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Preliminary socio-economic baseline survey and waste stream analysis for Bikenibeu West, South Tarawa, Kiribati

By Roniti Teiwaki & Associates

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SPREP
P O Box 240
Apia, Samoa
Ph: (685) 21929 Fax: (685) 20231
Email: sprep@sprep.org.ws
Website: www.sprep.org.ws/iwp

Executive Summary

This Report describes and analyses the socio-economic situation and the main elements of the waste stream in the Bikenibeu West community on South Tarawa atoll in the Republic of Kiribati. The study, sponsored by the International Water Programme (IWP), is in response to the needs of Pacific Islands Developing States (PIDS) to devise a low cost management plan for waste minimization aimed at improving water quality.

The survey methodology consists of quantitative and qualitative data obtained from consultations and interviews with community stakeholders, the use of household questionnaire and participatory observation during the survey. Bikenibeu West was chosen as the site of the pilot project, and the entire population was involved in the socio-economic survey. A sample of twenty households was randomly selected for the purposes of conducting a waste stream analysis of the area.

The survey revealed an urban residential community of 1618 people living in 205 households. The houses are of mixed quality, ranging from the relatively few and better serviced government houses to the many impoverished private houses with limited services. The social structure and community organization are based on sectarian interests rather than on traditional social systems. The three main religious groupings include the Catholic, the Kiribati Protestant Church, and the Bahai. The community is well served by educational and medical facilities provided by the Government of Kiribati. Bikenibeu West elects a councilor every four years to the local government body, Teinainano Urban Council (TUC). The TUC plays a very important role in waste management being responsible for the collection and disposal of household garbage/ waste in the whole TUC area.

The garbage survey showed that 48% of the waste stream was organic, 19% metals, 15% glass, 8% plastics and 3% paper. The findings confirm conclusions from previous studies and the concerns of Kiribati and other developing small Pacific Islands countries and territories (PICTs) that the lack of appropriate and proper waste management systems in the islands can have a detrimental impact on the water system.

The community aspires for a better lifestyle and is supportive of the purpose and potential contribution of the pilot project towards the improvement of community services, particularly in relation to waste management. The study highlights the need for better community services such as in the provision of household sewerage and suitable toilet facilities, a better town water system, provision of sites and services for building houses, and a review of existing loan schemes on houses, water tanks and toilets so as to make them more readily available to the low-income people.

1 Introduction

1.1 The Subject of the Survey

The Preliminary Socio-Economic Baseline Study and Waste Stream Analysis of Bikenibeu West ward on South Tarawa atoll in the Republic of Kiribati is part of a regional programme by the IWP to devise a suitable design of community-based waste pilot projects in the PSIDS. The demonstration projects are to show that there are viable, low cost alternatives that can be implemented at the community level for the management of wastes, both solid and liquid, that have a detrimental effect on water resources in the community. The participation of the community is crucial to the success of the waste management put in place, and therefore an understanding of the social, political and economic aspects of the community is very important.

1.2 Broad Survey Objectives

The survey objectives are to describe the current socio-economic situation and to evaluate the main elements of the waste stream in the Bikenibeu West ward.

The survey examine issues of demography, health and nutrition, education status and skills, occupations, migration, settlement patterns and disadvantaged groups, services and infrastructure, social structure and organization of community, political structure, land tenure, economic activities, the people's attitudes, values and beliefs in relation to waste problem, perceived quality of life and problems, and the community commitment to the project and constraints to community participation initiative.

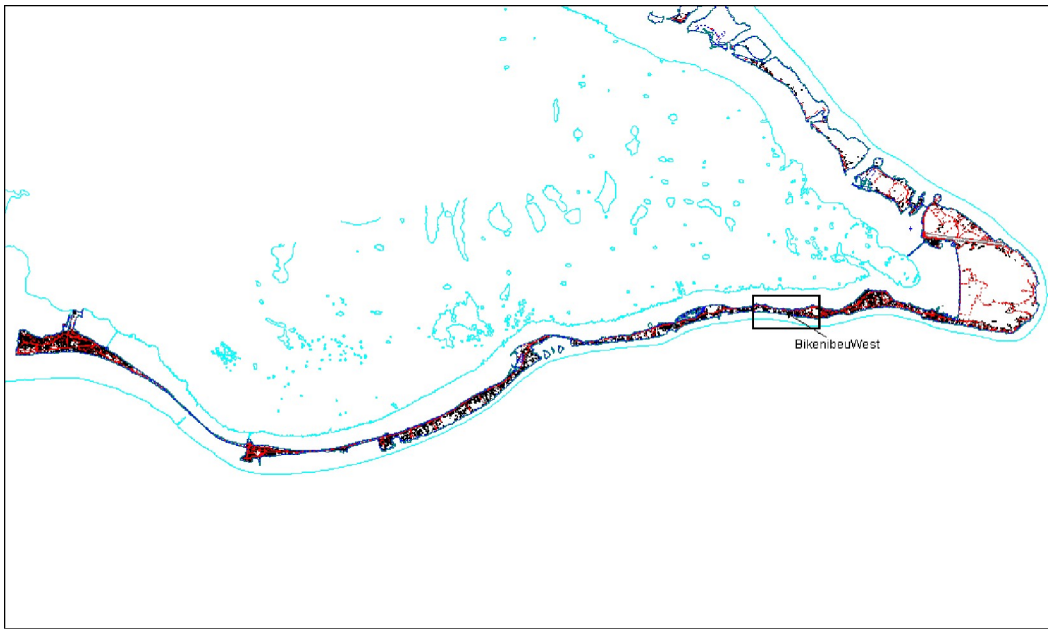

Figure 1: ***Bikenibeu West in South Tarawa.***

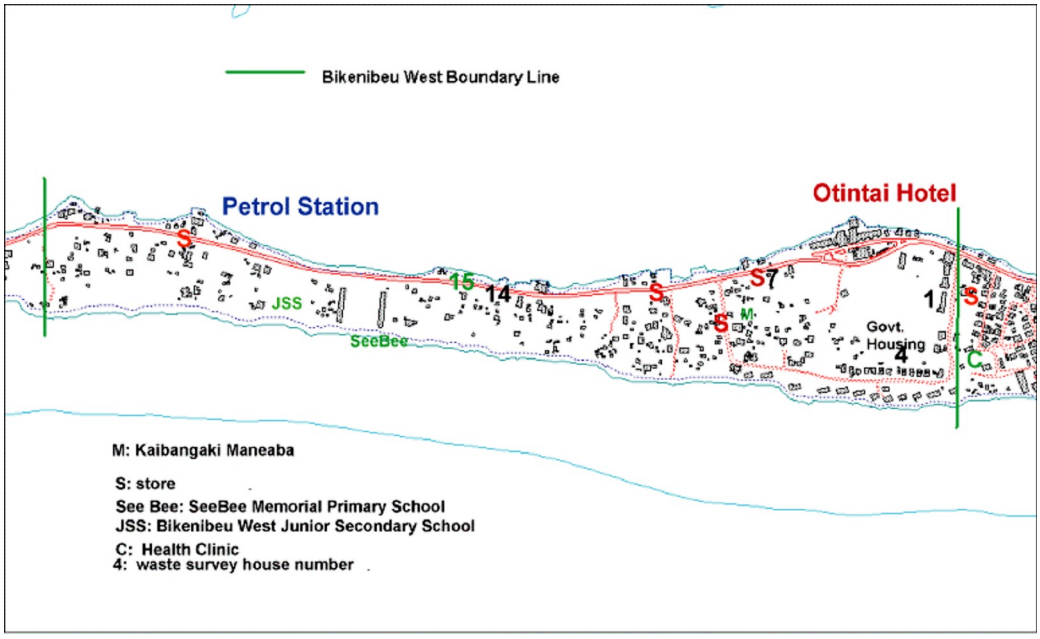

Figure 2: ***Bikenibeu West Ward***

The waste stream analysis includes the identification of the sources of all kinds of waste in Bikenibeu West, an estimate of the volumes and amounts of all kinds of waste generated on an annual basis, a description of the fate of all kinds of waste in Bikenibeu West, an analysis of recyclable materials from the Bikenibeu West current waste stream, and the identification of critical issues to be considered in minimizing waste within the Bikenibeu West ward.

1.3 Why Project is worth doing

The Bikenibeu West project is worth doing because it provides an integrated approach to identifying the root cause of water pollution in an atoll community. The IWP approach of examining the social, economic and political aspects of the community is crucial to the success of the project. The twin issues of waste and water are serious problems in the urban setting of Bikenibeu West and the project should be able to identify important factors that may facilitate or impede the project progress.

1.4 Goals of Project

The demonstration projects should demonstrate that there are viable, low cost alternatives that can be implemented at the local level that will reduce loadings of solid and liquid waste that are having a detrimental effect on receiving waters.

1.5 The Project Audience

The project audience includes the local community, the TUC, the Government of Kiribati, the non-government organizations (NGOs), the project sponsors, the United Nations Development Programme (UNDP), South Pacific Regional Environment Programme (SPREP) and the Global Environmental Facility (GEF), and the international donor community. The local community is already suffering from a mismanagement problem of both solid and liquid wastes and this will worsened if the problem is not addressed judiciously.

The project is useful for the central and local governments, which are mandated to provide a clean environment, good sanitation, provision of quality drinking water and a reliable power source to the urban community.

The NGOs, especially the Foundation of the Peoples of the South Pacific Kiribati (FSP-K) and women organizations (AMAK) have been active participants in waste and water management and public awareness programmes, and the project outcomes will be of interest for their respective activities. The potential aid donors, including the bilateral and multilateral organizations, are no doubt keen observers in the project. The outcome will guide the international community as how it will consider its aid strategy on the waste and water issues.

1.6 General Procedure in Conducting Survey

The preparation of this Report was done in 60 working days between January 7 and March 28, 2004. January 7, 2004 the local IWP Coordinator, Ritia Bakineti, briefed the local consultant Ronit Teiwaki on the purpose and scope of the project. The logistics and financial arrangement of the project was discussed, including the contract, the budget and the enlistment of additional personnel to assist in the surveys.

The Contract was signed between the IWP the Coordinator and the local consultant.

1.6.1 The Socio-Economic Survey Schedule January 9, 2004

Meeting between the local consultant and the three research assistants Taranimae Tangotu, Marion M Namina and Makin Binaatake to discuss the procedures for conducting the socio-economic survey using the questionnaire, the interview and personal observation. Refer to Appendix 1 for the Questionnaire Bikenibeu West Socio-Economic Survey January 2004.

January 10-25, 2004	-	The three research assistants, familiar with community development is sues, conducted a socio-economic survey of all the households in Bikenibeu West.
January 26, 2004	-	Review and analysis of preliminary findings. Improvement of question naire to include issues, such as personal income and personal assets.
Jan. 27-Feb. 2, 2004	-	Survey continued.
February 5, 2004	-	Submission of Completed Questionnaire to Consultant.
February 16, 2004	-	Discussion on Survey Findings.
February 17, 2004	-	Refinement of Survey Data.
February 20, 2004	-	Completion of Bikenibeu West Socio-Economic Survey.

1.6.2 The Waste Survey Schedule

The waste survey was done in collaboration with the FSP-K recycle project personnel and one other assistant over a three weeks' period during the months of January and February 2004.

Preliminary discussions were held with the FSP-K team during the first week in which they indicated their willingness and cooperation to do the Bikenibeu West garbage survey.

It was agreed that the survey would involve a sample of 20 households, representative of government and private households, to reflect the economic and social disparities in the community.

In the first week the 20 houses were visited and discussions were held with occupants about the waste survey. The households were asked to keep their rubbish for one week in a separate pile.

In the second week the rubbish piles of the 20 households were casually inspected without the awareness of the occupants. It was noticed that only 5 houses had complied with the project request to set aside their garbage. As a result waste green bags were distributed to the 20 households to put their rubbish in.

The arrangement appeared to be satisfactory because on the day of the survey, all except two houses used the green bags for their rubbish.

The survey was done on Saturday of the third week. The garbage from each of the 20 households was loaded onto a truck to a central collection base, where they were sorted into waste types, weighed and recorded.

1.6.3 Schedule on Completionof Draft Socio-EconomicWaste Analysis Surveys of Bikenibeu West

March 28, 2004	-	The Draft Report on the Socio-Economic survey and Waste Analysis Survey of Bikenibeu West (BIWESEWAS) was handed in to the IWP Local Coordinator.
March 31, 2004	-	The Draft Report on the BIWESEWAS was submitted to SPREP.
April 01, 2004	-	Comments on the Draft Report BIWESEWAS received.
April 13, 2004	-	Revised Draft Report BIWESEWAS returned to IWP Local Coordinator.

1.6.4 Dialogue withCommunity Stakeholders

Consultations and discussions on the survey were held with the principal community stakeholders, including the Church leaders, the Public Utilities Board, the principal service provider of water, electricity and sewerage system for the community, the Ministry of Health and Medical Services, the Ministry of Education, Youth and Sport, the local government body, Teinainano Urban Council (TUC) and the Ministry of Environment, Lands and Agriculture.

1.7 Review of Sections

Section 2 covers the reviews of the literature on the political and socio-economic situation of Bikenibeu West, and selected studies on waste issues in Kiribati and in Bikenibeu West.

Section 3 describes the survey methodology, and explains the rationale of using the techniques of questionnaire, interviews and participatory observation in collecting data from the respondents.

Section 4 discusses the findings of the political, socio-economic and the waste generation surveys conducted in Bikenibeu West.

Section 5 is a discussion of the Bikenibeu West Household Survey.

Section 6 explains the analysis of the main findings of the surveys. The implications of the survey data and comparisons with previous studies are made.

2 Background

2.1 Literature Review

There are numerous studies on the political, social and economic aspects of Kiribati, but there have been no specific studies as such on the Bikenibeu West community. However, for the purposes of the survey, a review of selected and most relevant literature on the political, social and economic aspects of Kiribati is made.

The Kiribati National Development Strategies (KNDS) 2004-2007 describes the present government policies of sustainable growth and equitable distribution of resources. The issues of over-population, rapid urbanization, and the strains on the physical, social and economic infrastructures and the decline of the traditional values are highlighted in the current KNDS.

The Kiribati National Census Report 2000 endorses the population trends of rapid growth and increased urbanization in Betio and South Tarawa.

Several studies had been done on the issue of waste management on Kiribati. There had been previous waste management studies done for the Bikenibeu West community. The Australian consulting firm of Sinclair Knight Merz conducted a solid waste survey of the area in 2000. The FSP-K undertook a waste-sorting project in 1996, and the FSP-K is currently undertaking a project on the Kaoki Mange (Return the Rubbish) in the area as part of a general waste recycling project in South Tarawa and Betio.

The FSP-K conducted a waste management project in the area in 1996. The project was to educate the people living in the Te Ununiki area of Bikenibeu West the sorting of waste into types and on-site recycling of organic waste.

The activities for the on-site recycling project were undertaken under the Kiribati Enviromental Education Programme (KEEP), and Community Development & Participation Initiatives (CDPI Project). The KEEP began in May 1996 and comprised three sub-projects: the Compost Project, the Atollete (composting toilet) Project and a Solid Waste Pilot Project implemented in Bikenibeu West area.

The FSP-K provided the empty 44-gallons drum for each household to put their non-organic waste for collection and disposal by the TUC garbage service. The households were also advised to retain their organic waste for home composting. (Per.comm. Atenati 04/04)

The FSP-K project failed because the people did not bother to sort out their wastes as instructed, and the TUC never bothered to follow the foundation work done by the FSP-K. .

In early 2003 FSP-K conducted a feasibility study on the viability of a recycling system utilizing Container Deposit legislation as a driver to increase recyclables collections. In mid 2003 Phase I of the program commenced with the installation of recycling collection points around South Tarawa.

As FSP-K had previously worked with the Bikenibeu West community, this area was chosen as a pilot area to test the collection point's effectiveness. South Tarawa's second recycling collection point was set up at Te Kaibangaki Maneaba. This point utilized a large sign to describe waste separation. This approach has subsequently been improved to the smaller style of sign now used.

Four recycling collection points have been set up in the Bikenibeu West community. There are 44 recycling collection points set up in other parts of South Tarawa.

This project is popularly known as 'Te Kaoki Mange!', which means 'Return the Rubbish!' The project has daily radio advertisements and weekly advertisements in the local papers. Community participation measured by materials quantity and separation, is constantly improving.

Figure 3: ***Te Kaibangaki Kaoki Mange! Recycling Collection Point***

The FSP-K project is now commencing Phase II of its program with funding from the UNDP and Asian Development Bank (ADB) to set up a commercial scale system. Container Deposit legislation is being drafted by the Office of the Attorney General, and the Project operates under the guidance of the Ministry of Commerce, Industry and Cooperatives. Phase II will last for one year, after which the operation will be financially self sustaining and will be let under contract to the private sector.

The Sinclair Knight Merz consultancy (2000) carried out the previous audit and characterization of solid waste stream in Bikenibeu West. The household survey of 19 houses was carried out over a period of 8 consecutive days. The results showed that the organic matter constituted more than half (51.3%) of the household waste with a mean daily generation of 2.55 kg/household/day. The idea of a landfill and a review of legislation on waste management are recommended in the study.

Gangaiya (1994) found that the bulk of the waste consisted mainly of organic materials and metals. The organic materials are mainly dry leaves. The metals consisted mostly of beer cans. The study recommended that the concept of composting using the organic materials be encouraged in the community.

The Public Health Project Technical Assistance (PPTA) Report (The Royds Consultants, 1996) estimated mean bulk density of waste was 100 kg/cum, and mean daily generation rate per household was 4.2 kg/d, roughly 0.53 k/capital/day – 8 people per household.

The Sanitation Public Health Environment Project (SAPHE) highlights the inefficiency of the existing waste management system by the TUC and recommends that the reuse and recycling at source is the most effective and economic way: on site-recycling (home-composting), recycling facilities within the landfill area and aluminum cans recycling, recycling of PET bottles and cardboard, and recycling of non-ferrous articles such as aluminium, stainless steel and copper.

The SAPHE project has completed a new landfill at Nanikai, refurbished the Betio Red Beach dumpsite, and is building a third landfill lagoon side in central Bikenibeu. SAPHE waste management works is expected to end mid 2004.

2.2 Setting of Project

The setting of the project, Bikenibeu West, was selected on the advice of the Kiribati National Committee (NC) on the IWP as it had been the site of previous projects on waste management, and because of its convenient location.

2.3 Importance of Project

The IWP Project is important not only for the local community but also for other similar situations nationally, regionally and globally. Nationally the project will provide useful data to the local stakeholders, principally the Government of Kiribati and the TUC, as how they may develop appropriate strategies to cope with the social and economic needs and aspirations of the people. The models put in place in Bikenibeu West will be of considerable interest to the regional and international organisations.

3 Survey Methodology

The survey methodology for the socio-economic survey will be discussed in relation to methodological approaches, sample, sampling design, questionnaires/interviews, procedures, and limitations and constraints of the survey.

A combination of the quantitative and qualitative approaches was used to obtain the social and economic data on the community.

3.1 Sample

In accordance with the advice of the IWP NC all the households would be covered in the survey as opposed to making a random selection of sample households.

Whilst this might appear to be a difficult assignment, doing the survey for the whole population of households was accessible and feasible. Thus, each household was visited and discussions on the project and responses on the questionnaires were recorded.

3.2 Questionnaire

The questionnaire design is a structured one listing all the relevant questions on the specific information needed in the survey. Most of the questions in the socio-economic survey are quantitative, though there are qualitative issues to be discussed and recorded.

Interviews were used to get information more informally from respondents. There were two interview types used in the survey. The use of telephone interviews was common with government and non-governmental personnel because it was more convenient and cheap. Interpersonal interviews were employed during the course of household visitations.

3.3 Limitations and Constraints of the Survey

Covering the whole population of Bikenibeu West in the survey presented administrative and logistic problems. The area is physically quite large and transport is required to cover the whole area.

The surveys had to be conducted late in the afternoon when the workingmen and women, the key household members, return from work or fishing.

After a hard day's work, these people were not always in the best of mood to be interviewed because they felt physically and mentally tired. It was possible some responses might have not been always accurate. In most cases the interviews were conducted with people, normally women, who would have no knowledge of key economic information on family matters. The men are the people who possess such important information.

The household waste survey was a tiring assignment and people had no idea of sorting out their waste. It was considered necessary to collect the waste and disposed of them to the dumpsites. The rain did not assist the survey. One of the twenty households asked to participate in the survey did not bother to co-operate in the survey.

4 Findings on the Socio-Economic Survey

4.1 Population

There are 1618 people living in 205 households in the area giving an average of 8 persons per household. With an area of 89 acres, the population density of Bikenibeu West is 20 persons per acre.

4.1.1 Population age and sex distribution

There are 548 women and 582 men, including 488 children.

4.1.2 Household size and structure

A typical household is defined as consisting of one main dwelling house, a kitchen house and one or two small raised houses *(te bwia)* built of local materials. The dwelling house combines the functions of a lounge and bedroom. The local kitchen is the cooking and eating place of the household. The airy *Te bwia* provide convenient sleeping space.

The Extended Family

The extended family plays a significant role in I-Kiribati life, assuming many social, economic and political functions. The extended family is still the most important social unit within the Bikenibeu West community with family members living in a cluster of houses on the same land or living together under one roof.

The latter situation is particularly true of extended families living in a government quarter, which had been extended to accommodate the extra number of people in the house.

Sustainability of Extended Family

The difficulty in securing land, accommodation and a job in South Tarawa make it more convenient for people from the outer island to stay and live together as extended families in an urban setting. The traditional concept of extended families was a viable means of mutual support and survival amongst the family members, and as long as this system of interdependence exists, the extended family will persevere to function as a social and an economic asset.

The sustainability of extended families depends on continuation of the symbiotic relationships amongst the family members. The breakdown of such relationships is destructive to the social and economic sustainability of extended families.

Sole Breadwinner
The survey showed that there are one or two wage earners in a household who are financially responsible for the upkeep of the extended family. The physical, social and economic strains on the breadwinners are obvious.

Outer Island School Children
The survey also noticed that many young people, especially pupils from the outer islands attending local schools are staying and are dependent financially on their relatives in the area.

It is common practice for outer island children attending schools in South Tarawa to stay with their relatives, and their parents who remain in the rural areas very rarely support these children financially. These children become additional social and economic burden on their South Tarawa families.

Old People
The survey showed that many old people, parents and grandparents, are important members of the households in the Bikenibeu West community.

Traditionally, I-Kiribati regard as their social obligation the welfare and maintenance of their old people, principally their parents and grandparents. These old people are very important part of the extended family. They are more of family assets rather than liabilities. Their presence in an extended family symbolizes family cohesion and togetherness, and a pride in traditional values and a sense of psychological satisfaction to the family.

4.1.3 Birth Death Rates
The 1995 demographic analysis indicates an average life expectancy for men is 57.2 years and women life expectancy is 62.3 years.

4.1.4 Health and Nutrition
A National Nutrition Centre is responsible for public awareness and education on nutrition issues. A useful weekly health programme, provided by the Ministry of Health and Medical Services is broadcast over Radio Kiribati.

The FSP-K had also undertaken a nutrition/home gardening project in the Bikenibeu West community. Community training workshops on home gardening were held so that people were able to grow their own vegetables to encourage good nutrition amongst young children.

These training workshops were held in the Catholic Kaibanga *maneaba*, and only those of Catholic faith attended. People from the other religious denominations, the KPC, the Bah'ai Faith, the Mormons and the Seventh Day Adventist (SDA) did not attend because it was held in the Catholic *maneaba*. They preferred to have their own sessions in their respective church *maneabas.*

The church groups are so self-centered that getting them together to meet in a church maneaba which does not belong to them may end up in the boycotting of the meeting. This is an important consideration in the planning of project community stakeholders' consultations that each religious denomination is accorded with caution and due respect.

However, theFSP-K continues to provide seeds and technical advice for home gardening as part of its health and nutrition programme.

Figure 4: ***See Bee Memorial Primary School, Tebabubura, Bikenibeu West***

4.1.5 EducationStatusand Skills

The literacy rate is 100%. Virtually all the people are able to read and write in the Kiribati language. English is a second language, and most residents are able to communicate in Basic English.

Primary schooling from Class One to Class Six is compulsory in Kiribati. The See Bee Memorial Primary School, located in the area, provides primary education for local children as well as for nearby villages of Eita andAmbo.

The Bikenibeu Junior Secondary School (JSS) is located in Bikenibeu West,and absorbs the post-primary pupils from the whole of Bikenibeu village, Bonriki and Eita villages.

Figure 5: ***Bikenibeu Junior Secondary School, Tebabubura, Bikenibeu West***

The high literacyin the community should enableeasier work in public relations andeducation materials, but in reality this is not the case.

Ironically, the survey found out there was no proper management of wastes in the community'seducational institutions. The See Bee Memorial Primary School has no proper toilets and pupils use the beach extensively. The school buildings do not have enough water catchments to collect rainwater, and the pupils resort to buying unhealthy ice blocks of dubious quality.The school environment is usually littered with paper and empty plastic containers of ice blocks. These are not positive aspects of environmental health education for youngI-Kiribati!

It appears there is no proper management of waste and of the school environment exercised by the Ministry of Education, Youth and Sport. This is an area where theproject may have to target, namely the empowerment of the educational human resources so as to become effective agents of environmental management and sustainable development. The young people should be educated and made to be environmentallyconscious.

The educational system has a very important role to play in the development of young I-Kiribati to become better citizens of tomorrow if they are taught of what, where, how and why waste should be managed. The issues of waste and water should be preached both under the *manaeaba* as well as in the classrooms.

There are several people in the community who have graduate and post-graduate qualifications.

4.1.6 Occupations

There are teachers, educational administrators, accountants, doctors, lawyers, business management, bank personnel, hospitality workers, agriculturalists, health educators, nurses, contractors, drivers, carpenters, plumbers, bakers, seafarers, religious personnel, musicians, fishermen and clerical officers. The presence of these many educated people in the area is a positive indicator of their potential contribution to the project.

4.1.7 Migration

65% of the residents are from the outer islands. The rural-urban drift is caused by the social and economic needs and aspirations of outer island people to look for opportunities in South Tarawa. There is negligible migration out of BikenibeuWest, and depopulation is not an issue.The migration of other I-Kiribati into the area is posing serious social, economic and political problems for the local populace and the authorities.

Table 1: Household Distribution by Home Islands

Home Islands	Number of Households
Makin	6
Butaritari	7
Marakei	12
Abaiang	11
Tarawa	36
Maiana	7
Kuria	2
Aranuka	3
Abemama	8
Nonouti	19
Tabiteuea	32
Onotoa	14
Nikunau	17
Beru	11
Tamana	6
Arorae	13
Tuvalu	1

There are more Tabiteuea people than any other outer island community in Bikenibeu West. The are as many Tabiteuea people as there are indigenous Tarawa people. The Tarawa people represents 35% of the total communitypopulation.Refer to Table.1Household Distribution byHome Island.

These outer island people have no incentive either to manage or develop the terrestrial and the marine environments because of the lack of tenure. Most of them occupy government houses, entered into lease agreements with Tarawa landowners, bought their own land, while a number of them remained as squatters in the area. The limited supply of land in South Tarawa is a major constraint to development, includingthe provisionof sites and services for residential and commercial developments.

4.1.8 Settlement Patterns

As part of the TUC, Bikenibeu West is a designated area for the purposes of urban land use planning. Most of the area is designated residential zone with the exception of the areas zoned for commercial undertakings, schools, clinic, agricultural nursery, church areas and *maneaba.*

The construction of buildings and developments in the area is subject to the Land Planning Ordinance 1973, the TUC Land Use Plan and TUC Building By-Laws, and the Environment Act 1999.

4.1.9 Disadvantaged Groups

The survey revealed that there are 28 handicapped persons in the community. These handicapped people are members of the *Te Toa Matoa*, a registered NGO established to cater for the interests of disabled people.

The present government pledged in its election platform that it would provide allowances for disabled people, including the handicapped and the blind. The government has already announced earlier this year that people aged 70 years old and over would be paid a monthly allowance of $40.00 before the end of the current fiscal year. There is much public anticipation as to when these allowances for the disadvantaged will be actually paid.

Figure 6: Typical Government *House, Ununiki, Bikenibeu West*

Figure 7: *Kiribati Traditional House, Te Kaibangaki, Bikenibeu West*

4.2 Services and Infrastructure

4.2.1 Health Facilities

There is a small dispensary clinic providing basic health services to the community where a public health nurse is assisted by two aides'. The clinic is open in the morning for general routine medical check-up and treatment. Thereafter, the nurse will make home visits attending to various patients, including family planning, baby health care, antenatal, diabetes, hypertension, and immunization cases. More serious cases are referred to doctors at the main Tungaru Central Hospital, about 10 minutes bus ride eastwards.

There are currently 9 local doctors employed at the main hospital. There are no private doctors in the country. There are also no private chemists or pharmacies either. (Pers. comm., Ag. Matron Maaka am 9/2/04). Refer to paragraph 4.8 Current Health Issues in Bikenibeu West for a discussion on the relationship between the environment and the prevailing diseases in the community.

4.2.2 Educational Facilities

There are pre-school, primary, junior secondary school facilities in the community. The Bah'ai Faith provides pre-schooling in the community for children of all denominations.

Primary schooling is compulsory and is available locally at the government owned See Bee Memorial Primary School. All the post-primary school children are able to enter into the middle school, the Bikenibeu Junior Secondary School.

Admission to the senior secondary schools is very competitive and only about one-third of the pupils from the Bikenibeu JSS are able to enter into senior secondary education.

Of the eleven senior secondary schools in Kiribati, 4 are located in South Tarawa and 7 in the outer islands. Two-thirds of these secondary school children are enrolled in Church secondary schools.

Table 2: ***Students Distribution by Educational Facility***

Educational Facility	Community Pupil /Total	Staff Numbers
Pre-School	110	8
Primary School	245/ 663	22
Bikenibeu JSS	270 /1219	50
Senior Secondary Schools	246	56
Tertiary (USP)	7	

4.2.3 Sanitation

The community uses three types of toilets: the flush, pour flush and compost. The number of households having flush toilets is 64; pour toilets 74 and compost 4. Of the 64 houses, 22 are government houses with toilets integrated with the urban sewerage system.

The private houses are not hooked to this sewerage system, and the current SAPHE project does not even accommodate the sewerage needs of these private houses. Most of these houses want to be connected to the urban sewerage system, and unless they have a suitable toilet facility, people from these households will continue to use the beach as toilet. There is no indication that private houses in the community will be hooked to the urban sewerage system. The other 42 houses with flushed toilets have their own septic pits. 118 houses have no provision for any kind of toilet whatsoever. The occupants of these houses indicated that they use the beach, either the lagoon or the ocean, for defecation.

4.2.4 Freshwater supplies

Of the 205 households, 102 households are linked to the reticulated town water provided and managed by the Public Utilities Board (PUB). The PUB is the only statutory service provider of electricity, water and sewerage to the main urban areas, which includes Bikenibeu West.

This treated water is piped from underground water from the water reserve areas in Bonriki and Buota and provide drinking water to the whole of South Tarawa and Betio.

The water consumers using the communal taps pay $5.00 monthly for a supply of about 200 litres of water on a daily basis. The households connected to the reticulated town water pay $10.00 monthly for daily rations in the morning and in the afternoon. (Per. comm., PUB Bikenibeu Water Supervisor 7 April 2004)

There are common adverse comments from the Bikenibeu West community members that the PUB town water suffers from occasional breakdown resulting in the non-availability of water causing much inconveniences.

During the survey, 115 houses indicated that they use well water for general washing and drinking. Well water is boiled before drinking.

4.2.5 Roads/Access

As shown in the map of the area, the community is very accessible with the trunk South Tarawa road running on the lagoon side and connecting the area with the whole of South Tarawa. There are subsidiary roads composed mainly of compact sand and coral that link the community to the main trunk road.

The area is also very close to the lagoon and to the ocean side facilitating the use of the sea for fishing, recreation, personal use and cleaning.

4.2.6 Electricity

The PUB supplies electricity to 157 households. The new powerhouse in Bikenibeu equipped with two new 1.44mw electricity generators provides power for Bikenibeu West.

4.2.7 Transport

Private buses provide public transportation on South Tarawa and Betio. There are 13 households with cars, and 5 hire trucks (2 belong to the Catholic group).

There is no taxi service in Tarawa, but the hiring of buses and trucks is common. Rental cars are available for overseas visitors.

4.2.8 Communications

There are 191 subscribers to the Telecom Kiribati Services Ltd telephone service. This excludes the 5 telephone lines connected to the Otintaai Hotel (*Pers. comm., Aileen 2004*). There are 174 households with radios. The use of CB radio is very popular and there are several licensed operators in the community.

4.3 Political Structure at the Local level

4.3.1 The Bikenibeu Village Traditional Political System

Bikenibeu West is traditionally part of Bikenibeu village. Historically, the Bikenibeu traditional social and political structure normally revolved around the village *maneaba* system.

The *maneaba* system was similar to a village 'parliament' where the traditional leaders in the community, known as the *unimane*, met to discuss and made decisions on village matters. The *unimane* had their own *boti* or sociological niche in the *maneaba,* and each *boti* would have its own ascribed role in the *maneaba* and in the village.

Thus, the *boti* of *karongoanuea* was exclusively allocated for the chiefly family, and its role in a *maneaba* could range from a ceremonial figure to an executive chairperson of the village. There are other *boti* in the traditional maneaba each with different ascribed social roles in the traditional setting.

Under the Bikenibeu traditional political structure, there was no such thing as the democratic rights of an individual such as the freedom of speech and equality between the sexes. Not every *unimane* in a *maneaba* setting would have the privilege of the freedom of speech. In a traditional setting, the women and young have no freedom of speech. Their roles were to ensure that the decisions of the *unimane* were carried out.

The outer island people who came from other parts of Kiribati to live in Bikenibeu village would not be able to fit sociologically in the context of a Bikenibeu traditional village political and social structure because they have no *boti* in the Bikenibeu traditional *maneaba*. These outer island people would have their own *boti* in their own villages in their home islands. Whilst they are in Bikenibeu West, these people cannot attend traditional village meetings because they will be regarded as intruders.

There had been no traditional maneaba for Bikenibeu village since the 1960s, and the indigenous villagers had used the Church *maneabas* for their meetings to discuss traditional village matters. However, the situation in a traditional *maneaba* is very different from that of a church *maneaba.*

4.3.2 Religious Background

The traditional village social structure and community organization have virtually collapsed and are being superseded by a social structure and community organization based on island parochialism, religion and sectarian interests. The church *maneaba* is becoming more important than the village *maneaba* as the center of local politics.

Figure 8: Te Kaibangaki Catholic Maneaba, Bikenibeu West

4.3.3 The Structure and Organization of a Church *Maneaba*

The setting in a church *maneaba* is very different from that of a traditional *maneaba.* In contrast to a traditional *maneaba,* there is no such thing as *Te boti* and the ascriptive roles of *unimane* and community members.

The principle of egalitarianism is paramount in a church *maneab*a. Each individual enjoys the freedom of speech, including the women and the young people. The chairperson usually controls the proceedings in a church *maneaba.* All the church members elect this chairperson and his/her committee members during the annual general meeting of the Parish, and they constitute the executive body managing the affairs of the Parish.

Bikenibeu West is dotted with several church *maneabas* and a notable absence of a traditional village *maneaba.*

4.3.4 The Church or Religious Communities in Bikenibeu West are as follows:

- The Bah'ai Faith;
- Kiribati Protestant Church (KPC);
- Roman Catholic Church;
- Church of Jesus Christ of Latter-Day Saints;
- Seventh Day Adventist; and
- Jehovah's Witnesses of Kiribati.

The Bah ai Faith National Spiritual Assembly
Headquarters are located in Bikenibeu West. There is a chairperson and secretary managing the affairs of the Bah'ai Faith, who are responsible to the National Spiritual Assembly (NSA). The NSA has a big area comprising Office Headquarters and a *maneaba* on the ocean side.

The Bah'ai Faith has been active in various community projects such as the training of pre-school teachers and running a pre-school in the local community. The NSA has its own women's group, The Holy Leaf Association. (Per.comm, Morrison 04/04/04).The Bah'ai Faith NSA telephone contact is (686) 28074.

Kiribati Protestant Church
The Bikenibeu KPC Parish is divided into ten sub-parishes, three of which fall within the jurisdiction of the Bikenibeu West Ward. The three sub-parishes or *makoro* as they are known locally are: Te Ununiki (Agriculture), Akabite and Marenaua.

The *makoro* is further divided into smaller units known as *te kurubu* (group). The *makoro* has its organizational structure with the elected office bearers of chairperson and treasurer. The *makoro* will normally meet fortnightly to coincide with payday to collect and count their financial contributions to the main Parish. The subdivisions have been made to suit the fund-raising activities of each *makoro* and *te kurubu* so that they are able to share evenly their yearly financial contributions to the Bikenibeu KPC Parish.

The KPC Bikenibeu West has a very active women's group (RAK) and a youth organization (YESS).

The Bikenibeu KPC Ministry telephone contact is (686) 28123.

Roman Catholic Church
The Bikenibeu Roman Catholic Church Parish consists of 14 sub-parishes, including Te Kaibangaki (The Cross) and Rurete (Lourdes), which are within the jurisdiction of the Bikenibeu West ward.

The structure and organization of Catholic sub-parishes *(makoro)* are similar to those of the Bikenibeu KPC *makoro*.

Most of the Catholic women in Bikenibeu West belong to the Catholic Women's League known as Te Itoi ni Ngaina. A Catholic Youth group exists in each sub-parish, including Te Kaibangaki and Rurete sub-parishes of Bikenibeu West.

The Catholics have their own agenda with Parish activities during the course of the year. The focus is mainly to do with fund-raising for the yearly religious festivals.As with the other major church (KPC), the Bikenibeu West parishioners spend so much of their time and effort in fund-raising for their Church.

Fund-raising activities are more important than any other activity in the community. These church activities tend to be disruptive socially and economically for the well being of the domestic household and the community as a whole.

The same comments may be alluded to the KPC. The community activities are very much the activities of the respective church groups. These church activities may be counter-productive to the betterment of lifestyle and achievement of sustainable development in the community. The project will have to find a strategy of how to integrate its actions with these routine community daily activities.

The Telephone contact for Bikenibeu Catholic Parish:

Priest (686) 28138
Head Catchiest (686) 28541
Te Kaibangaki (686) 28804
Rurete

Latter Day Saints (LDS) Church
Church of Jesus Christ Latter Day Saints has its Bikenibeu Church in Bikenibeu East. The LDS members have a relatively strong community spirit and have been involved in waste-related projects on South Tarawa, including the cleaning of the Bairiki Sports Centre and the reserve area between Nanikai and Bairiki.

The LDS areas in South Tarawa, including the LDS secondary school compound in Eita village and the LDS Temples in Teaorareke, Bikenibeu and Buota villages, are models of excellence in proper waste management.

The layout of their buildings and the beauty of their environment have much to commend, and are an envy for the environmentally conscious observer. In view of the its proven record, the LDS has much to contribute towards the project through its small but civil minded members.

LDS Mission Bikenibeu Telephone: (686) 28988

Seventh Day Adventist
Seventh Day Adventist has its Headquarters (HQ) at Korobu on South Tarawa. There are so few SDA adherents in the community and their activities are linked to the mainstream activities of the HQ. The SDA are environmentally and health conscious, and the project seem to be in line with the church principles of good health promotion, cleanliness and abstinence from smoking and alcoholic consumption.

SDA HQs Korobu, South Tarawa Telephone: (686) 21303

Jehovah s Witness
Jehovah's Witnesses of Kiribati is a newcomer to Kiribati with their missionaries as active as the LDS missionaries in visiting houses in South Tarawa and Betio. They have very few members, and their activities are low profile but they seem to do well at the grassroots level. They should be supportive of the project.

Jehovah's Witnesses Kiribati HQs, Ambo, and South Tarawa Telephone: 22298

Table 3: ***Household Distribution by Religion***

Religion	Number of Households
Roman Catholic (RC)	84
Kiribati Protestant Church (KPC)	80
The Bah'ai Faith	20
The Church of Jesus Christ Latter-Day Saints (LDS)	13
Seventh Day Adventist (SDA)	6
Jehovah's Witnesses of Kiribati	2

As the religious denominations are so important in the Bikenibeu West community so are the church groups such as women's groups, young people's groups and prayer groups.

Table 4: ***Church Organizational Groups***

Church Org. Groups	The Bah ai Faith	CJCLDS	JWK	KPC	RC	SDA
Women	The Holy Leaf Association	The Relief Society	N/A	Reitakia Ainen Te Kamatu	Te Itoi ni Nagaina	Te Toreka The Women Ministry
Youth	Informal	12-17 youth	N/A	YESS	TeKaibangaki Rurete	Bikenibeu Youth
Prayer Groups	Local Spiritual Assembly	Bishop 1st Councillor 2nd Councillor	Jehovah Witnesses Bikenibeu	Te Ekaretia Te Kai n Utu	Legion of Mary Charistimatic	N/A
Makoro	N/A	Bikenibeu 2nd	N/A	TeUnuniki Akabite Marenaua	Te Kaibangaki Rurete	N/A
Kurubu	N/A	N/A				N/A

4.4 Local Government Teinainano Urban Council (TUC)

Bikenibeu West, one of the 14 electoral wards of the TUC, returns an elected Councillor once every four years. The TUC charter empowers it to administer a variety of responsibilities, including the management of waste, the licensing of commercial activities, the issuing of building permits, liquor licenses, bus operators' licenses and being an agent of the central government at the local government level.

The TUC comprises elected and nominated councillors, chaired by a Chief Councillor elected from amongst the 14 Councillors, and a Council Clerk seconded from the central government. (Pers. comm., TUC Clerk Kabwearuru 2004)

4.4.1 Central Government Te Maneaban Maungatabu

The TUC area returns three Members of Parliament to the national legislature, the *Maneaba n Maungatabu* and together with the Bikenibeu West councillor, the local politicians provide the linkage between the local community, the local government and central government.

It is noteworthy that the current Bikenibeu West councillor and the present three Members of Parliament for the TUC constituency are all Catholics. There are no women politicians at the moment.

4.5 Land and Other Resources

4.5.1 Land Ownership

The survey showed that 64% of the households are sited on freeholds, 29% on leaseholds and 7% are squatters. 40% of the freeholds belong to residents who bought land from the original owners.

The majority of the leaseholds belong to the Government of Kiribati (GoK) on which are built government housing, a plants nursery, a primary school, a Junior Secondary School, a clinic and a government-owned Otintaai Hotel.

The lease agreements, between the GoK and the landowners, are a 99 years' arrangement with annual land rentals ranging from $1,166.00 for residential leases to $1,506.00 for commercial leases.

Under the lease agreements, the GOK has exclusive use of the lands for which landowners are compensated for relinquishing their property rights and access during the duration of the lease agreement (Pers. comm., Erene, Director of Lands &Survey 2004)

As for freeholds, the landowners have exclusive property rights under the Native Lands Act 1956. However, freehold lands may be acquired compulsorily by lease and purchase by the GOK for a public purpose in accordance with the provisions of the Lands Acquisition Act.

The South Tarawa Lands Register lists all the individual landplots on South Tarawa, from Bairiki to Tanaea, indicating the names of the plots in each village as well as showing the names of the landowners or co-owners, and the Lands Court Case Number, which legalized ownership to the registered landowners. Bikenibeu West consists of 46 land plots with a total acreage of 89 acres. (Telephone Interview: Lands Surveyor Tebutonga 5/03/04, 1400hrs).

The Catholic Church and the The Bah'ai Faith NSA are two major landowners in Bikenibeu West.

4.6 Water Resources

The Kiribati Constitution provides that underground resources, including water and minerals, belong to the State. However, in practice the State cannot enter the freehold lands to extract water and other underground resources, unless it invokes compulsory land acquisition, without the prior consent of landowners.

Residents in the Bikenibeu West area dig underground wells on their lands to get water without obtaining prior approval from local government or the State.

There are 115 private wells in the community. The permission of the well owners must be sought before other people use the well.

Well water is only good for washing, but few households drink well water after boiling it. A TUC by-law stipulates that wells must be at least 100 yards from a grave and a pigsty for health reasons.

The by-law is never enforced because of more compelling social and economic reasons than legal considerations.

4.6.1 Marine Resources

Bordered by the Pacific Ocean to the south and the Tarawa lagoon to the north, the residents have common rights and access to sea resources as does any other I-Kiribati. The lagoon resources, including inshore fishery and edible shells, show signs of depletion due to intensive over fishing and lack of proper resource management. Fishing for reef and ocean fish are also undertaken by local residents mainly for local consumption.

4.7 Economic Activities

4.7.1 Cash Economies

The major economic activities in the area include hospitality service, a fuel outlet, sour toddy outlet, small retail stores and commercial fishing.

The Otintaai Hotel, the only government-owned hotel in South Tarawa, is located on the lagoon side of the northeastern part of Bikenibeu West. Employing a total workforce of 80 people, 49% of whom are women, and 70% of the workforce lives in Bikenibeu. During the financial year 2003, the Otintaai Hotel made a gross income of $1,268,756.00. (Telephone discussion. Financial Controller Tony Vaia 1030hrs 5/03/04)

Table 5: ***Cash Employment and Source of Income***

Source of Income/Employment	Number of Households/Employees
Government	244
Seafarer allotment	26
Fishing	22
Smocking (traditional top for women)	14
Local cigarette making	13
Private business employees	13
Retail store	10
Selling local food	8
Ice block	8
Bakery	7
Private Contractors	5
Truck Hire	4
Net Fishing	4
Vegetable marketing	3
Handicraft	2
Thatch	2
Bus driver	2
Sour toddy	2
Family support	2
Weaving mats	2
String making	1
Fuel Outlet	1
Entertainment Music Band	1

4.7.2 Subsistence Economy

Subsistence lifestyle in an urban situation like Bikenibeu West is not easy because of the limited land space available for growing local foodstuffs such as breadfruit, coconut trees
and root crops. Toddy cutting and fishing are popular subsistence activities, which help to cushion economic hardship in a predominantly cash economy situation. It is impossible to survive in an urban situation, let alone in an outer island, without due regard to the subsistence economy and the cash economy.

The blending of both the subsistence and cash economies is a possible option for sustainable existence in an atoll environment, such as in the urban community of Bikenibeu West. Hence, the retention of traditional values and skills is still imperative in the modern era.

4.8 Current Health Standard and Issues

The Ministry of Health is currently pursuing an active health surveillance programme in the Bikenibeu West area. The current health activities in place include immunization, reproductive health, leprosy, TB Dot, child health care, non-communicable diseases, HIV/AID and adolescent reproductive health.

The following observations on health issues were noted during the course of the survey:

- The lack of proper toilets and quality drinking water for most households presents health hazard problems. The high incidence of acute fever and diarrhoea diseases in the community (Bikenibeu West Clinic Morbidity List 2002) may be related to the poor drinking water and poor sanitation. (Telephone discussion, Dr Takeieta Kienene Secretary Health 1100hrs 7/03/04).
- The accumulation of household waste awaiting overdue collection and disposal by the TUC garbage service creates a potential health risk. The waste becomes a breeding ground for flies and mosquitoes. The children and dogs are often seen playing with the waste.
- The poor quality of most houses without proper sanitation facilities and overcrowding in houses provide good breeding ground for mosquitoes and flies, and diseases. The health and development of a child under these circumstances will be adversely affected.
- The keeping of pigs very close to the houses and the wells is not hygienic with flies and bad smell from pig waste and food waste having adverse effect on the household and the well.
- The use of Church *maneaba* for accommodating patients from the outer islands is not conducive to good health. There are no proper amenities, such as water, toilets, and bathhouse and the patients resort to using unhealthy practices like defecation on the beach and using contaminated well water for washing and cleaning in the open space because there are no kitchen or bathhouse in a *maneaba* setting. The Church groups, which own the maneaba, receive rental income for the use of their *maneaba*.
- The burial of dead people close to the homes pollutes the water lens when the dead body decomposes. The proximity of graveyards to the household wells is therefore a health risk.
- The popularity of smoking as a traditional habit of I-Kiribati is also a major health risk. The sharing of smokes amongst people is very unhealthy and provides an effective conduit for the spreading of infectious diseases such as tuberculosis. Kiribati has a very high rate of tuberculosis.
- The unauthorized sale of distilled alcohol to schoolchildren of the See Bee Memorial Primary School and the Bikenibeu West Junior Secondary School by two licensed alcohol retail outlets located in the vicinity of the schools was a matter of serious public concern in South Tarawa. The Kiribati Police had been investigating cases of unauthorized sale of sour toddy and distilled alcohol, and under age drinking by the pupils of both schools.
- Defecation on the Bikenibeu West beach is a destructive habit physically, environmentally, socially and economically.

Table 6: ***Bikenibeu West Clinic Morbidity List 2002***

Respiratory Tract Infection	
Acute fever syndrome (no rash)	606
Pneumonia	3
Other ARI	643
Diarrhoeal Diseases	
Diarrhoeal	161
Dysentry	72
Food Poisoning	2
Skin Diseases	
Scabies	58
Eye Diseases	
Conjunctivitis	107
Fish Poisoning	
Fish Poisoning	8
Non Communicable Diseases	
Hypertension	6
Diabetes	6
Other Diseases	
Other diseases	2224
Total	**3896**

Source: Ministry of Health and Family Planning

- Using the Tarawa lagoon environment as a dumping site for human and domestic wastes had caused considerable sea pollution and contamination of fish and seashells, which had provided a significant source of protein and vitamin to the local population.
- The consumption of contaminated seashells, such as *Te bun*, *Te nouo* and *Te koikoi*, from Tarawa lagoon had been a source of diarrhea and food poisoning. South Tarawa beach is no longer a pleasant place for walking, and swimming in the lagoon is no longer safe.
- The shoreline along the only big, government-owned hotel in Kiribati, the Otintaai Hotel, which is a major economic activity in Bikenibeu West, suffers from the negative effects of human abuse of the coastal environment.
- Over consumption of imported, unhealthy chunk food, including ice-blocks by school children.
- The breakdown of the Kiribati traditional lifestyle, an activity based diet on fishing, cutting toddy and digging of *babai* pits.
- Obsession with a modern lifestyle characterized by sedentary existence and consumption of convenience foods.
- Too many unlicensed dogs, which are not managed properly by the legal custodian, the TUC

4.9 Attitudes, Values and Beliefs Affecting Waste Problem

The attitudes, values and beliefs of I-Kiribati in regard to waste are basically derogatory. The idea of waste as dirty, filthy and smelly makes it so unpalatable and useless, and should be disposed of as soon as practicable. It is a traditional practice to clean around the house, the lands in the bush, and the community environment.

Figure 9. **Typical Current Wastes.**

Cleaning rubbish is a job for the women and young people; men are customarily not involved in cleaning rubbish. It is such a lowly, humble job that prisoners are made to do it as a form of punishment.

The young people are now revolting against this routine activity because cleaning rubbish and managing waste have such a low profile socially and economically.

The paid cleaners in public offices are avoiding their job description of cleaning in and around the offices, and are behaving more as office workers than as cleaners. The office cleaners do not want to be seen cleaning and collecting rubbish outside the office due to personal embarrassment.

There are, of course, very marked differences between male and female attitudes, values and beliefs affecting waste. The men are more disinterested compared to the women who are more sensitive and conscious about waste. Perhaps this is to do with the socialisation of women in a traditional family structure and organization.

The woman is the domestic manager of the family household. She is responsible for managing household activities, which are usually waste-related: the kitchen, the bedroom, and the toilet, cleaning the surroundings, the laundry, and more importantly, the caregiver for the children, the aged and the sick members of the family.

Thus, the woman is more involved domestically and adept in dealing with both solid and liquid wastes of the household.

Waste is of some use to the I-Kiribati. The plant leaves had been a source of compost in the cultivation of the traditional crops, including
the coconut, the pandanus, breadfruit and the root crop,
te babai. The food waste is fed to the domestic animals, the dogs, the pigs and the chicken.

The burial of family deaths on family lands close to the settlements and wells is a health hazard. The public cemeteries are owned by the major religious denominations, but most deaths are buried near houses rather than public cemeteries. As previously indicated, the Council by-laws on this problem are not always enforced due to political considerations.

4.10 Law Compliance and Enforcement

The following national legislation, regulations and by-laws relate to management of wastes and water.

4.10.1 The Environment Act 1999

This provides for the general functions of the Minister, the conditions for development proposals, and the prevention and control of pollution. A section 31 of the Act prohibits the discharge of wastes in any position, beach, sea, lagoon or foreshore that will result in pollution or interfere with health, convenience, comfort or amenity of any person. Section 33 prescribes a penalty of a fine not exceeding a $1000.00 or imprisonment up to six months for the discharge of human excreta. This provision is not enforced.

4.10.2 The Environment Regulations 2001

This elaborates on the definition of pollution and wastes. The definition of pollution is broadened so as to include contamination of land, contamination of water, contamination of air, and noise. The Regulations provide guidelines on acceptable limits of soil and water pollutants. The definition of waste is elaborated to include household waste, demolition waste, hazardous waste, clinical waste, quarantine waste, ballast waste, and oil waste. The Regulations also require a report on the state of the Kiribati environment every two years. The Environment Act and the Regulations provide for the appointment of Environment Inspectors (EI). The EI are not enforcing the Act and the Regulations.

4.10.3 Public Health Ordinance 1926

This antiquated, but it is still applicable in the present circumstances. Administered by the Ministry of Health and medical Services, the law provides for the designation of sanitary districts and appointment of Sanitary Inspectors (SI).

This is concerned with public and household cleanliness to combat mosquitoes and flies. Section 11 stipulates that every dwelling house should have its proper toilet facility approved by the sanitary inspector. Section 20 prohibits the use of unsafe wells and must be closed by order of the SI.

4.10.4 Public Health Regulations 1926

This is concerned with public and household cleanliness to combat mosquitos and flies. Section 11 stipulates that every dwelling house should have its proper toilet facility approved by the sanitary inspector. Section 20 prohibits the use of unsafe wells and must be closed by order of the SI.

4.10.5 Public Utilities Board Ordinance 1977

This provides for the establishment of a statutory organization to supply electricity and water, and to dispose sewage. Section 7 of the PUB Ordinance provides the exclusive right of the Board to supply, distribute and sell water. The Board may authorize another person to supply, distribute and sell water. Section 8 empowers the Board to carry out certain functions necessary to fulfill its statutory obligations. Section 30 provides for the offences connected with the supply of water, including the contamination of water reservoirs. The Minister of Public Works and Utilities may make regulations for the prevention of waste, conservation, misuse and contamination of water and the securing of waterworks from injury, and the sanitary control of water reserves (section 35.1.r).

4.10.6 Land Planning Ordinance 1973

This provides for land use planning, zoning, and the promulgation of regulations for the conservation of the natural environment. The Lands and Survey Division of the Ministry of Environment, Lands and Agriculture provides the professional administration of the Ordinance.

The Land Planning Ordinance provides for the establishment of a Central Land Planning Board comprising representatives of the main stakeholders in land planning, use and management.

The Local Planning Board considers development proposals before submitting cases to the Central Land Planning Board for further consideration prior Ministerial decision. The TUC has been designated as the Local Planning Board for the purposes of land planning in South Tarawa.

As seen in the land use plan and zoning of Bikenibeu West, the settlement in the community is haphazard and does not conform to the South Tarawa Land Use Plan. The local government body also plays a key role in environmental management.

4.10.7 Local Government Act 1984

This provides for the establishment of Island Councils on each inhabited island of Kiribati, and empowers each Island Council to undertake a variety of tasks, some of which are related to management of wastes and water. Island Councils can pass by-laws to give legal effect to some of these responsibilities (sections 50-53 Local Government Act, 1984). The following TUC by-laws have environmental implications pertinent to the management of wastes and water in Bikenibeu West and the project.

4.10.8 TUC Public Health By-law 1975

This complements the provisions of the Public Health Regulations relating to the proper management of the environment. The By-law stipulates that the rubbish is to be disposed at the right place; wells must be lined with concrete and must be covered to avoid contamination; wells must not be dug within 100 yards distance from a graveyard; dead people must be buried at the cemetery and not near homes to avoid water lens pollution, and it is an offence to defecate on the beach.

4.10.9 TUC Control of Animals By-law 1975

This controls the straying of dogs and pigs into the community and helps minimize the contamination of community water resources.

4.10.10 TUC Building By-law 1986

This stipulates the conditions for the building of houses with sites and services agreed with the appropriate providers, such as the Lands and Survey and landowners, the Ministry of Works & Utilities, and the Public Utilities Board. The TUC Building By-law stipulates also that new buildings must have provision for toilet and water catchments.

The Building Inspectors provided for in the by-law have never been appointed and compliance is virtually non-existence. (Per.comm. TUC Clerk Kabwearuru, 13/04/04)

The survey found out that there is much evidence of public oblivion towards compliance and enforcement of the above laws, regulations and by-laws. It is the legal responsibility of the Kiribati Police, the Council Warden and the Island Council itself to ensure that this legislation are respected and complied with. The Bikenibeu West survey confirmed that the Kiribati Police and the TUC have been oblivious of their legal responsibilities. The public non-compliance and the lack of effective enforcement is a nation wide problem, and it is imperative that the appropriate authorities find a speedy solution to this impasse if the I-Kiribati aspirations for a better quality of life are to be realized. (TTI 1993, p. 111)

4.11 Perceived Quality of Life and Problems

Most of the people in Bikenibeu West originally came from the rural outer islands with aspirations for a better quality of life in the urban area of South Tarawa. They wanted opportunities for employment, better schools, better medical services and greater proximity to family members.

The relocation from a rural environment to an urban setting had not been easy and many problems have been encountered: job opportunities are limited, land is scarce and expensive, subsistence lifestyle difficult, and dependence on imported foodstuffs is expensive and unhealthy, and overcrowding in impoverished housing conditions cause serious social and economic problems for families.

4.12 Community Perceptions of Waste

Traditionally, Kiribati people are waste conscious and ensure that the waste is disposed of in the most appropriate manner. The rubbish is locally known as *te mange* and generally includes all solid waste such as the plant leaves, tins, plastics, bottles, rags, and any other valueless and useless material.

The plant leaves and tins are usually buried to provide composite for gardens. Where people have no lands of their own or gardens the rubbish is likely to be burned.

The plastics and the bottles are either buried or burned. Some plastic containers and bottles may be used for domestic purposes such as liquid containers for local products (toddy, sour toddy, boiled toddy, noni juice, coconut body oil, traditional medicinal drinks, and holy water!).

Empty bottles are still popular for decorating local graveyards. It is known that batteries have been promoted by some I-Kiribati as a good source of plant fertilizer!

The current role of the local government, the TUC, in the collection of rubbish in the villages has influenced the manner in which the people have managed their rubbish. Rather than deciding on the fate of their own rubbish, the households have relied heavily on the TUC not only to collect their rubbish but also to dispose them at the designated dumping sites.

The Council will pick almost everything dumped by the households and disposed them at the dumping sites regardless of the types of wastes.

The sorting of waste into types is a new concept for Kiribati people. The recycling of imported waste is new technology as far as the Bikenibeu West community is concerned.

Unless they are aware and understand the need for sorting wastes and how to dispose these properly, the ordinary Kiribati person, in the community, in the Council, and in the Kiribati Cabinet will continue to regard household rubbish as one entity for the purposes of waste management.

From the Kiribati perspective, *Te mange* does not include *Te butae*, or the human excreta. The Kiribati people would normally go to the bush and the sea to relieve themselves. In an urban setting as Bikenibeu West where there is hardly any forest or isolated place for defecation, people have no option but to use the beach. The opportunity costs of building and maintaining a proper toilet in the household has to be compared to defecating on the beach for virtually no apparent cost to the users.

4.13 Community Commitment to Project and Constraints to Community Participation

During the consultations with principal stakeholders in the community, including the Church leaders, the Councillor, the business community and women's groups, it became evident that there is unreserved support for the IWP Project, but there are political, social and economic issues to be considered before community participation is involved.

4.13.1 The Bureaucracy

As a matter of routine and courtesy, any project that will involve community participation must have the blessing of the Island Council and the GoK. The TUC is a key stakeholder in the community and it is imperative it is given due recognition and a useful role in the project. The TUC will be a useful partner to work with given its important statutory functions on waste management such as the collection of rubbish in the community, policing of straying pigs and dogs, and licensing and controlling of social and economic activities in the local community.

The Ministry of Health & Medical Services indicated its support to the IWP Project because it wants better sanitation in the community and endorses the idea of composting toilets for households rather than the use of the beach for defecation. In a telephone interview with the Permanent Secretary Health & Medical Services, who lives in Bikenibeu West, he expressed grave concern of people's habit of "sitting on the rocks", an euphemism for using the sea. The Ministry of Health is happy to co-operate with the Project.

The commitment of the TUC and the Ministry of Health and Medical Services towards the Project will be a positive step forward in assisting with the management of other constraints inherent within the community.

4.13.2 Economic Issues

The demand for financial reward for community involvement in the Project will be an initial constraint that needs to be negotiated with community leaders to find ways and means of minimizing project costs, especially trivial expenses on meeting allowances, labor and social costs. The preliminary discussions and consultations with the community groups are crucial, and the provision of voluntary labour and in-kind contributions from the community is very possible if the people are assured that the project will bring tangible benefits to each individual household.

4.13.3 Social Issues

The different religious denominations in Bikenibeu can provide the catalyst in facilitating the involvement of their members.

They must be all invited to participate in the planning and in the initial stages of project consultations to ensure their on-going commitment. As indicated, the church activities of fundraising are priority to the community and church involvement will prevent any possible conflict between the IWP Project and the church activities.

4.13.4 Gender Issues

The participation of women through their various Church or organized women's group is also crucial to the effectiveness of the Project. Whilst the I-Kiribati women have their own national women association, namely Aia Maea Ainen Kiribati (AMAK), women allegiance is foremost to their Church women's group. Culturally, the I-Kiribati women are more adept than the men and the youth in dealing with waste/water management, and they should be significant leaders in the project. Needless to mention that there are leading I-Kiribati women, who are scared of domestic waste and will not even dare touch the rubbish. The Project should be beware of these type.

4.13.5 Community Capacity

The lack of human resource capacity may not be a major constraint for the IWP Project. There is a pool of semi-skilled and skilled manpower in the area that have worked in a number of projects similar to the envisaged IWP project. The current SAPHE project and previous aid projects have enabled a number of I-Kiribati young men to acquire skills in basic plumbing and other skills useful for sewerage and water works. If the women are to be active in the project, and I believe they should be active participants in the project, there may be a need for them to be trained in basic skills relevant to the project. The project is one possible avenue of enhancing I-Kiribati women capacity and capability in waste management.

4.13.6 Education/Training on Waste Issues

The FSPK, the Community Development Sustainable Participation (CDSP) Project and the SAPHE have been active in the education and training on waste issues in the urban area.

The FSPK had carried out waste projects in Bikenibeu West with limited success, but it has not given up the challenge of tackling waste management. The CDSP has written pamphlets on composting toilets (atollete) and improving local wells.

However, there is still much ignorance about waste issues generally in Kiribati, let alone Bikenibeu West and South Tarawa. The need for more public awareness and the use of the media for educational purposes on waste issues are minor constraints that can be overcome quite easily. These educational and training programmes can be done in co-operation with the local NGOs, including the AMAK and FSPK.

Community involvement in the IWP Project is crucial to the ultimate success of the project. The Project must encourage self-help and local initiative so that the community members must realize that they are the ones to carry out the responsibility and obligations of achieving the objectives of the Project. The local community must contribute significantly to its own sustainable development rather than expect foreign aid money to provide everything.

The foreign intervention should play the role of a catalyst in the development process, facilitating the empowerment of the local community to achieve project objectives.

The greed for aid money is a major development constraint and any proposed joint venture arrangement between the community and the project must be negotiated so as to make the community the ultimate sole shareholder in the venture. Any attempt to make generous financial undertakings by the project will be counter-productive and is not conducive to the sustainable development of I-Kiribati in the longer term.

The local community is aware of previous projects (FSPK 1996, Sinclair Knight Merz 2000, IWP 2004) that had been carried out in the community. Whilst they generally expressed support for the Project, they sincerely hope that in the end the project will have tangible benefits to the community, such as in the improvement of water supply from the Public Utilities Board (PUB), the provision of better toilet facilities for each household and more efficient waste management.

5 Bikenibeu West Household Waste Survey

5.1 Collecting the waste

A survey of the household waste stream of a representative selection of Bikenibeu West households was held between Saturday 21st February and Saturday 28th February.

Twenty households agreed to participate in the survey, amounting to almost 10% of 205 households in the community. However, on collection of the waste, only eighteen households, comprising a total of 95 adults and 57 children (152 individuals) took part, a sample of 9.4% of community population.

Participating households were given garbage bags, and asked to put their rubbish for the week into the bags. This approach excludes large organic wastes that are also entering the waste stream regularly. The purpose of the collection was explained to the householders as part of a general survey in the community to determine the main elements of the waste stream.

The team returned on the next Saturday to collect the waste. The two households that were asked to participate and did not collect their rubbish threw it onto communal piles of rubbish in the street, which is the usual practice.

Some houses put their waste in a pile on the ground, but most did use the bags provided. Garbage bags are not much used in Kiribati for waste collection, the usual method being to pile garbage up in a communal pile, and the local government workers will come along and remove it. Waste collection can be erratic in this area, but it does occur fairly regularly.

Interestingly, about one third of households separated their waste into organic (mostly leaves swept up) and inorganic. There were also some houses where active separation of aluminum cans was taking place.

There is a recycling system for aluminum cans, plastic bottles and cardboard in the Bikenibeu West community set up by FSP-K.

It was clear that in some instances some of the rubbish provided was more than a week old. Whilst this distorts figures for per capita waste generation, it does provide a larger sample of material for sector analysis.

5.2 Methodology

Bags were collected with a truck, and where materials were not in bags, the material was transferred into bags. Some larger items of scrap metal were also collected at one location. Bags were then taken to a central separating point where the materials were classified as to category.

There are nine different categories of plastic; seven different categories of metals; rubber; shoes; disposable nappies; glass bottles; fabrics; alkaline batteries; Tetrapak; organics; four different types of paper product; household consumer and electrical items; other mixed odds.

Figure 10: ***Sorting of Wastes by Category***

A total of 30 different categories of materials were found: plastic materials numbers 1 to 6; soft plastics; large rigid plastics; other rigid plastics; aluminium cans; aluminium foil; stainless steel; copper; steel cans; other steel; white paper; thin board; books; rubber; shoes; nappies; glass; fabrics; alkaline battery; tetrapak (liquid paperboard); organics; other mixed materials.

The materials were sorted into category on a concrete slab, and then after all the bags had been sorted, each category of materials was weighed and bagged.

Some materials such as plastic bags, small batteries, toothbrush and toothpaste had low weights, a small scale used to weigh these. Some materials, such as organics, were heavy in weight and these were measured with a hanging spring scale and a large woolsack.

Aluminum cans were counted and weight calculated, as they are such a valuable component of the waste stream, and of virtual uniform size –375ml, or 17.2g each.

5.3 Overall Results

Data is outlined in the tables below. Totals are for one week, adjusted. Full tables of raw data are in **Appendix 2**. Numbers are rounded. A breakdown indicates:

- Household waste generation is 72.7 kg/capita/year;
- That is 322 kgs/day for Bikenibeu West community;
- 118,100 kgs/year total for Bikenibeu West community;
- Total collected as weighed at endof survey = 212.53 kgs;
- A total of 152 people were surveyed: 95Adults and 57 Children; and
- Of a 2002 census population of 1618 they comprise 9.4% of Bikenibeu West population.

Raw data treated crudely indicates the waste production rate is 1.4 kgs/person/week, or 0.2kgs/capita/day.

With a rate of 0.2 kgs/person/day,multiply this by 1618 people = 324 kgs/day for BikenibeuWest population. Multiply by 365, and we get 118,100 Kgs/year for Bikenibeu Westor 118 tonnes. Of this 50% is directly organic (organic materials plus paper).

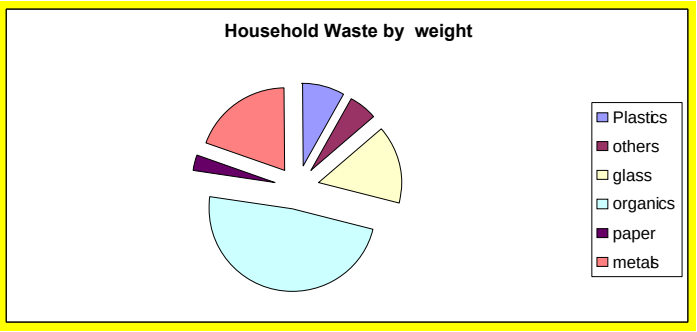

Figure 11: ***Chart Household Wastes by Weight***

5.4 Results by materials breakdown

Three materials stand out as major components of the Bikenibeu West waste stream. Organics comprise over 48% of the waste stream; metals come in at over 19%, and glass at 15%. Paper is very low at around 3%: this paper was wet due to heavy rain and a significant proportion of that came from one house.

Plastics at 8% are largely accounted for through Polyethylene Terephthalate (PET) bottles and plastic bags and wrappers, with a small number of large rigid plastic items pushing up the overall weight. 'Other' materials include a small but significant quantity of disposable nappies (nearly 3 kgs).

Figure 12: *PET plastics content, showing (from top left) drink bottles, cooking oil bottles and other PET items*

5.4.1 Organics

This material was virtually all leaves; only two palm fronds were included, and food was virtually non-existent, being all consumed by domestic animals. Municipal waste collections pick up a considerable quantity of large organic wastes. It is important to note that these larger organic wastes from trees did not enter this garbage survey, as these materials will not fit into garbage bags. But it is clear from observation of council collected wastes that this larger organic materials component is a very significant quantity of municipal waste collection.

All this organic material could be easily composted, but would benefit from the addition of other materials – such as copra wastes – and some shredding to encourage decomposition. The small amounts of contaminated paper based materials that are found in the household waste stream could also be recycled as compost.

5.4.2 Metals

Aluminum cans were high at 240 items and 4.1kgs, but it would seem likely that not all these cans were drunk in the week of the survey, as some houses contributed waste from aluminum can collections that were ongoing. Steel food cans were the major component: again, some items appeared to have been older than a week. However, steel cans are evidently a major component of the waste stream in Bikenibeu West. 'Other Steel' comprised some larger pieces of rusted steel. Some non-ferrous materials were found in small quantity.

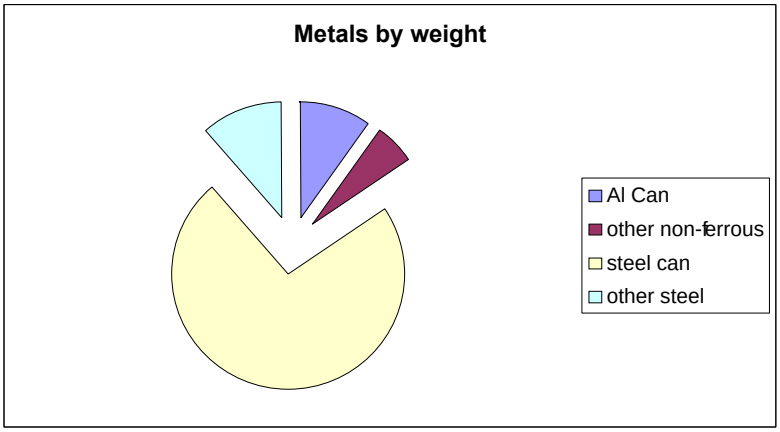

Figure 13: *Pie Chart Metals By Weight*

Table 7: All Metals by Material

Metals 19% by wt By volume	Al Can **R 2 bags**	Stainless sty. R	Other Al R	Steel Can **R 3 bags**	Al foil	Copper R	Other steel **R**
Total 41.1 kg	4.1	0.03	2	30	0.1	0.15	4.7

5.4.3 Glass

Soya sauce bottles were very prominent in the glass category at over 60% of the total, the remainder mostly jars. Virtually all the glass was clear, (beer in glass has a high import tariff in Kiribati to discourage consumption as beer bottles are more likely to end up as litter). Soya sauce bottles are commonly recovered from the waste stream for use as toddy collection bottles, and FSP-K does collect some glass at two locations on South Tarawa for reuse within the community. Glass will also be collected in future for aggregate replacement in concrete.

5.4.4 Plastics

PET plastic bottles were very prominent. Of 3.4kgs 1 kg was cooking oil bottles, and 1.2 kgs of drink bottles – water and soft drink. The remainder was mostly food jars, but with a high contamination rate, which is significant when measuring light plastic containers. See figure 11.

The other big component was 'soft plastics' which is plastic bags, wrappers and packaging; this also included a large piece of plastic sheet, which was wet due to rain. Several large pieces of broken plastic laminate – from housing or a boat – and two broken 20 litre pails added to the plastic weight overall. 12 HEPD bottles were found, mostly household cleaners, and very low weights of plastic numbers 3, 4, 5; a handful of disposable plates comprised the entire no.6 component.

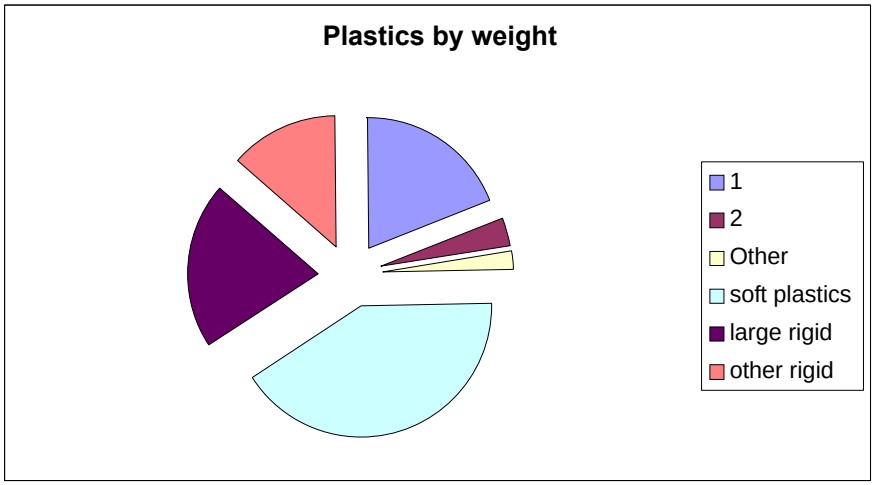

Figure 14: *Pie Chart Plastics by Weight*

Table 8: ***Plastic Waste By Number Type and Generic group***

Plastic Type no. **8%** by wt	**1** **R** PET	**2** **R** HEPD	**3**	**4**	**5** PP	**6**	Bags Inc. soft plastics	Large rigid items	Other Rigid Plastic
Total kg 17.7	3.4 **1.6 bag**	0.6 **0.3 bag**	0.08	0.05	0.12	0.2	7.2 **3 bags**	3.7	2.4 **1 bag**
% by wt	**19%**	**3%**					**40%**	**21%**	**13%**

5.4.5 Paper Products

Paper products were very low, and a very significant quantity of that came from one house: virtually all the white paper, and the books, amounting to a total of over 3 kgs out of a category total of 7.3 kgs. Of significance was the lack of cardboard cartons or even much evidence of broken cartons; they must be in use where available. Clearly paper in the Bikenibeu West waste stream is at such a low level that it could be absorbed into the organic waste stream and composted.

5.4.6 Other Items

Disposable Nappies (Kimbies) were the largest single definable category in the remainder. Fabrics were quite significant at 1.4 kgs, but these were wet due to rain, and comprised entirely pieces of rag. Of note is that dry cell batteries were very low at only 200g and six items, mostly AA.

Materials breakdown can be seen below. Materials marked R are either already being recycled or may be worth looking at to recycle in quantity. Aluminum cans and PET and HEDP bottles are already being recycled in Tarawa.

Figures have been rounded. Volume figures are estimated from actual amounts produced during the survey, and should be considered as indicative only, as volumes were not scientifically measured.

Table 9: ***Other Waste Items in Quantity***

Other Items 21% by wt of total	**Nappies 1%**	**Glass 15%**	**Rubber**	**Alkaline Battery**	**Tetrapak**	**Paper Products 3.4%**	**Shoes**	**Fabrics**
Total kg	2.9	31.5	0.1	0.2	0.4	7.3	0.9	1.4

5.4.3 Conclusions

There is a very high organic content. As stated before, the actual organic content in the municipal waste stream collection is even higheras larger items of palm fronds and branches did not enter this survey. This material should – wherever possible - remain close to the point of generation. Atoll soils are so poor on Tarawa that any removal of organic materials effectively contributes to soil degradation. The organic material is a very valuable resource: the challenge is to avoid contamination with inorganic wastes.

Another aspect of the very high organic component is that at 50% of the household waste stream (and around 70% of the municipal collected waste stream) the cost of land filling this material is very high. There is no need at all to landfill organics; indeed, by placing this material in a landfill, where it will form unstable land that is contaminated with a variety of materials, this valuable resource is effectively lost to the community. To givesome ideaof thevalue ofcompost, FSP-K sells ricebags of high qualitylocal madecompost for $5 per bag, and sells all that it can produce.

Metals and glass are also very high. All these materials are potentially recyclable or reusable in some form. Of the plastics, about 20% of the total is easily recyclable. Paper products are so low that they can enter the organic waste stream if they are being processed for decomposition. Together, these categories constitute over 70% of the waste stream. Clearly, there is considerable potential to dramatically reduce the waste to landfill, and recover significant resources.

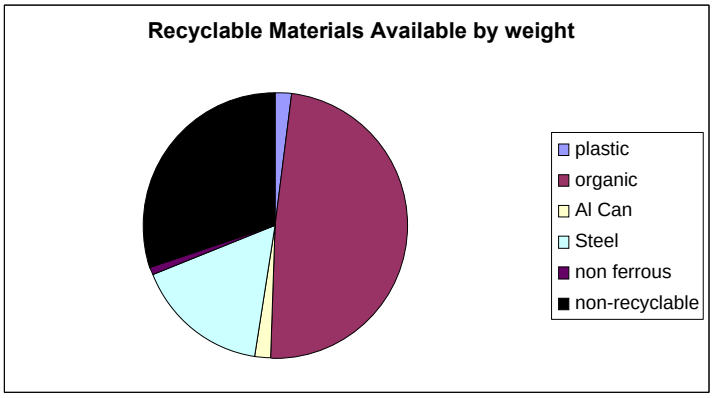

Figure 15: Pie Chart Recyclable Materials By Weight

6 Data Analysis

6.1 Bikenibeu West: A Microcosm of Urban Entanglement

The socio-economic survey endorses the demographic, social and economic indicators highlighted in public documents and studies. The issues of over-population, the rural-urban drift, the unemployment, the collapse of the traditional politicalstructure and the omnipresenceof the Church in local and national politics,the over crowding of schools, the dearth of qualified and trained teachers, the high incidence of communicable diseases, the apathy of the appropriate authorities to deal effectively with waste management, and lack of enforcementof waste-relatedregulations are recurring themesin the considerationof waste issues in Kiribati. (NDS 2004-2007, 2003; Report on the 2000 Census of Population, 2002)

The demographic data indicates that an over crowded, a low-income but a seemingly intelligent community exists in Bikenibeu West. The high literacy rate and the presence of educational institutions in the community should make it easier to deal with waste management.

The main providers/managers of waste management in South Tarawa are the PUB and the TUC. The quality of their services is good, but there is scope for improvement and delivery of a better service from these quasi-government organizations. They need to be more customers orientated, and organize periodic reviews and evaluations of their own performances.

The importance of the Church and the different religious denomination must be noted in the planning process, and the determination of the potential role of Church groups in the Project.

With the exception of government housing, settlement is not well planned and most houses are not properly built, sited and serviced so as to benefit from town water, electricity and sewage connections. These PUB services need considerable improvement and upgrading.

The provision of decent housing with good toilets, freshwater supplies, and a reliable supply of electricity are essential to the perceived quality of lifestyle aspired by residents. The local houses are good as long as they are built properly and are serviced with basic sanitation amenities.

The survey highlights the inefficiency of the local government and the majority of residents to deal effectively with issues of planned settlement, sanitation and waste management. The non-enforcement of the Council by-laws aggravates the chaotic situation.

The provision of health services at the community level is practicable and efficient. The provision of good educational facilities in the community augurs well for the development of human resource both for the community and the country.

The Bikenibeu West Household Waste Survey confirms that the main elements of waste stream in South Tarawa are organic materials, metals, plastics, glass and paper. These findings (Leney et. al 2004) support the findings of previous studies on household waste by Sinclair Knight Merz, (2000), Gangaiya (1994) and by the ADB (1996, 1997) that organic waste is a major component of South Tarawa waste, and composting and recycling of wastes are feasible and viable. Refer to Table 10 for a comparison of results of different solid waste surveys.

Both the socio-economic and household surveys conducted in the Bikenibeu West community indicate that the area can be regarded as a microcosm of urban entanglement in the developing island nation of Kiribati.

Table 10: ***Summary of Domestic Waste Composition Surveys***

Primary Waste Classification	Weight % Total Secondary waste	RT& Associates 2004	Sinclair Knight Merz 2000	ADB 1997/1996	Gangaiya 1994
Biodegradable	Organic	48.0	51.3	75.0 62.0	75.0
Metals	Aluminium cans	19.0	9.4	10.0 7.0	7.0
Glass		15.0	13.6	3.0	3.0
Plastics		8.0	7.2	5.0 12.0	2.0
Paper		3.0	7.0	5.0 14.0	2.0
Textile/Rubber			3.0	< 1.0 3.0	<1.0
Wood			7.7	< 1.0	
Food waste					5.0
Others	Tetrapak nappies fabrics shoes battery	7.0	0.8	2.0	6.0
Total		**100**	**100**	**100 100**	**100**

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Appendix1

Questionnaire
Bikenibeu West Socio-Economic Survey
January 2004

Household no: Head of Household	Gov t House	Private Modern House	Private Traditional House	Comments
No. of People o Child o Women o Adult o Handicapped				
Land o Lease o Own o Buy o Squatter				
Water o Tank o PUB o Constant Flow System o Well				
Toilet o Flush o Compost o Pour Flush o Beach o Others				
Electricity o PUB o Solar Energy				
Religious				
Home Island				
Employee				
Income o Allotment o Fishing o Marketing o Store				
Health				
Education o Pre-School o Primary o JSS o Secondary o University				
School o Fee				
Assets o Boat o Canoe o Pigs				

Appendix 2 Data Sheet Bikenibeu West Community Garbage Survey

Household waste generated (unit kg unless otherwise stated)

House Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Adults	5	2	3	5	2	2	4	6	12	4	4	3	5	15	8	2	5	8
Children	8	3	2	4	2	3	2	8	5	2	1	2	3	5	2	1	2	2
Bags	6	1	½	2	1	3	2	4	5	7	"	"	2	3	2	2	2	1
Comments	S			S				S		All Old	Inc Old	In Old	Pile Old	S	S	S	S	

OTHER Materials

Rubber	Shoes	Nappies	Glass	Fabrics	Alkaline Battery	Tetrapak	Organics
100g	900g	2.9	31.5	1.4	200g	400g	103
1pc	8 thong		60% Soy Sauce 95% Clear 4 bags Extra wt Contamination	Wet	5XAA 1XD	4@ 250ml 4@ 1ltr 3 from house 1	2 palm fronds mostly brown leaves Very little food

Plastic Materials by Number and category

Plastic No.	1	2	3	4	5	6	Soft plastics	Large Rigid	Other Rigid Plastic
Weight	3.4	600g	80g	50g	120g	200g	7.2	3.7	2.4
Qty Bags	1.6	0.3	-	-	-	-	3		1
Comments	1kg cooking oil bottles 1.2kg drink bottles other high contamination	12 Large Bottles	Mixed	Milk Powder Tin Lids	Mixed Food Containers	Plates	Large pc Sheeting WET	Buckets Perspex Formica Sheet	WET

Metals

Day	Al Can	Al foil	Stainless Steel	Copper	Other Alu	Steel Can 'Food'	Other steel
WT	4.1	100g	30g	150g	2	30	4.7
Total item	240 pcs 375ml Cans 2 bags					3 bags	
Comments	1 can = 17.24g		Kitchen Utensil	Water Pipe 2 pcs	Cooking pot Car part Toy car = 1kg pcs Alu roofing = 1kg		Oven door, Rusted steel sheet, Mesh.

Paper Products

Type	White Paper	Thin board	Carton	Mixed	Books	Magazine
Total Kg	2	2.1	0	2	1.2	0
Total Items Bags	Shopping bag	0.5	0	0.5		
Comments	Nearly all from House 1 WET	Very little Carton WET	None complete Or near complete	WET	3 books from house 1	

Other Items

	Other Mixed odds	Plate Glass	Ceramic	Leather	Lead-Acid Battery	Household Electrical/Consumer
Total KGs	4.1	0	0	0	0	1.9
Comments	Inc. composite wrappers and odd household and automotive eg. light globes					Inc. Padded bag Broken telephone Broken football