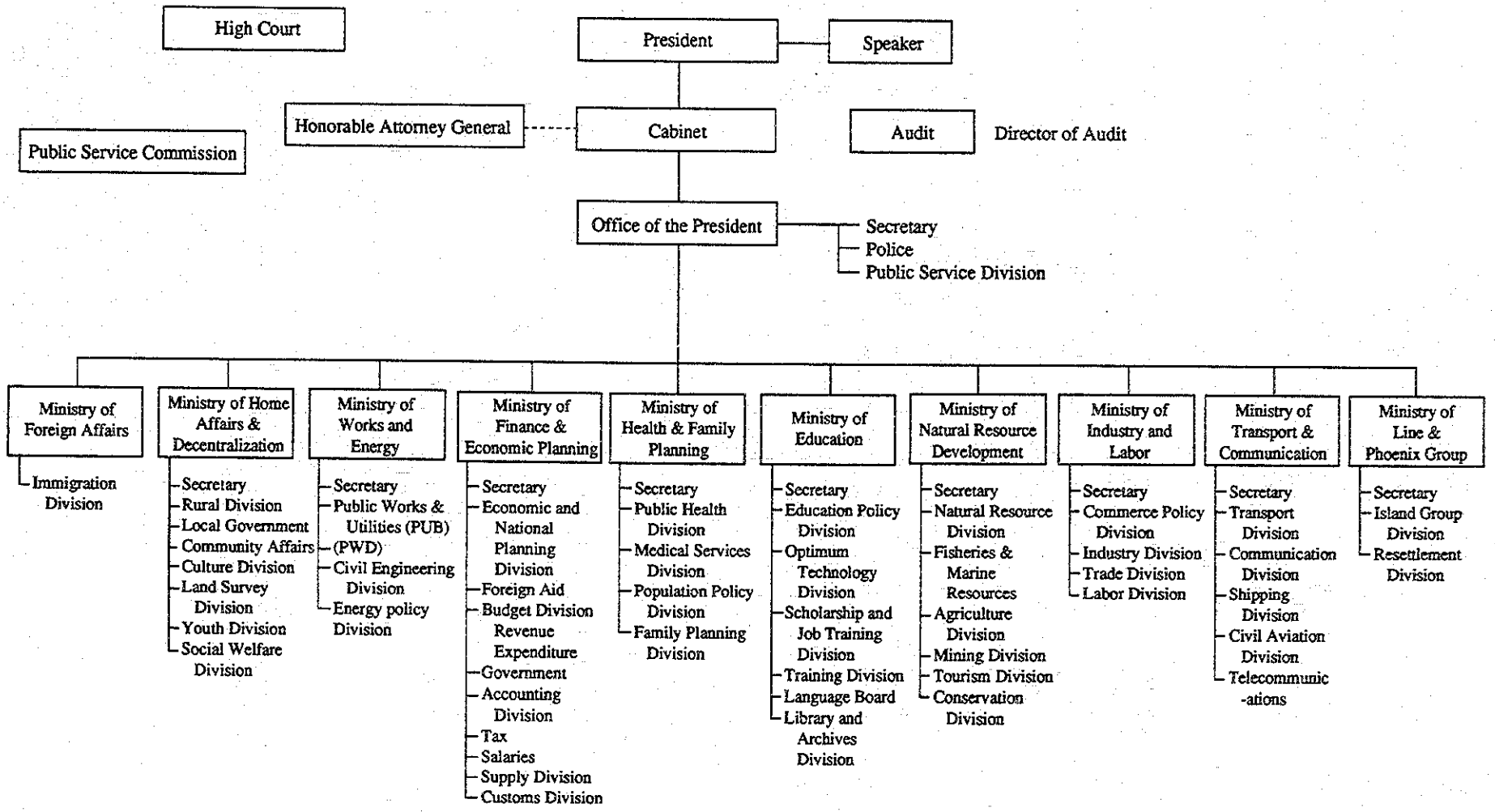


Fig. 2-1 Organization Chart of the Government of the Republic of Kiribati

2-1-2 Economic Trends

Kiribati used to be economically dependent on the export of phosphate from Banaba Island. Revenues derived from phosphate accounted for 3/4 of the total exports value and 1/2 of the national budget. When this resource started to deplete in 1979, the economy entered the doldrums and has stayed there since. The GNP which was about A$39 million in 1978 prior to the depletion had shrank by half to A$21 million by 1980 while imports started to soar.

The major exports of Kiribati today are copra and marine products. But copra production is unstable, being determined by the amount of rainfall each year. Remittances from seamen, phosphate rock miners working in Nauru and other Kiribati workers employed overseas also constitute an important source of revenue.

In 1990 the Kiribati GNP was US$ 54 million. The republic is hoping that the development of fisheries will be able to replace phosphate mining as its major export industry. A national fishing company established in 1981 is making foreign exchange earnings by directly managing bonito fishing and buying fish from local fishermen for sale elsewhere with the exception of those who live on the South Tarawa Island and on the Christmas Island the population is largely self-sufficient. Although it is difficult to estimate the GNP, it is probably about US$760 per person.

Table 2-2 Economic indices of the Republic of Kiribati

	Item	Amount	%		Item	Amount	%
		(A$ thousand)				(A$ thousand)	
Exports	Copra	6,987	54	Imports	Machinery & Transportation equipment	8,564	37
	Fish	2,232	17		Foods, Tobacco	6,586	28
	Shark's fin	46	-		Fuel	2,214	9
	Others (estimate)	3,7000 (estimate)	29		Chemicals	1,118	5
					Raw materials	302	1
					Other manufactured products	4,465	19
					Others	137	1
	Total	12,965	100		Total	23,387	100

Source: The Ministry of Trade, Industry and Labor in Kiribati

Table 2-3 Shares in Import Values by Source Country

Australia	49%
Japan	15
New Zealand	9
Fiji	7
United Kingdom	4
USA	3
Hong Kong	1
Other countries	12
Total	100%

2-1-3 Economic Cooperation by Japan

Japan has provided the Republic of Kiribati with technical support in a number of fields since before the country became independent in 1979. From 1980, grant aid assistance totalling ¥8.939 billion has been given.

A detailed description of the aid is given below.

(1) Grant aid

Table 2-4 Grant Aid to Kiribati (based on public records)

(Unit: Billion ¥)

Fiscal years 1979 to 1986	Sub-total	35.82
1987	Cold Storage Extension Project	2.53
1988	The Training of Fishing Vessel Crew Project	1.30
1989	Project for the Reconstruction of New Tungaru Central Hospital (Phase I)	9.21
		0.90
1989	Project for Outer Island Aquaculture Development	4.85
1990	Project for the Reconstruction of New Tungaru Central Hospital (Phase II)	1.45
		11.83
1990	Project for Outer Island Artisanal Fisheries Development	
1991	Building of multi-purpose passenger ships	
Fiscal years 1979 to 1991	Total	67.89

Source: Data provided by the Japan International Coorporation Agency (JICA)

(2) Technical cooperation

The Japanese government has provided training in fishing, communication, broadcasting and public health (38 people and ¥56.61 million), dispatched experts in fishing and ship building (8 people and ¥294 million), carried out development surveys, basic design study and expedition of execution (48 people and ¥391 million)

since 1974. Since fiscal 1988, Kiribati young people in leading positions have been invited as part of the "Friendship Programme for the 21st century" program.

Table 2-5 Technical Cooperation Activities performed for Republic of Kiribati

	Trainees given training in Japan	Experts dispatched	Number of people in dispatched investigation committees	Equipment and materials given	Development investigations	Total amount
Fiscal years						
1979 to 1986	30	7	48	38.5	2	7.33
1987	8	1	-	13.7	1	0.71
1988	16	-	10	-	1	1.18
1989	13	2	2	12.0	1	5.38
1990	8	1	8	6.0	1	1.10
1991	11	3	8	0.8	3	5.80
Total	86	14	76	71.0	9	21.50

Source: Data provided by the Japan International Coorporation Agency (JAICA)

2-2 Health and Medical Services in the Republic of Kiribati

2-2-1 Health and Population Indices

The population structure of Kiribati has a high ratio of young people which reflects a high birth rate. The population under the age of 15 accounts for about 40% and those under 50 for about 90% of the total. The rate of population increase is about 2.1%.

The infant mortality rate is high at 65 deaths per 1,000 live births. According to the statistics of the Ministry of Health and Family Planning, major diseases in Kiribati are diseases of the respiratory organs, wounds, conjunctivitis and diarrhoeal diseases.

The major causes of death are diseases of the digestive system (liver diseases), pneumonia, influenza and diseases of the endocrine system.

Table 2-6 Population statistics of Kiribati

Population structure (male: 49.5%, female: 50.5%)

Distribution by age group	1985	1990
Aged 0 - 14	38.9%	40.4%
Aged 15 - 49	49.7%	48.5%
Aged 50 +	11.4%	11.1%

	1981~1985	1990
Crude birth rate	37.5/1,000	32.3/1,000
Crude death rate	13.9/1,000	9.2/1,000
Infant mortility rate	82/1,000	65.0/1,000

	1985	1990
Life expectancy	Male: 50.6 Female: 55.6	Male: 57.7 Female: 62.8

	1985	1990
Total fertility rate	4.9%	4.3%

	1985	1990
Rate of natural population increase	2.1%	2.3%

Source: 1990 census conducted by the Ministry of Health and Family Planning

Table 2-7 Major Diseases in 1985 and 1990

1985			1990		
	Diseases	No. of patients		Diseases	No. of patients
1	Upper respiratory tract diseases	7,178	1	Wounds	21,224
2	Wounds	4,915	2	Conjunctivitis	17,559
3	Infectious skin diseases	2,678	3	Lower respiratory tract diseases	12,435
4	Diarrhea	2,670	4	Diarrhea	12,193
5	Conjunctivitis	1,202	5	Infectious skin diseases	11,321
6	Lower respiratory tract diseases	360	6	Lower respiratory tract diseases	2,546
7	Worm infestation	264	7	Worm infestation	2,358
8	Infectious diseases	249	8	Otitis media	1,948
9	Malnutrition	212	9	Fish poisoning	1,219
10	Anemia	126	10	Anemia	421
11	Fish poisoning	80	11	Malnutrition	338
12	Otitis media	29	12	Infectious diseases	126

Source: TCH Statistics

2-2-2 Administration of Health and Medical Services

The health and medical services are administered by the Ministry of Health and Family Planning (the M.H.F.P). The M.H.F.P has a permanent staff of 406 people including the Minister of which 367 people are on active duty. The M.H.F.P headquarters has three organs: one for the establishment of basic policies (Minister), one for the formulation of implementation programs (Secretary) and one for the implementation (Assistant secretary, chief medical officer, prevention, public health and superior head

nurse). The implementation function is divided into the Public Health Division, the Medical Division and the Executive Office; Preventive Public Health Division (Department) consists of the Organizing Community Sub-Division, Promotion of Preventive Medicine Sub-Division and Convalescence and Rehabilitation Control Sub-Division; and the Medical Division consists of the Diagnosis, Detection andTreatment Sub-Divisions and the supporting Hospital Department. The Hospital Department consists of the Laboratory Section, the Medical Specialities Section the the Medical Ratio Network Section. The Executive Office is divided into the Service Department and General Department. The Service Department is divided into the Health (statistics) Information Center, Health and Family Planning Education Section, Research and Development Section, Nursing Section, Pharmacy, Administration Section and Education and Training (Nursing School) Section.

Health and medical services are provided throughout the country through local health centers with a health aide and a nurses and almost every island has its own dispensary with a medical aide and nurses.

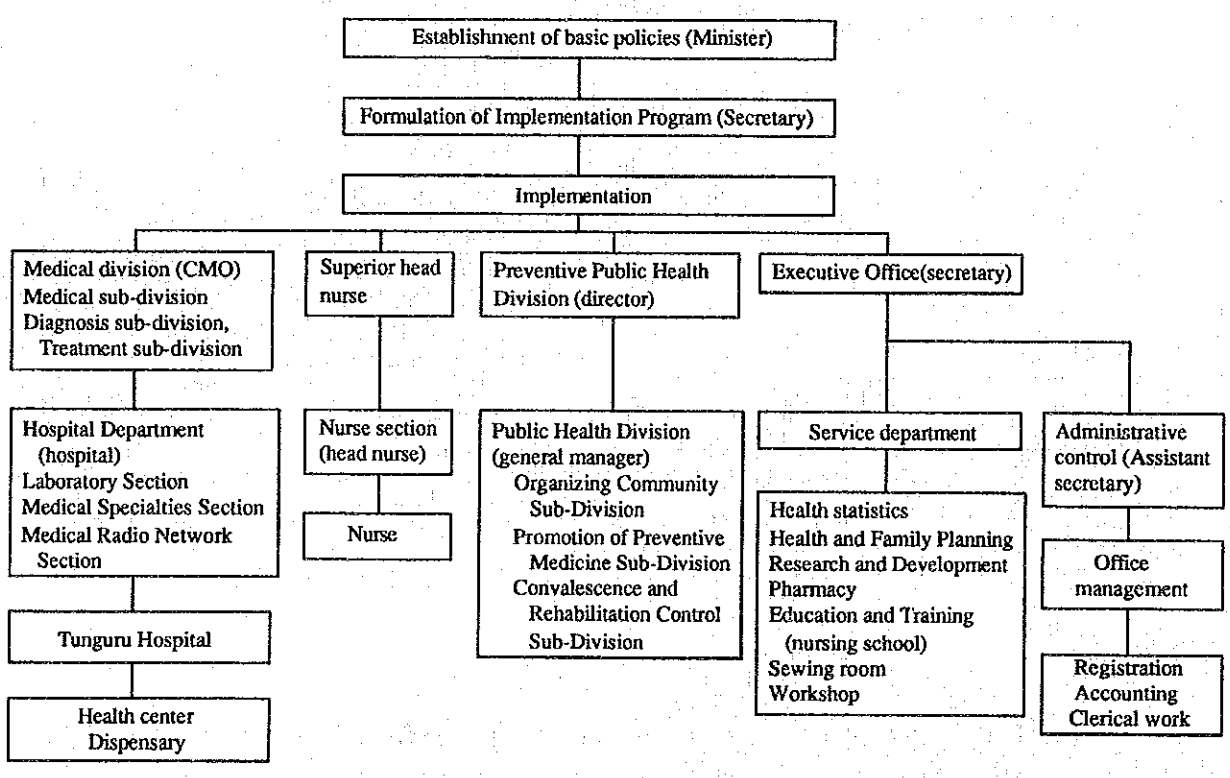


Fig. 2-2 Organization Chart of the Ministry of Health and Family Planning, the Government of the Republic of Kiribati

2-2-3 Outline of Health and Medical Services

The nationwide health and medical services are managed by the Tungaru Central Hospital (TCH) and by 24 health centers and 44 dispensaries which cover the local medical districts established for almost every island. Their activities are supported by village welfare groups (VWG) that handle primary health care. Each health center is designed to cater to inhabitants living in an area that is within a 5 km radius from the center and 85% of the population live in such areas. These facilities are connected to the TCH by telephone or medical transceivers which acts as a referral institution providing medical guidance in urgent cases. The TCH acts as the referral hospital for all the health centers and dispensaries and it received 520 cases in 1987. Cases that cannot be treated at the TCH are sent to New Zealand and Hawai for treatment. The treatment given in New Zealand is offered free. In 1986 and 1987, 8 cases were sent to New Zealand and another 8 to Hawai. These patients were diagnosed as cases of cerebral edema, myelitis, lung cancer, stab wounds in the abdomen and caissons disease.

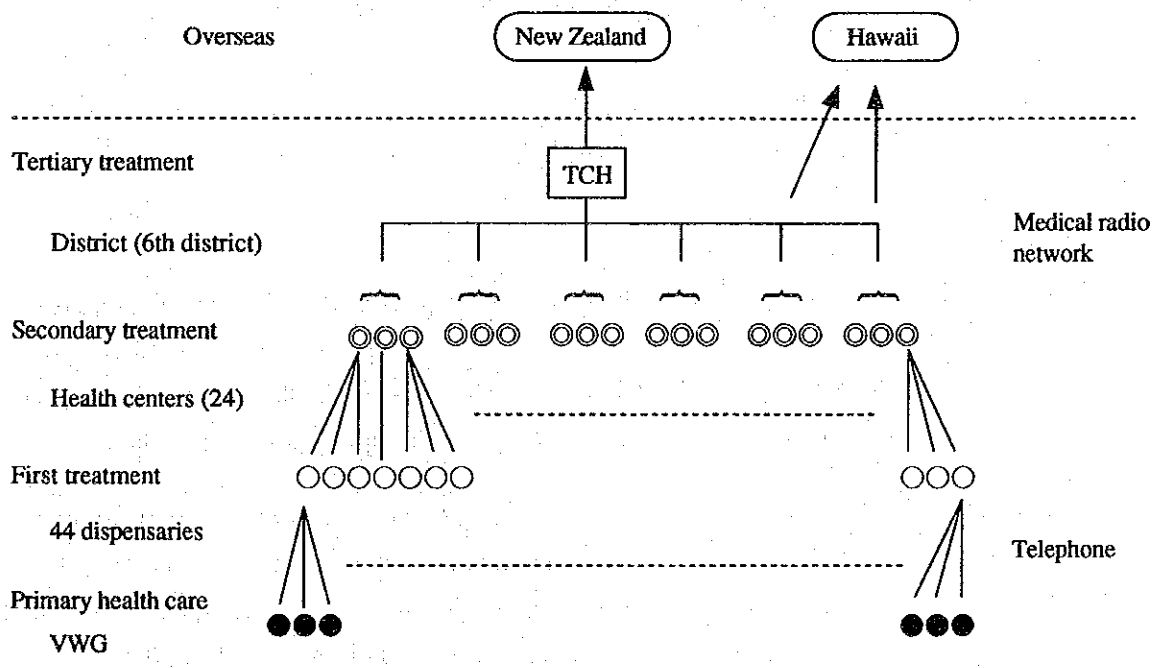


Fig. 2-3 Health and Medical Services

Table 2-8 Number of Patients that are Transferred Overseas for Treatment

Destination	New Zealand		Hawaii	
Year	Number of patients	Disease	Number of patients	Disease
1980	5	Crown Congenital heart deformity Artificial rib	1	Unknown
1981	2	Malignant tumor Tuberculosis	–	–
1982	2	Tibia fracture Tumor	–	–
1983	2	Traffic accident	2	Traffic accident
1984	1	Infant fever	2	Ileus
1985	2	Traffic accident Thigh fracture Clysphagia	1	Traffic accident
1986~1987	8	Palate mucosa tumor Lower thigh Hydrocephalus bone tumor) Bone tumor Eye diseases Myelitis	8	Placenta disorders Epimenorrhagia Caissons disease Stab wounds in abdomen Thoracic infarction Lung cancer

Source: TCH Statistics

The staff who operate the 24 health centers and 44 dispensaries throughout the country consist of three district medical officers (DMOs) (of which one is also central level staff), five principal nursing officers (PNOs), 14 medical assistants (MAs) who are all district staff, three senior nursing officers (SNO) and 52 nursing officers (NOs).

All the central level staff belong to either public health or Medical Division Support Services. The authorized number of staff is one principal medical officer, five medical officers, six principal nursing officers, two senior nursing officers, 25 medical assistants and 57 nurses. However, there are fewer doctors now than in 1980. A total of 123, 035 out-patients visited these facilities during 1987. The following table shows the number of staff at each health center and dispensary and the number of out-patients who have visited the facilities.

Table 2-9 Activities of Health Centers and Dispensaries

No	Island	Health center	Dispensary	Total	Job classification					No. of out-patients	No. of Referral out-patients to TCH
					DMO	PNO	MA	SNO	NO		
North											
1	Makin	Makin	Kiebu	2			1		1	1,349	8
2	Butaritari	Butaritari	Keuera Kumma Ukiangang Bikaati	5		*1	1		4	4,908	24
3	Marakei	Rawannawi	Norauea Tekaraka	3			1		2	4,001	19
4	Abaiang	Taburao	Nuotaea Teabunginako Tebanga Koinawa Ribono	6			1		5	4,879	30
Tarawa, Banaba, Betio											
5	North Tarawa	Abakaoro	Tabiteuea Teamibai	3					3	4,746	45
	South Tarawa	TUC	Bairiki Nanikaai Banraeaba	9						5,945	135
	South Tarawa	TUC	Bikenibeu West Bikenibeu East	9	1			3	7		
6		Etanibanaba		1			1		7	447	4
	Banaba	Betio	Takoronga Temakin	3	*1	*1			6		
Central											
7	Maiana	Tebangetua	Bubutei Tekaranra	3		*1			3	1,832	23
8	Kuria	Buriki		1						1,612	6
9	Aranuka	Buaruki	Takaeang	2					2	1,809	13
10	Abememe	Karitebike	Tabiang Tekatitieake Abatiku	5					3	3,601	14

No	Island	Health center	Dispensary	Total	Job classification					No. of out-patients	No. of Referral out-patients to TCH
					DMO	PNO	MA	SNO	NO		
South West											
11	Nonouti	Matang	Teuabu Temotu Abdmakoro	4 4		*1			3	3,633	35
12	Tabiteuea North	Utiroa	Tanaeang Kabuna Aiwa	4			1		3	3,049	44
13	Tabiteuer South	Buaruki	Tewa Taku	3			1			1,542	8
14	Onotoa	Buariki	Aiaki Abdmakoro	3			1		1	1,604	35
South East											
15	Beru	Temaraa	Aoniman Autukia	3		*1			2	2,219	25
16	Nikunau	Roreti	Tabonatang Muritoa	3			1		1	2,813	28
17	Tamana	Bakaka	—	1					1	2,471	7
18	Arorae	Roreti	—	1					1	3,823	12
Linex											
19	Christmas Island	London	Banana Poland	3	1		1		3	3,322	4
20	Fanning Island	English Harbour	Napari	2			1			760	0
21	Washingt on Island	Tngkore	—	1			1			1,602	1
22	Canton Island	Canton		1					1	68	0
Total		24	44	68	3	5	14	2	52	123,035	520

* Number of district workers and patients are from fiscal 1987.

Source: TCH Statistics

The district medical officers have acquired their doctor's qualifications in Fiji and other overseas countries while the principal nursing officers have the experience of a medical aide and are trained to give treatment when a doctor is not available. The assistant doctors receive one year of primary health care training after three years of basic nurse training at the TCH. A nurse goes through one year of training at the TCH and 3 years of training on one of the islands after graduating from nursing school to become a qualified nurse. Anyone who has graduated from the fifth grade of junior high school has the right to apply. There are between 70 to 80 applicants each year of whom 10 are admitted. Only two or three of all attending students are male.

The village welfare groups operating under the MOH perform services such as improving communal wells and construction of toilets based on primary health care policies.

2-2-4 Financial Resources for Health and Medical Services Expenditures

As all preventive and medical treatment costs for the citizens of Kiribati are borne by the government, they have to be paid for out of the budget of the Ministry of Health and Family Planning and from revenue from hospitalization fees.

The budget of the Ministry of Health and Family Planning for fiscal 1992 was A$3,878,500 which was 15.4% of the national budget (total expenditure) while salaries and wages accounted for 15.6% of the total budget. A comparison of the budget for 1990, 1991 and the budget estimate for 1992 reveals that the increase over the previous year was 16.9% in 1991 and 16.4% in 1992. Although only an estimate, the current expenses for fiscal 1992 is expected to go down to 7.3%. Salaries and wages for fiscal 1992 are expected to rise by 12.2% and current expenses by 19.2%. Although the current expenses in the supplementary budget for fiscal 1991went up by 29.2% to allow for the opening of the hospital in May, 1991, the supplementary budget for fiscal 1992 will go down by 4.2% so there is hardly enough funds to go around.

Expenses other than salaries and wages are as follows: drugs and medical supplies (35.5% of current expenses), transportation (18.7%), food for in-patients (11.4%) and maintenance of facilites (6.3%).

Table 2-10 Budget and Actual Revenue and Expenditure of the Ministry of Health and Family Planning

(Unit: A$)

Sub-head	Actual 1990	Approved estimate 1991	Revised estimate	Estimate	Increase/ Decrease	Note
Revenue						Based on current receipts
Medical fees	15,204	13,320	15,000	15,500	2,180	
Drugs and supplies	4,211	4,584	4,584	4,600	16	
Food	45	900	900	900	0	
Sub-total	19,460	18,804	20,484	21,000	2,196	
Total revenue	19,460	18,804	20,484	21,000	2,196	
Expenditure						
Wages						Annual increments Under-estimated
01 Salaries	995,978	1,154,618	1,158,444	1,310,400	155,782	
02 Insurance	102,144	71,593	118,718	78,200	6,607	
03 Temporary assistance and overtime	170,911	100,000	111,782	101,500	1,500	
04 Wages	54,423	56,383	15,753	64,300	7,917	
Sub-total	1,323,456 (46.4%)	1,382,594 (41.5%)	1,404,697 (35.8%)	1,554,400 (40.1%)	171,806	
Other expenses						
11. Entertainment	3,000	6,000	10,121	6,000	0	
12. Office expenses and incidentals	30,689	35,125	50,000	37,000	1,875	Increase in publications
13. Traveling & Transport	335,501	300,000	600,000	435,500	135,500	Increase in domestic travel and patient referral expenses
14. Overseas traveling	23,653	41,000	82,750	43,000	2,000	When international conference is held
15. Hire of vehicles	48,577	112,772	56,671	118,000	5,228	
16. Utilities	126,512	90,000	156,009	147,000	57,000	Increase in electric consumption
17. Building repair fees	22,053	22,000	17,986	26,000	4,000	Including repair expenses (3,000) for stadium
18. Volunteer assistance	0	0	0	9,000	9,000	New company welfare items
19. Local training	9,341	15,517	18,151	30,800	15,283	Increase in PHC expenses
20. Technical books and forms	837	3,500	3,500	3,900	400	
24. Repair of medical equipment	9,866	15,000	23,837	21,500	6,500	
25. Miscellaneous patient expenses	25,967	24,000	10,000	28,000	4,000	Increase in medical materials
26. Uniform	4,930	20,000	15,290	19,000	(1,000)	Increase in toilets
27. Procurement of new materials	29,628	10,000	36,418	21,500	11,500	
29. Food	194,228	200,000	291,266	263,900	63,900	Includes new moving equipment (1,500)
35. Volunteers	16,203	26,000	26,000	26,000		
48. WHO fund	42,398	42,000	41,000	41,000	0	
49. Drugs and medicine	533,937	775,000	856,166	825,000	50,000	
50. Overseas treatment	15,214	170,000	20,000	100,000	(70,000)	Fiscal 1993 US$34.025
60. B.P.A charges	5,141	10,000	20,000	10,500	500	
61. Telegram and telephone charges	48,428	30,000	88,284	61,500	31,500	
78. Overseas doctor donations	0	0	93,000	40,000	40,000	
79. National funds	0	0	0	6,000	6,000	Residential expenses
99. Various	300	1,500	1,500	3,000	1,500	Work therapy (500) Relief fund (2,500)
Sub-total	1,526,403	1,949,414	2,518,949	2,324,100	374,686	
Total expenditure	2,849,859	3,332,008	3,923,646	3,878,500	546,492	
Deficit	-2,830,399	-3,313,204	-3,903,162	-3,857,500	-544,296	

Source: Revenue and expenditure for the Republic of Kiribati in 1988.

2-2-5 Outline of Foreign Aid

Actual foreign aid received and aid requested by the Ministry of Health and Family Planning are as follows.

(1) WHO

1) Provision of medical equipment

2) Guidance on health and medical statistics and their assessment methods

3) Dispatching of long-term and short-term consultants

(2) Australia

1) Dispatching ophthalmologists

During the last five years, a team of ophthalmologists have been dispatched twice annually for three weeks at a time to perform eye treatment and operation.

2) Dispatching orthopaedic surgery team

During the last five years an orthopaedic surgery team has been dispatched once a year.

(3) The United Kingdom

1) Dispatching of dentist (the difference in salaries are paid for by the British Government)

2) Provision of dental clinic facilities and equipment was started in 1987 and amounts to about A$50,000

3) Provision of X-ray units to TCH started in 1989

(4) New Zealand

1) Treatment of emergency patients

Free of charge for up to 5 patients a year

2) Medical scholarships

Table 2-11 Outline of Projects for which Foreign Aid is requested by the Ministry of Health and Family Planning

(Unit: A$ thousand)

Major programs	1987	1988	1989	1990	1991	Total	Funds
1. Health system program and research	70	90	90	90	90	430	WHO
2. Public information and education	45	75	75	65	65	325	WHO
3. Oral health program	-	15	15	20	20	70	WHO
4. Prevention of mental disorder	8	10	10	11	11	50	WHO
5. Environmental health	55	55	55	65	65	295	WHO
6. Diagnostic therapeutic rehabilitation services	40	30	30	20	20	140	WHO
7. Essential drugs	15	50	55	35	30	185	WHO
8. Recording of traditional medicine	-	-	6	1	-	7	WHO
9. Tungaru Central Hospital redevelopment	2	-	2500	2000	-	4502	JAPAN
10. X-ray unit	-	72	-	-	-	72	UK
11. Extension of dental surgery and mobile team equipment	5	-	-	-	90	95	(CANADA)
12. Port health service betio	-	100	-	-	-	100	(GERMANY)
13. Upgrading Christmas island hospital	-	-	-	-	100	100	
14. Community health-family planning	10	10	20	30	30	100	(UNFPA)
15. Solar fridges on outer islands	30	30	-	-	-	60	(CANADA)
16. Outer island health clinics and equipment	30	30	30	-	-	90	(Com'ty/CANADA)
17. Emergency health care	40	40	40	40	40	200	NZ/Australia
Total number of projects	350	607	2926	2377	561	6821	
Technical assistance projects	1987	1988	1989	1990	1991	Total	Possible Funds
1. Doctors (surgeon)	140	70	70	-	-	-	(UK/Germany)
2. Senior dental surgeon	70	70	70	70	70	70	UK
3. Eye team	80	80	80	80	80	80	Australia
4. Plastic surgery team	40	40	40	40	40	40	Australia
5. Health assessment	-	-	-	-	8	8	WHO
6. Advisory missions	100	100	100	100	100	100	WHO
7. Disease control consultancy	20	25	30	35	-	-	WHO
8. Personnel available	10	33	33	27	27	27	WHO
Total number of technical assistance projects	460	418	423	352	325	1978	
Total	810	1025	3349	2729	886	8799	

( ) planned

Source: Kiribati Development Plan

2-2-6 Outline of the National Health Program

The government of the Republic of Kiribati has now successfully completed its 6th national development plan (1987 to 1991). It had the following objectives: preserving Kiribati's own culture, establishing laws and a system of government, solving the economic problems stemming from the depletion of phosphate rock, creating a good environment, population control and developing links to other countries.

The second national health program (1987 - 1991) now in progress is a part of the national development plan. It aims to ensure a physically and mentally satisfactory social life through improvement of health services based on primary health care measures and the basic policy of "Health for all Kiribati citizens by the year 2000".

These goals will be attained through the following three activities.

1) Stimulating cooperative activities
2) Improving the organization of health services
3) Overhauling health centers, dispensaries and hospitals and improving education and training of medical staff
4) Putting preventive medicine and family planning into practice by widening the scope of the national primary health care system.

These goals will not be possible to attain through the efforts of the the Ministry of Health and Family Planning alone, it requires a concerted effort by the citizens together. The following measures should be taken to solve the medical and hygenic problems that Kiribati faces today.

1) Vaccination of all infants
2) Spreading information about the family planning program
3) Health education
4) Making the medical system better prepared to fight epidemics
5) Stimulating good health
6) Improving the referral system
7) Improving the health system so that diseases can be detected at an early stage

2-3 Facilities and activities of Tungaru Central Hospital (TCH)

2-3-1 Roles and Functions of TCH

TCH is the only hospital capable of offering tertiary treatment and receives patients from all over the country and provides the citizens of Tarawa with a number of services.

(1) It is the only large general hospital in the country and the only place that offers medical services for the whole country. It performs such functions as: accepting in-patients, consultation and treatment of general out-patients and referral patients from all over the

country and emergency patients, dispensation of medicine, various type of examinations, surgical operations and hospitalization.

(2) The hospital staff also serves as the staff of the Ministry of Health and Family Planning to perform administrative functions.

1) It operates the nursing school and medical assistants' school and offers on-the-job training as a training hospital.

2) It performs health and education activities including family planning and maternal health care based on primary health care policies and it carries out examinations and preventive medicine using X-ray facilities.

3) The laboratory facilities of the hospital are also used in public health activities such as testing of drinking water and sewage facilities.

4) The pharmacy of the hospital is the only facility that prescribes drugs in Kiribati and ships drugs and medical supplies to dispensaries and health centers througout the country.

2-3-2 Organization of staff at TCH

TCH is run by the general medical director and is divided into the medical division and the service division. The service division not only handles TCH's services but also handles services for the whole country.

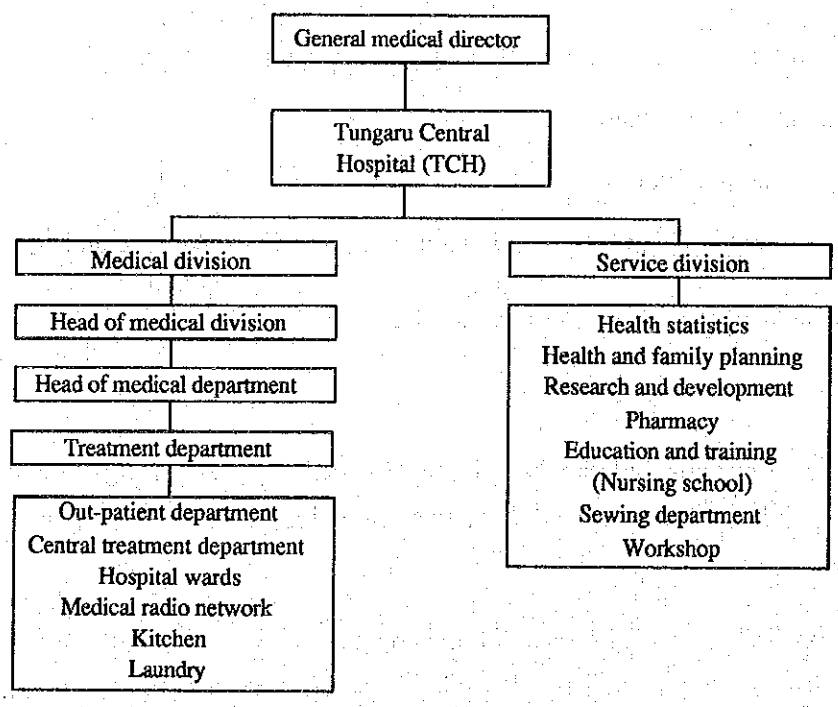


Fig. 2-4 Organization Chart of Tungaru Central Hospital

The hospital has 12 doctors (currently 11) and 88 nurses. The hospital is open from 8:00 to 12:00 and 13:00 to 15:30 (nurses and ambulance drivers have night duty). The nurses work in three shifts (7:00 - 15:00, 15:00 - 23:00 and 23:00 - 7:00) and one or two nurses serve each ward. At night the doctors are on call system.

Table 2-12 Staff and the Ministry of Health and Family Planning and the Tungaru Central Hospital

Staff position	Authorized number	Existing number
Health administration		
Minister	1	1
Secretary	1	1
Assistant secretary	1	1
Chief nursing officer	1	1
Deputy chief nursing officer	1	1
High executive staff	1	1
Personal aide	1	1
Executive staff	2	3
Clerk	2	2
Typist	3	3
Telephone operator	3	5
Chief medical officer		1
	17	21
Accounting		
Accountant	1	1
Accountant's assistant	1	1
Accounting department clerks	4	4
	6	6
Cleaning personnel	1	1
Gardener		2
	1	3
Support service		
Electrical engineer	2	2
Cook	1	1
Nutritionist	1	1
Mechanical engineer	1	1
Seamstress	1	1
Carpenter	2	2
Nurse aide	4	6
Workers	2	2
Watchman	1	1
Boatman	1	1
Cook	8	8
Handy man	30	30
Cleaning lady	5	5
Seamstress	1	1
Janitor	1	1
Wood cutter	1	1
	62	64
Driver	8	8
People on night duty (1 is Betio)	2	2
	10	10
Nursing school		
Principal	1	1
Senior nursing officer	3	3
	4	4
Health data service		
Medical and health statistics personnel	1	1
Statistics management personnel	1	1
Clerks	2	2
Reception of statistics	2	2
	6	6

Staff position	Authorized number	Existing number
Parallel treatment service		
Pharmacy and medical storage		
Senior pharmacist (overseas)	1	1
Pharmacist	1	1
Pharmacy technician	2	2
Medical storage staff	1	1
Medical storage assistant	1	1
Dispensary assistant	2	2
Package wrapper	2	2
Medical storage staff	3	3
Bottle cleaner	1	1
	14	14
Cleaning lady	1	1
	1	1
Laboratory service		
Laboratory head	1	1
Senior laboratory officer	1	1
Laboratory officer (overseas)	1	1
Laboratory engineer	3	3
Laboratory engineer assistant	6	6
Laboratory assistant	1	1
	13	13
Dental service		
Senior dentist (Englishman)	1	1
Dentists	2	2
Senior dentist technician (overseas)	1	1
Senior dental engineer	1	1
Dental engineer	2	2
Dental engineer assistant	6	6
Dental assistant	3	3
	16	16
Cleaning lady	1	1
	1	1
Prevention and primary health care		
District health education (Local responsibility)		
Medical director (prevention and public health)	1	1
Senior staff	1	1
Doctors	4	4
Medical staff	6	6
Superior head nurse	25	29
Medical assistants (four places)	2	2
Nurses (four vacant positions)	57	58
Nutritionist (works on external budget)		1
	96	102

Staff position	Authorized number	Existing number
Health survey		
Senior service officer	1	1
Survey officer	2	2
Survey assistant	5	5
Cleaning lady (name changes for distribution medicine)	2	2
	10	10
Health education		
Senior health educator	1	1
Health educator	3	3
Health education assistant	6	6
	10	10
Health educator guide		1
	0	1
Welfare		
Senior welfare officer		1
Social welfare staff (from MHRO)		1
Social welfare assistants (")		3
Welfare commissioner (")		7
Minister (")		1
Typist (")		1
Stadium, janitor (")		1
	0	15
(Reserved job) Social welfare assistants		1
	0	1
(Part-time basis) Cleaning lady	1	1
	1	1

Staff position	Authorized number	Existing number
Treatment (Hospital)		
Medical director (hospital director)	1	1
Anesthesiologist	1	1
Senior pediatrician	1	1
Senior internist and psychiatrist	1	1
Pathology test engineer (New position)	1	1
Senior surgeon		
Medical staff (Doctor)	7+18*	8
Principal Nursing Officer	1	1
Senior Nursing Officer	11	11
Nursing Officer ( )	69	76
X-ray		
Radiographer	1	1
X-ray engineer	2	2
X-ray assistant	1	1
	4	4
Total Permanent jobs	350	378
Reserved job		2
To be employed	14	16
Ministry of Health and Family Planning	3 367	10 406

* English person with a two-year contract. All other ▨ personnel are employed by the TCH.

Source: From publication of Ministry of Health and Family Planning.

2-3-3 Hospital Statistics and Current Conditions of Activities

The TCH has the following departments.

1. Outpatient department
   - (1) General outpatient
   - (2) Emergency
   - (3) Special outpatient
   - (4) Dental clinic
   - (5) Pharmacy

2. Central diagnostic and therapeutic department
   - (1) Radiology department
   - (2) Laboratory department
   - (3) Blood bank

3. Surgical operation department

(1) Operating theater
(2) Centeral supply and sterilization department
(3) Postmortem examination room

4. Ward department

(1) Private ward
(2) Internal medicine ward
(3) Surgical ward
(4) Pediatric ward
(5) Tuberculosis ward
(6) Obstetric ward
(7) Mental ward

5. Service department

(1) Kitchen
(2) Laundry

6. Nursing school

(1) Classrooms
(2) Nursing school dormitory

7. Health education and family planning

8. Maneaba

This hospital provides the therapeutic and support services of the therapeutic subdivision of the Ministry of Health and Family Planning. Thus its specialists also serve as staff of the Ministry of Health and Family Planning while its laboratory officers also conduct examinations for the Public Health Division and the doctors are in charge of instruction at the Health Education and Family Planning Division. Students of the nursing school also work in the hospital to gain practical training. The hospital thus assumes the role of supervising preventive medicine besides carrying out actual therapeutic activity and is involved in most of the activities of the Ministry of Health and Family Planning.

These methods effectively utilize the staff and reduces the running costs by comprehensively integrating the facilities within the limited annual budget.

That all of the facilities of the Ministry of Health and Family Planning except for the dispensaries and the health centers should be provided by the hospital seems to be the right answer for a country with a limited budget.

2-3-3-1 Conditions of the Activities of Each Department

1. Outpatient Department

(1) General outpatient department

Doctor in charge: 1
Open: 6 days a week and closed on Sunday
Medical service hours: 8:00 - 12:30, 13:00 - 16:15
Average daily number of patients: 40 - 50 new patients

The Department carries out medical services for some 22,000 inhabitants on Tarawa Island and accepts referral patients transferred from the dispensaries and health centers througout the country. During 1987, 520 referral patients were recorded.

According to the system, every patient must visit the local dispensary or health center to consult the local nursing officer first. If a more accurate diagnosis or further treatment is deemed necessary, such a patient will be sent to TCH. If it is more convenient and closer for the patient to go to TCH, however, a direct visit to TCH as an outpatient is also permissible. Even in making a direct visit, however, a referral letter issued by a dispensary or health center is still necessary. The patient will visit the general outpatient department first, receive his chart and undergo preliminary examinations by a nursing officer. If deemed necessary, the patient will be further examined by doctor. After the patient receives treatment there he (or she) will be given a prescription and receive the prescribed drug at the pharmacy.

(2) Emergency

In the old TCH the emergency patient department and general outpatient department were in the same wing and shared consultation room and other facilities. The general out-patients and emergency patients were thus treated in the same wing which prevented the smooth progress of treatment. In the new TCH these departments are still in the same wing but the entrance, consulting rooms and other facilities are separate which has improved treatment. In fiscal 1987 there were 177 (120 male and 57 female) emergency cases in fiscal 1990 there were 397 (268 male and 129 female). Table 2-12 shows the causes for admission which often was trauma caused by traffic accidents or food poisening.

Table 2-13 Emergency Cases in Tungaru Central Hospital in 1990

Disease \ Age / Sex	0		1 ~ 4		5 ~ 14		15 ~ 44		45 ~ 54		55 ~ 64		65 ~		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Pedestrian injured in traffic accident			8	2	14	8	49	14	29	11	18	7	7	2	125	44
Traffic accident																
Food poisoning			5	1	7	9	71	49	15	13	8	5	5	2	111	79
Fall from trees				3		7		3							13	
Entry of foreign body			1	2	1	4	1								3	6
Accidents caused by cutting, piercing							11		2		2		1		16	
Accidents																
Other																
Total			14	5	25	21	139	63	49	24	28	12	13	4	268	129

Note) M: Male F: Female
Source: TCH Statistics

(3) Special outpatient clinic

The special outpatient is divided into surgery, internal medicine, pediatrics, gynecology and obstetrics each with one or two consultation days a week. This department caters to patients who need special treatment and are under the care of a specialist. The internal medicine also handles psychiatric patients and the surgery also handles otorhinological, ophthalmological and dermatological cases.The consultation period is from 13:00 to 15:00 and the specialists treat the inpatients or perform operations before or after the consultation period. This department treated 2,700 patients in 1987 half of those were internal medicine patients followed by surgery and obstetric patients.

Diagnosis and treatment	Doctor in charge	Consultation day	Consultation time
Internal medicine	Physician 2	Thursday	13:00 - 15:00
Surgery	Surgeon	Monday	"
Pediatrics	Pediatrician	Tuesday	"
Gynecology	Obstetrician	Wednesday and Friday	"
Obstetrics	Principal nursing officers	"	"

(4) Dental care

A British dentist, working on a two-year contract is treating 50 patients a day. Both the building and the equipment, which make modern dental treatment available to the islanders, were completed in 1988 and financed by the British government. Currently, France is assisting in setting up a dental ward at the TCH.

(5) Pharmacy

The pharmacy not only dispenses drugs for the inpatients and outpatients at the TCH but also ships drugs to the health centers and dispensaries througout the country. Drugs and medical supplies are imported once a year based on the List of Essential Drugs on a tender basis, each at the lowest price from China, Japan and Germany. Empty beer, juice, whisky bottles, etc. are cleaned in hot water in the bottle washing room and carefully stored for use in distributing drugs and medical supplies. Vaccines and the like are air-lifted to each island according to the flight schedule of Air Tungaru.

Table 2-14 Schedule of Air-lift Operations to each Island

Unit: packages

Vaccine		BCG		DPT		OPV		TT		MEASLES		HAPTIC
Island	Year	1987	1990	1987	1990	1987	1990	1987	1990	1987	1990	1990
A	Maiana	30	21	90	21	90	20	90	19	30	20	7
	Kuria	15	28	45	31	45	29	45	26	15	25	55
	Abaiang	338	72	114	85	114	72	114	44	38	65	43
	Marakei	30	53	85	67	85	53	85	41	30	49	76
	Tab North	50	54	152	39	152	44	152	49	50	54	93
	Tab South	21	42	63	57	63	62	63	46	21	41	45
B	Onotoa	31	68	92	76	92	74	92	66	31	63	92
	Beru	45	40	92	46	92	44	92	37	45	39	55
	Nikunau	30	37	92	42	92	41	92	33	30	34	49
	Butaritari	30	66	92	72	92	42	92	55	30	66	64
	Makim	20	39	92	43	92	37	92	41	20	41	50
C	Aranuka	15	31	45	48	45	36	45	25	15	25	39
	Abemama	45	34	135	65	135	32	135	31	45	32	39
	Nonouti	47	29	140	38	140	37	140	26	47	29	27
	Tamaha*	23	29	29	28	29	33	29	29	23	29	39
	Arorae*	23	29	29	34	29	31	29	27	23	26	50
Total		493	672	1387	792	1387	687	1387	595	493	638	823

A = January /April/July/October — Every week Mondays
B = Februrary /June/August/November — Every week Tuesdays
C = March /June/September/December — Every week Wednesdays and Thursdays
Each island is responsible for the quality of aviation.

2. Central diagnostic and therapeutic department

(1) Radiology department

The hospital has one X-ray units with a display, for diagnosing special outpatients and in-patients. This is the only X-ray unit in the country (the portable unit provided by the UK in 1989 having broken down). For this reason, as many as 40 to 50 patients are scanned each day. The largest demand for X-rays is for chest scans, about one-third of all cases: barium contrast examinations are also given. Respiratory decease patients are always on the top of the statistics and emergency patients form accidents and other causes is increasing yearly. The effects of the improvements will be greatly felt in this department and in the laboratory department, described below.

Table 2-15 X-ray examinations performed

Region examined	1987		1990	
	Monthly average number of patients	(%)	Monthly average number of patients	(%)
Chest	300	35		77.1
Limbs	145	17		6.3
Spine	101	12		4.3
Head	100	12		3.9
Abdomen	97	11		0.9
Pelvis	80	9		6.5
Bariurm contrast radiography	42	4		0.6
A portable X-ray unit made in the UK was used.				0.4
Total number of patients examined (Number of films used)	865/month (1,2295/month)	100	3,239/month	100

(2) Laboratory department

Clinical examinations involve blood tests, bacteriological tests, biochemical tests and tests of water quality performed for the sake of public hygiene. A total of 14, 000 tests are performed each year. Most of these tests take time and are labor intensive as no automatic equipment is available. Currently, these tests are performed by a staff of 12 people. Blood test are the most common followed by bacteriological and biochemical examinations.

The buildings, facilities, equipment and devices of the old TCH were all run down and the new hospital has been a vast improvement in terms of the tests that can be made,

accuracy and testing time. The need for examinations will continue to increase so a greater maintenance and management effort is required.

Medical laboratory staff

	1
Blood test engineer	3
Bacteriological test engineer	4
Biotechnological engineer	2
Laboratory assistant	2
(water tests)	(1)
Total	13 (1 overseas)

Table 2-16 Blood Test

Blood analysis	1987		1990	
	Annual number of tests	(%)	Annual number of tests	(%)
Hemoglobin density	2,141	46	2,277	
Leukocyte count	682	15	930	
Leukocyte classification and counting	650	14	862	
Blood type determination	448	10	255	
Erythrocyte sedimentation rate measurement	262	6	301	
Hematocrit value	230	4	468	
Other	253	5	Not yet available	
Total number of tests per year:	4,666	100	1,093 (+α)	

Table 2-17 Bacteriological examination

Bacteriological examination	Major contents of examination	1987		1990	
		Annual number of tests	(%)	Annual number of tests	(%)
Feces	Parasites, culture, occult blood	1,771	47	3,205	
Urine	Culture, sensitivity , pH, specific gravity, pregnancy	846	22	475	
Spututm	Staining, culture, sensitivity	716	19	374	
Pus	Staining, culture, sensitivity	359	10	Not yet available	
Other		79	2	Not yet available	
Total number of annual examinations:		3,771	100	4,054 (+α)	

Table 2-18 Biochemical Analysis (1987)

Biochemical analysis	1987		1990	
	Annual number of tests	(%)	Annual number of tests	(%)
Blood sugar	1,131	46	946	20
Potassium	430	17	600	13
Sodium	420	17	600	13
Urea	199	8	564	12
Other (RPR, HBsA, SGOT, SGPT. total protein, etc.)	287	12	1,981	42
Total number of annual examinations	2,467	100		

(3) Blood bank

The TCH has the only blood bank in the country and supplies the blood required in emergencies, for operations and for use on other islands. A staff of two performs simple blood tests and the more difficult tests are handled by the clinical test department. In 1987, 1,709 people donated blood to the bank and 665 people were given blood.

Table 2-19 Blood Test

Judgment of compatibility	1987		1990	
	Annual number of tests	(%)	Annual number of tests	(%)
Blood type test	1,624	52	1,736	32
Cross matching test	753	25	3,240	59
Hemoglobin test	719	23	510	9
Total number of annual examinations	3,096	100	5,486	100

3. Surgical Operation Department

(1) Operating theater

The infection problem that existed in the old TCH has been solved by providing a dirty and a clean operating theater. The new facility can offer the most advanced medical environment in the Republic of Kiribati. Operations are performed on Tuesdays and Thursdays but nurses are on stand-by duty to be able to respond to emergencies and obstetric related operations.

A total of 430 operations were performed in 1987 of which 361 were normal operations and 69 were obstetrics related operations. The general trend is that normal operations increase but that obstetrics related operations are decreasing. The reason for this is a

general increase in traffic accidents and, on the other hand, the spread of family planning which has reduced the number of obstetrics related operations. This trend will continue and the number of operations are likely to increase as medical technology becomes more sophisticated.

Table 2-20 Operation Results (1985 to 1987)

	1985	1986	1987
Normal operation	328	349	361
Obstetrics related operation	111	73	69
Total	439	422	430

(2) Central supply and sterilization department

Nurses and orderlies perform sterilization work for the entire hospital. Four people are on duty at all times.

(3) Postmortem Examination Room

Autopsies for medical jurisprudence are performed two or three times a year. This room is also used as a mortuary for outer island patients pending the departure of ship or aircraft.

4. Ward department

Nurses work on three shifts of 7:00 - 15:00, 15:00 - 23:00 and 23:00 - 7:00. Normally one or two nurses attend each ward.

Table 2-21 Number of Sick Beds and Inpatients in each Ward

	1987		1990	
	Existing no. of beds	No. of inpatient	Existing no. of beds	No. of inpatient
Private ward	7	313	8	336
Internal medicine ward	21	658	24	835
Surgery ward	21	630	24	748
Pediatrics ward	8+(3)*	360	19	669
Tuberculosis department	17	111	18	93
Obstetrics ward	8	461	14	653
Mental ward	30	-	30	(97)
Total	112+(3)	2,533	137	3,334

* Denotes the extra number of beds that can be installed if required.
Note: The "existing number of beds" and the "design number of beds" for the mental ward has nothing to do with the actual number of beds in this ward, but that there is space to install 30 beds.

Table 2-22 Bed occupancy rate (excluding mental patients)

Year	Month	Monthly cumulative no. of patients	Monthly mean No. of in-patients per day	Maximum no. of in-patients per day	No. patients died
1990	7	(2,964)	(95.61)	(91)	(11)
	8	2,781	89.71	94	17
	9	2,699	89.97	88	13
	10	2,672	86.19	89	11
	11	2,501	83.37	68	9
	12	2,578	83.16	84	7
	1	2,633	84.94	100	14
1991	2	2,502	89.36	90	9
	3	3,133	101.06	106	13
	4	3,068	102.27	99	13
	5	3,298	106.39	103	17
	6	2,807	93.57	95	16
	7	2,824	91.10	86	18
	8	2,756	88.90	87	18
Total		36,252	91.54		175

Average duration of hospitalization: 10.9 days (excluding mental patients)
Major causes: Delivery complications, tuberculosis, intestinal infectious diseases, pneumonia, anemia, bronchitis, skin diseases, traffic accidents, alcoholism, toxemia of pregnancy, diabetes, easy labor.

(1) Private Ward

There are seven private rooms two of which have baths and can accomodate attendant family members as well. These rooms are used for patients with infectious diseases who must be isolated from other patients while they wait for the results of their clinical tests. The average stay is two to three days. Unlike the other rooms which are free, these rooms cost A$10 per day for adults and A$5 for children.

(2) Internal medicine ward

The male ward has 12 beds and the female ward has 10 beds and 2 ICU beds. The wards are on each side of the nurse station. Sometimes when there are more women patients when beds available, they are moved into the men's ward. The opposite is sometimes also the case.

(3) Surgical ward

The male ward has 10 beds and the female ward has 12 beds and 2 ICU beds. The wards are on each side of the nurse station.

(4) Pediatric ward

There are 12 beds for children under 6 years of age and 4 beds for children with infectious diseases.

(5) Obstetric ward

In the old hospital there was only one delivery bed so occasionally babies had to be borne in the labor bed. Now there are two delivery beds and births can be handled more smoothly. There used to be few postpartum beds and some of the prepartum beds had to be used as postpartum beds. Now there are 8 postpartum beds and this is no longer a problem. Even so there is a general shortage of beds so patients are discharged one or two days after delivery.

(6) Mental ward

Twenty-seven patients (including one woman) were hospitalized in 1988. Some of the longer-staying patients have been hospitalized for nearly 10 years. There is one large room each for men and women and also four private rooms which can be used for both men and women. As both mild and serious cases are accommodated in the same room, the former are adversely affected. There is an outdoor rehabilitation ground for sports activities but no vocational training is offered.

5. A three-year course nursing school

The nursing school admits 10 new students selected from applicants from all over the country every year and offers a three-year curriculum. The students receive classroom lectures and practical training at the TCH for the first two years and undergo practical on-the-job training including apprenticeship at a local dispensary in the third year.

After obtaining a license for nursing officer, they are assigned to local dispensaries or health centers. A working experience of three years or more as a nursing officer qualifies them to apply for enrolment in the medical assistant course. The medical assistant course accepts three to four new students every year for a one-year curriculum on diagnosis and therapeutics.

1) Classrooms

Currently, there are two 10-student classrooms for the nursing school and one 50-student classroom that is used for a number of different classes. There are 30 students in the nursing school and 5 students in the medical assistant course i.e. a total of 35 students that use the room alternately.

2) Dormitory for nursing students 1 building

All students, some of whom come from the outer islands, are required to live in the school dormitory. The dormitory consists of 20 rooms for girls and four rooms for boys. There is also a room where nursing officers on night duty can sleep for a few hours.

6. Health Education and Family Planning

Health Education and Family Planning prepares teaching materials on primary health care and family planning and uses them to teach people in local areas. They also offer guidance in the counselling room. The number of people who had received family planning reached 3,588 by the end of 1987 and 3,498 as of the end of September, 1988.

Health Education and Family Planning prepares radio publicity programs and sends them on the air through the public broadcasting station and prints pamphlets and posters or records tapes and carries them to the outer islands for propagation. The existing offset-printing machine was donated by WHO.

7. Maneaba

This facility is used for accomodating family members of hospitalized patients. It provides simple rooms with toilet and running water. The facility bears the name of Maneaba as it resembles the traditional assembly halls of the same name. It is used for deciding village affairs, discussing health education, commemorate events and for festivals and even as a movie theater.

Patients who have been discharged due to shortage of beds can also stay here and commute to the hospital. Patients from the outer islands can stay here while waiting for their ship. Meals for the patient and one attendant per patient at Maneaba are served by the hospital, which sometimes reach as many as 350 people. Other attendant family members who stay at Maneaba cook and wash for themselves.

8. Service Department

(1) Kitchen

Meals are served free of charge to inpatients and one attendant per patient and also to the nursing school students. About 350 to 400 meals are prepared every day.

(2) Laundry

The laundry is washed in washing machines. About 80 kg of white robes and drapes are washed everyday.

(3) Workshop

The workshop provides wooden and electrical tools for making simple repairs of medical equipment.

2-3-4 Outline of facilities

(1) Existing facilities

Table 2-23 Condition of existing facilities

	Facility	Principal rooms	Area (m^2)	Roof area (m^2)
General outpatient				
	General outpatient and emergency	Consulting room, chart filing room, treatment room, nurse prediagnosis room, processing room, emergency room, observation room, radio room, night duty staff room, storage room, patient hall, outer corridor	190.5	701.0
	Specialty clinics	Surgery 1, pediatrics , internal medicine 1, internal medicine 2, obstetrics, internal diagnosis room, nurse room, head nurse room, toilets for the doctors, outer corridor	163.4	
	Pharmacy	Rooms for handling packages, rooms for unloading packages, shipping room, packaging room, office, storage room 1, storage room 2, bottle washing room, drying room, sorting room, ventilation room 1 and 2, pharmacist's room, pharmacy, storage, toilets	478.1	629.12
	Sub-Total		832.0	1,330.12
Central therapeutic department				
	X-ray and laboratory	X-ray room 1 and 2, operating room, waiting room , dark room, film storage, changing room, washing room, waiting room	136.1	218.40
	Laboratory and blood bank	Washing room, measuring room, blood bank (a place for storing received blood), blood test room, biochemical test room, bacteriological test room, water quality test room, senior laboratory technicians room, waiting room, storage room 1, waiting room, toilet, corridor	253.8	339.48
	Operating theater	Operating theaters 1 and 2, preprocessing room and hall, recovery room, nurse room, ventilation, changing rooms 1 and 2, washing room, equipment storage, central sterilizing room, ward storing room, waiting room, ventilation room, gas cylinder storage, corridor	291.8	403.48
	Autopsy room		35.0	
	Sub-Total		716.7	961.36
Hospital department				
	Private ward	7 private rooms, treatment room, nurse station, work room, linen, tables, storage room 1 and 2, toilets, corridor	242.5	348.84
	Pediatrics ward	3 rooms, nurse station, work room, treatment room, play room, linen, tables, storage room 1 and 2, kitchen, corridor	202.2	313.96
	Internal medicine ward	Male ward, female ward, nurse station, work room, ICU, linen, kitchen, corridor	253.3	351.56
	Surgery ward	Male ward, female ward, nurse station, work room, ICU, linen, kitchen, corridor	230.6	351.56
	Obstetrics ward	Room for mothers who will give birth, labor rooms, delivery beds, nurse station, work room, bath, room for babies born prematurely, linen room, equipment room, kitchen, shower room, corridor	258.6	407.96
	Tuberculosis ward	4 rooms, nurse station, linen room, rooms storing tables, terrace	193.3	345.60
	Sub-Total		1,362.5	2,119.48

	Facility	Principal rooms	Area (m^2)	Roof area (m^2)
Service department				
	Kitchen	Kitchen, nutritionist's room, waiting room, freezers and refrigerators	128.0	197.16
	Cafeteria	Dining space, pantry	64.0	112.36
	Laundry	Washing room and waiting room	64.0	150.52
	Place for hanging clothes to dry		165.0	235.62
	Work shop	Electric repair room, workshop, sewing room and storage room	128.0	165.36
	Fuel storage		7.5	15.96
	Generator room		25.0	73.92
	Sub-Total		581.5	950.90
Management and education department				
	Offices	Accounting room, typist room, office, operator room, superior nurse room, treatment room, prevention room, secretary's room, meeting room, statistics and computer room, Health survey rooms 1 and 2, minister room, aide room, secretary room, aide room, medical director room overseas consultant room, toilets, room for boiling water, corridor, hall, stairs	795.9	602.64
	Health and education	Counseling room, staff rooms 1 and 2, recording room (sound-proved), operating room, design room, printing room, dark room, room for storing printed materials, toilets, entrance hall, corridor	402.9	593.88
	Nurse school	Large multi-purpose room, 10 class rooms, medical assistant rooms, training rooms, rooms for the teachers, medical chart room, corridor	308.2	527.00
	Nurse school dormitory	Large room for female nurse school students, male student rooms, rooms for medical assistants and for taking short rests, dormitory inspector room, washing room, wash basin, toilet, shower room, place for hanging up washing, corridor, stairs	605.5	519.16
	Sub-Total		2,112.5	2,242.68
Other				
	Manaeba facility used to put up relatives attending patients		160.0	346.32
	Outdoor toilets for people using Manaea and the hospital	For patients in the hospital or at Manaeba	164.5	340.48
	Corridor		504.0	1,197.84
	High level water tank		0	91.18
	Sub-Total		828.5	1,975.82
Total			6,433.7	9,580.36

(2) State of existing buildings

1) Electric power

The Bejio thermoelectric power plant supplies 4 lines of 3-phase 240V/415 V, 50 Hz power. A 1 MW generator was installed in 1987 and outages have decreased since then. The long distance from the power plant causes a voltage drop which is as high as 8.3%. The hospital has a diesel engine generator (75 KVA) to ensure a stable power supply for the operating room, water pumps and other pumps and the refrigerators. The Bejio power plant has not been very reliable lately. The price of a kilowatt hour is A$0.36.

2) Water

The hospital is connected to the public water system and uses sea water for the toilets. There is a large tank on the premises whose pumps are in good order. They are made to Australian standards. Water costs A$3 for a year for a continuous supply and A$ 1.0 for a ton otherwise. As the hospital starts to operate fully, it will need more water. However, since the city are restricting supply to preserve water resources, the water shortage is a serious problem.

3) Waste water

Waste water is chlorinated before it is piped into the sea 200 meters from the shore. The waste water pump operates well and is regularly cleaned by PWD.

4) Telephones

There are 9 lines, 34 internal lines but no intercom equipment.

5) Ventilation

Propeller fans mounted in the ceiling are used generally and otherwise window mounted air conditioners are used where a cooler temperature is required. The operating theater is provided with a semi-clean room specification air conditioner.

6) Kitchen

Kerosene and oil are used in the kitchen for fuel.

7) Radio antenna

The antenna is used in receiving and sending messages to the outer islands.

8) Furnace

The furnace is used to incinerate burnable rubbish and rubbish that cannot be burnt is collected.

2-4 Water condition in the Republic of Kiribati

So far the population has used wells that are simple holes in the ground. Such wells are easily contaminated since the walls easily cave in and often have no lids and are therefore very unhygienic. WHO and UNICEF are now making wells with concrete linings and lids.

In the 60's the SPEC provided pumps to the outer islands and WHO has been providing manual pumps since 1978.

The government and private corporations are taking the following measures to supply water.

Tarawa TTI : The company is teaching the people on the outer islands to build 3000 gallon (approx. 13 m^2) concrete tanks for collecting rain water.

MHPP : The Minstry is teaching people to use manual pumps and build 500 gallon tanks (2 m^3) for home use.

PUB : The PUB cooperates with the PWD to install solar powered pumps

SCF : The SCF cooperates with the PWD to improve the water conditions on the Mackin and Aurae islands. They are also sponsoring a project for building home use rain collection tanks with a capacity of between 500 to 1000 gallons. As local labor and materials are used, they can be built at half the normal costs.

AMAK : This cooperation provides the funds for building rain water collection tanks and provides technical help through the TTI.

Although water is provided in the more populated areas of Tarawa Island, most families take their drinking water from wells and gather rainwater from the roofs of their houses.

Each apartment in public housing estates are provided with tanks for collecting rainwater. Tankers with well water are also used for providing water. However, the increase of population in South Tarawa means that the limit of water resources is about to be reached.

Australia has helped looking for water resources in 1978 and 1983. In 1983 they initiated a water supply project by water lens development.

Water lens is rain water collected on a coral reef in the ground. The problem is that overuse of this water destroys the pressure balance between the fresh water and seawater causing an increase in the salt content in the fresh water.

Good drinking water is the basis of good health but it must also be economical to produce and maintain. Thus pumping up water from water lenses must be performed with due care. PUB is in charge of the water supply in South Tarawa and a strengthening of PUB will produce both technical and economical results.

2-5 Background and content of request

2-5-1 Background of Request

As a stable water supply is essential to the activities of the TCH, the Republic of Kiribati has proposed a TCH water supply project for collecting rainwater. The government asked Japan to provide grant aid assistance to implement this project on April 23, 1992.

2-5-2 Content of request

The details of the request are as follows.

1) Equipment required for collecting water from rooftops and equipment for purifying such water so that it can be used for drinking and medical uses as well as the installation of such equipment

2) Building facilities and setting up equipment so that well water can be used for washing, showers, in the pharmacy and for operations.

3) The construction of a power plant

CHAPTER 3

CONTENTS OF THE PROJECT

CHAPTER 3 CONTENTS OF THE PROJECT

3-1 Objective of the Project

The Government of Kiribati has prepared a plan to collect rainwater from a roof area of the TCH of some 10,000m^2 in order to alleviate the TCH's chronic water supply shortage. The objective of the Project is to construct facilities to collect rainwater as envisaged by the government plan.

3-2 Examination of Contents of Request

(1) Examination of Project Suitability and Necessity

A stable supply of service water is essential for the proper operation of a hospital. Since the opening of the new TCH, the level of medical activities has increased and the TCH's demand for water has also been constantly increasing. A stable water supply for the TCH is now being threatened by the increased water demand on Tarawa Island due to the noticeable shift of the population to the capital, severe leakage due to aging of the municipal water supply system and frequent restrictions on water supply to protect water supply sources. It is, therefore, deemed necessary for the TCH to actively use both rainwater and well water to improve the water supply situation while reducing its dependence on the municipal water supply. The construction of facilities to collect and use rainwater and well water on the TCH premises will largely improve the water supply situation of the TCH, thus making the implementation of the Project highly appropriate and desirable.

(2) Examination of Facility Management

The most important aspect of the management of the facilities to be provided under the Project is the maintenance of the water pumps and generator. A neither require advanced technologies or maintenance skills, the present maintenance system of the TCH with a full-time engineer assigned by PUB conducting regular inspections and repairs should be sufficient. With regard to the maintenance budget, the budget of the Ministry of Health and Family Planning in fiscal 1992 increased by 5% on the previous year to 3,878,500 Australian dollars (A$). The annual maintenance cost of the new facilities to be provided under the Project is estimated to be 3,305 A$ for the first year and the second year and 6,431 A$ for the third year onwards. As these figures are only 0.1% and 0.2% of the total budget of the Ministry of Health and Family Planning, no problems in terms of appropriation are anticipated.

(3) Relationship with Similar Projects

The Dental Clinic Building which is being constructed with French assistance on the same premises is designed to use a continuous concrete footing to provide an underground rainwater storage tank. As this method is both inexpensive and easy to implement, any water supply project in an island country in the future should examine the applicability of this method vis-a-vis the local conditions. The French assistance is restricted to the Dental Clinic Building and there is no intake facility which overlaps with the planned contents of the Project.

(4) Examination of Requested Facilities

An average of some 800 people use the TCH each working day. At present, the TCH has a daily water supply volume of $75m^3$, i.e. $35m^3$ of municipal water and $40m^3$ of well water. As the design daily water consumption for a general hospital in Japan is 800 litres/bed, the required water supply volume for the TCH with 120 beds is approximately $96m^3$/day. As many as 800 people, including family members attending referral patients from islands other than Tarawa Island and nursing students, use water in the case of the TCH. The current daily water supply volume of $75m^3$ is equivalent to less than a mere $0.1m^3$/person/day which is less than 40% of 250 litres/person/day, the standard figure in Japan. Here, a water supply level of 125 litres/person/day, some 30% higher than the present level, is assumed as the basis for analysis.

Firstly, it is important to identify the different purposes of service water consumption. The first candidate to replace municipal water is rainwater, the quality of which is good enough for use as drinking water. The next candidate is well water in view of the fact that the TCH premises are located on top of a water lens which was formerly the source for the municipal water supply.

Utilization of Rainwater

1) Collection of Rainwater from Roofs

The utilization of rainwater as drinking water is very important in Kiribati. Rainwater is collected from the roofs of buildings with metal roofs in either a concrete or metal tank for use as drinking water. Because of the small number of vehicles and the virtual non-existence of factories in Kiribati, rainwater is extremely clean and is immediately drinkable. The problem of water decay occurs when water is stored for a long period of time.

According to rainfall data from 1947 to 1991, the mean annual rainfall on Tarawa Island is 1,994mm. The total roof area of the TCH of 9,580.36m^2 is one of the largest in Kiribati and as the roofing material used for the TCH is galvanized steel sheets, rainwater can be easily collected. A simple calculation shows that the total annual rainfall on the entire roof area of the TCH is 19,103.24m^3. Allowing for evaporation and other loss, the annual usable rainwater is some 14,000m^3 based on an effective utilization rate of 75%. Consequently, rainwater is a very useful water supply source provided that measures to prevent water decay and for sterilization are properly introduced.

2) Collection of Rainwater from Ground Surface

The premises of the TCH cover a total area of 3.7 ha and the annual volume of rainwater on the site is, therefore, extremely large. Any system to collect rainwater from the ground requires asphalt or concrete paving of the ground surface and extensive facilities to remove impurities from the collected water and to sterilize it, making examination of its implications vis-a-vis the 7th 5-Year National Development Plan, the preparation of which is currently in progress by the Government of Kiribati, essential. It has, therefore, been judged that the collection of rainwater from the ground surface should not be included in the Project which is designed to urgently address the service water shortage of the TCH.

Utilization of Well Water

Well water is commonly used in Kiribati as drinking water. In fact, the Government of Kiribati conducted the improvement of existing wells and the construction of new wells during the 6th 5-Year National Development Plan period.

Tarawa Island formerly had 5 water lens at Tiare Ikere, Newerewere (TCH site), Bonriki, Tanaya and Buota. However, the water lens at Newerewere was abandoned due to an increased salt density. There are 2 wells on the TCH premises and some 40m^3/day of well water is directly sent to the toilets and shower rooms of each building. As the underground water source under the premises is very large, it is possible to extract a daily volume of 50m^3. The TCH plans to use this water at the Pharmacy and for prewashing at the Operating Theatre in addition to its current use for toilets and shower rooms.

Power Generator

The TCH receives the supply of power (3-phase, 4-wire, 240V/415V, 50Hz) from the thermal power station at Besio. Since the installation of a 1MW generator in 1988, the frequency of power failures has been drastically reduced. Nevertheless, power failures still often occur, particularly during peak hours, due to the recent increase of the power demand. The TCH has a 75 KVA generator to meet the emergency loads of the Operating Theatre, water pumps and refrigerators, etc. However, this generator does not have the surplus capacity to meet the loads of the new pumps and other equipment to be introduced under the Project in the case of a main power failure. As the new pumps must continue to run during power failures, the installation of a new power generator is deemed necessary.

Further examination of the following items which were not included in the original request is conducted in view of the possibility of their contributing to the improvement of the service water supply situation in Kiribati.

Salt-to-Fresh Water Distillation Equipment

This equipment produces fresh water from sea water by pressurizing the latter's passing through reverse infiltration membranes. A large part of the operation cost consists of the power cost and the membrane replacement cost. Although these membranes can be backwashed and re-used, they must be renewed every 5-7 years. No data is available on the life of the main equipment in Kiribati due to its unprecedented use. A maximum life of some 10 years is assumed in view of the harsh climate.

The alternate operation of 2 sets of equipment with a daily fresh water production capacity of 4.6m^3/each gives a production cost of approximately 7 A$/$m^3$ which includes the power, membranes and maintenance costs. The water produced is far purer and is of much better quality than municipal water and can be used for both medical treatment and clinical examination purposes. The cost, however, which is 7 times higher than that of municipal water, is a serious disadvantage and the inclusion of this type of equipment in the Project is, therefore, deemed inappropriate.

Utilization of Sea water

Sea water is already used for the flushing of the TCH's toilets. However, the demand is increasing and the current intake of sea water at high tide is inadequate to meet the

demand because of the limited storage capacity. The installation of additional tanks and water pumps is, therefore, deemed necessary.

(5) Necessity for Technical Cooperation

The pumps and other equipment to be provided under the Project are commonly used in Kiribati and do not involve advanced technologies. Consequently, it is unnecessary for the Government of Japan to provide technical cooperation in association with the Project.

(6) Basic Policy for Project Implementation

The positive effects and feasibility of the Project and the ability of the recipient side to implement and manage the Project have been substantiated through the afore-mentioned analyses and evaluation processes. The fact that the anticipated effects of the Project meet the criteria set by the Japanese grant aid system is another reason why the Project is deemed suitable for Japanese grant aid.

The project outline is reviewed and the contents of the Basic Design are examined below assuming that the Project is implemented with Japanese grant aid. Some components of the original request have been changed and the appropriateness of such changes is discussed earlier in the sections dealing with the suitability and necessity of the Project and the contents of the requested facilities.

3-3 Outline of the Project

3-3-1 Executing Organization and Operation and Management Plan

The executing organization of the Project is the Ministry of Health and Family Planning of the Government of Kiribati with the actual management responsibility for the Project falling on the Supporting Services Department. Regular inspection and maintenance of the machinery, including the water pumps and generator, will be conducted by the Public Works and Utilities Department (PWD) of the Ministry of Works and Energy.

3-3-2 Project Outline

Assuming an average daily water consumption of some 800 people (Ministry of Health and Family Planning staff: approximately 300, student nurses: 30, outpatients: 60,

inpatients: approximately 100, attendants: approximately 300) working or undergoing medical treatment at the TCH to be 125 litres/person, a total daily water supply of 100m^3 is planned. Table 3-1 shows the purposes of water use and the supply volumes, etc.

Table 3-1 Purposes of Water Use and Supply Volumes

Type	Supply Volume	Use
Municipal Water	25m^3/day	washing, drinking, cooking and medical treatment
Rainwater	25m^3/day	as above
Well Water	50m^3/day	showers and cleaning of Operating Theatre
(Sea water)	30m^3/day	flushing of toilets
Total	100m^3/day (excl. sea water)	

3-3-3 Location and Conditions of Project Site

The planned construction site is the available space between the existing TCH buildings. Some problems are posed by the traffic on the premises and the need to dig up roads. The presence of an underground water supply and drainage pipes, power cables and telephone cables, etc. also poses a problem in regard to carrying out the construction work.

3-3-4 Planned Facilities and Equipment

The provision of the following facilities and equipment listed in Table 3-2 is deemed necessary in view of the Basic Design Study findings.

Table 3-2 Outlined of Planned Facilities and Equipment

Facility/Equipment	Remarks
Rainwater Tanks (10)	effective storage: approx. 1,200m^3
Well Water Tank (1)	effective storage: approx. 90m^3
Sea water Tank (1)	effective storage: approx. 70m^3
Rainwater Supply Pumps (12)	
Power Generator (50KVA:1)	

3-3-5 Maintenance Plan

The maintenance of the facilities and equipment following the completion of the Project will be conducted by the Supporting Services Department of the Ministry of Health and Family Planning. The tanks will be regularly inspected and cleaned. The water pumps and power generator will be maintained by the PWD. The estimated annual additional maintenance cost is 3,350 A$ for the first and second years and 6,431 A$ for the third year onwards. These figures are only 0.1% and 0.2% of the current budget size of the Ministry of Health and Family Planning and it should not prove difficult to appropriate the required maintenance cost for the new facilities and equipment. The actual maintenance work will not require advanced skills or techniques. The technical level of the current staff of the Supporting Services Department and PWD should be adequate to conduct proper maintenance and the recruitment of new maintenance staff is unnecessary. The general maintenance work is described in detail next.

(1) Maintenance Plan for New Facilities

1) Buildings

The service life of a building greatly varies depending on whether or not both routine maintenance and cleaning are conducted. Properly enforced routine maintenance and cleaning make the early detection of damage or failure possible, minimizing the repair cost. The regular inspection and repair of the exteriors of the following items is desirable.

- Regular cleaning of gutters and drainage systems : monthly
- Regular cleaning of side ditches and manholes : monthly
- Cleaning and inspection of tanks (including interior) : monthly

2) Building Services

To ensure the proper functioning of building service equipment, it is important to follow the basic operation procedure. The Ministry of Health and Family Planning employs full-time electrical engineers to conduct regular inspections and repairs.

As the building service equipment requires regular maintenance and the replacement of consumable parts, regular inspections should be conducted based on the relevant schedule.

The service lives of such equipment are given below although these can vary depending on the level and quality of maintenance work.

(Electrical System)

- Generators : 17 years
- Power Distribution Boards : 25 years

(Water Supply and Drainage Systems)

- Pumps : 12 years
- Tanks : 17 years
- Pipes and Valves : 12 years

(2) Maintenance Cost

The maintenance cost of the new facilities and others costs, calculated on the basis of current prices (September, 1992) are given in Table 3-3.

Table 3-3 Maintenance and Other Costs

Maintenance Items	First Year (A$)	Third Year (A$)	Remarks
1. Operation of Facilities	6,847	6,847	
2. Maintenance and Repair of Facilities		3,146	
3. Saving on Water Charge	-3,542	-3,542	
4. Annual Rent (for land)	(3,839)	(3,839)	(included in budget of Ministry of Interior)
Total	3,305	6,431	(excl. rent)

1) Operation Cost

Based on the assumed electricity cost and fuel cost for the generator, the annual increase of the operation cost is estimated below.

i) Electricity Charge

Load: 15KW (pumps)
15KW × {(0.2 × 12 hrs + 0.1 × 12 hrs) × 20 days + (0.15 × 12 hrs + 0.1 × 12 hrs) × 10 days} = 1,530 KWH/month
Monthly Consumption: 1,530 KWH
Annual Charge: 1,530 KWH/month × 12 × 0.32 A$/KWH = 5,875 A$

ii) Fuel Cost for Generator

The estimate is based on the actual number of power failures and their duration last year.

(Summer) 2 hrs × 30 + 10 hrs × 3 + 1 hr × 10 = 100 hrs

Fuel Cost: 27 litres/hr × 100 hrs × 0.36 A$/litre = 972 A$

Total: i) + ii) = 5,875 A$ + 972 A$ = 6,847 A$

2) Facility Maintenance and Repair Cost

While the maintenance and repair cost of a building increases with the passing of time, it remains at a minimum during the first 5 years. In general, the cost of parts and overhauling of building services is nil for the first 2 years, followed by 3% of the original installation cost for the third year onwards.

Parts and overhaul cost for building services:

104,867 A$ (estimated initial cost) × 3% = 3,136 A$/year.

The replacement of municipal water (price: 1 A$/$m^3$) by rainwater will achieve a saving of approximately 10 A$/day (present municipal water consumption: approximately 10m^3/day) and 3,542 A$/year.

CHAPTER 4

BASIC DESIGN

CHAPTER 4 BASIC DESIGN

4-1 Design Principles

The Project aims at improving the service function of the existing facilities and is designed to enable their performance at full capacity.

(1) Annual rainfall data for the last 45 years show a significant fluctuation between the minimum annual rainfall of 733mm and the maximum annual rainfall of 3,843mm. Given such fluctuation, the cyclical pattern of the annual rainfall amount and no clear distinction between dry and wet seasons, measures should be adopted to deal with a dry year or season.

(2) While respecting the traditional use of rainwater and well water in Kiribati, a new system using improved technologies will be introduced.

(3) The standards to be referred to are AS and the customs in Kiribati will be taken into consideration in the application of AS.

(4) There is no construction company in Kiribati and only a small number of engineers are registered with the government. There is, however, a large number of general workers. Although the highest priority is given to the ease of construction work, the design contents should allow technical guidance by supervisors who may be dispatched from Japan and/or third countries.

(5) The only materials which can be procured in Kiribati are water and aggregates and all other materials must be imported. Therefore, the selection of materials and equipment, etc. which can be easily maintained is essential. In view of the location being on the coast, all materials should be highly salt-resistant.

(6) All the systems to be introduced will be simple in view of the local maintenance level. Automatic control systems will not be selected because of maintenance difficulties.

(7) Hard coral rock is distributed 1.5 - 2m below the ground on the project site. Consequently, the maximum depth of the foundations will be approximately 2m to make construction work easy.

(8) The entire construction must be designed in view of minimizing vibration, noise and dust, etc. in order to avoid any disruption of the normal activities of the hospital.

4-2 Examination of Design Conditions

In deciding the scale of the planned facilities and equipment, it is necessary to determine the usable volume of rainwater as well as the extent of use of both sea water and well water.

4-2-1 Rainfall Data for Tarawa Island

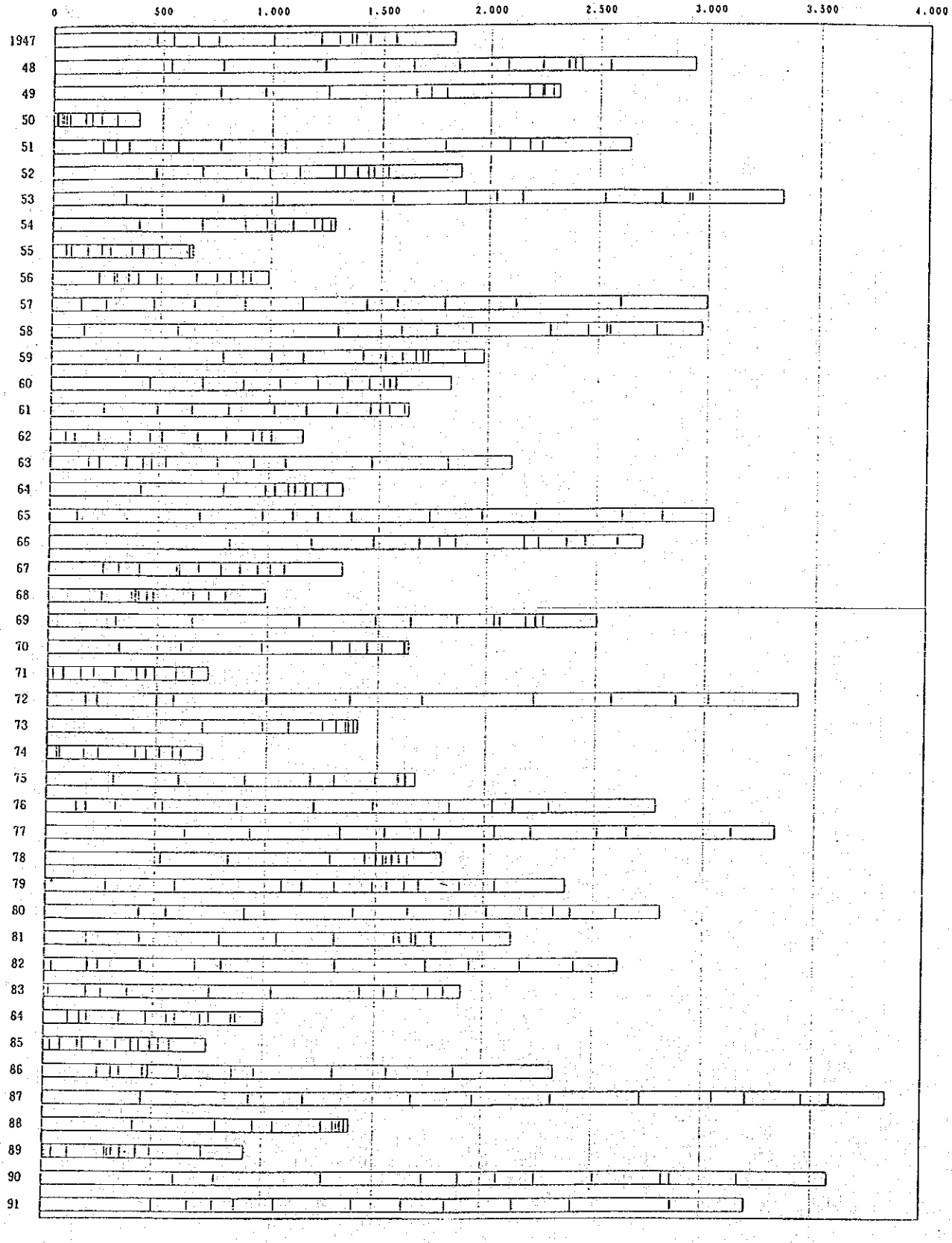
Rainfall data for the 45 year period from 1947 to 1991 for Tarawa Island are given in Table 4-1 and are also shown in bar graph form in Table 4-2.

Table 4-1 Rainfall Data for Tarawa Island

(MM)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUN	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	ANNUAL
1946		78							38	132	241	235	
1947	470	78	110	94	253	208	82	57	21	63	121	275	1,832
1948	539	237	458	406	212	226	153	119	28	33	135	383	2,929
1949	763	205	281	405	70	71	374	3	58	9	40	32	2,311
1950	14	4	4	17	8	12	15	73	30	45	69	101	395
1951	229	57	60	228	193	292	260	473	296	89	54	410	2,642
1952	473	212	197	109	135	157	40	63	49	25	67	340	1,868
1953	334	455	246	525	338	143	116	380	256	124	13	410	3,171
1954	396	289	197	98	36	1	81	93	30	6	37	20	1,284
1955	62	22	78	64	39	98	52	73	128	9	4	15	644
1956	217	68	11	53	45	85	181	95	61	56	37	82	991
1957	132	119	216	187	231	260	290	140	223	324	480	394	2,996
1958	148	432	724	292	165	165	352	174	89	13	213	206	2,973
1959	396	391	221	142	272	100	78	64	35	24	166	91	1,980
1960	453	242	187	166	166	135	102	64	28	25	6	255	1,829
1961	245	244	158	167	209	142	136	157	42	43	69	21	1,633
1962	70	40	113	142	92	55	163	129	124	41	42	140	1,151
1963	177	50	122	78	39	66	235	166	143	390	352	293	2,111
1964	418	377	192	40	4	58	29	47	29	2	65	69	1,325
1965	126	562	288	135	108	155	362	242	238	402	181	236	3,023
1966	824	369	283	212	94	74	310	66	128	87	151	112	2,710
1967	251	69	95	173	11	85	104	85	82	56	64	258	1,333
1968	246	134	15	0	4	14	38	29	180	73	75	181	989
1969	309	348	484	345	163	215	171	25	116	44	33	251	2,504
1970	326	282	368	311	82	80	67	101	2	3	4	14	1,640
1971	25	44	4	78	60	98	97	41	41	100	69	76	733
1972	176	53	270	78	421	373	336	507	361	291	154	402	3,452
1973	709	273	117	148	62	42	1	13	2	20	3	17	1,407
1974	2	43	1	12	112	67	167	50	62	60	37	97	710
1975	306	298	301	290	106	191	101	6	27	5	1	44	1,676
1976	138	44	135	216	337	342	271	354	199	92	161	491	2,780
1977	635	296	402	204	170	86	254	163	306	135	477	192	3,320
1978	525	307	456	161	50	32	13	27	33	0	40	158	1,802
1979	277	317	482	89	144	176	64	82	68	189	163	316	2,367
1980	430	124	357	487	250	241	125	181	121	77	213	200	2,806
1981	190	244	363	260	254	275	20	6	56	20	73	364	2,145
1982	34	164	48	195	247	120	507	421	202	228	245	206	2,617
1983	22	170	68	120	375	282	394	111	59	149	69	79	1,898
1984	110	54	33	148	122	97	37	114	39	101	19	125	999
1985	32	44	80	22	85	70	67	36	52	40	49	167	744
1986	248	63	37	108	24	142	238	104	347	247	312	453	2,323
1987	449	492	241	493	285	353	411	330	150	250	130	259	3,843
1988	412	378	169	92	211	53	18	9	7	18	1	21	1,389
1989	6	7	30	72	171	12	19	40	72	63	235	193	920
1990	603	185	477	465	166	176	171	271	310	39	308	407	3,578
1991	503	162	115	100	179	349	227	201	311	263	455	340	3,205
1992	202	301	335	525	292	102							
AVERAGE (1947~1991)													1,994

Table 4-2 Rainfall Graph for Tarawa Island



4-2-2 Current Use of Various Types of Water and Outline of Planned Use Under the Project

The current water use at the TCH is shown in Table 4-3.

Table 4-3 Current Water Use at TCH

	Place of Use	Type of Water	Daily Consumption (Working Day) 10% less for Holidays	Problems
Service Water	medical treatment, drinking, kitchen, laundry	municipal water	35m^3	restricted supply when rainfall is low
	toilets, operating theatre, pharmacy	well water	40m^3	no storage tank
	nursing school, dormitory, laundry	rainwater	less than 1m^3	inadequate collection facilities
Flushing Water	toilets	sea water	20m^3	inadequate tank capacity

The Project intends the collection, filtering and sterilization of rainwater which does not contain salt and which is drinkable from a quality viewpoint with view to its use as service water equivalent to municipal water. Well water slightly containing salt will also be filtered and sterilized for use for miscellaneous purposes.

The new water use based on the request is shown in Table 4-4.

Table 4-4 Envisaged Water Use by Project

	Place of Use	Type of Water	Daily Consumption (Working Day) 10% less for Holidays	Treatment
Service Water	medical treatment, drinking, kitchen, laundry	municipal water and rainwater	50m^3	rain water to be filtered and sterilized to be used together with municipal water
	toilets, operating theatre, pharmacy, nursing school dormitory	well water	50m^3	to be filtered and sterilized before use, contains minor quantity of salt
Flushing Water	toilets	sea water	40m^3	inadequate tank capacity

According to the present plan, a total amount of 50m^3 must be supplied daily in the form of municipal water and rainwater. Given the current municipal water supply level of 35m^3/day, the required daily rainwater supply volume is 15m^3. In view of the continuous worsening of the municipal water supply situation as described earlier and possible supply restrictions due to low annual rainfall (less than 1,000mm), the