

Kiribati

Country Briefing Paper

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**FROM VISION TO ACTION:
TOWARDS SUSTAINABLE WATER RESOURCES MANAGEMENT
IN THE PACIFIC**

KIRIBATI BRIEFING PAPER

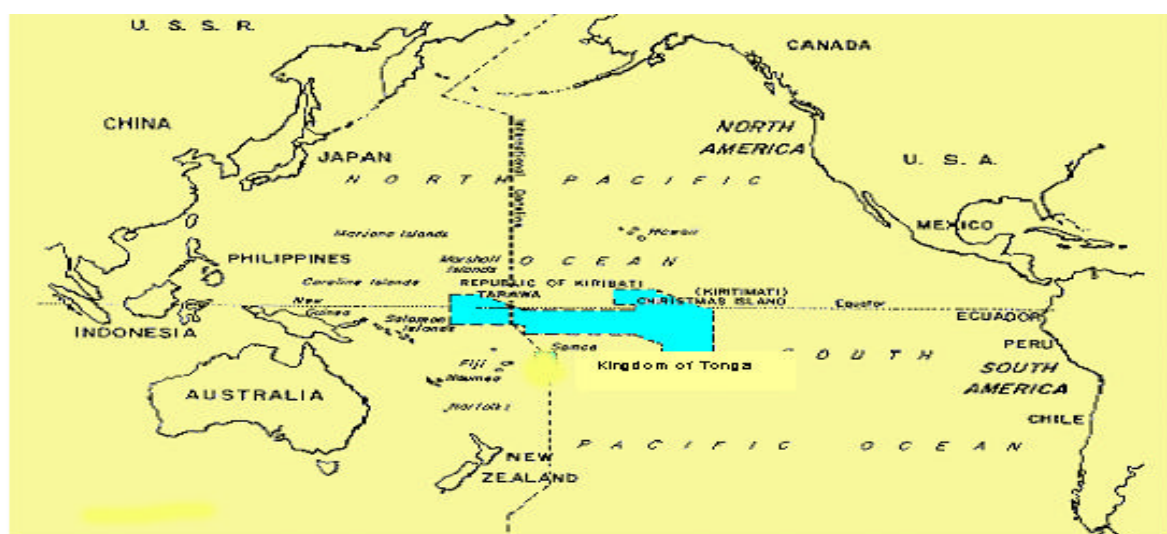
1 INTRODUCTION

1.1 Country Background

Kiribati has been independent since the year 1979. The majority of the population on the outer islands live in subsistence based economy. Development activities in the past have concentrated in urban centres, especially in South Tarawa, with the consequence of a steady drift of people from the outer islands to urban centres. The 2000 Census indicated a national population of 84,460, more than 92% of which live in the Gilbert Group. Total population growth rate has been 2.1% between 1978 and 1985, 2.24% between 1985 and 1990 and 1.4 % between 1990 and 1995 and 1.7 % between 1995 and 2000. The most disturbing factor is the annual growth rate on South Tarawa which is 5 % based on the 2000 census result.

1.1.1 Physiography.

Kiribati consists of three main island groups scattered over three million square kilometres of sea in the Central Pacific, between 4° N and 3° S, and 172° E to 157° W. The total land area is 810.8 sq.km, divided into 33 low lying coral islands, 10 of which are coral atolls.



Most of the islands are usually not more than 2 km wide, and are not more than 6 m above sea level. The climate is tropical. The depth of water wells varies from 0.5m to 3.0m. Rainfall is varied between the islands and from year to year. Long droughts of up to 16 months are relatively common. The yearly rainfall in the Gilberts ranges from 1,300 mm near the equator to 2,000 mm on Tarawa, and over 3,000 mm in the northernmost islands.

1.1.2 Main Problems of the Water Sector

In South Tarawa, where population density is an order of magnitude higher than in any other place in Kiribati, drinking water supply from the existing reticulation is insufficient, and often restricted to one hour a day.

At the same time rainwater collection by individuals and institutions, which could substantially alleviate the shortage of drinking water, is not widespread enough, in spite of existing regulations, and many existing roof-collection installations are inoperative or under-utilised.

The existing seawater-based sewerage system in South Tarawa is both under-utilised and wasteful, and public toilet facilities constructed in high-density areas are run-down and hardly used by the population, who have therefore returned to the tradition of defecating on the beaches.

The Public Utilities Board, responsible for the water supply and sewerage in South Tarawa, is in dire shortage of technical personnel. The water supply and sewerage systems are not adequately maintained over the past few years and the obvious increase in population resulted in the current water crisis. The water is charged at a very low rate (\$5.00 to \$10.00 per household per month) to domestic water users while commercial users are charged a very high rate of \$5.00 to \$8.00 per 1000 litres. Income generated from commercial users represents some 20% of water produced, which is not sufficient to meet the operation and maintenance costs of the water system.

The high incidence of water-related diseases (mainly diarrhoea) can be attributed to the fact that many people still use shallow open hand-dug wells contaminated by nearby sewage soak pits or leaking toilet pipes and fixtures. Numerous water supply and sanitation facilities installed in the rural areas have broken down.

2 NATIONAL CONSULTATION PROCESS

Due to time constraints, the team chose to adopt a flexible consultation process which is not confined to one meeting with all stakeholders but rather consolidate findings from several consultation processes occurred during the year that would still be valid for this purpose.

The meetings adopted as part of the consultation process are as follows:

?? Meeting between key stakeholders in the Kiribati water sector:

- ✂✂SAPHE Project Management Office
- ✂✂Ministry of Finance and Economic Planning
- ✂✂Ministry of Works and Energy
- ✂✂Public Utilities Board
- ✂✂Ministry of Health

Two meetings held to discuss and finalise preparation of country paper involving the different sectors responsibility in relation to water matters.

?? Meetings with different stakeholders

This includes FSP and finding out about the Kiritimati Water Supply Project (KWSP).

?? Community consultative and education workshops on South Tarawa - these were part of the local project activities of the CDPI project and includes consultations with water pilot project areas, water reserve areas, interest groups, church groups, general community, and schools.

?? Ministerial tours throughout Kiribati (Outer Islands)

These are GoK national tours throughout the islands of Kiribati

?? Urban Management Committee meetings (TUC, LMD, Tokatarawa, SAPHE)

?? NZAid Review team meetings (South Tarawa and Outer Islands)

List of Groups, organisations and agencies met:

- Community-based groups on South Tarawa including women's and youth groups
- Water Reserve landowners and residents (Bonriki and Buota)
- Outer Island Councils and Communities including women's and youth groups
- Ministry of Environment & Social Development
- SAPHE, MWE, PUB, MOH
- NGOs including FSP
- Ministry of Home Affairs and Rural Development
- Ministry of Education Training and Technolgy

Based on the consultations with the different stakeholders listed above, it is clear that water issue continues to be an environmental and health priority. Improvement in the provision of sufficient quality water is of high demand as people are increasingly aware of the implications of insufficient and poor quality water would have on their health, well-being, and their children's health. Improved quantity and quality of water is also important economically where it has been seen to also greatly affect commercial activities.

Outer island communities mainly need the upgrading and rehabilitation of old and damaged water systems originally installed under UNDP Project in villages where the systems were already in place. Other villages previously not installed with the system need such water systems to be able to have better access to limited freshwater water sources. Another main concern faced is the brackish of water from seawater intrusion to shallow wells particularly in narrower width lands which most have resulted from coastal erosion.

The needs in relation to water for South Tarawa communities are currently being addressed through implementation of the SAPHE Project. However water issue in terms of water access still exists particularly in areas that are not connected to the PUB reticulated water system and in areas and households with lower income. Overall the South Tarawa community found the current PUB water satisfactory but would like further improvements in quantity and quality.

3 VISION, ISSUES AND CONSTRAINTS

3.1 THEME 1: WATER RESOURCES MANAGEMENT

Groundwater is the main source of freshwater for South Tarawa and outer island residents. Around 43% of the population now lives on South Tarawa while the rest at the outer islands including Kiritimati Island.

The fact that shortages of drinking water have been experienced during prolonged droughts in some islands, appears to point out to that the traditional methods of extracting drinking water from the ground are inadequate. Hand dug wells are traditionally excavated in the village area, which is nearly always located fairly close to the lagoon-side beach. During prolonged droughts the freshwater lens shrinks, seawater moves inland and the wells located close to the beach become too salty to be used.

Consequently, the on-going introduction of water supply systems based on wells and galleries located a few hundred meters inland from the village, is absolutely necessary, not only in order to distance the source of water from potential sources of pollution, but also to assure that water will be extracted from the deepest part of the lens, where seawater intrusion is unlikely to occur (as long as the galleries are laid out correctly and are not over-pumped).

The population of South Tarawa is growing at a very fast rate (5% per annum) according to the recent population census in the year 2000. Based on that trend the population of South Tarawa could reach 47,000 in the year 2005 and 60,000 by the year 2010. With the limited water sources, it would be very difficult to provide this number of people with clean and potable water. The same also applies for Kiritimati.

The table below depicts the projected population of South Tarawa over the next 20 years based on two scenarios, viz high and low population projections.

High Projection	Current	Projections			
Year	2000	2005	2010	2015	2020
Population	36227	46516	59728	76693	98475
Water Demand(m ³ /day)	1159	1489	1911	2454	3151
Low Projection	Current	Projections			
Year	2000	2005	2010	2015	2020
Population	36227	42090	48901	56815	66010
Water Demand (m ³ /day)	1159	1347	1565	1818	2112

Table 1: Population and water demand projection for South Tarawa

Table 1 above was derived with the following assumptions:

- ?? The high project use 5% as an annual growth rate based on the 2000 census results
- ?? The low project use 3% as an annual growth rate based on the average growth rate over the past census results
- ?? The water demand is based on 40 litres per head per day.
- ?? It is assumed that the Water Supply System covers 80% of the total population of South Tarawa. The remaining 20% rely solely on rainwater and groundwater wells as is the current case. It is assumed that major water users such as Hotels, Hospitals, Schools and Industries rely on Desalination.

However, as recommended in Falkland 2002, if Bonriki and Buota water lenses are fully developed the total sustainable yield could reach 1950 m³/day, which just able to meet the water demand in the year 2005 using the high population project of 1489 m³/day assuming a leakage loss of 30%. For this reason it is now better to tap the water lens at Abatao and Tabiteuea.

In case the above lens could not meet the demand alternatives water sources have to be sought.

?? Development of groundwater resources further into North Tarawa. The table 5 below depict potential groundwater resources in North Tarawa. The main disadvantage of developing groundwater resources in North Tarawa is landownership issue. Landowners consensus on sensitive issue such as land is time consuming and require a lot of patient. The proposal to set up the Water Resources Committee is a good starting point before further groundwater resource development can be initiated.

The problem encountered at Teauraereke in the early 1990's and the current problem on Bonriki and Buota are good example that government should tackle when considering major development on groundwater resources.

Water Source	Estimated Safe Yield (m ³ /day)	Sources
Abatao	300	Based on the 1992 review (Falkland 1992)
Tabiteuea	250	
Marenanuka	150	
Abaokoro	50	
Nooto	200	
Taratai	600	
Tearinibai	250	
Nuatabu	150	
Buariki	1500	
Total	3,450	

Table 5: Groundwater Resources in North Tarawa. (Falkand 1992 and RDI, 1978)

?? *The desalination technology has been proved to be a viable option for water resources development in small island countries. The only obstacle in the use of this technology is that it requires a lot of energy. Kiribati experience is that it electricity cost is about 16 times more than the conventional groundwater. However, it was found that it was very easy to operate and maintain.*

The desalination technology will remain to be the only other alternative water source, should the use of groundwater become expensive in view of *opportunity costs* incurred by the landowners demand for more compensation and increase of land lease.

Developed countries who manufacture desalination plants should consider ways of reducing the cost of desalination plants and spares so that it can be cheap in the coming future for under-developing countries with limited water sources.

?? *Rainwater in Kiribati is considered only as a supplementary water source. This is due to the uneven distribution of rainfall through out the year. Droughts lasting many months (10 months or more) are common norm in Kiribati. This means then that one has to construct as huge tank that can sustain a long drought. This is often very costly and in the order of magnitude which is beyond reach by individuals and community groups. However, people are encouraged under the Law (building permit regulations) to include a tank of sufficient size (Minimum 5 m³) when constructing a new building. This will help relieve water demand on the PUB water when it rains.*

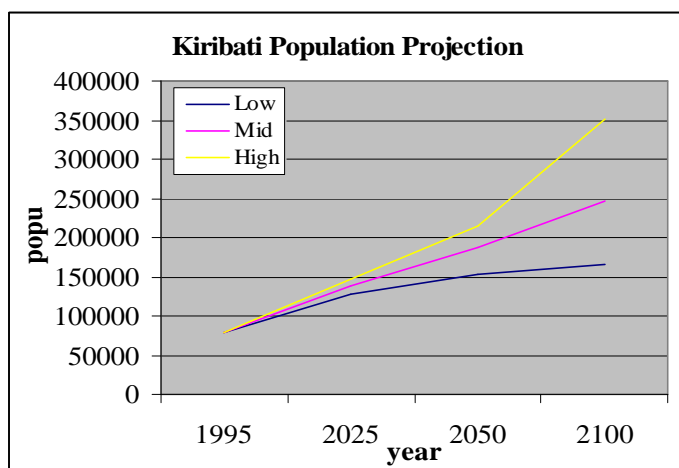
At the same time government buildings and large community buildings are strongly encouraged to construct large tanks to collect and store rainwater for internal use for use by the public during the

drought. The tank should not be considered as an investment in the water sector but as an integral part of the building.

3.2 THEME 2: ISLAND VULNERABILITY

There is no doubt that the climate is getting warmer and warmer due to the “GREEN HOUSE GAS EFFECT” and Kiribati as well as any other pacific countries are vulnerable and must learn to face/adapt this reality, especially extreme weather events. Some people may argue that this is a problem far in the future and so we do not need to worry about it, however frequent extreme weather events are now being felt in Kiribati. With Population projection indicating that Kiribati will have around 165,000 to 351,000 inhabitants in 2100, the strain on the water resources will be severe and will further increase vulnerability.

Figure 1: Population projection



In this theme, we will concentrate on Kiribati will prepare itself to disaster, and adapt to Climate Change. Some Scenarios according to PACCLIM (see [Table 1](#) [Table 1](#) [Table 1](#) pg. 87) are more certain than others. Temperature rise is more certain while Cyclones frequency; ENSO and sea level rise are next. Predictions indicate that changes in rainfall (-10%), sea level

rise (+0.4m), and island reduced by inundation in 2050 could reduce the groundwater (-38%) costing between US\$1.4-2.7 million per year. (World Bank Study August 2000)

To decrease the huge cost should the climate change materialized, it is better for Kiribati to adopt an disaster and / or adaptation approach and these are discussed in details in section 4.

Impact	2025	2050	2100	Level of Uncertainty
Seal level rise (cm)	11-21	23-43	50-103	High
Air temperature increase (Centigrade)	0.5-0.6	0.9-1.3	1.6-3.4	Low
Change in rainfall (%)	-4.8-3.2	-10.7-7.1	26.9-17.7	High
Cyclones				
<i>Frequency</i>	Conflicting results			Very high
<i>Intensity (%)</i>	0-20			Moderate

<i>Region of formation</i>	No change	High
<i>Region of occurrence</i>	No change or increase to north and south	High
ENSO	A more El Nino	Moderate
<i>Note: Sea level from global projection, Temp and rainfall from CSIRO9M2, ENSO and cyclone (Jones and other 1999)</i>		

Table 1: Climate Change and Variability Scenario for Kiribati

3.3 THEME 3: AWARENESS

Education on water protection and conservation has been integrated in previous environmental projects such as with the Kiribati Environmental Education Programme (KEEP) executed by the Ministry of Environment & Social Development (MESD) and implemented by The Foundation for the People's of the South Pacific (FSP) – 1996 – 2002; other programmes within the Environment & Conservation Division of MESD such as Waste Management Project, Climate Change Project, and Conservation Project.

Education on water is also being covered and integrated through the formal education system under the Ministry of Education, Training and Technology and specifically through the Environmental Science subject at the Primary school level and Science, Social Science, and Geography subjects at Secondary school level.

Recent and more focused awareness and education for Water has been undertaken extensively with the Community Development and Participation Initiatives (CDPI) Project, an ADB funded TA that commenced on 1 September 1999. The Project serves as a community and awareness component of the Sanitation, Public Health, and Environment Improvement (SAPHE) Project. The goal of the Project is to improve the long term ownership and participation by the community of public water supply and sewerage systems in particular throughout South Tarawa and part of North Tarawa. Its overall objective being to strengthen beneficiary participation and enhance community awareness and understanding of the aims and objectives of the SAPHE Project.

Specifically the CDPI Project:

- ?? Promoted water conservation to reduce the demand on limited availability of water from public water supply systems;
- ?? Promoted participation of households and community groups in the construction and use of complementary water supply systems, including rainwater tanks;
- ?? Promoted good sanitation practices and provide assistance in the construction and use of composting toilets;

- ?? Mobilized Non Government Organisations (NGOs), Community Based Organisations and action groups, in the promotion of community participation for the formulation and implementation of sanitation, environment and public health programs; and
- ?? Supported the development and implementation of effective environmental, sanitation and health education within and by the community.

Gender awareness has been built and maintained in all aspects of the CDPI project and which is also necessary for all SAPHE Initiatives to ensure project sustainability and the maximum impact of project messages and activities. Women only workshops or meetings have been a result of the fact that women's key role and responsibility in household water and sanitation has and will continue to strongly influence decisions in relation to project activities. The project community education campaign has aimed to educate and influence the attitude and behaviour not only of a particular group but the whole community, men and women, young and old.

Partners that have been involved and worked closely with the CDPI Project in implementing education and awareness activities include Lands Division (MHARD), Environmental Health and Health Education (MOH), Water Section (MWE), Public Utilities Board (PUB), Kiribati Housing Corporation, Agriculture division (MNRD), Curriculum Development and Resource Centre (METT), MESD, FSP, Te Itibwerere Community Theatre Group, and village-based communities.

The main constraint for the Project is that it is originally designed for a rather short period of only 18 months but which has been extended to the end of November 2001. Stage 2 of the CDPI Project has been proposed and approved to continue and build upon activities from the Project, however this has not started yet and resulted in discontinuity of major awareness and education campaigns and activities that are essential and critical to the success of the project and sustainability of water supply and sewerage systems by the wider community.

3.4 THEME 4: TECHNOLOGY (Appropriate Technologies for Water Supply and Waste Water Treatment; Demand Management and Conservation; Human Resources)

In the Kiribati context, groundwater and rainwater are the most appropriate conventional water sources. On South Tarawa with a limited freshwater source, the saltwater reticulation system was constructed in the 1980's for toilet flushing.

The type of pump used for pumping water from the groundwater sources is the helical rotor type of pump. This type of pump is used because of its ability to pump water at a slow flow rate. Using a

pump with high flow rate can cause saltwater intrusion. For the saltwater reticulation system and the freshwater reticulation system, the centrifugal type pump was used to provide pressure to the system.

On the outer islands of Kiribati, there are hand-pumping systems and solar pumping systems installed in the 1990's with funding assistance provided by the United Nation Capital Development Fund (UNCDF). The water sources for these systems use a modern infiltration gallery design with perforated pipe as conduits.

The common type of sanitation system in the country ranges from a simple pit latrine commonly used in the outer islands and peri-urban areas of South Tarawa to sewerage system on the three major centers of South Tarawa; i.e. Betio, Bairiki and Bikenibeu. The raw sewage from the sewerage system is discharged at the edge of the reef without any form of treatment. The compost toilet was introduced in the country very recently, but it is not very popular. At present the compost toilet is not culturally acceptable - only 6% of the South Tarawa population prefer to use compost toilet (SAPHE Consumer Survey, 2001).

Apart from the pit latrines, the septic tanks are quite common on areas on South Tarawa where the sewerage system does not serve. A modern on-site wastewater treatment tank was used at the new House of Parliament complex and at one of the Junior Secondary schools on South Tarawa. These plants are operated by the owners with assistance provided by the PUB as and when required.

Demand management is important for water resources management on small islands. In urban areas such as South Tarawa, demand management measures should include an appropriate pricing policy plus consumer education on the reduction of waste. Other measures may include reduction in water supply pressure to minimum levels and the use of water conserving devices.

As many water supply systems often have substantial leaks, an active leak detection and repair program is essential for both delivery systems and individual household systems. The savings in water can often have positive benefits in delaying the need for development of new sources.

The problem of low water pressure in the water supply system is closely associated with limited water resources. To increase the water pressure one has to run the water supply system 24 hours a day so that the water reaches all consumers on the reticulation system. This will obviously lead to excessive water usage and wastage.

A promising alternative is to have a constant flow system with flow restricting devices on each connection. A similar system has been successfully implemented in Kiritimati Island under an Australian aid program. The system ensures that each household receives a constant but low flow of water that is fed into small tanks and stored until required. Different sized flow restrictors can be provided according to household water needs and monthly charges can be set accordingly.

The constant flow method of water distribution is an answer to the present low water pressure problem in the South Tarawa Water Supply System and an unequitable water distribution to PUB water consumers. The method has been successfully tested in one area on South Tarawa and was found to work well. The water can reach all water consumers at a slow flow rate. Even though the available water does not meet all water requirements (i.e. washing, cooking, drinking and bathing) it should be a good test case for people to conserve water and to live with limited water resources. This can also be applied on small island countries in the Pacific with limited water sources.

3.5 THEME 5: INSTITUTIONAL ARRANGEMENTS (Policy, Planning and Legislation; Institutional Strengthening)

3.5.1 Sectors dealing with Water

There are three departments dealing with water – The Environmental Health of the Ministry of Health and Family Planning, The Water Unit of the Ministry of Works and Energy and PUB.

3.5.2 The Water Unit

The Public Works Division (PWD) is one of the units of the MWE, the others being the Kiribati Oil Company Ltd., the Solar Energy Company, the Energy Planning Unit, PUB, Plant and Vehicle Unit and the Administration Unit.

The Water Engineering Section of the PWD was established in 1986, to coordinate Outer Island water project activities by conducting investigation of new water supply schemes, preparing designs and estimates, preparing project documents for funding submissions, implementing and managing Outer Islands water supply projects. The Water Engineering Section have been very recently delegated the responsibility for an overall water resources management in the country. This also include South Tarawa and Kiritimati.

3.5.3 The Environmental Health

The responsibility for water supply in the Outer Islands used to be under the MHFP in the late 1960s, but was transferred to the Ministry of Works and Energy in 1985. The responsibility was assumed by the PUB in 1985 but was transferred to the newly established Water Engineering Section of the PWD in March 1986. The MHFPSW however retains the responsibility for water quality monitoring and the provision of sanitary facilities to the villages.

3.5.4 PUB

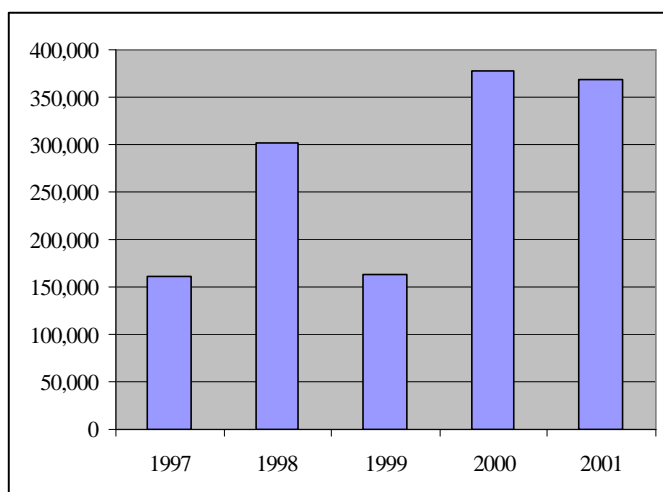
Following the Cholera outbreak in the year 1977, the then Gilbert Islands Administration under the British rule saw the need for better coordination in the water and sanitation sector. This resulted in the establishment of the Public Utilities Board (PUB) on 1st July 1977 to coordinate and manage, inter alia, water supply and sewage disposal on South Tarawa.

The PUB is a Government owned corporation under the Ministry of Works and Energy (MWE). It has three sections: power generation, water supply, and sewerage. The headquarters are based in Betio, with depots in all three centres in South Tarawa: Betio, Bairiki and Bikenibeu.

PUB's Board of Directors are directly responsible to the Minister for Works and Energy, and the Chairman of the PUB Board of Directors is the Secretary for Works and Energy or other nominated officers from the Ministry of Works and Energy.

To avoid duplications of works between the three bodies' clear guidelines must be established. These are discussed in section 4.5.

3.6 THEME 6: FINANCE (Costs and Tariffs, Alternative models; Role of Donor Organisations and Financing Institutes)



In this theme we are going to look and/or concentrate more on PUB.

Figure 2: PUB water sales

Over the last few PUB water sales have, on average, been increasing and charging it's domestics customers \$1.00 per m³ and a higher rate if water is delivered by

truck. Commercial customers are also charged higher rate. At the end of 2001, there were 3,937 users connected to the PUB system with Domestic/Institutional making up 92% while the rest was made up of Commercial/Industrial. The operating expense for PUB at that time were, Personnel costs topped the operating costs at 55%, while the cost of electricity to operate the gallery pumps and desalination plant amounted to 17%. It was also be noted that out of the 55% spent on personnel, about \$ 175,000 was spent on overtime, a significantly large amount at 70% of actual basic salaries and wages for the period. Depreciation expense was computed on the basis of assets held by the water supply dept. during the period. Taking into account the total production of 449,082 m³ in 2001, the average cost to produce and sell a cubic meter of water was about \$ **2.07**. This was on the basis that the costs were spread on the total production. Considering **NRW at 45%**, the resulting cost to produce and sell then amounted to \$ **3.61/m³**.

It should be also noted that in 1996, the existing tariff was \$1.00 per m³, the level of tariff which was implemented since 1981. In 1996, water tariff should have increased in real terms to \$ 2.09 per m³ Using the 2001 financial data, (which has not significantly changed as of May 2002), the average cost to produce and sell a cubic meter of water was calculated at \$ **3.61**. This cost varied with the assumed level of NRW, which in this case has been set at 45%. If it takes \$2.07 to produce and sell a cubic meter of water, the final amount considering the \$1.54 lost for every cubic meter sold will bring the total cost to \$ **3.61**, as shown in the following table:

	Per M ³
Cost to Produce and Sell	2.07
Non-revenue water	1.54
Should be rate/m ³ sold	3.61

Tariffs are considered affordable if they do not exceed 5% of the income from the low income groups. It also considers the lifeline amount of water necessary for basic needs such as drinking, cooking and personal hygiene.

So it brings us to our next questions

How will the appropriate tariff be determined?

Determining the appropriate level of tariff or water pricing should actually be the last step to consider after all the parameters for an efficient and effective utility operations have been set.

At the PUB, it should first consider setting targets as follows:

- ?? Decreasing NRW to reasonable levels - from 45% to 30%-25%
- ?? Achieving cost effectiveness – reducing or controlling costs where feasible. Review operations and re-engineer processes that will effect a reduction in operating costs in all possible areas. Use benchmarks, such as established industry averages.
- ?? Maximizing revenue base through efficient marketing, billing and collection procedures – Adopt more customer focused management. Improve collection efforts, thereby reducing provision for bad debts, etc.

Reducing alone the NRW to 30%, will mean a reduction in the tariff from \$ 3.61 to \$ 2.64 per m³. By improving operation, the tariff was reduced by 27% or the equivalent of inefficiency that would have been passed on the consumers. Any increase in tariff should be coupled with measures to improve operational efficiency. Tariffs should not be set at levels where inefficiencies continue to exist. Otherwise, the problem of a poorly managed utility will continue to exist, with the burden being passed on to the consumers.

4 PLAN OF ACTION

4.1 THEME 1: WATER RESOURCES MANAGEMENT.

?? Objectives

To improve water supply

?? Actions already undertaken

- 3 Desalination plants purchased
- Extraction from Bonriki and Buota has increased to about 1300 m³

Future actions needed (National level, Regional level, International Cooperation)

National level

- Encourage the use of rain tanks
- Reduce the leakages
- Expand the water reserves to North Tarawa
- Consumer education and awareness

Regional and International Cooperation

- Provide technical assistance
- Provide funding

?? Means of implementation and responsibilities

		<i>Responsibilities</i>	<i>Means of implementation</i>
Better utilization of existing water resources	Leakage control	Kiribati (PUB ¹ and PWD ²)	Local and Donor funding
	Consumer education and	Kiribati (FSP ³)	

¹ PUB – Public Utility Board

² PWD – Public Works Division

	awareness		
	pricing policy	Kiribati (PUB, PWD and MFEP ⁴)	
	plumbing measures	Kiribati (PUB and PWD)	
	more rainwater catchments	Kiribati (PUB, PWD and KHC ⁵)	
	groundwater protection measure	Kiribati (PUB, and PWD)	
technical assistance in terms of water experts		SOPAC ⁶ , ACTEW, ANU ⁷ etc	Donor
funding to projects		ADB, World Bank etc	

4.2 THEME 2: ISLAND VULNERABILITY (Disaster Preparedness; Climate Adaptation; Dialogue on Water and Climate)

?? Objectives

It is clear that Kiribati, as well as other pacific countries, is quite vulnerable to climate change. It may be unwise to take/adopt measures that will contribute to the reduction of green house gas, however the options or objective is to Prepare and / or Adaptation approach.

?? Actions already undertaken

At present the only actions undertaken with regards to Climate Adaptation and Disaster Preparedness are the formation of Climate Change Study Team and Disaster Committee in the early and late 1990's. Their tasks are limited to advising and policy making.

?? Future actions needed (National level, Regional level, International Cooperation)

National Level.

There are a number of options which can be taken at national level to ease the impact of climate change on the water resources. These include

- better utilization of existing water resources (*leakage control, consumer education and awareness, pricing policy and plumbing measures that discourage high water demand*); and
- developing additional or supplementary freshwater resources (*more rainwater catchments, groundwater protection measure, reclamation of land and look into the possibility of using desalination.*)

Regional Level and International Cooperation.

The options that can be taken at these levels are

³ FSP – Foundation of the South Pacific

⁴ MFEP – Ministry of Finance, Economic and Planning

⁵ KHC – Kiribati Housing Cooperation

⁶ SOPAC –South Pacific geosciences Commission

⁷ ANU – Australian National University

- Provide technical assistance in terms of water experts – engineers, scientists etc
- Provide funding to projects.

?? Means of implementation and responsibilities

<i>Adaptation measure</i>		<i>Responsibilities</i>	<i>Means of implementation</i>
Better utilization of existing water resources	Leakage control	Kiribati (PUB and PWD)	Local and Donor funding
	Consumer education and awareness	Kiribati (FSP)	
	pricing policy	Kiribati (PUB, PWD and MFEP)	
	plumbing measures	Kiribati (PUB and PWD)	
developing additional or supplementary freshwater resources	more rainwater catchments	Kiribati (PUB, PWD and KHC)	
	groundwater protection measure	Kiribati (PUB, and PWD)	
	reclamation of land	Kiribati (PUB, and PWD)	
technical assistance in terms of water experts		SOPAC, ACTEW ANU etc	
funding to projects		ADB, World Bank etc	

4.3 THEME 3 AWARENESS

?? Objectives

- The Project aims to improve the long term ownership and participation by the community of public water supply and sewerage systems in particular throughout South Tarawa. Its overall objective being to strengthen beneficiary participation and enhance community awareness and understanding of the aims and objectives of the SAPHE Project.
- Stage 2 of the Project will focus more on targeting key interest groups to create a more in-depth and long term positive impact for sustainability of water and sanitation systems.

?? Actions already undertaken

Actions previously mentioned are those already been undertaken to promote water awareness i.e. through efforts of past projects such as KEEP, projects of the Environment Division, the Ministry of Education, Training and Technology, NGOs, and the recent CDPI project which is a component of the SAPHE Project. Awareness actions has been conveyed through activities such as community and interest group education and training workshops, school workshops, use of multimedia (radio and paper), use of local drama group, development of IEC materials including school activity packs, coordination of national water day activities and participation in other national events, hosting school competitions, and working closely with other stakeholder agencies.

?? Future Actions Needed (National level, Regional level, International Cooperation)

National Level

Future actions necessary to strengthen community understanding and participation include:

- Continue with special interest training workshops
- Work closely with schools e.g curriculum development and teacher trainings
- Development of more IEC materials including simplification and translation of Community resource manual (developed in stage 1).
- More collaboration among different components of the SAPHE Project and relevant Ministries (for more efficient communication and implementation of activities).

Regional and International Cooperation

Regional and International links were ensured through senior project staff provided by international contractors such as from Coffey MPW. Other significant contributions have been in the provision of project resources and major liaison to Government Executing Agency.

It is also hoped that regional and international bodies continue to provide assistance in:

- funding of future community education projects on water and sanitation,
- capacity building of local counterparts.

?? Means of implementation and responsibilities.

- Information to be available in framework for stage 2 of CDPI Project (include responsible staff and divisions/Ministries to be allocated)
- Community Consultation and Awareness (radio shows and press releases) – Public Relations Officers (SAPHE, PUB, MESD).

4.4 THEME 4: TECHNOLOGY (Appropriate Technologies for Water Supply and Waste Water Treatment; Demand Management and Conservation; Human Resources)

?? Objectives

The main objective is to use Appropriate Technologies for Water Supply and Waste Water Treatment; Demand Management and Conservation; Human Resources to conserve water, protect the lens and reduce operation cost.

?? Actions already undertaken

There were number actions taken. These are

- o Usage of the helical rotor type of pump to minimize the impact of saltwater intrusion.

- Usage of modern infiltration gallery design with perforated pipe as a conduits to skim water over large area
- The constant flow method of water distribution to provide equitable water distribution to PUB water consumers.

?? Future actions needed (National level, Regional level, International Cooperation)

There are a number of options, which can be taken at national, regional and international level.

These include

- National level
Encourage the usage of appropriate technology (plumping measure such constant flow, low pumping rate pumps, and infiltration galleries).

Regional Level and International Cooperation.

The options that can be taken at these levels are

- Provide technical assistance in terms of water experts – engineers, scientists etc
- Provide funding to projects.

?? Means of implementation and responsibilities

<i>Adaptation measure</i>		<i>Responsibilities</i>	<i>Means of implementation</i>
Utilization of appropriate technology.	plumbing measures	Kiribati (PUB and PWD and the Linnix)	Local and Donor funding
	Pumps plus infiltration gallery	Kiribati (PUB and PWD and the Linnix)	Local and Donor funding
technical assistance in terms of water experts		SOPAC, ACTEW ANU etc	
funding to projects		ADB, World Bank etc	

4.5 THEME 5: INSTITUTIONAL ARRANGEMENTS (Policy, Planning and Legislation; Institutional Strengthening)

?? Objectives

To improve institutional arrangements

?? Actions already undertaken

- SAPHE project is now working on it

?? Future actions needed (National level, Regional level, International Cooperation)

National Level

- Improve coordination of water projects between various ministries

Regional and International

- Provide technical assistance in terms of water experts – engineers, scientists etc
- Provide funding to projects.

Means of implementation and responsibilities

	<i>Responsibilities</i>	<i>Means of implementation</i>
Improve coordination of water projects between various ministries	Kiribati (PUB and PWD and the Linnix and others ministries)	Local and Donor funding
	Kiribati (PUB and PWD and the Linnix)	Local and Donor funding
Provide technical assistance in terms of water experts – engineers, scientists etc	SOPAC, ACTEW ANU etc	
- Provide funding to projects.	ADB, World Bank etc	

4.6 THEME 6: FINANCE (Costs and Tariffs, Alternative models; Role of Donor Organisations and Financing Institutes)

?? Objectives

Setting the water tariff for PUB

?? Actions already undertaken

- PUB now receives assistance from SAPHE project

?? Future actions needed

National level

- ?? Decreasing NRW to reasonable levels - from 45% to 30%-25%
- ?? Achieving cost effectiveness – reducing or controlling costs where feasible. Review operations and re-engineer processes that will effect a reduction in operating costs in all possible areas. Use benchmarks, such as established industry averages.
- ?? Maximizing revenue base through efficient marketing, billing and collection procedures – Adopt more customer focused management. Improve collection efforts, thereby reducing provision for bad debts, etc.

Regional and International

- Provide technical assistance in terms of water experts – engineers, scientists etc
- Provide funding to projects.

?? Means of implementation and responsibilities

	<i>Responsibilities</i>	<i>Means of implementation</i>
Improve utility operation	Kiribati (PUB and PWD)	Local and Donor funding
Provide technical assistance in terms of water experts – engineers, scientists etc	SOPAC, ACTEW ANU etc	
- Provide funding to projects.	ADB, World Bank etc	

5 CONCLUSIONS

Like many countries in the Pacific, water is a crucial and political issue in Kiribati. As the population increases, the pressure on the water resources also increases – not to mention the climate change effect. This can now be seen on South Tarawa where around 43% of the population resides. There is an indication that Kiritimati in the very near future will face the same problem.

In Kiribati there are three main bodies that deal with water – Water Unit, Environmental Health and PUB. The role of the water unit includes the water resource manager, policies and legislation matters, and implementation of rural water projects. The Environmental Health Unit role includes chemical and bacterial testing of water supplies while PUB runs and operates the Water Supply system on South Tarawa.

There are a number of visions, issues and constraints which Kiribati is or will be facing. These include lack of water, vulnerability to climate change, lack of community awareness, usage of appropriate technologies, and lastly the setting of an appropriate water tariff.

In order to fulfil its vision, tackle the issues and/or overcome the constraints, the following actions are or will be taken.

?? Improve utility operation (*Decreasing NRW to reasonable levels, Achieving cost effectiveness, Maximizing revenue base through efficient marketing, billing and collection procedures*)

?? Improve coordination of water projects between various ministries

?? Utilization of appropriate technology (*constant flow etc*)

?? better utilization of existing water resources (*leakage control, consumer education and awareness, pricing policy and plumbing measures that discourage high water demand*); and

?? developing additional or supplementary freshwater resources (*more rainwater catchments, groundwater protection measure, reclamation of land and look into the possibility of using desalination*)

Regional and International Organisations can assist Kiribati by

?? Provide technical assistance in terms of water experts – engineers, scientists etc

?? Provide funding to projects.