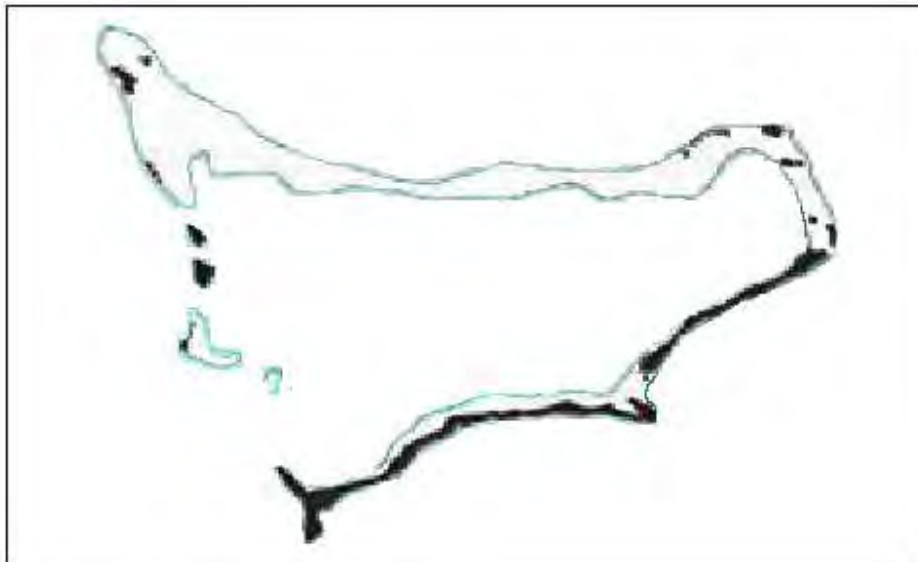




**KAP II TA - TOR 4.1, 4.2, 4.3**

## **BUTARITARI**

Community Consultation, Risk Assessment & Adaptation,  
and Training



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For  
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## Executive Summary

A visit to Butaritari was carried out for the same purposes as in previous islands, Tamana, Beru, Onotoa, North Tarawa, Kuria and Makin. Similar activities were carried out as part of the consultation process.

The team that visited Butaritari comprised Dr. Temakei Tebano (ThEcoCare Group and current National Consultant to KAP II for Components 4.1 and 4.2 and 4.3), Miss Rosalind Kiata (Media Consultant, KAP II), Miss Erimeta Barako (Participatory Planning Officer, MISA) and Ms Titeem Auatabu (Resource Information Officer, Mineral Unit, MFMRD). Also assisting were the IPO and ICW officers of Butaritari Island Council. The key areas discussed fell under water, coastal erosion, seawater seepage into *babai* pits, reduction in natural resources, overcrowding and sea level rise. Adaptation strategies to overcome or reduce risks and vulnerabilities related to climate change and sea level rise were discussed during all sessions.

The relocation issue in light of reduction in landmass due to accelerated coastal erosion, as the last resort, was discussed but the emphasis was on adapting to risks and vulnerabilities at an island level and finding solutions to those being faced by the Butaritari people. Details on project funding and how they can be accessed were provided by Miss Barako. Miss Auatabu presented comprehensive information on protecting, looking after and managing our coastal areas through limiting the amount of aggregate mining and enhance mangrove and coastal vegetation planting to ensure surge storms have minimal impact on coastlines.

Miss Kiata trained participants on information gathering and dissemination on all issues discussed in the consultation. The exercise provided participants with a feeling of satisfaction in that they heard and enacted issues of concern to our existence in light of climate change and sea level rise. A recorded drama by the Catholic Youth Group in Tarawa on all aspects of CC and SLR was screened at end of day 1 to give participants an overall view of the consultation and the issues most pertinent that they will enact as part of the participatory, risk assessment, awareness and adaptation process.

The bulk of the four-day consultation was spent on explaining the causes and factors contributing to global warming with subsequent events such as climate change and sea level rise and potential adaptation measures to reduce or counter their impact at a village and island level. Documentaries on CC and SLR and other relevant videos were screened.

A review on contributions to the 2007 consultation from various government and private sectors were summarized by Dr. Tebano. Dr. Tebano also presented his factual lectures on linkages between and among systems (on power point) and emphasized that all systems are linked in many ways most of which are not understood. Destroying one system will eventually affect other immediate or farther systems sooner or later. The connectivity between and among them is through air, energy, water currents and waves, food chain, and many more. He also strongly supported biblical writings in relation to man's responsibility to care for the Earth.

Each presentation by team members was followed by open discussion on risks and vulnerabilities, including problems related to CC and SLR, and potential strategies taking into account of traditional knowledge and workable measures in light of the increased intensity of drought, storm surges and unpredicted bad weather.

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 to witness the selection process. There were 72 participants six from each ward within a village. Bikaati participants were transported to and from the consultation venue at the Island Council's hotel *maneaba*.

Risk assessment and island profiling were partly done through consulting participants on the affected sites followed by site visits, filming and recording exact positions with a GPS. Areas and issues related to island profiling were dealt with by a MISA staff accompanying the team.

Seepage of seawater into *babai* pits appeared to be the major concern of the Tanimaiaki/Tanimainiku, Ukiangang and Bikaati residents. Much of the erosion problems on Butaritari, Island, which appears to be a second concern, to a large extent is linked to Teibo Causeway, aggregate mining and land reclamation. The impact of sea level rise is questionable. A decline in marine resources is a third concern despite the fact that Butaritari had lost some of its readily available resources through the construction of Teibo Causeway in late 1980s. Channels built along the causeway to allow water pass through is by far not adequate and is causing more accretion in the area. Better designs need to be found to improve the current condition. Thousands of dollars will be required to reduce coastal erosion and seawater seepage into *babai* pits on the island.

Water is not a major issue on Butaritari at the time of the consultation. The rains fell almost every day but was reported that the latest drought had much impact on ground water, some wells were turning brackish. Currently, there is plenty of portable ground water used for all household purposes. Like Makin, Butaritari Island receives more rain on average than any other islands in the Gilbert Group. Droughts have had much impact on vegetation and fruit trees, as well as ground water resources, hence plans need to be made for future uncertainties. Rainwater is available in homes with corrugated iron or aluminum roofing. The number of catchments on the island is small compared with the number of people living there. The Island Council and Government housing have some plastic water tanks but no concrete cisterns.

Bikaati Village situated on Bikaati Islet depends heavily on ground water resources but the wells would not stand prolonged droughts as had happened. It requires immediate water enhancement in terms of more permanent water catchments such as concrete cisterns to ensure there is rainwater for drinking for all residents as long as they can provide. A water system needs to be installed in terms of an overhead tank, a solar pump and a piping system. A concrete rainwater catchment is urgently required by Anginibaiatooa Primary School.

There is little agricultural activity in terms of vegetable and swine/poultry home farming. Water is a limiting factor. The village is busy with sorts of fishing activities. The most exploited marine resource are sipunculid, tridacna, tunas and reef fish.

The Butaritari people are aware of CC and SLR after village consultations made by the Tiibi Kauntira, IPO, and ICW in early February. However, distrust by residents, typical of the northers, did not help advance the causes of the consultation. Adaptation measures have not been thought of seriously since then but need to be enhanced. It was seen that intensifying training and consultation on CC and SLR complimented with media training in its various forms and with contributions from government ministries in their respective areas related to CC and SLR will boost the awareness level that should slowly lead to determining appropriate adaptation measures most appropriate to Butaritari situation. The training and participation of IPOs, ICWs and village representatives is an important integral part of capacity building to ensure public awareness continues after the conclusion of the project.

## ACRONYMS

ACP	Asia-Caribbean-Pacific
AG	Attorney General
CCA	Climate Change Adaptation
CPUE	Catch per unit effort
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
RC	Roman Catholic
SEC	Solar Energy Company
SLR	Sea Level Rise
SPC	Secretariat of Pacific Communities (formerly South Pacific Commission)
SWO	Social Welfare Officer
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 focuses on the status of terrestrial physical environments, marine physical environment, marine and terrestrial resources (living and non-living), communication and transport, the general discussion and recommendations on issues needing immediate action to counter or reduce risks and vulnerabilities that are affecting the lives of Butaritari residents on a daily basis. The island profiling aspect is compiled by MISA staff accompanying the team.

### **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 in the July meeting.

### **1.3 Rationale of the Butaritari Visit**

A visit to Butaritari is similar to previous visits that aim to assess, record and report potential risks and vulnerabilities related to CC and SLR. This exercise falls under public awareness and consultation, TOR Component 4.2 of the Consultant (Dr. Temakei Tebano) and Training Component 4.3 now under the same TOR. Butaritari is the seventh island visited under this assignment.

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### **Itinerary**

29<sup>th</sup> July:

Left Makin for Butaritari at 4.40 pm arrive Butaritari 5 pm. Met Clerk and discussed workshop plan, catering, participants, etc.

30<sup>th</sup> July:

First day of consultation for Butaritari village participants, Ukiangang, Ononmaru, Temwanokunuea, Te Vaticano and Antekana. 9am – 4-30pm (Temakei, Titeem, Erimeta and Ereata).

31<sup>st</sup> July:

8am – 2pm. Session taken by Rosalind (media training). Brief visit to Ukiangang and Tabonuea by Civil Engineer Ereata Kakau; Erimeta Barako collected information for island profiling. The rest of the team assisted in the media training.

1<sup>st</sup> August:

Village councilors general election day. Field trip and general inspection of problem areas (coastlines and bababi pits) to Kuma, Keuea, Tanimaiaki and Tanimainiku in the morning. The remaining villages were done in the afternoon. IPO NaUaraoi led the team.

2<sup>nd</sup> August: Day 3 of the consultation for group two participants – Kuma, Keuea, Tanimaiaki, Tanimainiku, Tabonuea and Bikaati villages, as for group 1 and day 1.

3<sup>rd</sup> August: Being Sunday no activity done.

4<sup>th</sup> August: Day 2 for group 2. Sessions taken by Rosalind Kiata. Wrap up in the afternoon by Dr. Tebano.

5<sup>th</sup> August: Returned to Tarawa.

## 1.4 Location of Kiribati

The full text on this topic can be cited in previous similar reports on Tamana (Tebano, *et. al*, 2008), Beru (Tebano and Abeta, 2008), Onotoa (Tebano, 2008) and Tarawaieta (Tebano, 2008).

Butaritari is one of the islands in the northern Gilbert Group and is the seventh island visited in this KAP II outer island consultation exercise.

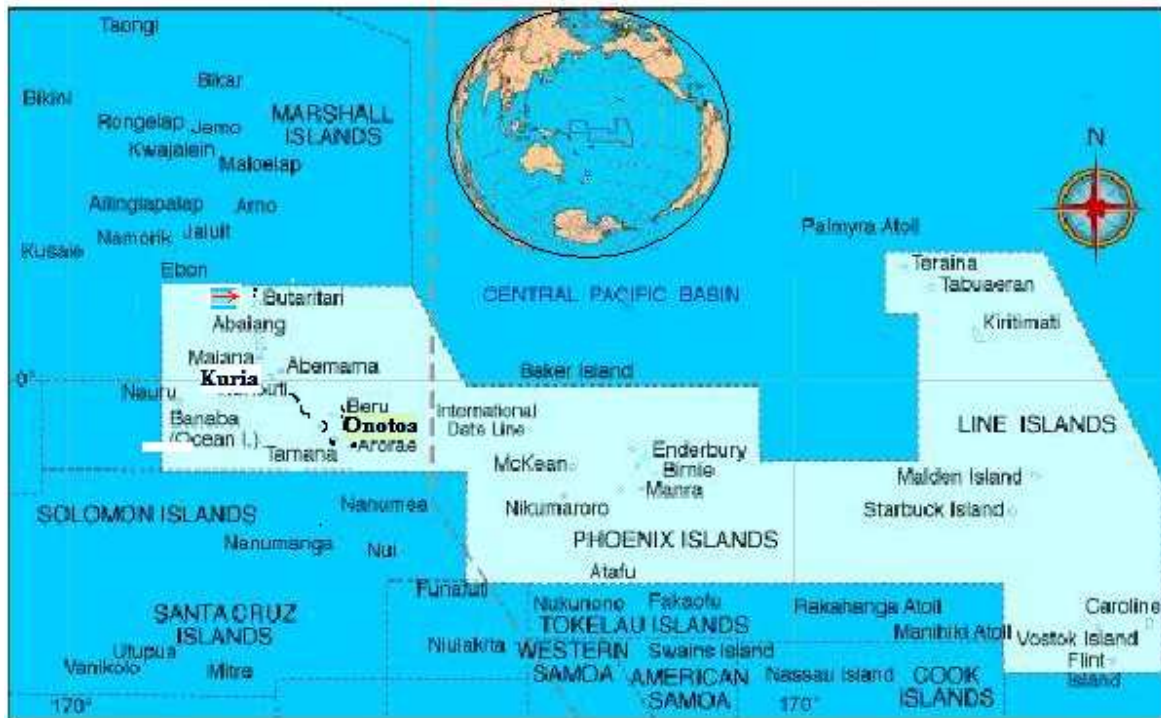


Figure 1a: Islands in the Gilbert Group, Kiribati.

## 1.5 History and Background

Butaritari is an island in the northern part of the Kiribati Group. It has an area of 13.6 square kilometres and an estimated population of 3,164. Butaritari is well known as the island where Robert Louis Stevenson lived in the late nineteenth century. Besides Tarawa and Abemama Atolls, Butaritari has one of the best anchorage for medium sized boats.

Robert Louis Stevenson wrote of Kiribati *mwaie* (*ruoia* – a dance) that was performed on Butaritari in his days on the island: "Of all they call dance in the Pacific, the performance I saw on Butaritari was easily the best Gilbertese dance appeals to the soul: it makes one thrill with

emotion, it uplifts one, it conquers one: it has the essence of all great art: an immediate and far from exhausted appeal".

Permanent traders established themselves in the Gilbert Group during the 1850's and by the 1860's the European population in the group had increased to about 50. They traded European manufactured goods for such products as coconut oil and turtle shell. The making of coconut oil and the preservation of turtle shell were not new skills to the Gilbertese and they were doing them in exchange for new items being brought in. Because of the greater fertility and larger rainfall in the northern islands greater production was possible there. This, plus the fact that the best anchorage in the group were at Tarawa, Abemama and Butaritari made the northern Gilberts the centre of the coconut oil trade (Talu, *et al.*, 1984).

The first resident traders in the Gilberts were Randell and Durant. Both landed at Tikurere, an islet of Butaritari in 1846. Randell remained there but Durant soon left for Makin. Randell and Durant set themselves up as independent traders - however, the prize they received for the coconut oil was many times what was returned to the Gilbertese in trade goods (Talu, *et al.*, 1984).

Japanese military interest in the Gilbert Group dated from the earliest days of the war. The primary strategic object of the Japanese expansion at the beginning of the war was the occupation and development of what was called the southern resources area which was considered vital to Japan's economic welfare as it contained most of the essential raw materials. It was also believed necessary to maintain free lines of communication with the Japanese homeland to cripple naval strength in the Pacific and to establish a strong defensive perimeter to protect the homeland and its new economic adjunct to the south.

The first bombs dropped in the colony were by the Japanese on 8<sup>th</sup> December 1941 when a four-engined flying-boat dropped six on the Government Headquarters at Banaba (Ocean Island). But the first islands to be occupied by the Japanese were Makin and Butaritari on 9<sup>th</sup> December 1941. The force consisted of 200 to 300 troops from the 51st Guard Force based on Jaluit. At Butaritari, the troops landed at Ukiangang. The Commissioner, Mr. H. C. Williams, went to meet them. They held him prisoner and he was sent to Tokyo. The troops advanced north and settled

at Butaritari village. They chased the traders away, took all the things from their stores, and turned On Chong's store into their barracks.

Butaritari 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 area now called Kiribati has been inhabited by Micronesians speaking the same Oceanic language since sometime between 3000 BC and 1300 AD. The area was not isolated; invaders from Tonga and Fiji later introduced Polynesian and Melanesian cultural aspects, respectively. Inter-marriage tended to blur cultural differences and resulted in a significant degree of cultural homogenisation.

#### *Colonial era*

From the early 19th century, Western whalers, merchant vessels and slave traders visited the islands, introducing diseases and firearms. The first British settlers arrived in 1837. In 1892 the Gilbert Islands consented to become a British protectorate together with the nearby Ellice Islands. Together they became the crown colony of the Gilbert and Ellice Islands in 1916. Kiritimati (Christmas Island) became part of the colony in 1919 and the Phoenix Islands were added in 1937. 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).

In most of the northern islands, there are several district leaders, each of whom leads a group of *kaainga* (family and immediate members). On Makin and Butaritari one chief was recognised as paramount. The chiefly dynasty of Makin and Butaritari was consolidated under one Uea, the latest being Nauraura Nakoriri, before and after the arrival of the British rule. The heads of the *kainga* were always consulted on matters affecting the community and could initiate action, but always they were obliged to seek the approval of the chief, who provided overall leadership and regulated relationships amongst the *kaainga*.

#### *Independence to present day*

The Gilbert and Ellice Islands gained self-rule in 1971, and were separated in 1975 and granted internal self-government by Britain. In 1978 the Ellice Islands became the independent nation of

Tuvalu. The Gilbert Islands became independent as Kiribati on July 12, 1979. Although the indigenous Gilbertese language name for the Gilbert Islands proper is "Tungaru", the new state chose the name "Kiribati", the Gilbertese rendition of "Gilberts", as an equivalent of the former colony to acknowledge the inclusion of Banaba, the Line Islands, and the Phoenix Islands, which were never considered part of the Gilberts chain. In the Treaty of Tarawa, signed shortly after independence and ratified in 1983, the United States relinquished all claims to the sparsely inhabited Phoenix Islands and those of the Line Islands that are part of Kiribati territory.

## **1.6 Geography**

Butaritari is one of the medium sized atolls in the Gilberts chain of Kiribati, located just south of Little Makin at 3° north of the equator. The atoll is roughly 4-sided and nearly 30 km across in the east west direction, and averages about 15 km north to south.

The reef is more submerged and broken into several broad channels along the west side. Small islets are found on reef sections between these channels. The atoll reef is continuous but almost without islets along the north side. In the northeast corner, the reef is some 1.75 km across and with only scattered small islet development. Thus, the lagoon of Butaritari is very open to exchange with the ocean. The lagoon is deep and can accommodate medium sized to large ships, though the entrance passages are relatively narrow.

The south and southeast portion of the atoll comprises a nearly continuous islet, broken only by a single, broad section of inter-islet reef. These islets are mostly between 0.2 and 0.5 km across, but widen in the areas where the reef changes directions. Mangrove swamps appear well developed in these latter areas as well as all along the southern lagoon shore. Narrow islets are somewhat characteristic of Kiribati atolls running east-west.

Bikati and Bikatieta islets occupy a corner of the reef at the extreme northwest tip of the atoll, bordering what may be a second small lagoon to the north of the main lagoon. Larger Bikati (2 by 0.5 km) harbours a village. The main village is Butaritari, population now probably about 1800 to 2000. This is the largest village outside of Tarawa. The total island population is between 3,000 and 4,000 (Census, 2005). Typical annual rainfall is about 4 m, compared with

about 2 m on Tarawa Atoll and 1 m in the far south of Kiribati. Rainfall on Butaritari is enhanced during an El Niño.



*Fig. 1b: Map of Butaritari Island*

### **1.7 Myths and Legends of Butaritari Island**

Details of the myths and legends related to Butaritari can be cited from the writings of Sir Arthur Grimble (*Legends from the Gilbert Islands*) and Sir Harry Maude.

This is one of the versions on how Kiribati came into being. “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 spirits inhabitants on it. This land is now called South Tabiteuea. Feeling satisfied with his marvellous work, he left and went further north. At last, he sighted 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. These are now referred to as the islands of North Kiribati”. Geographically these islands lie north of the Equator.

Butaritari people believe that three islets were created in the Northern Gilberts (Kiribati) at the time when the earth and the sky were separated. They also say that Samoa, Tabiteuea, Tarawa and later the rest of the Gilbert Islands, were originally clouds transformed into islands when

they came into contact with the plant called Terenga, which spouted from Awaiki the core of the earth. This tree became Te Kaintikuaba which the spirits of Te Bomatemaki saw emerging in Samoan soil. They were said to have rushed to it and remained there. The inhabitants of the islands were those spirits who dispersed from Te Kaintikuaba when it was destroyed by Teuribaba, another inhabitant. The dispersals were believed to have been to the north of the Gilberts. Their descendants later returned to the Gilberts and travelled throughout the group.

### **1.8 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 Butaritari 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 [Makin]	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>Butaritari Atoll, northern Gilbert; 9 main villages 6workshop participants from each village representing all village sectors..</i>	<i>Coastal erosion</i>	<i>King tides, storm surge and sea level rise. [aggregate mining on the rise for more permanent structures]</i>	<i>Coastline at Ukiangang, Keuea and Bikaati, rows of coconut trees and coastal vegetation are sitting on the eroded beaches; babai pits affected.</i>	<i>Ukiangang, Keuea, Bikaati</i>	<i>3 very serious</i>	<i>Law to regulate aggregate mining on the island; properly designed seawall along currently affected areas- reactive.</i>	<i>Ministry of Works and Public Utilities; MELAD, MISA.</i>
<i>Butaritari Atoll.</i>	<i>Babai plants die from saltwater intrusion</i>	<i>Water intrusion to babai pits at Ukiangang, Taniamaikai, Tanimainiku and Bikaati.</i>	<i>Related to extreme high tides ,aggregate mining and coastline elevation some of it is below sea level; porosity nature of soil mainly composed of gravel, sand and coral pebbles.</i>	<i>South-west coast of Bikaati, Center of Taniamaikai and Tanimainiku villages, north of Ukiangang.</i>	<i>3 – very serious and needs urgent attention</i>	<i>Construction of proper concrete wall to reduce seawater overtopping; to relocate pits to areas further inland.</i>	<i>Ministry of Works and Public Utilities; MELAD, MISA</i>

<i>Butaritari Atoll</i>	<i>Fresh water becoming brackish day by day. during drought period</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>Most villages along the western coastline, some are on the windward side.</i>	<i>I not very serious right now.</i>	<i>More water catchments such as plastic tanks, cisterns should be encouraged. Ground water must be enhanced, wells must be well looked after, covered with board and properly secured with concrete around it.</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>Butaritari Atoll</i>	<i>Terrestrial resources</i>	<i>Drought</i>	<i>Fruit trees (main in particular for fruit disease); general vegetation affected.</i>	<i>All villages</i>	<i>I not very serious</i>	<i>Replanting and research into cause of breadfruit problem.</i>	<i>MELAD, MISA</i>

### 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>
<b>Bikaati Islet, Tanimaiaki, Tanimainiku, Ukiangang.</b>	<i>Terrestrial resources (babai pits)</i>	3	<i>MELAD, MISA, MWPU</i>	<i>Concrete walls and relocation to midland.</i>	
<b>Keuea, Bikaati, Ukiangang</b>	<i>Coastal erosion</i>	3	<i>MISA, MWPU/PWD</i>	<i>None</i>	
	<i>Water</i>	2	<i>MWPU/PUB, MISA</i>	<i>None</i>	
	<i>Marine resources</i>	2	<i>MFMRD, MELAD</i>	<i>None</i>	
	<i>Private and public assets</i>	1	<i>MISA, MWPU, MELAD</i>	<i>none</i>	

**Ranking islands for responses to risks – National Level (form 1.3)**

<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>Terrestrial – babai infiltrated with seawater</i>	<i>Many babai pits are not cultivated after the latest intrusion</i>	<i>Human mistake in leaving artificial channel open for freshwater run-off hence causing seawater overtopping during extreme high tides and bad storms</i>	<i>Construction of proper and long term channel to allow fresh water run-off only – a one way system</i>	<i>MISA, MELAD, MWPU/PWD</i>	<i>To be determined after inspection and EIA</i>	<i>To be identified</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>Finfish and non-finish resources</i>	<i>All finfish are declining.</i>	<i>Overfishing, unregulated fishing</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, MISA, OAG</i>		
<i>Fruit trees (terrestrial)</i>	<i>Just recovering after the latest drought</i>	<i>No replanting scheme, drought</i>	<i>Replanting scheme encouraged, home gardening encouraged- high priority.</i>	<i>MELAD, MISA</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>Eroded coastline north of Teibo Causeway and Keuea village.</i>	<i>Storm search and king high tide over-wash</i>	<i>Unpredicted impact of CC and SLR on coastline; Accretion at Teibo Causeway linked to erosion.</i>	<i>Very urgent response to areas mostly affected by man-made structure and natural events.</i>	<i>MISA, MWPU, Makin Island Council</i>	Approx. \$200,000 (material, labour and administration)	tbi
<i>Babai pits</i>	<i>Storm search and king high tide over-wash</i>	<i>Unpredicted impact of CC and SLR on coastline</i>	<i>Very urgent</i>	<i>MELAD, MISA, MWPU, Makin Island Council</i>	\$150,000	tbi

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

Population by sex	Age groups	Schools/Public utilities	Government/non-government paid workers	Major occupation	Production/export	Imports
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
<i>see MISA report and Kiribati Census 2005</i>	<i>see 2005 Census</i>	<i>refer to Education Digest 2005</i>	<i>refer to Education Digest 2005</i>	<i>refer to Education Digest 2005</i>	<i>refer to Kiribati Balance of Trade, 2005 (MFED)</i>	<i>refer to Kiribati Balance of Trade 2005 (MFED)</i>

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

Island	Type of resource, environment and infrastructure	Ranking score (Forms 2a and 2b)	Agency/ministry for further observation and research	Partners	Start-up date
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>Butaritari, northern Gilbert Group</i>	<i>babai dying</i>	<i>3</i>	<i>MISA, MWPU, MELAD</i>	<i>MWPU</i>	<i>na</i>
<i>Butaritari</i>	<i>Coastal erosion(main road between Teibo Causeway and Keuea)</i>	<i>3</i>	<i>MISA, MWPU, MELAD</i>	<i>MWPU</i>	<i>na</i>
<i>Butaritari</i>	<i>water</i>	<i>1</i>	<i>MWPU, MISA</i>	<i>MWPU</i>	<i>na</i>
<i>Butaritari</i>	<i>Marine</i>	<i>1</i>	<i>Fisheries</i>	<i>MFMRD</i>	<i>Not available</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

## 1.9 Topography

Butaritari Island is a lagoon island. Its fringing barrier reef lies at windward side and bends at both ends forming an underwater barrier with multiple passes at the leeward side. The shoreline slightly rises from sea level to over a meter at the highest point. Ruderal vegetation is common along the coastal area with more defined vegetation into the bushland (Thaman and Tebano, 1995). The midland may be slightly higher than the coastal areas by a few centimeters while the ocean beach front is even higher as the waves keep building up the shoreline with more sand and coral debris. The windward shoreline is protected with rocky shores while the leeward western portion is mainly made up of sandy beach that gently slopes down to a reef flat that in turn connects to a lagoon, a back reef and open sea. There are *babai* pits along the main road running through main villages and close to the lagoon or ocean side, more pits can be found further inland only accessible by bush tracks.

## 1.10 Main Settlements

Figure 1c below shows the approximate location of the main villages. The isolated far north-western village is on Bikaati Islet, very northern village on the mainland is Kuma; going in a southward direction are villages of Keuea, Tanimaiaki, Tanimainiku, Tabonuea, Antekana, Butaritari and Ukiangang. Butaritari Village is the administrative headquarter of Butaritari Island Council.

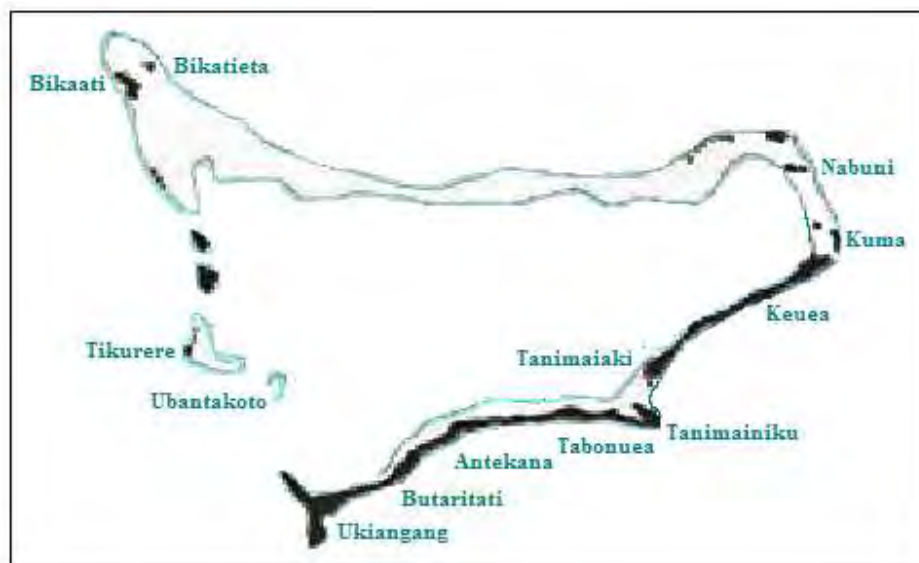


Fig. 1c: Map of Butaritari showing main villages.

## **Chapter 2: CONSULTATION FINDINGS**

The findings of the Butaritari consultation on the status of natural resources, coastal erosion, water resources and the marine and physical environments is a combination of data and information gathered during the five days of consultation, field observations and interviews with people of different backgrounds. Interviews were kept as informal as possible.

### **2.1 Status of Natural Resources**

#### *2.1.1 Marine Living Resources*

Participants claimed that the marine resources, fin-fish in particular, is not as used to be prior to the closure of the interisland passage with Teibo Causeway in the late 80s. Reef and pelagic bonefish species declined, some disappeared. Mangrove crab, *te mwanai* (*Cardissoma* sp.) has declined in numbers. The cause of the problem squarely falls on the closure of the inter-islet passage and a substantial increase in human population.

Accretion along the lagoon side of the causeway is causing many erosion problems along the coastlines in both northward and southward directions. The volume of cool and oxygenated seawater replenishing the lagoon had reduced considerably to almost zero. This resulted in oxygen starvation, reduced flushing of the lagoon, reduction in food particles in the water column, warm lagoon water and other biological and ecological problems. The re-opening of the passageway to reverse the current impacts will be too costly in terms of economic and social aspects.

The use of traditional canoes is gradually being overtaken by motorized canoes and skiff boats. The use of monofilament gill nets is on the rise. Over a hundred fishing nets were recorded in 2005 and it is assumed this number has increased since. Shark is rarely landed, could be associated with a decline in their population due to overfishing for shark fin trade. Other reef resources such as octopus - *te kiika* or *kao* (*Octopus* sp.) and lobsters – *te nnewe* (*Panulirus* sp.) are unheard of if they are ever being fished.

Moray eel traps are few (Fig. 2a) and stone fish traps are a thing of the past as most existing ones are no longer maintained. Butaritari had about twenty skiff and motorized boats and less than one

hundred traditional canoes (Census, 2005), the numbers are unlikely to change much as the number of people living on Butaritari is pretty much stable.

An ice plant provides ice cubes for the fishermen but not much fish goes to the plant itself, most of the fish is sold on the road side or at fishermen's residents. There are no obvious fishery activities enhancing the fishermen's skills or conservation strategies for resource management purposes. Oyster cultivation trial is ongoing on the island for pearl trade.

Ciguateric moray eels and other carnivorous fish such as *te ingo* (*Lutjanus bohar*) are common in well known lagoon reefs but fishermen know where not to fish. The consultation participants also raised concerns over the issue. A response from the team advised that ciguatera is no longer a problem but a 'blessing in disguise' in that the toxic areas and fishes therein are the conservation areas and breeding stocks, respectively, for the sustainable fish stocks in Butaritari reefs and lagoon.



Fig. 2a: Moray eel traps (photo by Bwe Temakei, 6-9-08)

Fish species brought to land by fishermen during the one week stay on the island comprised the trevallies, skip jack – *te ati* (*Katsuwonus pelamis*) and yellow-fin tuna – *te baibo* (*Thunnus albacore*). Giant clams such as *te were* (*Tridacna maxima*) and *te werematai* (*T. squamosa*) are plentiful around Bikaati islet (Fig. 1c). *Te kima* (*Tridacna gigas*) is rarely harvested as the smaller species are abundant.

The most common preservation method practised on Butaritari is salting and sun drying; those who have dip-freezers powered by gasoline generators keep their catches fresh. Fish baking on

dug-out earthen ovens are unheard of. Overall, marine resources on Butaritari are being heavily exploited to feed the exploding population but there is no protein shortage as far as the island people are concerned. *Cardissoma* crab is readily available. However, higher water temperatures associated with climate variability and climate change may seriously impact the living corals important for reef fish sustainability. Warmer water and a change in current patterns may prevent pelagic fish species such as tunas from coming closer to land hence forcing fishermen to go out to sea farther. The combined effect of all these factors may have a detrimental impact on marine living resources and food security at large. Adaptive measures in terms of the latter must be seriously considered at a village and island level.

### 2.1.2 Terrestrial Living Resources

Like most other islands in Kiribati, Butaritari has few terrestrial living resources but much higher rainfall than the rest of the islands. These include fruit trees, fruit plants and garden plants. Of particular importance for the sustenance of the island's population coconut (*Cocos nucifera*), a giant taro – *babai* (*Cyrtosperma chamissionis*), breadfruit and pandanus, like fish, are the main starch staples. The most recent drought had a drastic impact not only on plants and trees but on other terrestrial animal resources as well.

On Butaritari *babai* is cultivated and utilized almost on a daily basis and particularly on special and important occasions, so as banana and *te mai* (breadfruit – *Artocarpus* varieties). Pandanus - *te tou* (*Pandanus tectorius*) compliment the main staples when in season. Banana varieties (*Musa*) grow on the island and papaya (*Carica papaya*) varieties and citrus fruits such as lemon and lime are also grown. Banana is exported to Tarawa and has special air freight. Vegetable gardening for Chinese cabbage is practised but on a small scale. *Te karewe* – fresh toddy is popularly drunk but the impact of drought on coconut trees is significant. Toddy provides a daily intake of Vitamin C.

The cultivation of *babai* by gang workers known as *te karoronga* or *kawawa* is practised but not as used to be as family members are getting larger and would not require extra hands in most cases. The burning of coconut leaf compost and dead shrubs is practiced but to a small extent as compared with Kuria. Bush fires deliberately set or by careless deeds are dealt with by *kaainga* members as most land plots are shared amongst related *kaainga* members. Pandanus is more

common in villages but appeared not to be doing well away from dwellings. Replanting activities are unheard of perhaps only on small scales at family land level.

The storage of coconut for future needs is not heard of, nor the harvest of pandanus to make *tuae* or *kabubu*, pandanus cake and powder, respectively. The making of *bwiro* from breadfruit for long storage purpose, traditional for the northerners is rarely if not practised these days. These all mean that none of the plant or tree fruits are processed for safe keeping for future use and food security. The imminent impact of prolonged droughts could be serious enough if adaptation measures are not devised soon. Fruit juice making on Tarawa may look northward in terms of fruit provision for the small industry.

Land-based reared protein sources, pigs and chickens (Figs. 2b, 2c) are abundant and made available for special occasions. While the local pig breed is fed mainly on coconut and fish shortage of these may seriously affect the number of animals available on the island. Complimentary grass feed of *mtea* (*Portulaca samoensis*), *wao* (*Boerhavia repens*) and *booi* (*Portulaca lutea*) may not be available in times of drought. While pigs are commonly roped on one of the hind legs or forearms chickens are domesticated and run wild in villages. Penning and fencing using local material was the usual practice but the declining availability of them offers no choice but letting chickens roam freely and pigs tied to a bush that provides shade during most of the day.

The crab *te mwanai* (*Cardissoma* sp.) provides protein almost on a daily basis but the status of its populations are not yet being assessed; the residents claim they are not plentiful as used to be years ago.



Fig. 2b: Roaming chicken (photo by Erimeta Barako); Fig. 2c: Pig feeding (photo by Erimeta Barako)

The avifauna resource of Butaritari exists on the uninhabited islets but is insignificant in numbers as compared with those in the Phoenix Islands. There are nesting black noddies and white terns around the island. The birds, although small in size, may provide some protein source when marine and terrestrial sources are scarce. Their habitats must be protected by law.



Fig.2d: Views at Teibo Causeway (from top left to right). View across causeway; accretion on lagoon side; one of five culverts; accretion on one side of culvert (photos by Temakei Tebano)

It appears from information collected that the marine living resources of Butaritari are heavily exploited but can sustain the current pressure. However, there is a need to enhance finfish species popularly fished by putting in place management plans to meet the need of future generations. More importantly is a need to re-look at best options that may bring back those resources that are already lost as a result of some activities detrimental to the environment and marine resources. This refers to reopening the inter-islet passage and reworking the current causeway to allow substantial water flow and water exchange between the ocean and the lagoon. This will in effect reduce coastal erosion which is a chronic environmental problem on Butaritari where Teibo Causeway is (Fig. 2d). Observation on the current status of the existing causeway is that it will continue causing more erosion along the entire coastline of the island. The impacts will be difficult and costly to revert and the valuable resources already lost will remain so in the years to come. Non-fish resources need to be managed and protected from over-harvest, in particular sea cucumbers and small *Tridacna* species.

### 2.1.3 Non-living resources

Ground well water is the main source of water for many purposes on the island. Community rainwater tanks and reservoirs are few and not adequate to cater for the need of large numbers of people during prolonged drought periods. There are also few concrete private homes with aluminum roofing, the Butaritari Island Council owns about a dozen buildings built of more long term imported material. Properly constructed water cisterns will last a long time and must be encouraged. Plastic water tanks have a short life span given the hot humid environmental condition that degrades the material in a very short time.

Most wells, if not all, seen are not covered. The concrete blocks or coral boulders surrounding the outer rim are either too low or broken to effectively stop seepage of dirty water from the surrounding during heavy rains. The 2005 Census showed that over one hundred families are dependent on rainwater and over five hundred households depend on ground well water.

There is a need to improve a water system throughout the island with particular note on schools that depend on ground water from elsewhere. A good example is Anginbaiatooa Primary School at the north end of Teibo Causeway (Fig.2e). A concrete cistern with an aluminum roof to self fill itself is ideal for the school's drinking water requirement and supported with a solar operated water system to provide the remaining home water requirements. The latter is the only means of portable water to the school staff community.



Fig. 2e: An overhead tank on an islet providing water for Anginbaiatooa Primary School, Keue; a pipe bringing water to the school; a solar pump (photo by Titeem Auatabu)

For all villages on Butaritari alternative well sites must be identified and reserved for future needs. The construction of concrete water catchments at public places such as church compounds that have huge chapels and meeting houses, *maneaba*, with aluminum roofing must be

encouraged. Wells need to be properly secured from surface water flooding and potential pollutants.

Sanitation cannot be separated from a water system as it is one of the main causes of ground water pollution and contamination. While there is a substantial number of land-based toilets recorded on Butaritari how well are they functioning and managed is any body's guess. There is a need to properly determine the current status of the system(s) to ensure the safety of ground water is not compromised.

Aggregate mining for construction work is the major contributing factor to coastal erosion. Much of construction work requiring sand and gravel is apparently done by the Butaritari Island Council. Construction works at a household and church community levels in terms of land reclamation and more permanent buildings also add to the negative impacts on the coastal environment. Reducing or controlling aggregate mining remains with the Island Council and its peoples. A bylaw, specific for Butaritari, that regulates these activities and complimenting the 2007 Revised Environment Act needs to be put in place soonest. Alternative sources need to be identified to ensure Butaritari coastline is protected from unprecedented surge and bad storms.

## **2.2 Status of the Physical Environment**

### *2.2.1 The Marine Environment*

In this report the marine environment will include the sea surrounding Butaritari Island, a reef and intertidal reef zone, marine fauna and flora, traditional navigation skills in relation to weather forecasting and current patterns. Other relevant issues are also discussed.

Butaritari by definition is an atoll with a lagoon like most islands in the Group. The physical status of the marine environment can be described in terms of a well developed and open lagoon with flushing from the leeward oceanic waters, hence supporting healthy patch reefs with a variety of branching, massive and calcareous coral species. The lagoon is more than 5 meters deep in most areas thus allowing medium sized vessels enter and leave at any time of tide.

The north western portion of the lagoon is partly submerged and the barrier reef can only allow small crafts enter or exit the lagoon during high tides. It is some 1.75 kilometers across with few islet developments. The consultation participants claimed that the lagoon water closer to land is

dirty and not as used to be years ago. This is due to the dumping of degradable and non-degradable rubbish in the lagoon, the harvest of sea cucumbers in great numbers and gutting them in the sea, and the use of the beach and sea for toileting purposes. The key factor is a large number of people living on the island which exceeds 3,000 according to 2005 Census. The increasing number of outboard motors and the more frequent visits of marine vessels contribute to water pollution in many ways. The west-oceanic water is undoubtedly healthy and clean and provides good flushing to the lagoon.

Finfish are abundant among corals and in the open sea beyond the reefs. Sea shells in terms of clams are abundant on submerged reefs and patch reefs. Micro-organisms, although not significant in terms of food source, occupy a range of ecological micro habitats within the entire reef system. Reefs surrounding Bikaati Islet are full of life with clams in particular.

The experience of fishermen over changes in weather patterns is confirmed over the lessening usefulness of traditional navigation skills in terms of travelling and fishing seasons. The weather pattern has changed, that is, the southerlies come at the time of the northerlies and vice versa. The current directions also change, meaning that the timing of the eastward or landward bound current bringing pelagic fish close to the fringing reefs has also changed. This creates confusion among the fishing communities on Butaritari. Adjusting and re-inventing fishing seasons is a challenge to the fishermen of today.

### *2.2.2 The Coastal Environment*

This section covers the coastal environment discussing erosion, the beach, the rocky shores, aggregates and mining, the coastal strands, bushes and shrubs, and coral boulder removal.

Observations and assessments from this visit consider coastal erosion and *babai* pit flooding on Butaritari as serious problems and a threat to properties and people's lives. The seriousness is measured in terms of rows of coconut trees and vegetation disappearing or standing on the beach, and the increasing number of *babai* pits being flooded during extreme high tides (Fig. 2f). All eroded sites and flooded pits were visited, estimated costs to protect them were determined. Pictures were also taken as proof of their current status (Fig. 3a), their locations were recorded with a GPS (Table 1).



*Fig. 2f: a concrete wall to reduce babai pit flooding; an eroded coastline giving way to flooding during extreme high tides (photos by Titeem Auatabu)*

The most affected area that requires urgent attention is 24 meters north of a concrete classroom at Anginibaiatooa Primary School, locations of 03°06.861'N and 172°53.535'E (Fig. g). This is part of the main road less than 5 meters wide and prone to further extreme high tides and bad weather. A channel will cut through sooner or later before end of 2008 if the estimate is correct.



*Fig g: A close look at the badly eroded area north of Anginibaiatooa Primary School.*

The impact of sea level rise is obscured by human destructive activities such as aggregate mining and land reclamation, to name a few. On the other hand, the 2007 revised Environment Act has not made any impact on coastal protection on the outer islands but is making progress on South Tarawa and Betio (Tebano-Farren pers. comm., 2008).

Table 1: Eroded areas, location and approximate costs (provided by Ereata Kakau, Civil Engineering Section, MWPU).

<b>Island</b>	<b>District/Area</b>	<b>Location</b>	<b>Cost (\$)</b>	<b>Total (\$)</b>
Butaritari	Tanimaiaki Namon-rua		34,800	
	Tanimainiku Namon-rua 1  [2]	03°05.953'E; 172°53.631'N  03°05.932'E; 172°53.612'N  03°06.068'E; 172°53.611'N  03°06.021'E; 172°53.637'N	58,000	
	Tanimainiku Nakiroro clinic	03°06.278'N 172°53.503'E	13,510	
	Ukiangang Namon-rua		65,200	
	Keuea [Anginibaiatooa Primary School]	03°06.861'N; 172°53.535'E	204,410	
				<b>497,520</b>

The flooding of *babai* pits is the result of natural and human induced causes. Natural causes include extreme high tides, surge storms, natural shifting of aggregates underpinned by seasonal trade winds, ElNino and LaNina which now control global weather patterns, and to some extent a refutable increase in sea level. Human induced causes include aggregate mining from the surrounding areas of the pits, and coastal erosion linked to land reclamation in the same area where the pits are. Pits initially dug close to shorelines were a result of unforeseen scenarios such as sea level rise and extreme weather patterns. These call for some protection in terms of concrete blocks erected to prevent further flooding; this can be provided as the relocation option is impossible. The pits are likely to be abandoned in 25 to 50 years time when sea level rise continues at a current predicted rate. For food security reason community *babai* pits and private pits must at this time be considered for more appropriate locations further inland in the case of complete inundation of the existing ones.

There are not many seawalls or land reclamations on Butaritari. Those recorded in the 2005 Census were less than forty in total and observation on the island has not come across any newly constructed ones. Coastal erosion is currently concentrated at the Teibo Causeway area. Those found in other locations away from the causeway are either associated with aggregate mining or seawall/land reclamation activities.

A complete review of the policy and design of seawall construction needs to be undertaken, which currently is the case as far as civil engineering is concerned. Possible methods to remedy coastal erosion recommended include re-opening an inter-islet channel closed by the existing causeway, relocation of roads to further inland and replanting of mangroves (where appropriate) to stabilize flat areas (Gillie, 1993).

Recommendations regarding causeways are similar to those made by SOPAC. In the case for Butaritari a specific focus should be on more culverts and small bridges in between across Teibo Causeway to provide much needed water flow. The removal of aggregate at the lagoon side of Teibo Causeway must go hand in hand with the former. As for *babai* pits concrete walls may provide short term protection. But the planting of mangroves below the beach mark coupled with enhancement of coastal vegetation along the shore line may provide additional protection. Most vulnerable areas on the island must be on the high priority list.

### *2.2.3 The Land Environment*

This section discusses the locations or sites of villages in relation to storm surges and overtopping events, water issues, house gardening, land clearing practices, replanting and location of cemeteries.

Before the British colonial era individual *kaalinga* (family and immediate members) lived in hamlets built on their own plot of land. When the British Crown learnt of tribal warfare between *kaingas*, mainly for the purpose of grabbing land from others as was the main wealth in those days, all isolated hamlets were moved and erected in a chosen area which is called *te kaawa* or village. The move was to foster harmony between and among warring tribes hence creating a long and ever lasting peace among all island populations. The preferred village locations were close to the sea at the lagoon side where most fishing activities are carried out; canoes had to be put in and out of the water almost on a daily basis.

Villages were rarely located at the windward side, except in a few cases like Makin where overcrowding is becoming a problem. Butaritari is a fairly large island by Kiribati standard and supports over 3,000 people in 8 villages. All the villages at Butaritari Island, except Ukiangang, are situated at the lagoon side. This is where most of the fruit trees and plants are found. Coconut plantations occupy most of the arable land area. Increases in population on Butaritari will no doubt exacerbate the potential risks and vulnerabilities in terms of portable water, declining terrestrial and marine food sources, sanitation systems affecting sea water and ground water sources, and other related over-population problems.

The initial choice of village locations was most appropriate then but in light of the current climate change, climate variability and sea level rise homes and other physical structures are at risk and vulnerable to any unprecedented storm and bad weather events. Private and community properties like *babai* pits are threatened with sea water intrusion in some identified areas on Butaritari mainland with much impact felt on Bikaati Islet.

The increase in human population requires more dwellings and homes, hence the expansion of villages is imminent. Development projects, communal or private, in the form of construction work that requires aggregate mining and timber material, certainly contribute to the destruction of the environment and the land plant resources at large. Productive land shrinks as villages expand and marine and terrestrial resources are constantly and increasingly being tapped. Water consumption increases and the drawing of more and more water to meet daily requirements will affect the drinkability of ground water. Compounding these problems is drought that can seriously impact all forms of life. The relocation of many dwellings in the existing villages must be seriously considered at a home, village and Island Council level as an adaptation measure in light of the impending impact of climate change scenarios.

The current water status on Butaritari is not as serious as compared to several months ago. However, more frequent and prolonged droughts will mostly affect Bikaati Islet as it has limited ground water reserve and prone to storm surges, extreme tides and bad weather. The storage of rainwater with tanks and concrete cisterns must be encouraged at Butaritari mainland and particularly so at Bikaati. The current capacity to hold rainwater is insignificant on Butaritari. Concrete water cisterns last longer and require little maintenance, this must be encouraged. During the Christian Missionaries era concrete water cisterns made of local lime cement

obtained from burned coral were popular. They have been abandoned and corrugated iron tanks replaced them. Today plastic tanks are most popular but have limited and short life span.

While the Butaritari Island Council owns a number of semi-concrete buildings with aluminum roofing a large number of catchments will suffice to provide government and island council workers with rain water for a long period if the thinking is made a reality. Private and communal water catchments must be encouraged to ensure adequate drinking water is available when required.

Equally important is the improvement of the existing wells to protect them from contamination of all forms. The use of hand and solar pumps to provide village households with portable well water can further improve the standard and quality of water as it will no longer require bailing. Potential ground water sites must be identified and protected from activities such as animal husbandry and gardening, erection of toilet blocks, the digging of *babai* pits and cemeteries.

House gardening on Butaritari is insignificant in that only less than a dozen households at Butaritari village are engaged in the activity. Although home gardening can produce a variety of vegetables there is no ready market for it except a home and local consumption. This weakens the desire of many families to produce such items. Pumpkin or squash production is quite popular before the recent drought period but is slowly coming back. Banana is exported to Tarawa on a special arrangement with Air Kiribati for special airfreight. A similar arrangement may encourage the production of a Chinese cabbage, lemons and limes, and papaya.

The planting of a variety of breadfruit trees from around the Pacific will ensure the longer fruiting season hence reducing the consumption of imported rice and flour. Similarly, the planting of pandanus varieties that are good for making *tuae* and *kabubu* must be encouraged. The storing of coconut for future needy times must also be encouraged. These lifestyles do not exist on the island and experts from AMAK or other women groups must be involved.

Animal husbandry, in terms of swine and poultry, must form the basis of land protein availability when other sources are at stake. The agricultural activities must be strengthened to ensure all local produce can sustain the livelihood of Butaritari population in times of food shortage. It is imperative that a bylaw is strengthened to ensure potential ground water sources are not unnecessarily contaminated or polluted with activities discussed above.

Similarly, the dumping of rubbish (compost and plastic) on the beach or the coastal areas is detrimental to the marine and coastal environments. Proper disposal sites must be identified by the Butaritari Island Council to ensure waste disposal sites are properly utilized and co-managed.

#### *2.2.4 The Physical Structures*

This section looks at public and private structures in the context of their vulnerabilities to climate change and sea rise and how the situations can be improved through the design of appropriate adaptation strategies that can be self-contained or assisted by government.

##### *Public Structures*

There are no public structures vulnerable to coastal erosion or other natural/human induced causes except those created by humans. Settlements close to reclaimed lands experience coastal erosion and accretion in most instances. Land reclamation interferes with natural beach movement thus causing accretion on one side and erosion on the other.

##### *Private Structures*

Seawalls and land reclamations are being mixed up in most considerations. The distinction between them is that seawalls are constructed at the highest tide mark while land reclamation extends to below highest tide mark; in some cases reclaimed lands are sitting on a reef-flat or mudflat.

## **Chapter 3: COMMUNICATION AND TRANSPORT**

### **3.1 Voice Communication, the Media**

It is only in recent months that satellite telephones were installed on Butaritari as part of improving voice communication on the outer islands. Telephone links with Tarawa and other islands were installed on the island in late 2007. About ten CB radios were reported operational on Butaritari privately owned by churches or individuals. Butaritari has more than 300 transistor radios reported in 2005 (Census, 2005). Radio Kiribati and FM98 provide daily local, regional and world news. Weather forecasts are also broadcasted by Radio Kiribati when made available from the Meteorological Office in Betio. Local newspapers like Uekera, TeMauri, Tarakai, Newstar and Kiribati Times rarely make any impact on the outer islands. Their major markets are Betio and South Tarawa. Daily communication with Butaritari via telephone or CB radio (about 20 currently operational) can be handy in case of unprecedented disasters caused by storm surges and seawater inundation, and other similar events linked to climate change and sea level rise.

### **2.3 Road, Sea and Air Transportation**

Bicycles or push bikes are the most common form of road transportation that serves many purposes including coconut and firewood collection. There were over 300 units recorded in Census 2005. The next most popular are motorcycles nearing 100 in all and are increasing with a most popular made of Honda trailers. Several trucks are owned by individual businessmen, churches or Butaritari Island Council. The later provides daily transportation for school children but are also made available on a hire basis.

Traditional canoes on Butaritari appear to be on a decline. There were approximately 200 recorded in the 2005 Census and this number is likely to decline as motorized crafts are becoming more popular. A demand for faster island sea transportation means and shorter fishing times spent in the open lagoon or ocean is evident. Motorised skiffs and boats skim in and out of the wide lagoon day and night despite of the unparalleled increase in fuel cost. More than thirty motorized boats are operational on Butaritari. There are also huge double hulled canoes that

provide frequent transportation to and from Bikaati Islet. They occasionally make trips to nearby Makin Island trading clams, moray eel and other marine seafoods that are lacking there.

Inter island sea travel is provided by several private and government vessels serving Butaritari almost on a weekly basis. Food and other required supplies are brought in from Tarawa, local produce in terms of shark fins, bananas, pumpkins, copra and handicrafts are shipped to Tarawa. Regional and privately owned container vessels bring in much needed supplies from outside the South Pacific in terms of fuel, food, machinery, construction material and others.

Air link is provided by Air Pacific and Our Airline (formerly Air Nauru) and Air Marshall (currently suspended). The latter stopped by at Butaritari in the late 80's taking local produce to Marshalls Islands. The operation ceased as there was not adequate produce to feed the Marshall Islands market.

Butaritari has both means of evacuation in case of emergency, sea and air. Butaritari airstrip, built by the Americans during World War 2 is larger than most airstrips outside of Tarawa. Aircrafts that require short runways can be accommodated here as in the case of Air Marshall.

#### **Chapter 4: GENERAL DISCUSSION AND RECOMMENDATIONS**

The flooding and sea water seepage into *babai* pits on Butaritari particularly at Bikaati, Tanimaiaki, Tanimainiku and Ukiangang villages are the major concerns as far as food security is concerned. Associated with this is the quality of ground water and the status of land-based toilets, particularly on Bikaati where land resource is limited. A long term solution to protect *babai* pits from being flooded needs to be found and acted on as soon as possible. The impact of climate change and sea level rise will exacerbate the current problems even further. Butaritari Island Council and Kiribati Government need to work together to solve the problems before it is too late.

Coastal erosion on the island appears, in most cases, to be associated with Teibo Causeway where the neighboring coastlines are undergoing both accretion and erosion processes. The most affected site that needs urgent attention is north of Anginibaiatooa Primary School and the coastline where the school stands. School buildings have been moved further inland but the strip of land where it stands is getting narrower (approximately 100 meters has gone) and would not offer any more room for further relocation. Coastlines and areas adjacent to flooded *babai* pits in the village areas mentioned above also require protection.

Butaritari is known for healthy mangrove forests at the southern and northern portions of the island. Hence, the planting of mangroves may help provide natural coastal defense, however this may take around five years before its impact is felt. Coupled with this is the planting of vegetation along the coastlines to stabilize eroded beach areas. The clearing of coastal vegetation as a form of tidying and clean up practised in Kiribati should be discouraged. Public campaigns run by KAP II, MELAD and other appropriate bodies need to cooperate on this important issue. A final resort, if everything else failed, is a seawall using proper designs provided by the Civil Engineering Unit, Ministry of Works and Public Utilities. Rules and guidelines pertaining to the construction of such structures must be strictly followed. Of critical importance is the environmental impact assessment (EIA) that should offer advance warnings on any issue to be seriously considered before further steps are taken. There are reported instances where structures are constructed ignoring designs provided resulting in poor resilience and ineffectiveness,

meaning the structures do not help solve problems, public money has effectively been wasted on unworthy undertakings. Responsible ministries must check the quality of workmanship, identify irresponsible personnel and deal with them accordingly.

The 2007 revised Environmental Act needs to be applied on the outer islands soonest if the coastal areas are to be protected. In the same light, an Island Council bylaw specific for Butaritari's current problems needs to be devised and acted on. More awareness programs on protecting the land must be encouraged and embarked on by respective government ministries and non-governmental organization partners.

Marine and terrestrial resources of Butaritari Island are just adequate to support the current population density despite of loss of resources via human destructive activities to include causeway construction, aggregate mining, land reclamation, waste dumping, habitat destruction, to name a few. There is a need to devise management plans to ensure the resources are unnecessarily over-exploited or locked away via destructive 'development?' projects. The enhancement of marine protein via milkfish farming or other mari-culture activities must be looked into. Equally important is the encouragement of local farmers to plant more local fruit trees such as pandanus, *te bero*, *babai*, bananas, pumpkins and others to ensure local foods are eaten and stored for future use in times of prolonged droughts and bad weather conditions. Traditional preservation methods must also be encouraged and demonstrated to ensure the local populace is familiar with them.

Water and sanitation improvement must be looked into seriously to ensure the health of the people of Butaritari. Water catchment must be enhanced, encouraged and potential water reservoirs are identified for future use. Bikaati Village needs substantial help to enhance its rain water catchment systems as ground water turns brackish during prolonged droughts. A concrete water cistern must be encouraged. To ensure ground water system is properly maintained and managed residents of Bikaati must be involved in all steps of planning, procurement of material and other equipment required. They must be involved in its implementation and management to give them a feeling of ownership and responsibility. The Butaritari Island Council, in consultation with communities, must give full support to such a vital undertaking.

Overcrowding must be thought of as an inherent problem that compounds potential risks and vulnerabilities related to climate change and sea level rise. Butaritari is fourth in population density after South and North Tarawa, Abaiang and Kiritimati. The impact of overcrowding on all resources must be taken seriously. Relocating families to safer grounds within the island now will help reduce the impacts of predicted ground water and storm surge problems.

It is with great care that both communal and private structures are discussed in a manner that does not discourage those concerned to ensure cooperation and realization of the realities of their impact on the environment and the rest of the communities. Structures such as reclaimed land and aggregate mining causing the loss of properties, resources and coastlines must also be re-considered in light of long term benefits by all. Areas suitable for aggregate mining must be identified and controlled by laws and regulations. Public money must not be committed in unsustainable projects that are undermined by continued human destructive activities. Proper assessment of potential risks and vulnerabilities involving experts in required and related fields must be the first stepping stone before other related processes are carried out.

To ensure Butaritari is linked to the rest of the world voice and text communications need to be enhanced and improved further. Break downs in telephone communication causes a lot of problems particularly when it comes to urgent matters such as serious health cases, disaster caused by extreme tides and surge storms, to mention a few. Sea and air transport are vital for emergency purposes in a case of evacuation and emergency services. The current airstrip may need to be extended and properly sealed; similarly the existing boat channel may require widening and dredging depending on environmental impact assessment findings. Cheap sources of energy such as solar and wind must be enhanced to cut down costs on fossil fuel.

For future direction community consultation on CCA and SLR must continue and development projects in light of these must be considered as part of Phase 3 of KAP to focus on the practicalities of mitigation and adaptation strategies. Risk identification and management must be handled through cooperative approach by respective ministries and non-governmental organizations. The Butaritari Island Council must strive to continue the consultation process that KAP II is currently embarking on.

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