

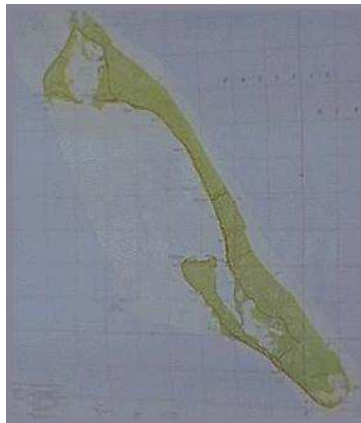


**KAP II TA - TOR 4.1, 4.2, 4.3**

# BERU ATOLL

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Community Consultation, Risk Assessment,  
Training and Island Profiling



compiled by

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For KAP II (Phase 2)

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## **Executive Summary**

A visit to Beru Island was carried out in fulfillment of the tasks and terms of reference (TOR) of the National Consultant, Dr. Temakei Tebano, similar to the Tamana visit. The selection of Beru was based on a number of criteria detailed in the Tamana Introductory Chapter report. The training component under Component 4.3 is integrated into Component 4.2 targeting local government community workers and representatives of small communities within village community set ups.

The two member team comprised Mr. Riibeta Abeta (an ECD officer responsible of CC and SLR activities and processes, MELAD) and Dr. Temakei Tebano (TheEcoCare Group and current National Consultant to KAP II for Components 4.1 and 4.2 and 4.3). The key areas discussed during the visit fell under water, coastal erosion and natural resources. Adaptation strategies to overcome or reduce risks and vulnerabilities related to climate change and sea level rise were discussed in group discussion session as wrap up to the consultation.

The media training component was not available hence much time was spent on explaining the causes and factors contributing to global warming with subsequent event such as climate change and sea level rise, was followed by documentaries on CC and SLR and other relevant videos. Mr Abeta conducted this session. A review of contributions to the 2007 consultation was done by Dr. Tebano who emphasized the main points presented by various guest speakers. Dr. Tebano also presented his own views on linkages between and among systems and emphasized that all systems are linked in many ways most of which are not understood. Disturbing or destroying one system will eventually affect other systems sooner or later.

Village representations comprised youth groups(s), women interest group(s), fishermen, and other significant groups within each village set up. The selection was done through village councilors who then consulted village elders who convened a village meeting. Fifteen villagers were nominated with approval of the elders witnessed by village members. The TK, IPO and ICW who attended and trained at the first national consultation in 2007 were part of the training team assisting in group discussion sessions and other activities required.

The northern villages of Tabiang, Aotukia and Aoniman attended the first day of consultation, the central villages, Rongorongo, Nuka and Teteirio, attended the second day while the southern villages, Taboiaki and Eriko, attended the third day. Each day began at 9 am and finished at 3 pm. The age of the participants ranged from 21 to less than 60 years old. The northern villages had women among them, the remaining two did not have any women representation at all, the only excuse given was that they were busy with home chores. One can conclude that women are still overprotected with much suspicion from their male counterparts.

Risk assessment and island profiling were done in the afternoons through group discussion focusing on problems associated with water, coastal erosion, marine and terrestrial resources and relocation within island or outside Kiribati. DVDs of relevant documentaries on CC concepts and real life solving problems, such as water shortage in Kukuit - Kenya, Africa were screened.

Of interest was the application of knowledge gained from morning lectures. Participants came up with clear suggestions that there is a need to reconsider how best the existing causeways could be improved. The team felt that the details of such sensitive issues be left to the Beru people to discuss with their Island Council. The Tiibi Kauntira was present in all sessions and agreed to the suggestion.

Adaptation measures to the potential risks and vulnerabilities mentioned above were discussed and presented in small groups. Further discussions were made on issues raised in the presentations. Lengthy discussion was made on the abundance of filamentous algae in the lagoon which appeared to be associated with the over-exploitation of sea cucumber from among sea-grass beds right to the deep lagoon waters using scuba gears. The lagoon is becoming a desert according to the description given by the villagers. Mangroves and ironwood trees are dead at the barachois at both ends of the island and many edible benthic organisms, including mud crabs, are no longer there as a likely result of the existing causeways.

Coastal erosion appeared to be aggravated by human activities in terms of aggregate mining. Juvenile bonefish and other fish species are being exploited at an alarming rate. Drought is having a significant impact on water resources and fruit trees. The level of awareness on CC and SLR on the island is low hence there is a need to intensify training and consultation on CC and SLR complimented with a media training in its various forms. A representation of various groups within village set ups is an important integral part of the training to ensure that public awareness is continued after the conclusion of the project.

## ACRONYMS

ACP	Asia-Caribbean-Pacific
AG	Attorney General
CC	Climate Change
DRCS	Digital radio concentrator system
EC	European Commission
ECD	Environment Conservation Unit
EDF	European Development Fund
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
IC	Island Council
ICT	Information Communication Technology
ICW	Island Community Worker
IPO	Island Project Officer
JSS	Junior Secondary School
KAP II	Kiribati Adaptation Project II
KCCSC	Kiribati Climate Change Steering Committee
KPC	Kiribati Protestant Church
LDC	Least developed countries
MDGs	Millenium Development Goals
MELAD	Ministry of Environment, Lands and Agricultural Development
MFMRD	Ministry of Fisheries and Marine Resources Development
MISA	Ministry of Internal and Social Affairs
MPWU	Ministry of Public Works and Utilities
MTR	Medium Term Range
SEC	Solar Energy Company
SLR	Sea Level Rise
SPC	Secretariat of Pacific Communities (formerly South Pacific Commission)
TCH	Tungaru Central Hospital
TK	Tiibi Kauntira (Chief Council)
TOR	Terms of Reference
UNCDF	United Nations Conservation Development Fund
UNDP	United Nations Development Program
USA	United States of America
WHO	World Health Organization

## **Chapter 1: INTRODUCTION**

### **1.1 Scope of the Report**

This report is intended to serve various purposes including island profiling, but due to time, personnel and financial constraints on this particular assignment, island profiling would only focus mainly on the physical environment and those aspects that are most related to climate change and variability, sea level rise and adaptation strategies. A review of some past activities carried out on Beru and other islands will be revisited to ensure that the most pertinent actions on any particular aspect of previous developments, related to risks and vulnerabilities identified under this task are taken to the fore for appropriate action by respective ministries of Government.

### **1.2 Selection Criteria**

The selection criteria are discussed fully in the Tamana Report by Tebano, *et al.*, 2008). KAP II senior management presented them in early May to the KCCSC and was approved unanimously.

### **1.3 Rationale of the Beru Visit**

A visit to Beru was a follow up from the 2007 National Consultation held at the Otintaai Hotel from 4<sup>th</sup> to 7<sup>th</sup> December, 2007. The visit is similar to that made to Tamana in February with an intention to consolidate reports on the island's vulnerabilities and risks in relation to climate change, climate variability and sea level rise. This is part of a public awareness and risk assessment assignment under the TOR Component 4.2 of the Consultant (Dr. Temakei Tebano) and Training Component 4.3 now under the same TOR.

Beru Island is the second island visited after Tamana, the latter being one of the Government's pilot sites for a number of projects being implemented there. This is the first round of visits planned and those to be visited next are Onotoa, North Tarawa, Butaritari, Makin and Kuria.

Findings from this visit will compliment those already compiled on other activities carried out on the island by other government ministries and ngos; all will provide useful information to Kiribati Government for short, medium and long term planning in light of appropriate adaptation measures to reduce or contain potential risks and vulnerabilities related to the impact of climate change and sea level rise.

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### **Itinerary**

#### **24<sup>th</sup> March, 2008.**

7.30 am: Depart Tarawa for Beru, arrive Beru 9 am, checked in at the Beru Guest House, met the Acting Clerk around 12 noon. The Acting Clerk to the Island Council briefly discussed the program for the consultation; suggested that since Monday being a public holiday (arrival date) and participants may not be ready the

following day the consultation could be held as of Wednesday to give the office time to consult village councilors who will then inform their villagers about the consultation and its requirements. The advice was taken.

2 – 6 pm

The team hired two mopeds and headed northward to the Tabiang-Tebikeeriki causeway, checked the surrounding areas for signs of coastal erosion, drove slowly through villages to check out for any water projects; returned to the guest house for lunch and continued to the southern district right to the milkfish ponds. Checked the coastal areas for erosion signs, took photos, returned to the guest house for dinner.

### **25<sup>th</sup> March**

9 am: The Chief Councilor dropped by at the dining room and had brief discussion with the team members on how best the consultation could be conducted. It was agreed that participants come to the headquarter for the consultation using their own wheels and bring their own lunches. They will be compensated with refreshment and transport money; each of the village districts nominates 30 participants (women and men, youth and other group representatives).

### **26<sup>th</sup> March**

9 am Participants from the northern district comprising Tabiang, Aotukia and Aoniman villages arrived before 9 am. The consultation started at 9.30 am with an opening speech by the Chief Councilor, Mr. Tebwa. He welcomed participants and clarified all issues pertaining meal allowance and transport costs. He also stressed the fact that the consultation is more important than any other businesses as it is about adaptation strategies to ensure everyone is prepared for the worst scenarios that may affect Kiribati now and in the years to come.

Dr.Tebano set the scene and the procedures of the consultation proper. Mr. Ribeta Abeta took the first session focusing on the causes of global warming, climate change and sea level rise. Relevant documentary movies were screened to give a good feel of the realities associated with climate change and sea level rise.

11.30 am

Dr. Tebano presented a summary of the most relevant contributions from the 2007 consultation. In addition, he re-presented his contribution on linkages between and amongst all systems and organisms and stressed that the abuse of any system can also affect other systems; everything has been balanced out and it is human beings that are causing a lot of destruction in an unparalleled manner.

### **27<sup>th</sup> – 28<sup>th</sup> March**

9.30 am – 2.30 pm

The same contents of the program were redone for the central district (Rongorongo, Nuka and Teteirio) and the southern district (Tabontebike and Eriko).

The afternoon session focused on group discussion on problems related to water, natural resources, coastal erosion and relocation in the events that homeland Beru is partly or wholly inhabitable the immediate and long term scenarios.

6.30 pm: Visit to Hiram Bingham High School. Film show on climate change and sea level rise with a detailed lecture on the causes of global warming and associated factors delivered by Mr. Ribeta Abeta. There was also a brief lecture on biodiversity and ecosystems delivered by Dr. Temakei Tebano.

29<sup>th</sup> March

The morning hours were used for more site visits as indicated by participants. The evening was used to screen films on climate change and sea level rise, adaptation strategies in other countries and local scenes showing the impact of climate change on our island ecosystems.

30<sup>th</sup> March

Being Sunday the afternoon was used for more site visits. Visiting friends and relatives, confirming flight bookings.

31<sup>st</sup> March

Flew back to Tarawa, transit booking for Tabiteuea en route Onotoa was not possible. Arrive Tarawa 12.30 pm

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#### **1.4 Location of Kiribati**

Kiribati consists of three main island groups scattered over 3 million km<sup>2</sup> of the Central Pacific, between latitudes 4° N and 3° S, and longitudes 172° E and 157° W (Fig. 1a). The total land area is 810.8 km<sup>2</sup>, comprising 33 low-lying coral islands, 10 of which are coral atolls (Figure 1a). The Gilbert Island group consists of 17 islands (including Banaba) with a total land area of 285.7 km<sup>2</sup>. Tarawa Atoll, in the Gilbert group and the location of the capital, consists of more than 20 named islets, the southern six of which are linked by causeways. The distance between Tarawa and outer islands in the Gilbert group ranges between 51 km and 600 km (Thaman and Tebano, 1995).

The Phoenix Island group consists of 8 largely uninhabited islands with a total land area of just 28.6 km<sup>2</sup> located some 1 750 km east of Tarawa. The only inhabited island of the Phoenix group is Kanton (Canton) Island with the land area of 9 km<sup>2</sup>. The Line Island group consists of 8 islands with a total land area of 496.5 km<sup>2</sup>, extending over a north-south distance of 2 100 km, located at a distance of between 3 280 and 4 210 km east of Tarawa, and some 800 km south of Hawaii. This group includes the largest island in Kiribati, Kiritimati, having an area of 388.4 km<sup>2</sup>. Most of the islands are not more than 2 km wide, or more than 6 m above sea level, except Banaba in the Gilbert group which rises about 87 m above mean sea level. The depth of water wells in most cases varies from 0.5 m to 3.0 m (Thaman and Tebano).

Beru is one of the medium size atolls by Kiribati standard in the southern Gilbert Group and is the second island visited in this KAP II outer island consultation exercise. It was a sub-administrative centre for the southern islands during the centralization process in early independence days.



Figure 1a: Islands in the Gilbert Group, Kiribati.

## 1.5 History and Background

The name of the island of Beru literally means ‘lizard’ or *beru* derived from a legend on the island (see Myths and Legends). The origin of the name goes back to South America where there is a place name called Peru.

Beru is an island in the Southern Gilbert Group. It was settled perhaps simultaneously with the rest of the islands in the Gilbert Group beginning more than two millenia ago by successive waves of migrants from Southeast Asia, Tonga, and Fiji. The first Europeans to sight the islands were the Spanish (1606). In the late 1800s many islanders were often taken against their will to work abroad. The islands were administered (1892–1916) with the Ellice Islands as a British protectorate that became (1916) the British Gilbert and Ellice Islands colony. They gained self-rule in 1971, and, after the Ellice Islands gained (1978) independence as Tuvalu, the remaining islands were granted independence (1979) as Kiribati (Wikipedia, 2008).

## 1.6 Geography

Beru Island is located in the Kingsmill Group of the South Gilbert Islands in the Pacific and is part of the Republic of Kiribati. Beru was previously known as Eliza, Francis Island, Maria, Peroat, Peru Island or Sunday (Wikipedia, 2008). It is part of a larger reef, some 15 kilometers long (NW-SE) and 4.75 km wide at the widest point (NE-SW). The center of the reef is a shallow depression called Nuka Lagoon. The land mass occupies fully a third or more of the shallow reef structure and is positioned mostly towards the northeast edge of the reef. In maximum dimension the islet is 13.9 km long, and varies in width between 0.5 and 2.9 km (Wikipedia, 2008).

Extensive spit development has created the nearly enclosed Tabiang Lagoon at the north end till early 2000s when a causeway was built thus connecting the north western end of Tabiang village with Tebikeeriki. Mangroves and ironwood are present here but are dying as there is not adequate water flow to supply fresh and cool seawater from the lagoon. A small lagoon or barachois at the northern tip is surrounded by man-made fishponds, as is a similar feature at the south end of the islet. A 3 km long barachois with extensive mangroves occupies the interior south of Nuka Lagoon. A causeway, built in the early 1900s is present across the inlet mouth and a landing strip is present on the interior flats. The lagoon on the island known as Nuka Lagoon, had a broad passage entering it, currently the mouth of the lagoon is shallower than used to and fishermen are finding it difficult to paddle out into the wider lagoon especially during neap tides. What caused sand accretion no one knows. Rumors claimed the causeway has changed the direction of the current and hence brought about the accretion. The island is 96 km east of Tabiteuea Atoll and 426 km southeast of Tarawa Atoll and is located near the equator (1°20' S latitude) (Fig. 1b). The closest island to Beru is the island of Nikunau (Wikipedia, 2008).



*Fig. 1b: Map of Beru Island, villages shaded brown.  
(Map modified from an old map of Beru by the first author of the report).*

## 1.7 Myths and Legends of Beru Island

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The name of the island of Beru literally means 'lizard'. The origin of the name goes back to Latin America where some stories told of the migration of people from South America, probably from Peru, to the Pacific Ocean. Other myths told of a lizard from the "Tree of Life" or Tekaintikuaba swam across the sea from the land of Matang and died reaching the location where Beru is now situated. Hence the name Beru was derived.

According to the legend of Beru Island in the Southern Gilberts and some other islands, *Te Kaintikuaba* was made from the spine of Na Atibu. It was a tree, in Samoa, which was the home of spirits who, together with Nareau the Wise, made the islands of Tungaru (the Gilbert Islands). They and their spirit descendants became inhabitants of these islands. *Te Kaintikuaba* can therefore be translated as "The Tree of Life". This is one of many versions.

Nareau the Wise saw that the branches of *Te Kaintikuaba* grew well on Samoa and were covered with spirits of all kinds and shapes. These spirits did nothing but laze in their places all day. The topmost was Tetaake, and first branch facing north was Baretoka's place. Tekuma, Tekoroangutungutu, Tekaa and Nei Moaine were on the branch facing south, Matang East was on the eastern branch, Matang West on the western and Kairo was in the centre of the tree. Nei Boto was at the trunk, Uruba and Teuriubaba at ground level, Akau and Nei Tira at the roots, Teimone and Matennang at the tap-root, and others were on the ground in the shadows of the tree.

The first spirit to migrate was Baretoka, who took his branch with him. He went northwards. On his way, he met Nei Batiauea, a female spirit, who had originally come from the intestines of Na Atibu, Nareau the Wise's father, whom he had killed in *Te Bomatemaki*. Baretoka anchored Batiauea's canoe, using his branch to prevent it from moving any further. When Batiauea's canoe was stopped so abruptly, it swung around him stretching into a curved shape. It was called Teraea or Taraea, which was the original name of Tarawa. Those two spirits lived on this newly formed island and had four children; Tearikintarawa, Kirabukentarawa, Taorobantarawa and Nei Arirei.

The second spirit to leave was Tetaake, who also flew north, to Beru looking for a place to live. Unfortunately, he had to fly elsewhere because Tabuariki, the deity of the people living in the Gilberts before the Samoan, beat him cruelly. So he went further north and landed at Baberiki, in the extreme north of the Gilberts. He died there and was succeeded by his worms, who became spirits and later travelled south again.

At this time, Nareau the Wise was in Samoa procreating with the spirits there. One day, he decided to trace the whereabouts of his two children who left *Te Kaintikuaba*. He left Samoa,

heading north, and on his way he created a resting place by trampling the sea and uttering powerful magic. Behold, land was formed with spirit inhabitants on it. He called this island Takoronga i Nano or South Tabiteuea as it is called nowadays. Feeling satisfied with his marvellous work, he left and went further north. At last, he sighted land and this was Teraea, or Tarawa.

On Teraea, he created Tubuatarawa and its spirit inhabitants (now Buariki village on North Tarawa) and renamed the whole island Tarawa. He stayed on Tarawa and started his work of creating new lands. He used his power to create Makin, Butaritari, Marakei, Abaiang, Maiana, Kuria, Abemama and Aranuka and their spirit inhabitants. When he had completed his work, he remained and procreated with the spirits on Tarawa. Marriages also took place among the spirits so there was an expansion of the spirit population on Tarawa. Nareau the Wise was pleased with his achievements so he decided to visit other islands, particularly South Tabiteuea. He made many visits among the islands he had created using adopted personalities such as Nareau the Killer, The Flatterer, The Liar, The Terror, The Seducer and all kinds of other characters. Sometimes he may visit in search of his children's partners because he was concerned about them.

During the period in which Nareau the Wise had been visiting from island to island, many spirits from Samoa migrated to South Tabiteuea and Tarawa, procreating during their stay. Some of these spirits returned to Samoa and some remained in the Gilberts. These spirit movements went on for a considerable time.

When Nareau the Wise had had enough of these visits, he changed his name to Tematawarebwe and returned to Samoa with three of his sons, Kourabi, Namai and Buatara. On reaching Samoa, he told his sons and some of the inhabitants to carry *Te Kaintikuaba* away to a place he would show them. The spirits who usually inhabited *Te Kaintikuaba* were left behind as they were absent during its removal. The tree was carried northwards until it arrived at Teakiauma, a place in a village called Baretu, on Beru Island. The next thing that Tematawarebwe and his carriers took was the *Umananti* (literally Spirits' House). This was carried and placed in the central part of the island. This was the *maneaba* (meeting house) now called Tabontebike. Tematawarebwe remained on Beru.

## **1.8 Literature Review on Previous Projects**

Previous reports on various aspects of development within Kiribati indicated that there had been projects conducted on the island in the past years with the involvement of different international agencies. These included among others fisheries, water and sanitation, solar energy, communication, education, social studies and health.

### *1.8.1 Water System*

There were several water projects in the southern islands sponsored by several overseas agencies in the early 1960s such as WHO, UNICEF, Norwegian Government and SPC; recently UNDP/UNCDF Water Project has outreached most of the outer islands including Beru. Eriko Village, second last village at the southern end of the island has benefited from such a venture. The breakdown of a solar pump has left most of the households with no portable water; the Tamana pump had been installed and most households can access them on the roadside. Those islands that have had water system projects implemented include Tabiteuea North, Nikunau, Arorae, Tamana, Tarawa and Tabiteuea South.

### *1.8.2 Fisheries Sector*

#### *Ice Plant*

Beru is among the islands in the Gilbert Group to benefit from the construction of fishermen community center that comes with an ice plant. The center is a Japanese aid grant made available through JICA in early 2004 ([http://www.fj.emb-japan.go.jp/eco\\_corporation/eco\\_kiribati.html](http://www.fj.emb-japan.go.jp/eco_corporation/eco_kiribati.html)). The center and ice plant are meant to help fishermen to develop their fisheries activities and provide fish to the center for those who do not have the means to catch fish for their families. The ice plant produces ice cubes made available to fishermen to ensure catches are of good quality. The main drawback is lack of rainwater to make good ice as drought has been taking its toll for more than 12 months.

### *1.8.3 Education*

Beru originally had two primary schools during the British colonial era, one ran by the Island Council while the other was owned by the Roman Catholic Church. In early 1980s government took control of all primary schools and added a third one. The current ones are Namon Primary School, Tebono Primary School and Tebubutei Primary School. A secondary school at Rongorongo is owned by the KPC and had been in existence post World War 2. A junior secondary school (JSS) was added in late 2003 through early 2004. There are a few preschools which are run by churches or villages.

### *1.8.4 Energy (Solar Energy for Outer Islands 8 ACP KI 2)*

Kiribati relies heavily on imported fossil fuels for its commercial and transportation energy needs, but many problems are faced by the energy sector. Diesel generators supply electricity to most of the urban centers like Tarawa. For the outer islands, however, where there is no regular supply of fuel for generators, solar photovoltaic technology has been promoted. Importing fossil fuels for energy generation has been putting an increasing strain on the economy of Kiribati, while the technical expertise and infrastructure needed to utilize the resources better are lacking.

The use of alternative, renewable energy sources will help to offset future dependence on imports and contribute to the overall aim of achieving the maximum degree of energy independence, while providing opportunities for development primarily in the rural sector. Beru is deriving some benefits through the use of clean energy source, solar energy, provided by the Solar Energy Company. The project was started in early 2004 and continues till these days. Only few families on Beru have access to a solar lighting that also benefits the children studying at home and the family in particular when doing other household chores at night time. The Island Council is making use of solar energy to power lightings at its guest house while also utilizing generators for lighting purposes for its employees.

Implemented by a state owned enterprise, Solar Energy Company (SEC) and supported by technical assistance from a European based consultancy firm this project successfully installed 1,700 solar home units across 12 islands in 2004. As such 20% of homes on outer islands have a solar home system improving the living standards of many of the poorest households in Kiribati. Beru also benefited from this project as discussed above.

#### *1.8.5 Health (Improvement of Health Services on the Outer Islands)*

The Financing Agreement was signed by the European Commission in December 2004 and by the Government of Kiribati in April 2005. During the long planning and programming period all involved personnel from the key stakeholders have changed. The project is aimed at developing primary health care systems and facilities; however the Government of Kiribati has indicated that the project should take account its new growth centre policy one aspect of which is the development of a second hospital on the Southern Gilbert island of North Tabiteuea and overall development of Christmas Island. The Government is keen to see activity take place on the outer islands in the project's first year especially the construction of clinics and dispensaries. At project start-up it will be important to apply the lessons learnt from the Kiribati Training Programme including ensuing management roles and functions within government and other stakeholders are clearly defined (Republic of Kiribati and European Commission Joint Annual Report, 2004).

This project directly aims at making progress towards achieving a number of the Millennium Development Goals. The MTR verifiable indicator of 'number of health facilities improved' could be modified to reflect directly the MDGs addressed by the project, in particular child mortality which is monitored in Kiribati by the Ministry of Health and WHO. Beru Island is one of the beneficiaries among other islands. Two newly completed dispensaries, one was built between Tabiang and Aotukia villages, another one at Rongorongo for central villages, and the third at Temara y for the southern villages. These were opened last year (2007). They have their own solar powered water systems and rainwater catchments.

### *1.8.6 Communication (ICT)*

Voice and other similar communication means have been very poor due to the scatteredness of the islands in a vast Pacific Ocean. Government sees a need to concentrate on improving the basic ICT infrastructure first and envisaged to slowly develop the Kiribati Outer Islands Telecommunications Development Plan, using the recovered Digital Radio Concentrator System (DRCS) equipment provided free of charge by TELSTRA to provide the local access network. Telecommunications is a capital-intensive industry and Kiribati needs cash to improve and maintain the services. Like any other Least Developed Countries (LDCs), Kiribati still relies heavily on aid-funds for developing its basic ICT infrastructure. A Satellite terminal + switch + cable has been installed on Beru as part of improving communication between and among islands and South Tarawa, the main administrative center.

## **1.9 Information Collection Templates**

The templates below reflect on the approaches described above as a result of consulting with appropriate ministries, and the advice of international and regional advisors, a list of problems and vulnerabilities provided by island representatives of the first National Consultation of 2007, ranking and prioritizing them by seriousness by participants. Some modifications were made as appropriate to suit the current consultation and risk assessment on the outer islands. Risk assessment focuses on water, coastal erosion and marine resources. Physical environment and structures, and human resources are added for additional information on island profiling.

Below are the form templates (see Appendix i) to guide the recording of information in a systematic and uniform manner for all islands visited. They contain information collected from Beru Island in the areas of risks (brackish water, coastal erosion, declining food resources, the physical environment and infrastructure, and human resources. Similar information for other islands will also be recorded.

### *Risk Assessment*

- Island Risk Assessment (*form 1.1*)
- Ranking Risks - Island Level (*form 1.2*)
- Ranking islands for risk response – National Level (*form 1.3*)

### *Island profiling*

- Island Profiling - Natural Resources (*form 2a*)
- Island Profiling – Physical Environment and Infrastructure (*form 2b*)
- Island Profiling – Human Resources (*form 2c*)
- Ranking Resources, Environment and Infrastructure –Island Level (*form 2d*)
- Ranking Resources, Environment and Infrastructure – National Level (*form 2e*)

## Island Risk Assessment *(form 1.1)*

Island [Beru]	Vulnerability/ Risk	Hazard/ danger	Nature of disaster	Location/Site	Ranking [1=not serious; 2=serious; 3=very serious]	Proposed Adaptation measures [reactive/ preventive]	Responsible agency/ministry
Refers to islands in the Gilbert Group  [reef/raised or atoll – needs to be specified]. Number of villages to be visited, number of participants, sex, age and occupation.	Island residents identify the vulnerabilities and risks they are experiencing in light of climate change and sea level rise.  A list given during the 2007 consultation is checked against this new listing.	Causative hazard type identified	Extent and impact of disaster, who are affected, how are they affected	Identify area(s) on the island where the problem occurs – name of district or village is recorded and marked on a map. Pictures of these sites are videotaped or shot with digital camera.	Implication on urgency of response	Measures and strategies must be proposed by the communities themselves with the assistance of a consultant or members of the visiting team; reactive implies immediate practical actions to mitigate impacts (e.g. planting mangrove, seawall construction, construction of wooden embankments). These strategies are <i>reactive</i> in that they are actions taken to mitigate the effects of erosion for example; Preventive – includes warning systems, planning and regulatory measures.	Government ministries or other agencies that are involved or have similar interest in the programs/issues are identified, results of similar activities from other ministries are put together with the recent findings of KAP II outer islands reports.
<i>Beru Island, atoll island, second farthest in the southern Gilberts; 8 main villages 15 workshop participants from each village representing all village sectors.</i>	<i>Fresh water becoming brackish day by day.</i>	<i>Drought</i>	<i>Prolonged drought with no rain for more than ten months, people are fetching water from wells further inland, fruit trees within village compound (breadfruit, fig tree, etc) are turning yellow and dying.</i>	<i>All villages along the western coastline except Aotukia; the rest are Tabiang, Aoniman, Rongorongo, Nuka, Teteirio, Tabukiniberu, Eriko and Taboiaki (refer to map of Beru, Fig. 1b, 1c).</i>	<i>2 –serious if the rains do not come in another 6 months or longer.</i>	<i>Freshwater sources from further inland are tapped with the use of solar pumps for overhead tanks - reactive</i>	<i>Ministry of Works and Public Utilities – Public Utilities Board’ Ministry of Internal and Social Affairs; Ministry of Health and Medical Services.</i>
.	<i>Coastal erosion</i>	<i>King tides, storm surge and sea level</i>	<i>Seawalls damaged, some homes destroyed, wells contaminated with sea water, some areas eroded</i>	<i>Southern villages of Taboiaki and Eriko.- Fig. 1b, 1c] also refer to</i>	2	<i>Law to regulate aggregate mining on the island; properly designed seawall along</i>	<i>Ministry of Works and Public Utilities;</i>

		rise. [aggregate mining on the rise for more permanent structures]	and plants and trees fell to the sea.	photos from the island.		currently affected areas- preventive.	MELAD, MISA.
	Declining marine resources	Cool water caused by LaNina; overharvest of some fish species	Protein from sea may not be available for a few days in times of rough weather; malnutrition in children and adults as well	Residents of all villages on Beru	2	Law to regulate fishing activities and quota per effort per day - preventive	Ministry of Fisheries and Marine Resources Development; Office of the Attorney General.
	Declining terrestrial resources	Drought	Prolonged drought with no rain for more than ten months; fruit trees within village compound (breadfruit, fig tree, etc) are turning yellow and dying; brackish water cannot be used for watering purposes.	All over the island	3	Watering scheme carting soft water from further inland or use solar pump for purpose.	Ministry of Environment Lands and Agricultural Development; MWPU
	Public structure – church inundation and wash off	Close to coastline rising sea level and storm surge	Location of church makes it vulnerable to storm surge and coastal erosion	All residents of the island	2	The construction of a sea wall along the west coastal area at the location of the church	MISA, PWD
	Private homes wash off by storm surge and bad weather and rising sea level	Sea walls not high enough to protect vulnerable homes along the coastline.	Location of homes and material used to build sea walls	Those who live right on the coastal area	2	Relocation of homes to further inland; assistance on material for concrete and stronger and appropriate construction design	MISA, PWD

**Ranking Risks for Action – Island Level (form 1.2)**

<b>Island</b>	<b>Risk</b>	<b>Ranking score as in form 1.1; 3 highest, 1 lowest</b>	<b>Responsible ministry/agency</b>	<b>Current status of activities</b>	<b>Timing and estimated duration of response (months)</b>
<b>Name of village and area be stated, map of site provided</b>	<b>List of risks.</b>	<b>Risk with highest score appears first, those with lowest score come last</b>	<b>Name of agency or government ministry specifies</b>	<b>Describes whether there had been similar activities carried out before or a new issues; if risk has been responded to describe status of the activities and future direction  (contact MISA and other relevant ministries)</b>	<b>This needs to be factored in with the budget or obtained from relevant agency/ministry.</b>
<i>Beru</i>	<i>Marine resources</i>	<i>3</i>	<i>MELAD, MISA</i>		
	<i>Water</i>	<i>2</i>	<i>MWPU, MISA</i>		
	<i>Terrestrial resources</i>	<i>2</i>	<i>MWPU, MISA</i>		
	<i>Coastal erosion</i>	<i>2</i>	<i>MFMR,AG Office</i>		
	<i>Public structure</i>	<i>2</i>	<i>MISA, PWD</i>		
	<i>Private structure</i>	<i>2</i>	<i>MISA, PWD</i>		

**Ranking islands for responses to risks – National Level (form1.3)**

<b>Island</b>	<b>Type of risk</b>	<b>Ranking score (forms 1 and 2)</b>	<b>Implementing agency/ministry</b>	<b>Partners</b>	<b>Start-up date</b>
<b>Provide island name  (and district – Gilbert northern, central, southern)</b>	<b>List of risks identified for island</b>	<b>Provide corresponding ranking score</b>	<b>Provide name of agency tasked to carry out the required job</b>	<b>Provide names of agencies and funding donors in the project</b>	<b>Supply exact date of the start-up date for implementation</b>

### Island Profiling – Natural Resources (form 2a)

<b>Terrestrial/Marine Resource</b>	<b>Current Status</b>	<b>Potential cause(s) of problem</b>	<b>Action needed [low/high priority]</b>	<b>Partners</b>	<b>Cost of activity [AU\$]</b>	<b>Source of funding identified</b>
Specifies type of resource – terrestrial or marine; specifies whether fauna or flora; name resource	Refers to observed status by residents whether dying, declining, extinct, etc. Verification needed if can be done during a visit – photos and site visits	Residents' list of causes, verification needed – survey or research may be required; examine existing reports and relevant information.	Consultation, cooperation, team work, regulation, etc. Specify urgency for action	Identify partners who can assist or who are responsible [government or private]	To be determined by agency	To be identified by agency
<i>Finfish and non-finfish resources</i>	<i>Sharks and flying fish depleted, others declining.</i>	<i>Overfishing, unregulated fishing, heavy harvest during spawning runs.</i>	<i>Byelaws to be set up to regulate fishing activities and protect spawning seasons; quota limits and off-seasons – high priority</i>	<i>MFMRD, OAG</i>		
<i>Water</i>	<i>Becoming brackish and contaminated with sea water – in particular in villages close to the shoreline.</i>	<i>Drought for many months, closeness of villages to coast, increasing population.</i>	<i>Inspection and island visit; low priority</i>	<i>Government, PUB</i>		
<i>Fruit trees (terrestrial)</i>	<i>Dying and scarce</i>	<i>No replanting scheme, drought</i>	<i>Replanting scheme encouraged, home gardening encouraged- high priority.</i>	<i>MELAD</i>		

**Island Profiling – Physical Environment and Infrastructures (form 2b)**

<b>Terrestrial/Marine Environment or infrastructures; public or private</b>	<b>Current Status and site/location</b>	<b>Potential cause(s) of problem</b>	<b>Response type required [urgent or not urgent]</b>	<b>Partners</b>	<b>Costs</b>	<b>Source of funding</b>
Specifies type of environment or structure in question – eg. Reef, lagoon, coastline, mudflat, marshland, buildings, causeways, seawalls, land reclamation, etc.	Refers to observed status by residents – damaged, dead, lost, wave over wash, etc. Verification needed if can be done during a visit – photos and site visits	Residents’ list of causes, verification needed – survey or research may be required; examine existing reports and relevant information.	Consultation, Cooperation, team work, etc. Specify urgency for action	Identify partners who can assist or who are responsible [government or private]	To be determined by agency	To be identified by
<i>Island Council Nuka-Teteirio causeway</i>	<i>Storm search and king high tide over-wash making it unsafe for people and vehicles</i>	<i>Bad design and poor maintenance</i>	<i>urgent response</i>	<i>MISA, PWD, KPC</i>		
<i>Sea wall: Rongorongo seawall (KPC)  Nuka seawall (RC)</i>	<i>Old, improper design, not high enough, on edge of beach  Bad design and poor maintenance</i>	<i>Location selection prone to storm search and bad weather</i>	<i>Not urgent</i>	<i>MISA, PWD</i>		

**Island Profiling – Human Resources (form 2c)**

<b>Population by sex</b>	<b>Age groups</b>	<b>Schools/Public utilities</b>	<b>Government/non-government paid workers</b>	<b>Major occupation</b>	<b>Production/export</b>	<b>Imports</b>
Number of males and females (2005 Census)	Schooling, non schooling, over 50 years old	Name of school (primary, secondary, jss) and number of children; name of public utilities. Types of buildings (concrete or local) within each establishment	Number belonging to each group, level of education	Apart from paid jobs	List	List
408, 477	3-21, 40+	<i>Namon PS, Tebono PS, Tebubutei PS; Beru JSS; High Bingham Senior Highy School</i>	<i>around 50 government and island council</i>	<i>fishing, toddy cutting, weaving and cutting copra</i>	<i>copra, shark fin, handicraft</i>	<i>food items, machinery and fuel</i>

**Ranking Resources, Environment and Infrastructure for Action – Island Level** (*form 2d*)

<b>Island</b>	<b>Type of resource, environment and infrastructure</b>	<b>Ranking score</b> ( <i>Forms 2a and 2b</i> )	<b>Agency/ministry for further observation and research</b>	<b>Partners</b>	<b>Start-up date</b>
Provide island name (and district – Gilbert northern, central, southern)	List of resources identified for island	Provide corresponding ranking score	Provide name of agency tasked to carry out the required job	Provide names of agencies or ministries who may be involved in the process	Supply exact date of the start-up date for the task
“	<i>Marine</i>	<i>3</i>	<i>Fisheries</i>	<i>MFMRD</i>	<i>Na</i>
<i>Beru (southern)</i>	<i>Terrestrial</i>	<i>2</i>	<i>Agriculture, MELAD</i>	<i>MELAD</i>	<i>Na</i>
	<i>Public structure - church</i>	<i>2</i>	<i>PWD</i>	<i>MWPW</i>	<i>Na</i>
	<i>Private – sea walls</i>	<i>2</i>	<i>PWD</i>	<i>MWPW</i>	<i>Na</i>

**Ranking for Action and Implementation – National Level** (*form 2e*)

<b>Island</b>	<b>Type of resource, environment and infrastructure</b>	<b>Ranking score</b> ( <i>Forms 2a and 2b</i> )	<b>Implementing agency/ministry</b>	<b>Partners</b>	<b>Start-up date</b>
Provide island name (and district – Gilbert northern, central, southern)	List of risks identified for island	Provide corresponding ranking score	Provide name of agency tasked to carry out the required job	Provide names of agencies and funding donors in the project	Supply exact date of the start-up date for implementation
Na	na	na	Na	Na	Na

## 1.10 Topography

Beru Island is a lagoon island hence atoll by definition. Its fringing barrier reef at the east-windward side and submerged reef at the west-leeward side both form protection from enormous wind and wave actions. The shoreline slightly rises from sea level to over a metre as the highest point. Ruderal vegetation is common along the coastal area with more defined vegetation into the bushland (Thaman and Tebano, 1995). Most of the western coastal area is dotted with villages and settlements except a village of Aotukia located inland at the north-eastern portion (Fig. 1b, 1c).

## 1.11 Main Settlements

Figure 1c below shows the location of the main villages, other settlements and establishments within the island's geographical location.



*Fig. 1c: Map of Beru showing villages along the west coastline; primary schools are at Aoniman, Nuka and Eriko villages; junior and senior secondary schools are at Nuka and Rongorongo, respectively; medical clinics are located at Aotukia, Rongorongo and Temara (Eriko); an airstrip is visible at the southern arm of the island; the main road runs through the villages and toward either end of the island along the lagoon side, branches out in many directions to other important centers.*

## Chapter 2: CONSULTATION FINDINGS

### 2.1 Status of Natural and Human Resources

Like most other atolls and raised islands in Kiribati, Beru has few terrestrial, marine and other important resources to support much needed development on the island. Of particular importance for the sustenance of the island's population coconut and fish are the main staples. Both marine and terrestrial resources are being overexploited as the population grows. The Beru people are finding it hard to cope with their harsh environment especially at this particular point in time when prolonged drought and high temperatures are taking their tolls on all forms of life. People are complaining about food resource shortages and finding themselves toiling in the sun for shorter hours as compared to ten or more years ago. Imported food items supplement traditional foods in large quantities.

Like most southern islands *babai* (giant taro – *Cyrtosperma chamissionis*) is utilized on special and important occasions only, while *te mai* (breadfruit – *Artocarpus* varieties) and *te tou* (pandanus – *Pandanus tectorius*) form the main staples when in season which normally sets around September to March (beginning of low sun or rainy season till beginning of high sun or dry season). Some banana (*Musa*) and papaya (*Carica papaya*) varieties and citrus fruits such as lemon and lime are also grown but the porous sandy soil makes agriculture difficult hence composting and the use of natural fertilizers such as pig and chicken manure helps sustain the cultivation of Chinese cabbage and other vegetables.

#### 2.1.1 Marine Resources

Bonefish and other fish species are declared overfished by the Beru fishermen (*form s1.1; 1.2*). The consultation participants, with a good proportion of fishermen, claimed that bonefish is being harvested with fine mesh sized nets (1 – 1.5 inches monofilament nets). Mangrove crabs (*Cardissoma* sp.), *koikoi te koikoi* (Saguin clam - *Asaphis violescens*), *nikatona* are scarce or no longer there because of the existing causeways.

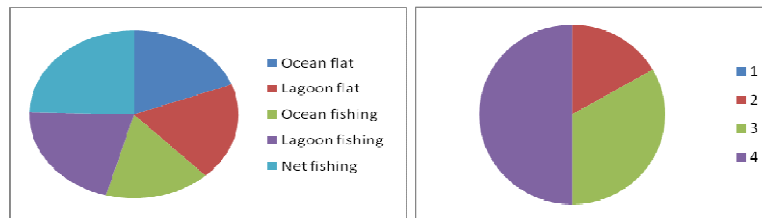
Giant clams – *te kima* or *aubunga* (*Tridacna gigas*) and the smaller species, *te were* (*T. maxima*, *T. squamosa*) are depleted. Sea cucumber species (Holothuriodes) are depleted leaving the lagoon to the mercy of filamentous green algae. Lobsters and octopus are still caught in numbers at night but the population has drastically gone down.

Beru Island representatives claimed during the December 2007 consultation that among other urgent issues the scarceness of their marine resources require urgent attention as they touch the daily lives of all Beru residents (Tebano, 2007). Among other reasons given was the impact of causeways and increasing water temperature impacting corals and other fish species. The presumed impact of climate change in terms of warmer water is yet to be checked, however, the more obvious direct impact of humans and fishermen in terms of excessive fishing cannot be overlooked. The non-existence of effective bylaws to regulate catches and commercial species in

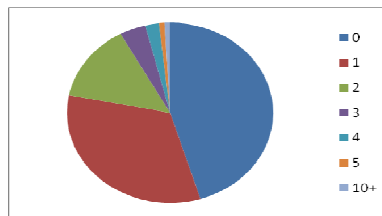
particular has not offered any protection to island resources food security for its residents. This is an increasing problem in most, if not all, islands in the Gilbert group.

Beru residents complain about commercial tuna boats fishing illegally close to their islands thus impacting the coastal tuna resources on which they also depend. The Island Council has no means to deal with the situation except report the matter to police for appropriate actions by the central administration on Tarawa.

There remains a strong dependence on marine resources to meet daily needs Beru, however the trend toward more dependence on imported inferior canned fish is becoming clearer in terms of diseases related to eating habit. Commercialization of some fish species is seriously impacting the food security of I-Kiribati thus encouraging people to trade their fresh resources in exchange for cash and imported food items.



**Fig.2a: Fishing locations preferred. Fig. 2b: Proportion of families owning canoes.**



**Fig. 2c: Households with number of nets**

### 2.1.2 Terrestrial Plant Resources

The natural terrestrial vegetation types found on Beru are limited to coastal strands vegetation, small strands of inland forest. Secondary and cultural vegetation types include *te nii* (*Cocos nucifera*) coconut-palm-dominated agricultural lands, including *babai* pits, houseyard and village gardens, areas of ruderal vegetation. There is little (or none at all) natural inland forest, almost all of it has been replaced by coconut plantations or cleared for schools, dwellings and other purposes. Papayas and some varieties of pandanus are grown within or along the edge of a compound, so as breadfruit varieties. Decorative flower plants and vegetable gardens are common around homes.

Prolonged droughts are affecting vegetation in many ways, most significantly coconut trees, breadfruit and pandanus trees, the major fruit trees on the island (*forms 1.1; 1.2*). It was reported during the December 2007 consultation mentioned above that all kinds of trees and plants are dying, coconut trees in particular. The watering of houseyard plants and trees was not reported and it is assumed the impact of drought compounds the neglect of residents leaving plants and trees to the cruelty of the sun.

### 2.1.3 Agricultural Land Resources

The long western lagoon coastline is occupied by villages separated by bush-land with old coconut plantations, pandanus and *babai* pits. This is also the most productive part of the island where a huge reservoir of fresh water lens lies. The coastal area is planted with pandanus, dwarf coconut trees, breadfruit and other tropical fruit trees that are suffering from excessive heat and dryness caused by the prolonged drought.

Fragility of ecosystems is often compounded by their small size. Limited land resources make many terrestrial and near shore resources, including freshwater, vulnerable to over exploitation and pollution from poorly planned waste disposal. Limited land resources have become especially troubling for low lying atolls, in view of the projected rates of sea level rise over the next 50-100 years. Beru, although claims to be the land of Nareau (the god), may not be spared.

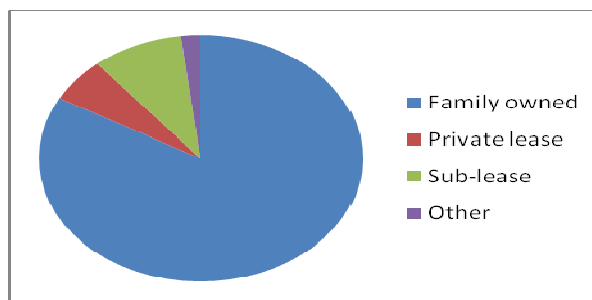


Fig. 2d: Land owning proportions



Fig: 2e: The impact of drought on trees and plants is very serious.

#### 2.1.4 Animal Resources

Domesticated pigs and chickens provide *meat* on special occasions. Dogs are not consumed in contrast to the neighboring Tamana Island and two northern islands, Makin and Butaritari where dog meat is considered a delicacy with valuable medicinal curative powers. Cats are kept as pets and rats are still a problem as in other islands. Coconut crabs are found but rare. Avifauna includes white and black terns, black noddy and occasional visits by frigate birds and herons. Geckos and lizards are common in homes, so as other smaller and inconspicuous animals such as ants, millipedes, bugs and cockroaches. Mosquitoes cannot be ignored as they can cause dengue fever and other mosquito transmittable diseases.

Milkfish, although may be categorized under a marine resource, is unique in that Beru has been blessed with milkfish ponds at both ends of the island. Similarly, micro-algae, locally called '*te bokaboka*' has been one of the prominent land-based resources dating back to pre-European contact and has traditionally provided Beru people as a food source during serious prolonged droughts that devastated most edible agricultural land resources back in time immemorial. Both resources are tapped at very special occasions. Additional milkfish ponds created at the construction of causeways are owned by the Beru Island Council. The significance of such a resource is being questioned by the public in light of other resources, marine and aqua animals as well as terrestrial plants and trees.

#### 2.1.5 Minerals/Aggregate/Water Resources

Kiribati is naturally endowed with several types of mineral resources. These range from terrestrial minerals such as phosphate and gypsum to offshore cobalt-rich crusts and manganese nodules in the country's EEZ. In the period 1900-1979, phosphate mining was undertaken in Banaba. This ceased in 1979 after the major deposits of fossilised sea-bird guano became exhausted. However, there are still a few un-mined areas on the island. Recently mining companies have shown an interest in mining this remaining phosphate on Kiribati. Beru has a salt pond at the northern end of the island and provides a free unprocessed mineral during drought periods when there is no cash to buy imported processed salt.

The other terrestrial and coastal resources include sand, coral, gravel and limestone aggregate that are feeding into the upsurge in construction activities (Fig 2f, 2g). This is true for Beru and the rest of the islands in Kiribati.

The underground resource on Beru, common to all islands apart from top soil, is underground water. Beru has a vast reservoir of fresh water with densest lens in the broadest parts of the island such as Nuka and Tabiang districts (refer to Fig. 1b, 1c). Rongorongo district, being the site for the KPC Hiram Bingham Senior High School, is occupied from the lagoon to the ocean side.

Private and community water catchments are few and only last two or three months at most. Most wells (private and public) are not properly maintained or properly looked after to avoid contamination. All villages, except Aotukia, are located along the western coastline hence wells are only a few meters away from the breaking waves (*forms 1.1; 1.2*). The quality of water in terms of its drinkability decreases with time. Fresh water replenishment from rain that penetrates into the porous sandy soil and into the reservoir has not been happening for a long time (estimated from early 2007).

One village on Beru Island (presumably Eriko) was provided with a solar powered water supply system to aid villagers obtain good drinking water using funds provided by the United Nations Development Programme (UNDP) in the early 1960s. Similar projects followed but there are signs of discontinuation in the supply of portable water drawn with solar pump. Pipes remain visibly half buried but nothing comes out of them.

All households are dependent on well water for all purposes such as drinking, washing and agriculture. Over 300 wells are open, that is, uncovered while about the same number are covered (Fig. 2h, 2i). Very few have more than two tanks. Concrete catchments are not maintained and most of them are abandoned and replaced with plastic tanks. Most development plans are pivotal on the availability of fresh water. Clean water and proper sanitation enhance the health and productivity of the work force and have particular implications for the children and future generations.

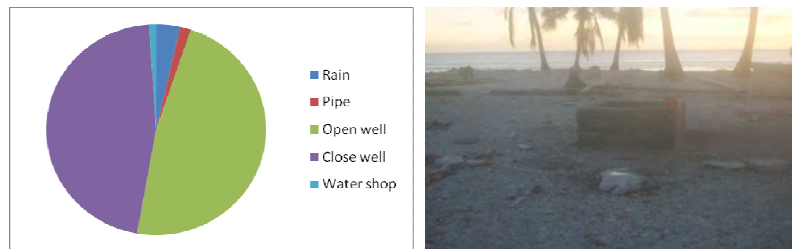
The availability of water has been a long-standing problem throughout Kiribati. Natural sources of permanent potable water are limited to groundwater in freshwater lenses. These freshwater lenses are floating on the higher-density seawater beneath the atolls. They are highly vulnerable due to loss of land and inundation resulting from climate change. Other sources of water include hand-pump wells, roof catchments and galleries. Groundwater resources in Kiribati are commonly contaminated from human and other solid wastes. This arises from rapid population growth and urbanization, inadequate use of proper toilet facilities and lack of infrastructure in the sanitation sector. Due to the shallow water tables, seepage of waste into the fragile groundwater system is a common occurrence in Kiribati.

As a result, there is a need to assist with water and sanitation problems in Kiribati in south Tarawa and the rural outer islands on the following issues:

- development of policy and legislation;
- water sector action plans for Kiribati;
- undertaking of pilot projects, research and feasibility studies to address water and sanitation issues;
- improvement of infrastructure within the water and sanitation sector, eg. proper maintenance of toilets;
- climate change adaptation including leakage control, water conservation and development of alternative sources of water.



*Fig. 2f: Coastal Aggregate, coral slaps. Fig. 2g: Gravel mining still active on outer islands.*



*Figure 2h: Proportion of sources of drinking water. Fig 2i: An open well less than 20 meters from high tide mark vulnerable to seawater seepage and washover.*

### 2.1.6 Energy

Kiribati relies heavily on imported fossil fuels for its commercial and transportation energy needs, but many problems are faced by the energy sector. Diesel generators supply electricity to most of the urban centers like Tarawa. For the outer islands, however, where there is no regular supply of fuel for generators, solar photovoltaic technology has been promoted. Importing fossil fuels for energy generation has been putting an increasing strain on the economy of Kiribati, while the technical expertise and infrastructure needed to utilize the resources better are lacking.

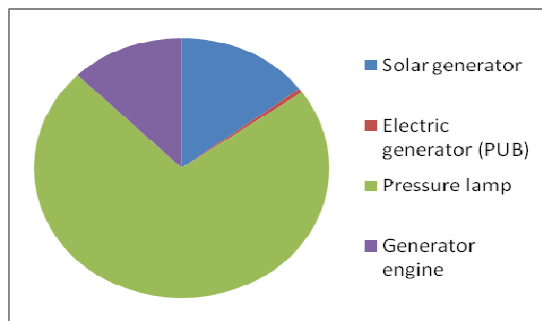
The use of alternative, renewable energy sources will help to offset future dependence on imports and contribute to the overall aim of achieving the maximum degree of energy independence, while providing opportunities for development primarily in the rural sector.

Biomass plays an important role for domestic purposes such as cooking in the outer islands and for most families in South Tarawa. Timber products including coconut palms constitute the biomass resources in Kiribati. Increasing population and the overexploitation of fuel-wood has resulted in the loss of suitable supplies. On Betio and South Tarawa, coconut cake has to be purchased to meet the growing demand. Both methane and kerosene are currently at their highs

and likely to go up further. Solar cooking pots have rumored but tangible applied evidence remains to be seen.

One alternative source of energy, wind power, is used for pumping water on Kiritimati. However, due to problems of maintaining the equipment, it is not utilized for any other purpose. Photovoltaic systems have also been installed in rural homes.

Electricity generated via solar units for family households are increasing in number and one in three families would have a solar lighting system costing around \$9 a month. Other appliances connected to a solar system would cost more. This is a continuation of the solar project that began in late 2003 through 2004. Village and individual generators are also available for *maneaba* and household lighting and for other purposes (Fig.2j).

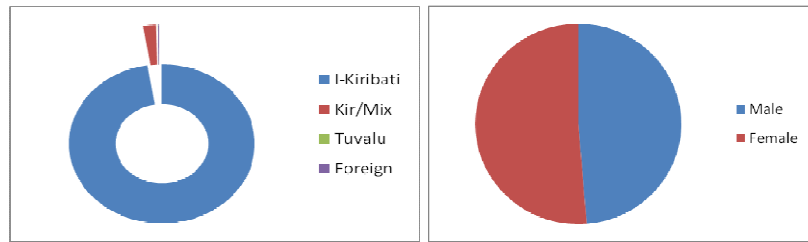


*Fig. 2j: Sources of energy and lighting.*

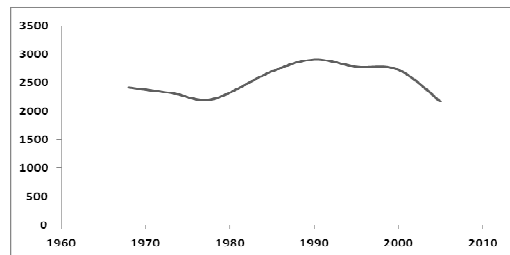
### 2.1.7 Human Resources

The total number of people on Beru in 2005 was 2,169 individuals (2005 Census). Of this number 2,114 were of I-Kiribati origin, 47 were of mixed origin while 3 were of Tuvalu origin and 5 expatriates (Figure 2k; *form 2c*).

Of significant interest is the dominance of I-Kiribati ethnicity in the population, that is, there is very little mixing with other ethnic groups. The proportion of females is slightly higher than males and this could be due to a number of factors including higher survival rate at birth, males seeking employment overseas or at Tarawa and females live longer than males, the latter is evident in the 2005 Census (Fig. 2l). Out of the total number of 875, more than half of the population (467) is female; the remaining (408) is male (*form 2c*).



**Fig. 2k: Composition of Beru population by ethnicity. Fig. 2l: Population by sex.**



**Fig. 2m: Population growth trend**

There has been a negative growth rate between 1970s and early 1980s, picked up and climaxed around 1990s, started declining again in the early 2000 to present. This downward trend would appear to continue into 2010 to its original level as was in the 1970s (Fig. 2m).

## Chapter 3: SOCIAL SERVICES AND ECONOMICS

### 3.1 Social Services

Items falling under this sub-heading are education, health, sanitation, transport and communication.

#### 3.1.1 Education

Formal education on Beru is in the forms of pre-school, primary and junior secondary (JSS) (Forms 1, 2 and 3). By late 2000 to early 2003 all islands in Kiribati had one JSS which automatically absorb primary school leavers and preparing them to senior secondary or technical schools. The largest proportions of children are engaged in these educational institutions. Children between 2 to 5 years go to pre-schools, those aged 6 to 9 attend primary and continue to junior secondary at ages between 10 and 14, the majority of the population is within adult population in the age group between 18 – 50 years of age (Fig. 3a). This forms the highest age group within Beru population. The post-school age group may begin as early as 18 if they did not continue to senior secondary and tertiary levels, the dominant age group on the island (Census 2005).

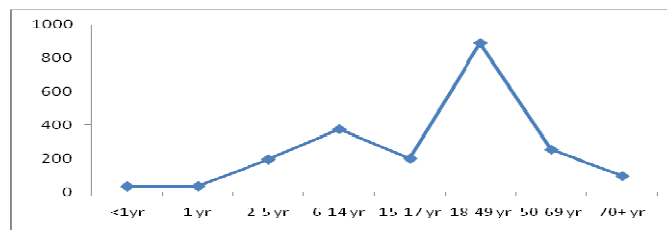


Fig. 3a: Broad age groups

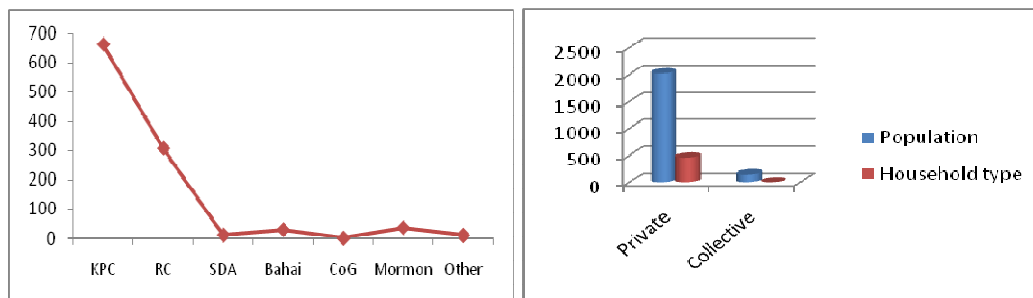


Fig. 3b: Population by denomination

Fig. 3c: Population by household type

The 2005 Digest of Education Statistics showed that there were 350 children enrolled at the Beru three primary schools with almost equal numbers at each school. Nineteen registered teachers were employed six for each school except Tebubutei Primary with seven registered teachers. Similar enrolment numbers are expected for the following years as far as unconfirmed official records. Those who passed entry into senior secondary schools have to migrate to South Tarawa

or other islands within the Gilbert Group where government and private schools are situated, a small number is recruited by Hiram Bingham High School mainly those with Protestant background. Continuation into tertiary education may require settling in South Tarawa or travelling to countries outside of Kiribati. Beru had produced a number of fine leaders, professionals in the religious, academic and medical circles.

Protestantism is very strong in the island while Roman Catholicism picks up about half of the former. Other denominations are minor but Mormonism steadily wins the confidence and hearts of the people (Fig. 3b). The majority of Beru own private homes but there are also those who live in communal houses (Fig. 3c).

### 3.1.2 Health

Beru people are considered healthy by Kiribati standard as residents need to be active in order to survive the harsh environment, the scarceness of terrestrial and marine food sources. Alcohol consumption is banned and so the population concentrates more on food collection and daily house chores. Smoking is rife on the island among teen and adult populations. Overweight is uncommon among adult populations as overeating is discouraged at very young age, especially girls. Obesity is considered a form of lavish living and uneducated in cultural upbringing.

The consumption of *kava* or *yagona* is becoming a grave concern as people are spending so much money on it costing over \$60 for a kilogram. A large proportion of drinkers (mainly men) are spending a good proportion of time drinking *kava* through the night and coming home in the early hours of the morning, sleeping all day doing nothing. Skin dryness and under-nourishment are common among *kava* drinkers. Kidney failure related to *kava* drinking is being the cause of death identified in many cases.

Kiribati Central Hospital, situated at Nawerewere, revealed that non-communicable diseases such as diabetes and hypertension exist among age groups of between 44 and 65 on the island of Beru and two other neighboring islands, Onotoa and Tamana (Fig. 3d-1 and 3d-2). It is of insignificance on Beru as the number of cases remains very low. A changing eating habit with more inferior imported food items outpacing local foods is the main contributor to such diseases (Tebano – Teriboriki 2008 pers. comm.). The adoption of a cash economy which is the backbone of trade is the driving force behind all of these changes.

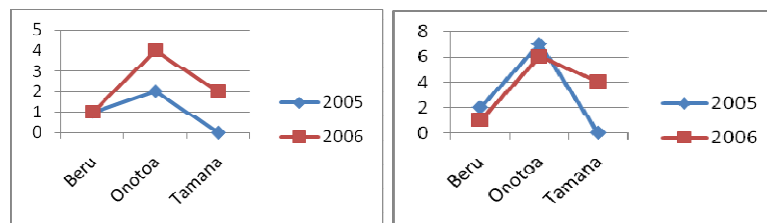


Fig.3d -1: diabetes cases; 3d - 2 – hypertension cases

Cultural upbringing where little vegetable and fruits are consumed also contributes to the earlier onset of diabetes in many adult populations in Kiribati. Fresh and semi-fermented toddy are the readily available sources of Vitamin C and A, respectively, but sugar is easier to obtain; a local fruit *Morinda citrifolia* (*te non*) and other wild plants are now rarely consumed. Papaya, bananas and citrus fruits (lemon and lime) which are also good sources of vitamins are rarely planted on the island despite their availability from the Agricultural Unit on the island. Chinese cabbage grows well in compost soil but also rarely grown as it requires daily watering and attention and is out of mind at the time of prolonged drought.

### 3.1.3 Sanitation

A significant number of households still rely on the beach, bush and sea for sanitation purposes. Although there are a variety of toilet designs available on the island the habit of open toileting still remains (Fig. 3c) (2005 Census). A substantial number of land toilets are operational and village welfare groups still encourage residents to adopt one of the affordable designs. A latrine that uses little water for flushing is most common. The figure below (Fig. 3c) depicts the proportion of toilet designs currently operational on the island.

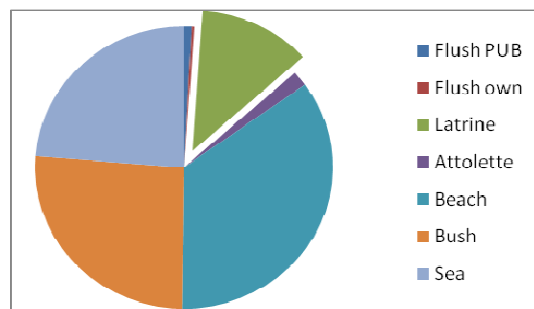


Figure 3e: Types of toilets available on Beru

### 3.1.4 Culture and Lifestyle

The people of Beru are neither poor nor rich by world standard, however residents are healthy and active. A day cannot go by without any form of gathering, it could be either a birthday gathering, wedding, welcoming or farewelling someone (mainly family members and visitors) and name them. Kindness and friendliness are known to be cradled on Beru Island. Openness and humor add to the gentle and lovely nature of the islanders. Residents live a subsistence living and make some cash through selling fish, copra and shark fins, or receive remittances from relatives working abroad or on Tarawa. Those who work for the Island Council receive small salaries in comparison with those working as senior officials in government ministries or private companies. Entrepreneurship in retailing shops privately or village owned is becoming popular as imported food items are becoming part of daily living. The use of alcohol is prohibited by island rule purported by old men. Smoking is a widespread habit and is regarded as part of

traditional custom to provide or offer a cigarette or a locally rolled Irish tobacco to a visitor or several tobacco sticks to a village or gathering.

The villages are run by the old men (*unimwane*) who preside over all village and island affairs. Middle-aged men assist by enforcing all rules laid out by the *unimwane* or by implementing certain binding commitments as a result of the decision making of the *unimwane*. Within a village and island set up, there are also other groupings such as youth, women interest and welfare groups, church groups and fishermen groups. Recently there are ‘*yagona*’ groups that gather every now and then especially when the *yagona* itself is in stock by some island dealers.

### *3.1.5 Transport*

The smallness of the island does not require regular road transportation system like South Tarawa. Bush bikes or bicycles are most common, mopeds and trucks are also available. Bicycles are a norm and every household would aspire to acquire a bicycle for basic transportation, carrying copra and collecting coconut for household requirements. As of 2005 Census there were 124 motorcycles and 357 bicycles. These numbers must have increased up to the time of report writing. Outboard motors are few in number about ten, most of which are linked to small commercial fishery ventures such as shark fin and sea cucumber.

Government and private shipping companies provide sea transportation means, this can be irregular depending on cargo and copra capacities coming in or going out. Chartering boats for school children and other purposes is common. A domestic government-owned airline, Air Kiribati is providing air links between Beru and South Tarawa (the capital) as well as with neighboring islands. Fares are generally higher than sea fares. Beru Island is contemplating buying a catamaran to run passenger and cargo services like other islands do.

### *3.1.6 Communication*

The main means of information and news is via a transistor radio (battery or solar operated). Communication via telephone or CB radio (2) is also available. Radio news is broadcast by either the Government’s Broadcasting Commission or a privately owned FM 89 radio. More than half of the population owns a transistor radio. Videos and DVDs provide visual and audio entertainments. Four local newspapers, Temauri (KPC), TeTarakai (Betio Fishermen Association), Te Uekera (Government) and Newstar (Private) provide weekly news on local, regional and international news and sports mostly in local language.

## **3.2 Economic Aspects**

### *3.2.1 Trade*

Since 2000 and previous years up to 2005 the balance of trade had been on the imports exceeding the exports (Balance of Trade, 2006, unpublished report). The price of copra which is the main export commodity has been fluctuating thus making the balance of trade less favorable for Kiribati economy, hence is affecting all the islands including Beru. The 2005 trade balance

has been the highest in the history of Kiribati that amounted to \$9.4 million as compared to \$7.9 million for 2006 (Fig. 3f). Government is striving to reduce debt by focusing more on export in other sectors.

Overall, Beru contribution to offset trade imbalance is insignificant but the impact of trade on economies of small islands is immense.

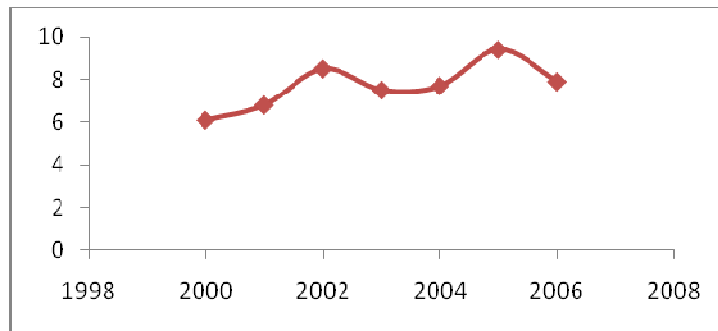


Fig. 3f: Kiribati balance of trade (A\$ million)

### 3.2.2 Imports

The main import commodities to Kiribati include polished and high in fat and salt food items, machinery and equipment, fuel and miscellaneous manufactured goods. Plastic wares are most popular among local shops importing them from some Asian and metropolitan countries. Including plastic bags, these wares are potential hazard to our fragile environment. Import partners include Australia 33%, Fiji 27.1%, Japan 18.1%, NZ 6.9% (Balance of Trade, 2006, unpublished report). Hon Kong, Taiwan, Philippines, Malaysia, and others are being added to a growing list. Imports exceed export value by about 7 times (Fig. 3g).

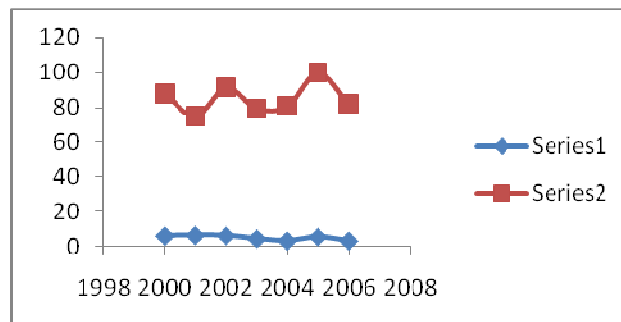


Fig. 3g: Import and Export levels (Series 1 – imports; series 2 – exports).

### 3.2.3 Exports

Export commodities include copra, coconuts, seaweed and fish. Pet fish from Kiritimati is popular in Hawaii and the mainland of USA. Export partners are US 22.8%, Belgium 21.5%, Japan 14.3%, Samoa 7.8%, Australia 7.5%, Malaysia 6.7%, Taiwan 5.6%, Denmark 4.6%

(unpublished Trade Balance report, 2006). The export value is predicted to remain in future until Kiribati finds some other means of balancing the trade deficit (Fig. 3g) by aggressively looking into light manufacturing and reducing heavy dependence on imported food through encouraging domestic markets on more nutritious local food items.

### 3.2.4 Income Revenue

The end of phosphate revenue from Banaba in 1979 had a devastating impact on the economy of Kiribati and indirectly on the outer island on which development assistance is derived in the areas of road, island council facilities and other public infrastructure. The Revenue Equalization Reserve Fund, a trust fund financed by phosphate earnings over the years, is still an important part of the government's assets and contained more than U.S. \$600 million in 2007. Kiribati has prudently managed the reserve fund, which is vital for the long-term welfare of the country. This year the value of the reserve fell and US\$22 million was claimed to be linked to world market and the devaluation of the US currency. Similarly the Kiribati Provident Fund fell by about US\$6 million.

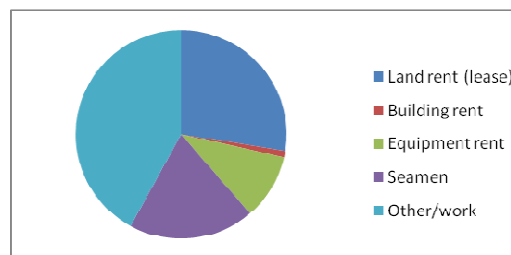


Figure 3h: Sources of revenue

In one form or another, Kiribati gets a large portion of its income from abroad. Examples include fishing licenses, development assistance, tourism, and worker remittances. External sources of financing are crucial to Kiribati, given the limited domestic production ability and the need to import nearly all essential foodstuffs and manufactured items. Historically, the I-Kiribati is a notable seafarer, and today 1,400 I-Kiribati are trained, certified, and active as seafarers. Women seafarers are being added. Remittances from seafarers are a major source of income for families in the country, and there is a steady annual uptake of young I-Kiribati men to the Kiribati Maritime Training Institute. Beru has a significant number of men working on overseas vessels who send money back to their relatives.

Official development assistance amounts to between U.S. \$15 million and \$20 million per year. The largest donors are Japan, the EC, Australia, New Zealand, and Taiwan. U.S. assistance is provided through multilateral institutions. Remittances from Kiribati workers living abroad provide more than \$11 million annually.

Most islanders, like I-Beru, still engage in subsistence activities such as fishing and growing of food crops like babai, bananas, breadfruit, and papaya. The leading export is the coconut product, copra, which accounts for about two-thirds of Kiribati's export revenue. Other exports to which Beru contributes include shark fins and handicraft. Kiribati's principal trading partners are Australia and Japan. The Australian dollar (AUD\$) is the official currency used in Kiribati replacing the pound sterling used during the British colonial era.

## Chapter 4: THE PHYSICAL ENVIRONMENT AND STRUCTURES

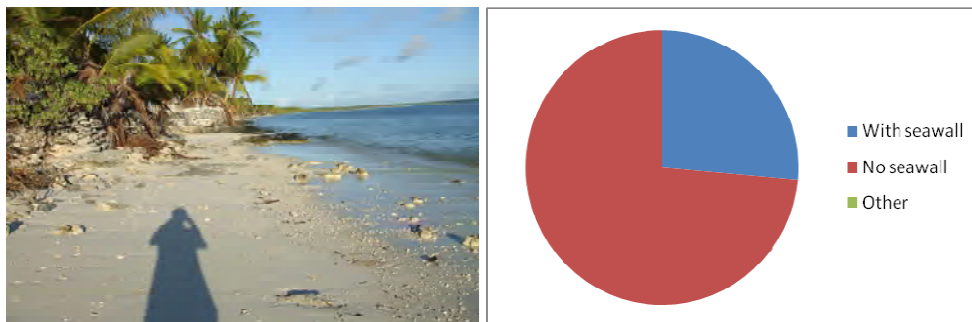
### 4.1 The Physical Environment

#### 4.1.1 Coastal Erosion

For the most part, coastal erosion appears to be mostly linked with aggregate mining for construction purposes such as housing, road, causeways, and land reclamation activities. To some extent seawalls appear to contribute to coastal erosion as well.

Participants of the consultation explained that the latest storm surge, that also damaged the Nippon Causeway between Bairiki and Betio, had caused substantial damage to wells and fruit trees in Eriko village. Eriko residents claimed that the ferocity and force of waves accompanied by strong wind were describable as it was the first time in their lifetime to witness such an event. Few waves over-washed over the western coastline of the village flooding the whole village and the main road.

Aggregate mining was still ongoing during the days the consultation was held. An engineer from PWD had arrived for the upgrading of the Nuka-Teteirio Causeway as requested by the Island Council. Gravel sand and coral boulders were collected from the Taboiaki village southern end as these are plentiful there.



*Fig. 4a: An eroded lagoon coastline in Beru.*

*Fig.4b: Proportion of population with/-out seawall*

Coastal erosion is one of the major problems facing Kiribati. Being a small low-lying and relatively flat country, Kiribati is entirely coastal. Therefore most activities such as recreation, liquid and solid waste disposal, extraction of sand and gravel rock for construction and building of roadways take place along the shorefront of all islands in Kiribati, Beru is no exception. However, due to the lack of understanding of the wave and current dynamics around the islands and the misconception that the coasts will recover, these atoll environments are under severe stress and are affected by significant erosion, pollution and damage to marine coastal biodiversity.

Activities that contribute to the increasing problem of erosion on Kiribati include fill reclamation for road construction, blasting of reefs for boat channel construction, and aggregate mining for

construction purposes. Coastal erosion is most acute near the urban centre of South Tarawa, where population density, unregulated shorefront development and overexploitation of coastal resources are the highest. As Beru has only a medium sized landmass with only about a meter above sea level any erosion along its coastline can cause substantial loss of arable and agricultural land and leaving not enough room to move back to. Two current land reclamation projects at Rongorongong and Nuka may exacerbate coastal erosion at any part of the island depending on the direction of current and impact of other human activities within the vicinity.

#### 4.1.2 The Coastal Zone

The windward side of the island is experiencing pocket coastal erosion as they are unfrequented by human activities as compared to leeward western rim where the main physical activities are carried out. The coastal area at the ocean side is suffering from wave action causing some erosion. Coastal plant strands protecting the coastal area are suffering from saltwater accumulating in the leaves and cooked up by the endless scorching sun. The roots offer little protection in binding the sandy soil from being eroded away. A reef flat, with coral boulders remaining after the construction of causeways on the island, offer some to reef organisms dwellers. This the unproductive zone of a reef but further toward a reef crest more marine life becomes luxuriant. Algae and sea-grass species are abundant but most of them are not edible except for a seasonal *Caulerpa racemosa*.

The leeward side of the island has a shallow lagoon. The northern portion has exposed patch reefs making it unnavigatable during low tide. The southern portion offers shallow lagoon water allowing small to medium size crafts enter and leave the lagoon at high tide and into the oceanic water of the island. The Nuka mudflat and lagoon area is claimed to have become shallower disabling fishermen to easily enter and leave the lagoon. They need to drag their canoes several kilometers into the lagoon before they can put up their sails. The lagoon is claimed to be home of the filamentous green algae as is void of sea cucumber and most in-faunal organisms. Sea cucumber in all its forms has recently been over-exploited for lucrative markets in Asia and Japan.

Aggregate mining is continuing taking its toll and unabated by the Island Council. There is no effective law to safeguard the island's coastal areas and the current 2007 Environment Act may be too weak to effect the main cause of coastal erosion on the island. The only practical solution to the current problem is to get the people and Island Council sit together and discuss the best strategies to address the problem. One potential strategy is to encourage people to do aggregate mining inland where they excavate identified infertile areas, mine sand and gravel and replace them with compost for agricultural purposes.

### *4.1.3 The Marine Environment*

The oceanic water surrounding the island is cooling the entire landmass during hot sunny days. LaNina is bringing in easterly cool trade winds. The Nuka lagoon area is shallower as used to be and is linked with mud-sand accretion caused by the existing causeway. Water pollution from the overharvest of sea cucumbers and other human activities such as toileting and rubbish dumping are contributing to the poor quality of water and hence a decline in most finfish and invertebrate species. A large proportion of residents still rely on the beach, sea and bush for sanitation purposes thus making the marine environment unsafe to the general public (Fig. 3c). Coral growth is limited to the shallow and narrow portion of the windward reef backdrop at the eastern side of the island. The submerged leeward at the western side offers habitats for a variety of fish and algal species. Ciguatera does not occur there.

## **4.2 Public and Private Physical Structures**

### *4.2.1 Public Physical Structures*

Public structures likely to be impacted by storm surge and increased sea level are the existing causeways at either ends of the island. Coupled with these are land reclamations at Rongorongo and Nuka villages mentioned earlier. These structures need improved designs and proper maintenance to reduce vulnerabilities associated with surge storms and bad weather.

The vulnerability is trait of the Pacific islands countries has received increasing attention over the last decade. Exposure to natural disasters and to external global perturbations (for instance in climate change, trade, and capital markets) and a heavy reliance on a limited range of economic sectors, creates a high degree of vulnerability. Moreover, the factors contributing to islands vulnerability appears to have increased in recent years. The baseline of assets and lives at risks is also increasing as population and infrastructure located in coastal areas expand and Pacific island economies open to global economy. Small islands in Kiribati need to develop advance plans to curb or reduce their vulnerability associated with global warming and globalization in general.

### *4.2.2 Private Structures*

Most private seawalls along the leeward side are being repaired but are showing signs of physical damage caused by previous surge storms, the recent one hit Beru toward the end of 2006. The frequency and stronger surges may cause irreparable damage to most seawalls hence plans need to be put in place right away to ensure the structures withstand unpredicted events such as increased sea level accompanied by higher and stronger waves.

Out of 462 respondents surveyed in 2005, 122 households claimed that they had seawall, the remaining 340 did not have seawalls (Fig. 4b). Because of the decreasing trend in population as discussed earlier (Fig. 2g) and the unlikely expansion of villages for new settlements new

seawalls are unlikely to be constructed sooner or later. The migration to urban centers such as Tarawa and Kiritimati contributes to some extent.

Examination of some private seawalls showed that a good proportion is properly maintained. Those showing signs of disrepair appeared to be associated with the non-presence of household occupants as they are either being away from home for many years or have recently died and no immediate family members to continue the maintenance work. These are the areas that are likely to be flooded during extreme tides and surge storms; attention should be given to these private structures as they will eventually affect the immediate area within a village set up.

Close inspection of the sea walls on Beru revealed that coral boulders have been used in their initial construction and remain so in any repair work needed. Freshly mined boulders are quite conspicuous on repaired sea walls. Piles of coral boulders mined from within the lagoon flat are testimony of continued intensive aggregate mining. The only plausible solution to the problem is for the whole Beru community to sit down with the Island Council and plan out what is best to protect the island's fragile ecosystems.

## **Chapter 5: ADMINISTRATION AND POLITICS**

### **5.1 Administrative divisions**

Kiribati was formally divided into districts until its independence. The country is now divided into two island groups which have no administrative function, including a group that unites the Line and the Phoenix islands (ministry at Ronton, Kiritimati). Each inhabited island has its own council (3 councils on Tarawa: Betio, South-Tarawa, North-Tarawa; 2 councils on Tabiteuea). The island groups are:

- Gilbert Group
- Line and Phoenix Group.

Each of the 21 inhabited islands has a local council that takes care of the daily affairs. Tarawa Atoll has three councils: Betio Town Council, Te Inainano Urban Council (for the rest of South Tarawa) and Eutan Tarawa Council (for Rural North Tarawa). Beru has its own council that performs its functions laid out by central Government under a Local Government Act (Kiribati and European Commission Joint annual Report, 2004).

The Island Council is run by a Tiibi Kauntira (TK - Chief Councilor), one of the village elected councilors, a vice chief and the remaining members of an Island Council. Councilors are elected by their respective villages through ballot voting and each councilor holds the position for a 4-year term but may be replaced any time in the case of death, migration or non performance. There was mention in the last few months that Government is going to change the election process for chief councilors and that a chief councilor will be elected by registered voters and not by the elected councilors as currently practised.

The staff of the Council comprised a Clerk, a Cashier and an Island Project Officer; these are paid by a central administration. Other staffs include a Council Local Cashier, an Island Community Worker, Island Welfare Officer, carpenter, plumber, drivers and laborers. The judiciary section is staffed by a Court Clerk paid by the Attorney General's Office, magistrates and judges who are also paid by the AG's office. Policing and law enforcement is done by government police officer(s) assisted by village special constables.

### **5.2 Politics**

The Kiribati House of Parliament, *Maneaba ni Maungatabu*, is run under a parliamentary system that is headed by the *Beretitenti* who plays dual roles as Head of Government and Head of State nominated by MPs and elected by the people of Kiribati.

Currently there are 3 political parties, Boutokan te Koaua (current government with Mr. Anote Tong as President), Maneaban Te Mauri Party (opposition) and Temauri party (independent). Current members of Parliament from Beru are MP Tetabo Nakara, currently Minister of

Environment Lands and Agricultural Development in the Tong Government, and MP Kirabuke Teiaua, currently without government portfolio and a newly elected member.

## **Chapter 6: GENERAL DISCUSSION ON NEEDS AND FUTURE DIRECTIONS**

As the country develops and more goods are consumed, the issue of domestic waste disposal becomes critical. This is especially the case in South Tarawa but is also problematical on outer islands. The Government has developed a basic waste disposal framework and waste management on South Tarawa has been greatly improved through a recycling program supported by UNDP. A similar but smaller approach for small islands like Beru will ensure that unmanaged solid and liquid waste does not seriously impact underground water lens and the environment in general (Republic of Kiribati and European Commission Joint Annual Report, 2004). Water is the fundamental of life by people, animals and plants alike.

The importance of climate and sea-level change and variability requires the adoption of urgent adaptation measures in particular for coastal management and environmental vulnerability assessment. Aggregate mining for construction as population and migration increase will have a highly detrimental impact on coastal areas increasing their vulnerability to erosion. Coastal erosion also threatens settlements, arable land, water lenses and the coastal ecosystem. Control of aggregate mining requires alternative sources for aggregate mining and effective implementation of the 2007 revised Environmental Act 1999 needs to be put in action soonest.

The success of the current project, particularly after its conclusion, depends largely on the contribution of each local government in continuing similar activities in the areas of public awareness and consultation and risk assessment with proper implementation adaptation strategies put in place. The appropriate personnel are the IPOs, ICWs, Clerks to Island Councils who have attended the 2007 Consultation and training in Tarawa and who are still part of the outer islands consultations and trainings. A monitoring mechanism developed by government through its appropriate ministry is necessary to ensure local government activities are supported and enhanced.

Environmental Impact Assessment (EIA) procedure is integrated through all prescribed developments however monitoring equipment and expertise is very limited and requires additional support if environmental impact is to be monitored effectively. In addition, being prone to storm surges and drought there is a need to set up efficient disaster prevention and preparedness mechanisms, including climate adaptation measures, prediction mechanisms and monitoring systems with a view to reducing the consequence of disasters. Outer islands that lack functional coordination for such vital services need to be included in all planning processes to ensure that they are aware of the necessary procedures when required.

Water and sanitation cannot be overlooked as they are vital for the existence of all forms of life, humans in particular. There is a great need to overhaul outer islands' water systems to ensure all

have access to good water for domestic and agricultural purposes. Water catchments in all forms need to be encouraged with technical and financial assistance provided. Wells need to be protected from any form of contamination and this may require strict regulations on what form of water source meets the required health standard. Toilets facilities also need to be reviewed to determine the most acceptable type among those currently exist on the island. Attitude change toward toileting to discourage the use of beaches and bushes for such purposes requires constant and well supported drives by local communities and church groups.

Marine resources are the main protein staples on Beru as agricultural land is very limited due to drought and reducing access to family owned plots. Proper management of all types of edible and non-edible marine resources needs to be put in place as soon as possible. Fisheries and expert advice is greatly needed to help fishermen manage their own resources. Lack of protein may be detrimental on the health of the population. Likewise, agricultural and terrestrial resources also need to be managed through proper planting techniques and the selection of most appropriate plant species that thrive on atoll harsh conditions. Home gardening is lacking on the island and the replanting of main fruit trees such as coconut, pandanus and breadfruit need to be encouraged.

All physical infrastructures (public and private) on Beru are prone to storm surge and bad weather. Any increase in sea level over the next decades will undermine the welfare of coastal communities. A long term planning process involving appropriate government ministries and non-government organizations needs to be put in place to ensure adaptation measures are undertaken.

Heavy dependency on imported food items is not healthy for the people of Kiribati in the long term and Government must make strenuous effort to reduce or retract the trend by embarking on programs that promote the consumption of traditional and local foods. This translates to health and the ability of each family to save money in order to fund personal and local projects that will allow them adapt to climate change, climate variability and sea level rise. Diabetes and hypertension are two non-communicable diseases existing on the island but with low key, however most probable linked to heavy consumption of imported polished foods and less exercise due to warmer days. Dependency on fossil fuel must be drastically reduced through the implementation of projects that promote the use of clean energy sources such as solar, wind and wave.

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