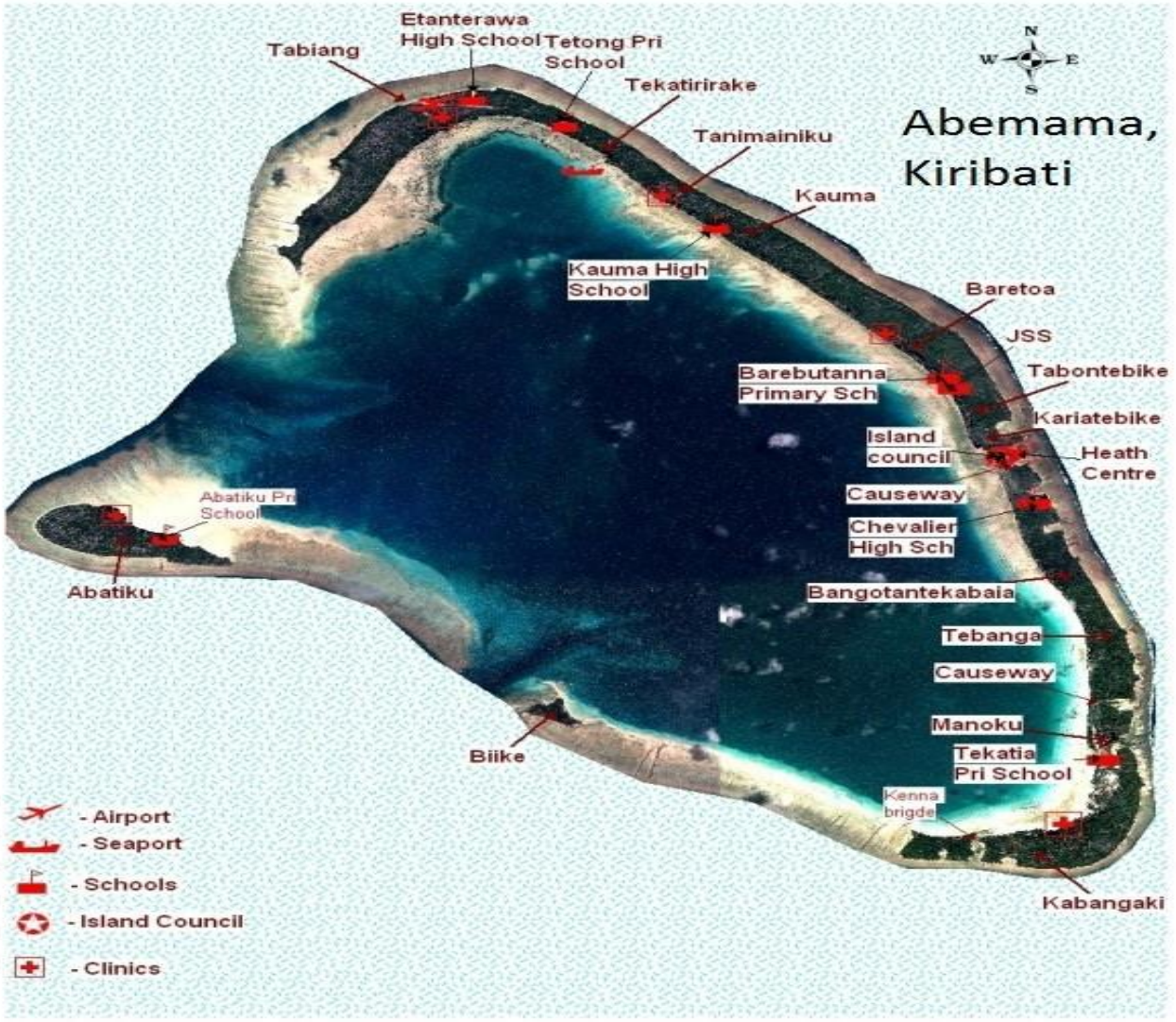
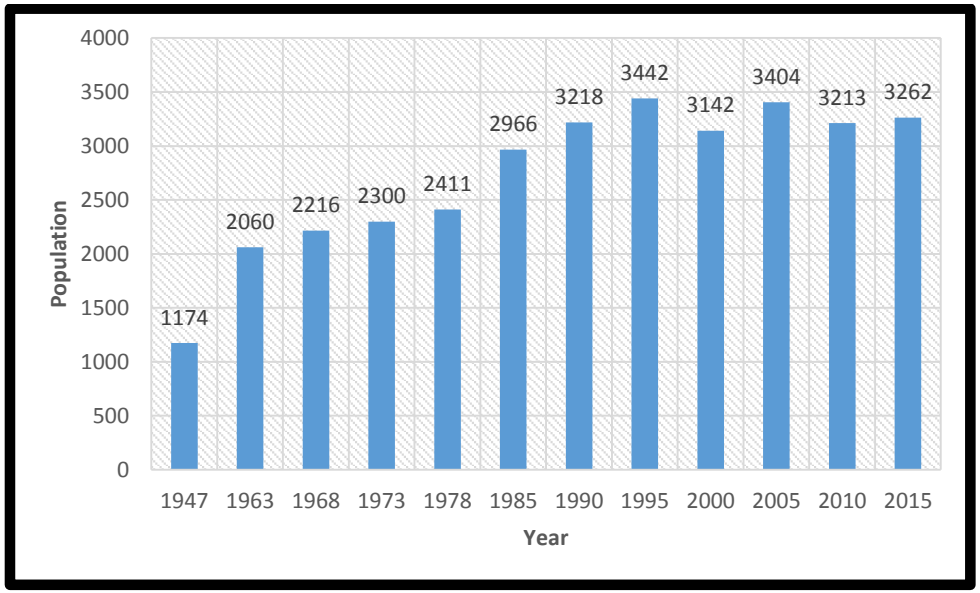

Integrated Vulnerability Assessment
(IVA)
Abemama Island
TE MAURI TE RAOI AO TE TABOMOA


Abemama, Kiribati
N
W
E
S
Etanterawa High School
Tetong Pri School
Tabiang
Tekatiririake
Tanimainiku
Kauma
Kauma High School
Baretoa
JSS
Barebutanna Primary Sch
Tabontebike
Kariatebike
Island council
Heath Centre
Causeway
Chevalier High Sch
Abatiku Pri School
Abatiku
Bangotantekabaia
Tebanga
Causeway
Manoku
Tekatia Pri School
Biike
Kenna brigde
Kabangaki
- Airport
- Seaport
- Schools
- Island Council
- Clinics

INTRODUCTION

The atoll of Abemama has a land area of 7.89 sq km with a width between 50m – 2km. In total there are 3 main islets; the largest which is the main islet has 11 villages and has the highest population. Abatiku is the second-largest islet and is located at the north-western reef, while Biike is smallest is located south. The villages on the main islet are connected by causeways making transportation easier for the villagers.

The population of Abemama as of 2015 population census was 3262; which is 3.0% of the total population of Kiribati. There has been a slight increase (1.5%) in population compared to the 2010 census.



Population of Abemama 1947 – 2015

As shown from Figure 1.1 there was a drop in the island population in 2000 and increased in 2005 and dropped again in 2010 and has slightly increased in 2015. According to the 2015 census, there is a total of 602 households in Abemama. On average the household size for Abemama is 5.4 people. Majority of the land on Abemama is owned by the chiefly family on the island, the Island Council lease a quarter of the land for its clinics, health centres, schools, airstrip and administration station and small areas being leased by various religious groups and Cooperative Society.

A portion of the land on Abemama is used up by wild bush and cultivated bwabwai. The dominant tree in terms of numbers is the coconut tree and others include pandanus (te kaina), breadfruit tree (te mai) and bananas that grow mainly in the village.

Work plan

The report provided gives a summary of Integrated Vulnerability Assessment for Abemama. It will incorporate the Household survey which will provide the quantitative component of the survey, while the Participatory Rural Appraisal (PRA) will provide the qualitative or narratives of the Household survey conducted.

The survey was conducted by two teams, the KNEG team conducted the PRA in communities while the household survey was conducted and supervised by the National Statistics Office (NSO). Both teams were funded by the LCDF in partnership with OB. A total of 98 households on Abemama were being surveyed and this accounts for 16% for the households on Abemama.

IVA Framework

The IVA Framework is designed as a generic guide for planning, implementing and reporting an integrated vulnerability assessment (IVA) that targets atoll communities in the Pacific Islands region. It is based on a sustainable livelihoods-based approach that combines the assessment of vulnerability to both climate change and disasters. An analysis of previous vulnerability assessments approaches in the Pacific Islands region suggests the importance of merging vulnerability and risk-based assessments. According to the fifth assessment report by the Intergovernmental Panel on Climate Change (IPCC) defines vulnerability as the 'propensity or predisposition to the adversely affected', that includes 'sensitivity or susceptibility to harm and lack of capacity to cope and adapt (IPCC 2007). Similarly, vulnerability is defined by the United Nations International Strategy for Disaster Reduction (UNISDR 2011) as the 'characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard'.

The IVA framework combines the principles and components of the other frameworks that have guided previous assessments in the Pacific (SOPAC 2004; Limalevu 2009; USP 2011; McNamara et al .2012; Nakalevu 2006; Duncan 2001). The framework incorporates the GIZ climate change vulnerability framework and the Sustainable Livelihoods Framework (SLF) (DFID 1999). The broad categories of analysis in generic vulnerability framework (Figure 4) pertain mainly so climate-specific vulnerabilities in terms on exposure, sensitivities and adaptive capacity while the sustainable livelihoods framework (Figure 3) focus is on people's access to various resources (natural, infrastructural, human, finance) to support their livelihood needs and the institutional structures and processes that influence people's resources access and use.

Methodology

Three main key component of an IVA exercise adopted in this IVA data collection exercise which include; 1) Community consultations using a Participatory Rural Appraisal methodology 2) Household Survey 3) Sector - specific technical assessment. These are the three mechanisms used to produce information (data) that would appraise the current situation in view of the vulnerability situation on the island. The parameters used determined the vulnerability status of an island which reflected on the socio-economic and environmental situation as a consequence of a climate change impact and disaster risks interacting with the human security objectives and livelihood assets.

The PRA methodology used in this exercise is narrative and qualitative. This is based on the conviction that a PRA need to be conducted in a time efficient manner that works within the advantage of participants. The methodology adopted dwell on the old process of the 'whole of island approach' that was used on the island of Abaiang. In this process, there were six matrix adopted to generate information; seasonal calendar, seasonal plant and animal behavior; SWOT analysis which provide information related to adaptive capacity; sensitivity looking at agriculture and food security, food and biodiversity, infrastructure, human health and fisheries and food, then developing a Venn diagram to show the relationship of institutions on the island.

Therefore, data collected from this PRA exercise were categorized under the following subheadings; sensitivity, exposure and adaptive capacity and aligned to Human Security Objectives and the Livelihood Assets to show the relationship in terms of how they are affected by climate change impact and disaster risks.

PARTICIPATORY RURAL APPRAISAL (PRA)

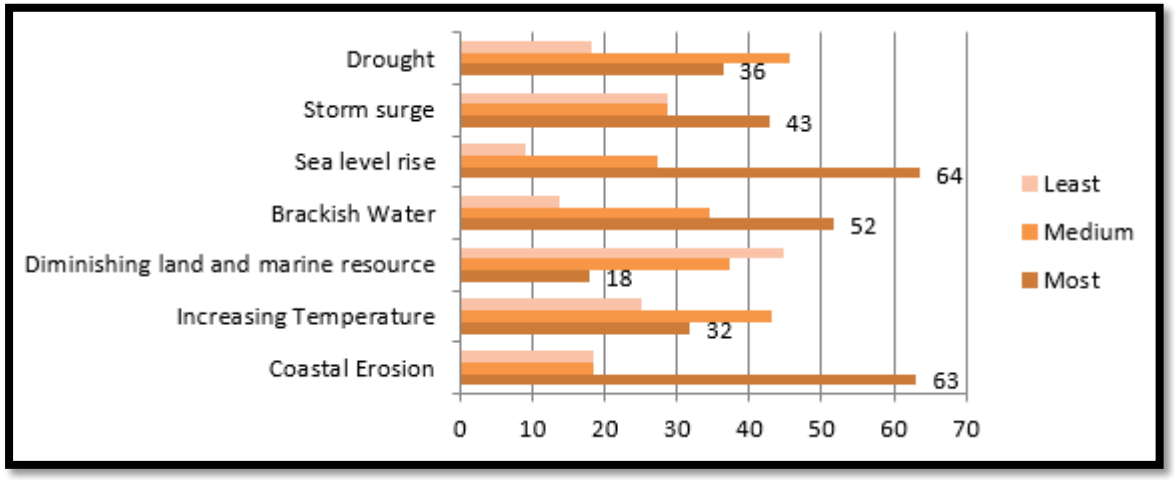
Summary of Human Security Objective (HSO) extracted from PRA

	Forest Health	Coastal Health	Water Security	Security of Place	Energy Security	Income Security	Community Health	Food Security	Av HSO
Tebwanga	3.00	2.8	2.0	3.2	3.2	2.6	2.4	2.2	2.68
Tekatirirake	3.20	1.0	1.4	1.8	2.0	1.2	3.2	2.0	1.98
Baretoa	3.20	3.2	1.8	3.2	2.0	3.0	1.8	2.4	2.58
Kabangaki	3.20	2.6	1.4	1.6	2.0	2.8	2.2	2.2	2.25
Tanimainiku	3.20	2.2	2.0	2.2	3.2	1.6	2.4	2.4	2.40
Abatiku	3.20	2.2	1.8	2.0	1.8	2.8	3.2	2.2	2.40
Bangotantekabaia	2.60	2.2	1.2	1.6	2.2	1.2	2.0	2.0	1.88
Tabiang	2.00	2.0	1.4	1.6	1.4	2.8	3.2	1.6	2.00
Tabontebike	2.80	1.8	1.4	3.2	1.4	3.2	3.0	2.4	2.40
Reina	2.40	1.6	2.0	1.6	1.4	3.2	2.2	1.8	2.03
Island Score	2.88	2.16	1.64	2.20	2.06	2.44	2.56	2.12	2.26

From the PRA conducted on Abemama it was identified that the most vulnerable HSO on the island is water security which falls between 'Very Bad' (1) & 'Bad' (2), whilst the rest of the HSO fall between 'Bad' (2) & 'Okay' (3). The most vulnerable village in Abemama was identified as to be Bangotantekabaia with Water Security & Income Security the most vulnerable HSO. The village of Tekatirirake indicated that its coastal health is highly vulnerable with the lowest score of '1' (Very Bad). But as clearly shown majority of the villages have indicated that the most vulnerable issue is Water Security which is why the column on water security is mainly shaded in red. However, the Forest Health of Abemama is the least vulnerable HSO compared to the other HSOs.

Major Challenges in Villages

From the survey conducted it was found that majority of the respondents indicated that sea-level rise and coastal erosion are the most significant issues faced by the communities on Abemama. This is then followed by the availability of freshwater as households have reported that their freshwater supply is getting brackish. The third most significant even reported by the respondents is the increase in frequency and intensity of storm surges.

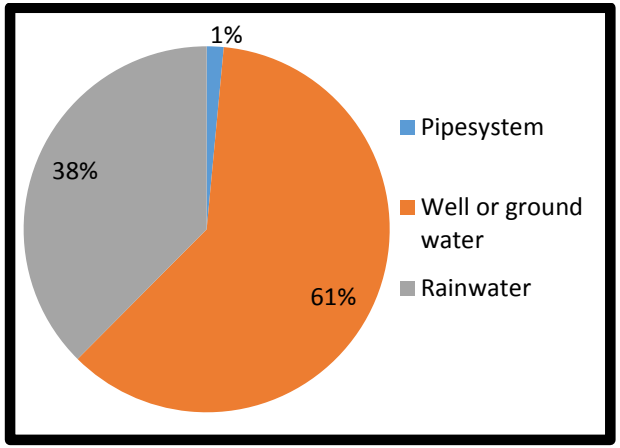


The illustration above clearly shows the percentage of households ranking the following challenges in their communities. As shown, the three most significant issues on Abemama are; sea level rise, coastal erosion and brackish water. More than 50% of the households surveyed have indicated these problems. These problems are also very much related to each other, sea level rise is closely connected to coastal erosion and people tend to confuse sea level rise with coastal erosion. Majority of cases usually reflect coastal erosion and this can also be justified in the PRA for the village of Tekatirirake where Coastal Health is the most vulnerable issue.

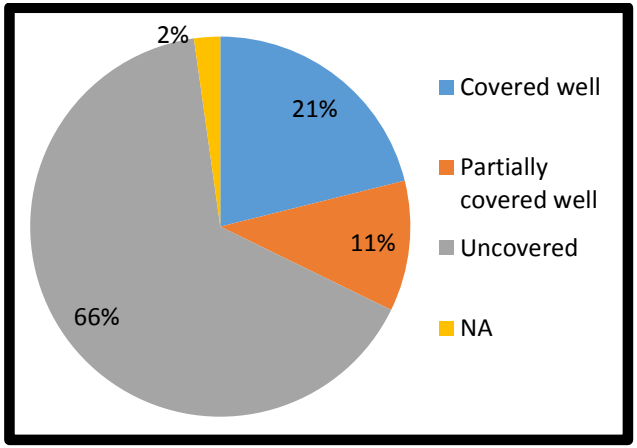
Coastal erosion is getting more prominent along the shoreline over the year. According to the locals, this is mainly because the intensity and frequency of severe weather conditions or storm surges have been increasing over the years. This is the reason 43% of the households indicated that storm surges is a significant problem for the village. Such conditions also impact water quality on the island, many along the shoreline are experiencing saltwater intrusion into their well. Due to coastal erosion, the shoreline is moving further inland, and as a result, seawater is intruding into the freshwater lens. This is one reason why water security on the island is the most vulnerable issue as discussed earlier.

Water Security

As defined earlier water security is having access to protected water systems that are relatively safe from the impacts of water related hazards such as floods and droughts, as well as access to water supply functions and services that are managed in an integrated and equitable way (Cook and Bakker 2012). Majority of the households on Abemama depend mainly on well or groundwater and rainwater as their main source of drinking water, while a small percentage depending on the pipe system (Census 2015).



: Main source of drinking water (Census 2015)



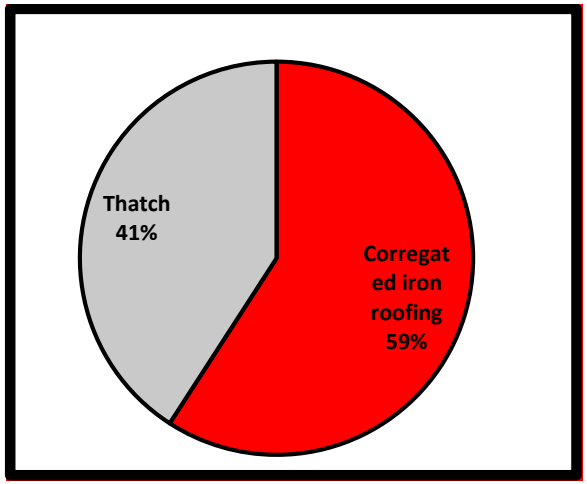
: Status of well or ground water (H/hold Survey)

As shown from Figures 7 & 8, the majority of the villagers on Abemama depend mainly on well or ground water as the main source of drinking. From the household surveyed, it was found that 66% of the households do not cover their well water, this increases the risk of water contamination.

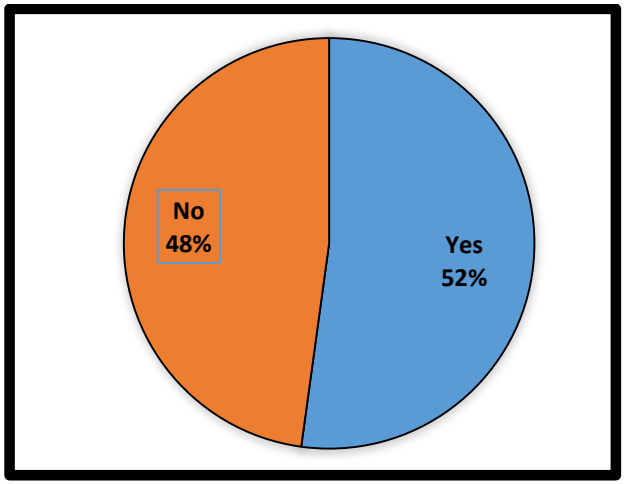
It was also observed that most of the wells on Abatiku are open and are not being covered nor protected. Worse is that the majority do not have toilets, and uses the beach and bush as their toilet. Another contributing factor to water issue is the prolonged drought as experienced by many villages. This is due to the slow replenishment and recharge of ground water. Prolonged dryness and drought-like conditions are associated with over-extraction of water leading to brackish water sources.

Water Security is most vulnerable in the following villages; Kabangaki, Abatiku, Tebwanga, Tekatiriraki, Baretoa, Bagontantekabaia, Tabiang and Tabontebike. The most affected livelihood Assets are Ecosystem, Infrastructure, Finance, and Institution & Governance. Tanimainiku was the least vulnerable village with water issues, with a score of 2 which might not be very bad or vulnerable but still in a bad stage.

Saltwater inundation is another leading cause for poor water quality on Abemama. For instance, during storm surges or king tides, overtopping caused turning wells near the coastal areas saltier. The inconsistent rainfall is another issues for those that rely on rainwater as their source of drinking water.



Types of rainwater catchment in households.



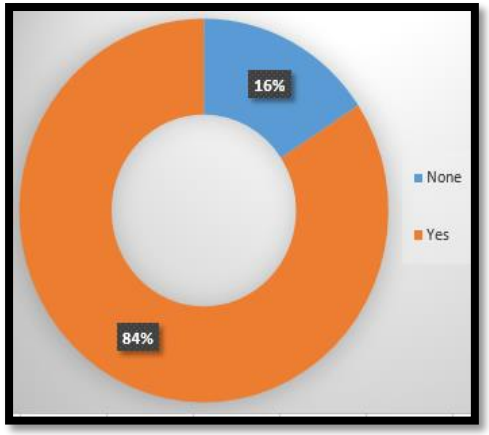
: Survey Dirty gutters (H/hold Survey).

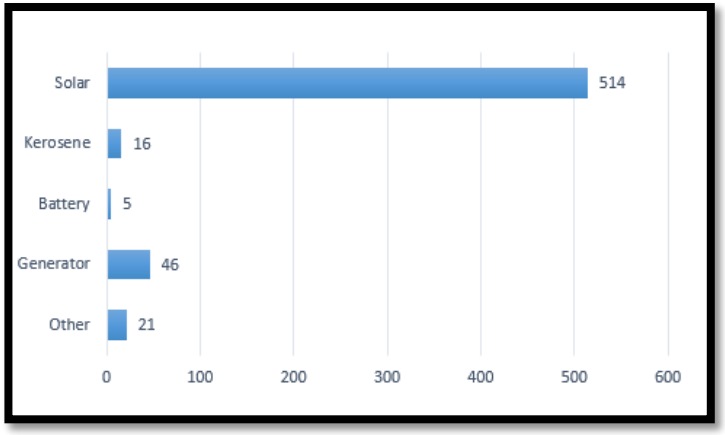
Infrastructure is another issue that affects the quality of the water on the island as shown in Figure 9; 41 % from the household that relies on rainwater do not have the proper infrastructure in place to fully exploit the wet seasons or rainy weather. Furthermore, it is heavily practised that a bucket is used to extract rainwater from the tanks, this might increases the risk of water contamination. The bucket itself as an extraction device to contamination. Another alarming issue found from the Household Survey was that 52% of the gutter used for rainwater harvesting appear to look dirty. There is also no access to individual household toilet and people usually use the bushes or beach as a toilet. Again this is very common practice not only on Abemama but also other outer islands on Kiribati.

Energy Security

Majority of the outer islands in Kiribati depend highly on renewable sources of energy mainly solar energy. Only South Tarawa, Betio, parts of North Tarawa and Kiritimati depend on the PUB power grid as a source of power, while the rest of the islands depend on renewable energy. Majority of the households on

Abemama also depend highly on solar energy as the main source of power for the household. The dependency on solar energy is reflected from the number of households that are using solar kits and that is always concerning on cloudy days.





The 2015 population census report found that 84% of the household on Abemama do own solar system in their households. The main source of lighting in the household was also found to be solar which accounts for 85% of the total households. Community centres such as village maneaba or church maneaba are also being powered by solar.

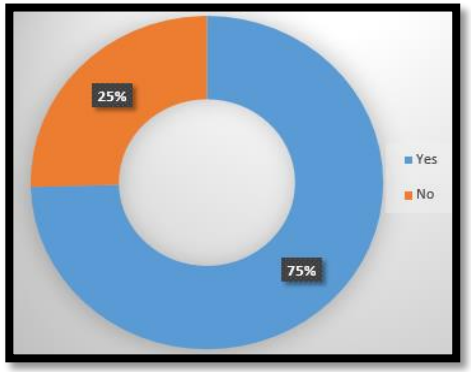
From the PRA conducted it was found that the main issues with the energy sector are; their ability to access affordable energy source, the problem of proper maintenance of solar kits and repair of solar systems that are damaged. For most the communities visited, this was the main problem that people are facing,

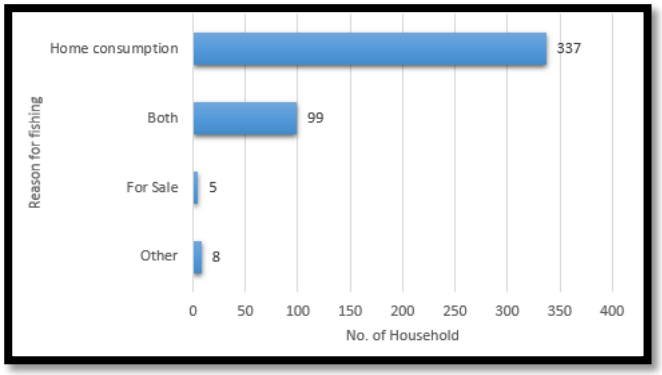
there is limited capacity, knowledge and human resource on the island. This has created frustration and discomfort among the villages due to the unavailability of electricity. According to the villagers, there is also no or limited awareness of sustainable energy practices and conservation done in the village. The island needs more skilled technicians on solar equipment to fix and do maintenance for them.

The other concern that the people of Abemama are experiencing, is the shortage supply of petroleum on the island. This is also another reason most people do not depend on diesel generators as their main source of electric power. This is why 81% of the households do not own electric generators. Furthermore, the majority of the households also depend on firewood (56%) and coconut husk (33%) as their main source fuel for cooking.

Food Security

Majority of the people on Abemama rely so much on their natural resources to sustain their livelihood. This can be reflected from the population census conducted in 2015, which found that for households who have engaged in fishing, 75% only go out fishing for home consumption.





Food Security was found to be the third most vulnerable HSO. Over the years' locals have noticed a decline in fish stocks and this indicated from the size of fish caught are decreasing. This issue was claimed by the fishermen by experience. Due to this problem, fishermen would have to go further out into the open waters for a good catch. This is the risk that most of the fishermen would have to take to help them sustain their livelihood. This issue further impacted with the lack of proper equipment and infrastructure in place to assist the fisherman. Boats that most locals use to go fishing do not meet the requirements in open waters. The island does have a Fishermen Association exists but is not functioning due to lack of support from council and government.


Prolonged droughts, irregular & unpredictable rainfall distribution is also affecting agricultural production recently. This is discouraging for local farmers as their crops cannot survive during the dry seasons. Extreme weather conditions are also destroying crops inland, this is usually during severe storms and strong winds blowing seawater inland and during King tides when seawater goes inland. These problems are becoming more frequent and increasing in intensity. Poor soil condition is also a contributing factor to the decline in agriculture dependency rate. Furthermore, farmers also do not have proper farming tools such as shovels, wheelbarrows, forks, fence for livestock, etc. There is also a Farmers' Association exist on the island but just as the fishermen association it is also not functioning.


Dependency on imported goods is also increasing on the island, due to the increase in household income from copra, more and more household moving away from depending on their natural resources moving to imported food.

Coastal Health

Coastal health refers to the status and potential of a coastal ecosystem to maintain its structure, function and resilience under stress, and to continuously provide quality ecosystem services for present and future generation. Coastal ecosystem plays an important role for the people of Kiribati, this is mainly because the majority of people depend highly on it to sustain their livelihood. The majority of Abemama also depend on their coastal ecosystem to sustain their livelihood.

As discussed earlier in food security, there is a general decline in marine stock over the years. This is evident from the decline in fish stock and other marine life (giant clams, sea cucumbers, arc shell, seaweed etc.). The problem of overfishing is also evident on Abemama as more catchy methods are used lately (net fishing, gill netting etc..). There are awareness programs done or implemented on the island that would assist in protecting marine biodiversity such as establishing a Marine Protected Area (MPA) up until 2018-19 and where recent MPAs have been established through CBFM (Community Based Fisheries Management) and LDCF Food Security project. Furthermore, according to locals, there is also a lack of funding available from government and donors to finance projects on coastal protection like building sea walls or marine biodiversity protection.

Based on community consultations, the feedback was provided on the impacts of coastal infrastructure (seawall, causeways etc) affecting coastal marine resources. While this information has yet to be verified by the Coastal Fisheries Division, it has become a constant point of argument from island communities in accordance to their subsistence and livelihoods in line with coastal resources.

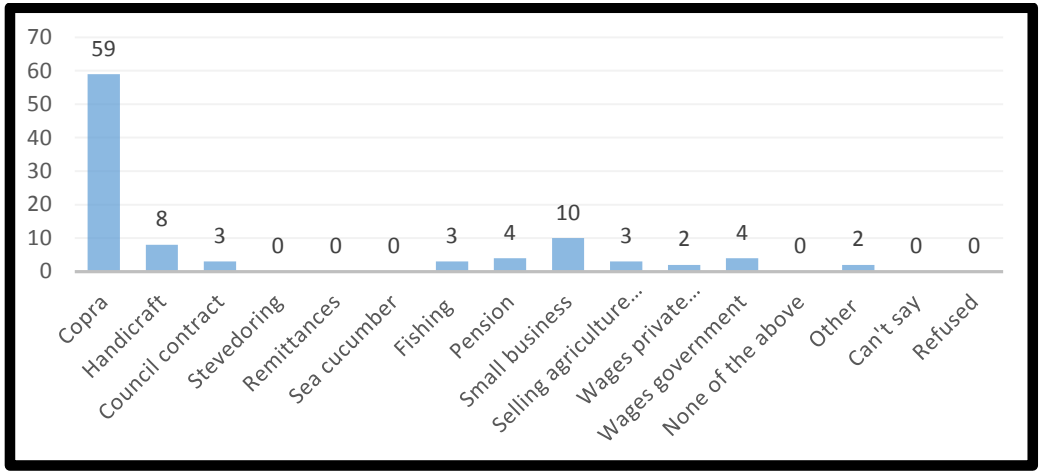
Coastal erosion is also a growing concern on Abemama, over the years' residents have been experiencing more intense storm surges bringing high energy waves causing the shoreline to be eroded. Another leading cost of this problem is people are building physical structures such as seawall to protect themselves, but unintentionally it causes erosion to their neighbours. Mining of coral rubble is also a contributing fact to coastal erosion, many of the local do not realize that just as mangroves accumulation of coral rubble acts likes a natural defence for the shoreline. There is a lack of consultation and awareness to people about how

man-made structures or activities can lead to coastal erosion. More investment is required on infrastructure on ecosystem-based adaptation to protect against flooding and erosion.

The household survey conducted found that 63% of the households indicated that coastal erosion is the second most significant challenge on the island, with water issue being the first. The images above show coastal protection mechanisms that are available, the first image shows mangroves act as a natural protection for the shoreline, while the other image shows the man-made structure (seawall) protecting the shoreline from erosion.

Income Security

The income security refers to the ability to generate the financial income required to pay for basic needs, health, education, political participation and to live in a healthy environment. Majority of the locals on Abemama highly depend on their local produce as the main source of income. For many of the outer island, there are limited employment opportunities and therefore live on subsistence agriculture & fishing.



One of the main problem that is affecting the people's income is animal infestation destroying coconuts. Another problem that is also affecting the people's source of income is the limited access to proper infrastructure that would help people generate more sustainable income. People do not have access to ice plants to store their catch, there are also limited outboard motors for boats to help fishermen to fish in the open waters. This has discouraged economical fishing as the catch only could cater for subsistence purposes.

Community Health

Community health refers to a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being. Community health on Abemama is the second best from the eight HSO the overall community for Abemama is relative good. The main concern for the locals is the lack of medical supplies, there is also an increase in cases of non-communicable diseases such as diabetes, hypertension and obesity on the island. This is very common in Kiribati, overall the country has reported an increasing number of people living with non-communicable diseases mainly diabetes and hypertension. For this reason, the shortage of medical supplies is a major concern for the people of Abemama.

Waterborne diseases such as typhoid & diarrhoea are also common among children on Abemama. The main reason for this problem is that the main source of drinking water (ground water) is not well looked after. As discussed in water security 66% of the household surveyed do not cover their well. This leaves the well exposed to contamination, reducing the quality of the ground water and thus causing health issue for the community. The local clinics are not well equipped to facilitate the increasing demand of medical services on Abemama. Lack of resources to fully equip the clinics on Abemama is a concern for locals and this puts the community health at risk. Few villages indicated that their community health is also affected due to the absence of the clinic in their community or settlement, most would have to travel a long distance to the nearest clinic.

Forest Health

Forest health refers to the status and potential of a forest ecosystem to maintain its structure, function and resilience under stress, and to continuously provide quality ecosystem services for present and future generation. For most of the outer islands, the forest is usually the coconut plantation on their block of land. The forest health for Abemama is the least most affected HSO.

From the survey conducted the main problem that people are very concern about is the infestation of rats destroying the coconuts. Since the majority of the local highly depend on copra as their main source of income. Prolonged droughts have also affected the forest health over the years, minimum rainfall has resulted in a lot of coconut trees dying. Furthermore, destruction farming method is another problem that is affecting forest health. Slash and burning is the common destructive farming method on the island and regulation of and enforcement of such activity is not strong and therefore offenders usually get away with it.

There is also limited resources available for proper management of the forest. According to the locals, there are is limited finance to support forest health activities such as planting more resilient trees that would withstand the impact of climate change, Traditional Environmental Knowledge (TEK) is also disappearing. Traditional forest management knowledge is fading e.g. traditional non-destructive logging methods.

Summary of Human Security Objectives (PRA)

HSO	Vulnerable Issues
Forest Health	• **Prolonged droughts affecting forest health** • **Deforestation due to destructive farming practices (e.g. slash and burn/intended bush burning within coconut plantations).** • **Traditional forest management knowledge is fading (e.g. traditional non-destructive logging methods).** • **No financial support for sustainable protection/replanting /initiatives.** • **No finance to maintain sawmilling projects** • **No/limited awareness of forest management** • **Island strategic development plan does not include Forest protection/tree replanting issues** • **Forest resource management issues not covered in the village meeting** • **Women's forest resource management issues are not represented village meetings**
Coastal Health	• **No infrastructure of ecosystem-based adaptation to protect against flooding/ erosion**

	• No mariculture restocking programs exist despite an extensive decline in marine stock (e.g. sea cucumber/ giant clams/ arc shell/ seaweed decline). • No finance to start coastal resource management projects/ initiatives • Existing village funds not set- aside for coastal resource management or erosion/flooding stabilization. • Fish stocks & other marine life (e.g. indicated by the size of fish decreasing / or catch per unit decreasing. • The decline in invertebrate stocks (e.g. catch per unit decreasing) • Coastal erosion by development (e.g. land reclamation causing erosion elsewhere/ causeway/ boat channels/ groins/ seawalls. • The decline in coastal/inshore fish stocks & other marine life (e.g. indicated by the size of fish decreasing/or catch per unit decreasing)
Water Security	• Water quantity - Drinking water, the community has a limited supply of fresh/clean drinking water. Drought and over-extraction as contributing factors. • Water Quality-Climate, water quantity affected by low rainfall (dry spell and over-extraction) • Water Quality-Saltwater - water quality affected by saltwater inundation (e.g., storm surge/overtopping). • Well protection – no/poor covering/raised walls of open drinking wells (e.g., well plates covering/raised concrete rings • Water Treatment/Filtration – No/Poor water treatment or filtration systems (e.g., not reaching boiling point long enough/no solar disinfection/SODIS.
Security of Place	• The village has households/ buildings within a 2m high-risk zone (e.g. at risk of flooding/falling in the sea • Waterlogged land within the village (e.g. excessive stagnant/marshland/poorly drained. • Church (catholic/KPC) and copra warehouse collapsed due to erosion.

	• The high cost of building materials/tools (e.g. costs unusually expensive).
Energy Security	• Village household solar kits broken/not well maintained • Supply of petroleum energy sources is disrupted (e.g. shortages of fuels due to transport issues). • Limited capacity and knowledge for managing maintenance and repair of solar kits system have created frustration and disco comfort among the villages due to the unavailability of electricity. • The village relies on a petroleum-based community energy system (e.g. generator located in Maneaba/Church • The village relies on petroleum (at least 50% of the community – kerosene/benzene/diesel/LPG) • The village relies on a community solar system (e.g. solar system located in maneaba/church). • No trained solar technicians (e.g. island technicians) • No awareness of sustainable energy practices and conservation is done in the village
Income Security	• No/Limited access to formal credit (e.g. village bank/bank loans). • No/Limited access to informal credit (e.g. money lenders). • No/Limited access to micro-credit/finance (e.g. DBK loans). • Decreased income derived from cash crops (e.g. Coconut based products) • Decreased income derived from inshore • Decreased income derived from handicrafts. • No access to ice plants (e.g. green zone/ozone-friendly initiatives). • Fisheries equipment problem (e.g. outboard motor /fishing lines. • Agricultural basic equipment/inputs problems (e.g. basic tools/planting materials).
Community Health	• No limited medical supplies in the clinic.

	• Communicable Diseases-Water bone diseases (e.g., diarrhoea/typhoid) • Non-communicable diseases, obese adults (more than 3 in 1 adult are obese) • Non-communicable diseases, diabetes • Non-communicable diseases, hypertension/heart disease • Non-communicable disease, respiratory diseases. • Long-distance to the nearest clinic (e.g. if no clinic in the village).
Food Security	• The decline in fish stocks (e.g. indicated by the size of fish decreasing/or catch per unit • High severity of increase infestation of existing pests and diseases • Prolonged droughts/ irregular/ unpredictable rainfall distribution affecting agricultural production recently • Island strategic development plan does not include food security issues • Farmers Association exists but not function well (e.g. not receiving support) • Fishermen Association exists but not functioning well (e.g. not receiving support). • No/poor quality fishing vessels/fishing gear • No/Limited access to basic tools/fencing (e.g. shovels/ wheelbarrows/ fences for livestock control). • Sufficient income to meet daily consumption however food prices are high. • High consumption of food imports with low nutrition value (e.g. noodles/rice/snacks • High severity of increase in the infestation of existing pests/diseases • Prolonged droughts/ irregular/unpredictable rainfall distribution affecting agricultural production recently

HOUSEHOLD SURVEY (HH)

The sampled households surveyed in Abemama is 98, this accounts for 16% for the total households. The total number of people involved or lived in households surveyed is 425, almost 15% of the total population (2015 census).

Challenges	# of people affected
sea leve rise	8
increasing temperature	33
Diminishing land and marine resources	34
brackish water	46
storm	5
coastal erosion	33
decrease in rainfall	1
increase in water salinity	1
others	6
drought	4
dead plants	2
strong wind	1
high tide	3
sea water inundation	1
dust	2

Table 1 List of problems and challenges encountered at the household level.

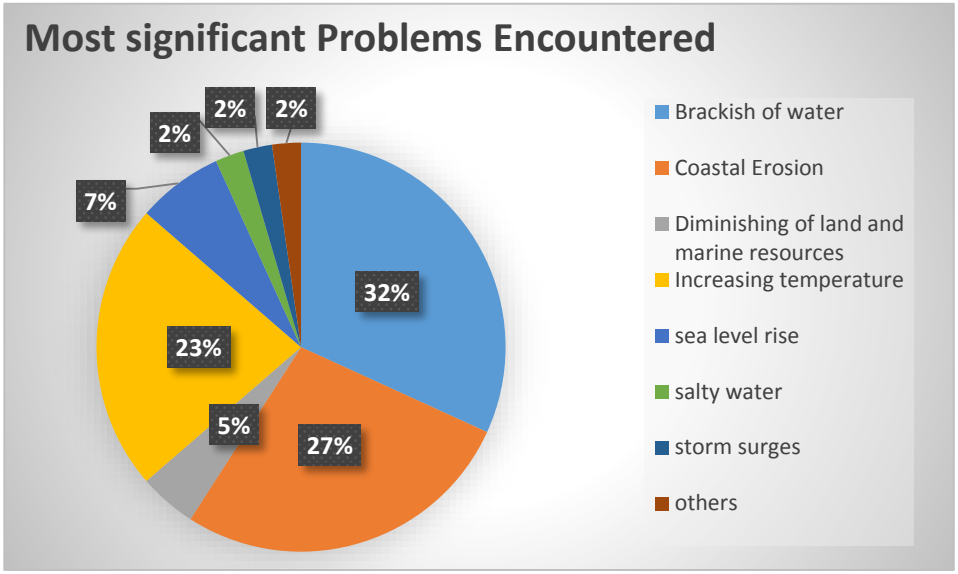


Figure 1. Pie graph showing the significance level of the climate change related issues encountered in Abemama at the household level.

Water, Sanitation and Hygiene (WASH)

To start with the household survey, the first question after the biography questions is to list what are the major impacts of climate change that people encountered at the household level. The majority response from the household surveyed mentioned that they have seen impacts on their main water sources (brackish water wells). The increase in temperature, coastal erosion and diminishing of land and marine resources are also experienced by many.

After listing the issues that are related to climate change, the next question is which are the most significant. From these challenges encountered, Figure 1. shows the most significant issue which constantly affects the people of Abemama, is brackish of water, which was also listed by many in table 1. Coastal erosion and the increase in temperature are also significant accounts for 27% and 23% respectively.

PRA results on water security mentioned that underground water is the major source of water in Abemama account for 61% of the total water consumed. So if the household survey claims that brackish of water especially the underground is problematic, then this is a major issue given the heavy dependence of underground water in Abemama. The PRA also mentioned that 66% of wells are not covered properly and so it contributes to the contamination and affects the water quality of the source. So the contaminated underground water could be minimized by treating and covering wells properly.

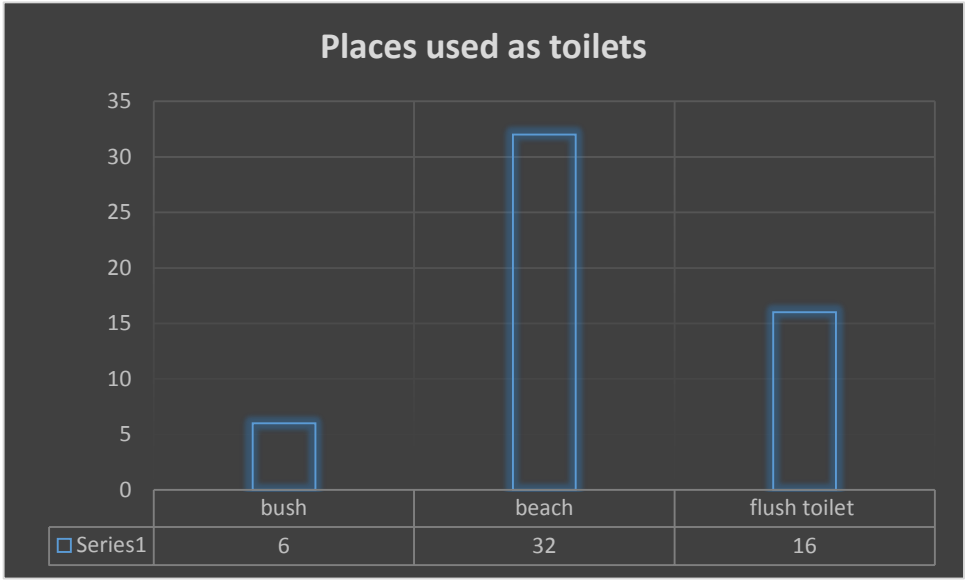


Figure 2. Graph showing where do people usually went for defecate.

The sanitation in Abemama was very poor as shown in the graph below. The majority of the surveyed households claimed that they use the beach as a toilet (open defecation). This number represents the overall households of Abemama sanitation sector in which it requires more work and improvement from the concerned sectors, including the community and the household level. A small proportion of the households surveyed uses proper toilets, while only 6 uses the bush.

Poor sanitation may lead to other concerned issues especially community health and other contagious outbreaks.

Another contributing factor is the use of bushes and beaches as toilets which could have detrimental impacts on freshwater sources through contamination.

This could be severe given the vast number of the population lived in the atoll and its distance from South Tarawa, where medical service is more reliable and efficient.

Also, there is a great number of people that go 50-50 on if or if not they wash their hands after going to the toilet. Given the number of people using the beach and the bush as a toilet (open defecation), it is very unlikely that they could consider washing their hands afterwards. However, out of the total households surveyed, only 20 claims that they always wash their hands after using the toilet.

Hygienic practices (handwashing stations) is very important that it relates to so many other sectors especially health. This needs to be improved in Abemama.

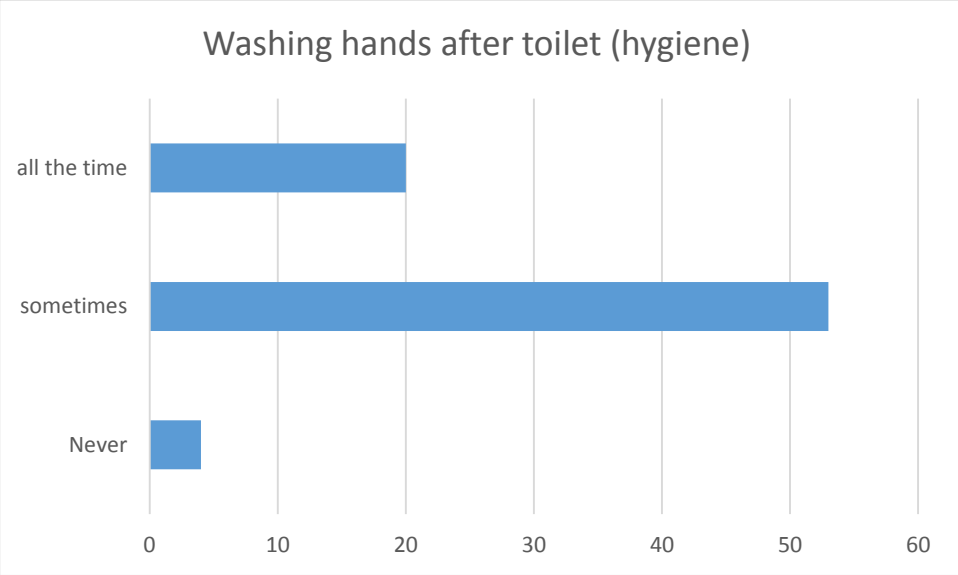


Figure 3. Graph showing the level of hygience by the people of Abemama through washing hands after using toilet

Food Security

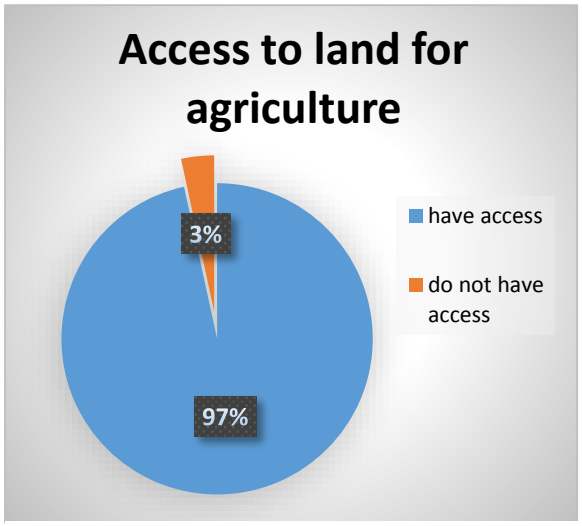


Figure 4. Pie chart showing the number of people who have access to land for agriculture

From the overall household surveyed, almost all have access to land to grow food for economical and subsistence purposes. This table shows that 97% have access to land to grow food while only 3% did not have access. From the total number of people who have access to land for agriculture, 35% grow fruits, 22% grow vegetables while 44% grow crops.

The fertile of the soil to grow food (fruits, vegetables and crops) is average as shown in figure 5. This means that the soil cannot give 100% health in terms of growing and receiving the required minerals to foods planted. As shown again in figure 5, some people claimed that the soil is poor especially to grow fruits and vegetables compared to grow crops.

Abemama people are not only depending on agriculture for survival or economical but also livestock and fish. Abemama is one amongst Kiribati islands that is very resourceful with marine ecosystems and forest. There is a great portion of forest land compared to residential areas in Abemama as mentioned in the island background above (Introduction section). The majority of the population in Abemama recognizes the importance of marine ecosystems such as coastal, mangrove, seagrass, reef and ocean, and the services they provide or could provide daily to the household level. In fact, out of 98 households surveyed, 75 claims that it is very important to safeguard coastal and its species/resources, 62 treasure mangrove resources, species and its services, 61 claims that seagrass plays a vital role for small fishes and other marine species, 66 depend on the reef for daily meal and 60 uses the ocean to provide food for the family.

Income Security

There is a barrier with assessing the income security for the surveyed households, and this has to do with the sensitivity and the uncomfortable to share details for income. It was observed that the majority of the households have held back in answering specifically to what is their main sources of income. This could be culturally influenced as it is so sensitive to brag or to talk about your income especially as this might bring ashamed or it might affect communal status. There is a need for improved assessment in this area. The most answered category is the one which everyone could have, or easier to get if you have a piece of land or if you at least own coconut tree(s), and that is copra income.

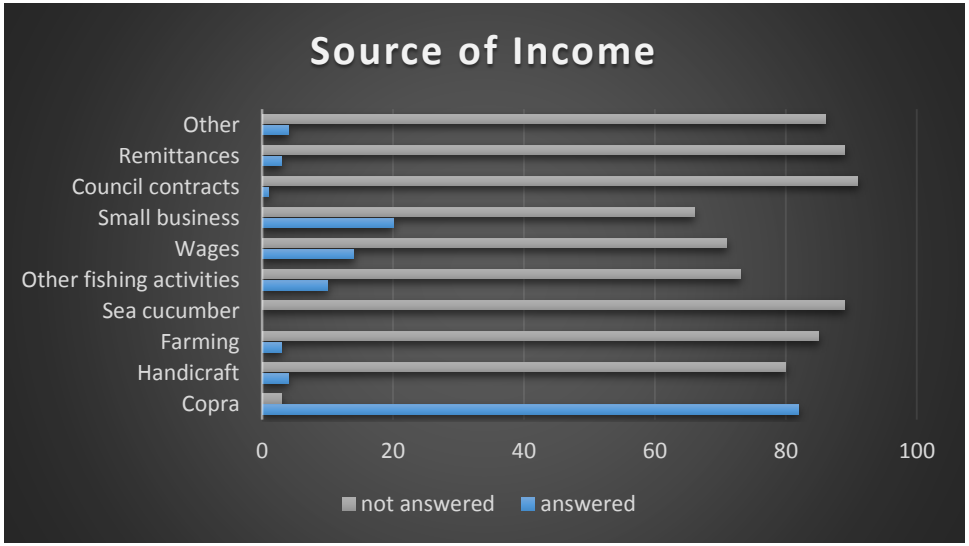


Figure 6 Clusttered graph to show the main sources of income at the household level.

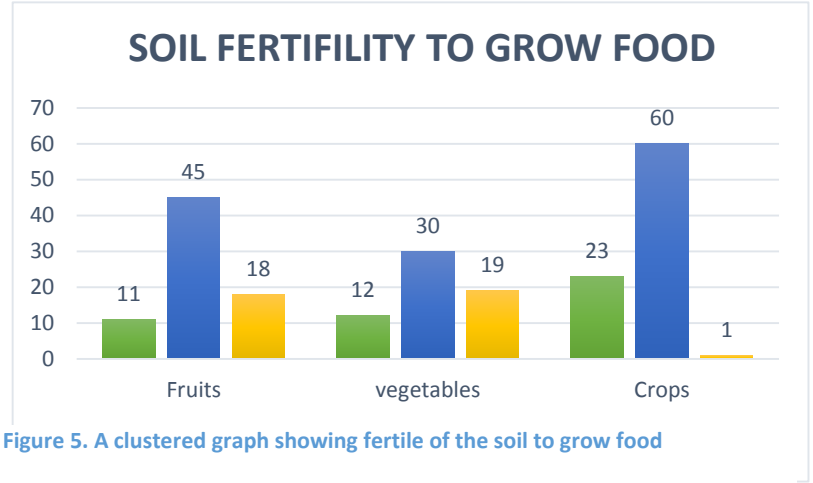


Figure 5. A clustered graph showing fertile of the soil to grow food

Copra is the main source of income for many and the majority of the households did have a share or claim that they have constantly had financially stable with copra income. Some have answered that through small business, wages, fishing activities and others have also contributed financially to the households, but in a minimal amount.

Among those who have responded to the question on income, they are categorized into 3 groups as in figure 7; men (inner pie chart), women (middle pie chart) and youth (outer layer of the pie chart) for their income per month. The majority of men claimed that they have been receiving more than $400 a month, 18 are having $200-400 per month, while 21 had less. This could be from copra or fishings, wages or other sources.

For women, 19 mentioned that they have been having more than $400 per month, 16 having $100-199 per month, 13 for $200-299, 22 have been receiving less than $100 per month, while 11 have $300-399. For youth, the majority have been receiving not more than $200 per month while only 8 have managed to get $200-299 a month.

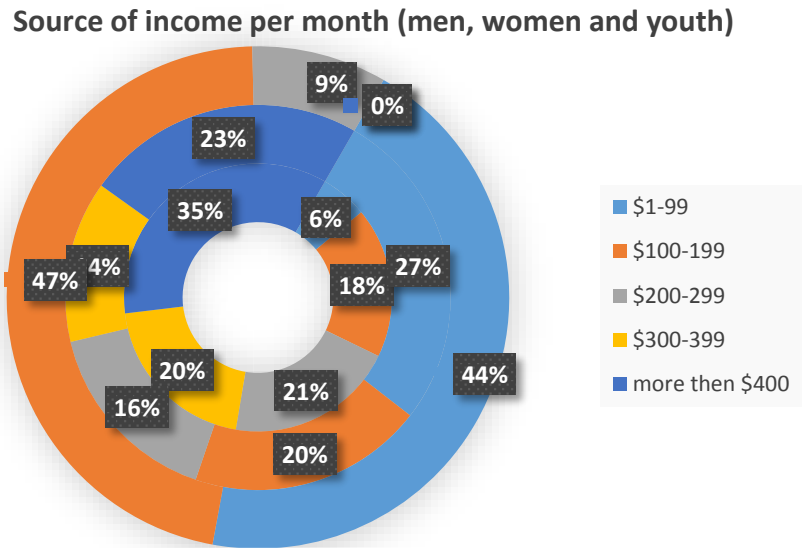


Figure 7 Combined pie chart for men (inner), women (middle), and youth (outer) percentages of income per month

Transport and Telecommunications

This section is very vital for the social-economic and developmental processes of the island. Also, transport within the island (intra-transportation) is essential for small businesses, for shopping, to go to the clinics, and for personal movement, from one point to another. The table below shows that the majority at least from the sampled households surveyed are having a motorcycle for transport, while most are having a bicycle. The two main means of transport are the most convenient and affordable in most outer islands. However, table 2 also shows that some people move from one village to another by boat or walking, while only one household surveyed has used a car to move within the atoll.

Table 2 Main transportation within Abemama, sampled household surveyed responses

Main transport	Number of people
bicycle	37
motorcycle	44
walking	5
boat	4
car	1

For the inter-island transportation (from and or to Abemama), 63% of the surveyed households have constantly used aeroplane. 32% have used ships while the remaining 4% used the boat to get to and from the nearby islands. When asked about whether transports are always accessible or available in times of need from the households, 50% said that "always available" and another 50% said "sometimes available" both for intra-transportation and inter-island transportation.

Equally important to transport is how the people in Abemama could communicate within the atoll and further outside of Abemama. The majority of 65 households out of 98 have used a mobile phone as a major means of communication within Abemama. Only a few to none have communicated within Abemama using wireless radio, landline, radiotelephone, internet and letter/mail. Likewise, for communication with the outside of Abemama, mobile phone users are the majority with 59 out of the 98 households surveyed.

Household Health

Concerning with the poor sanitation and the lack of hygienic practices in Abemama as abovementioned, the next assessment is on the health of the household especially diarrhoea cases in at least 3 years ago. When asked about the number of cases with diarrhoea at the household level, a lot have related this with the

water issue. Some have claimed that the brackish of water is the cause of diarrhoea cases while some stated that drinking water straight from wells without boiling it is the cause.

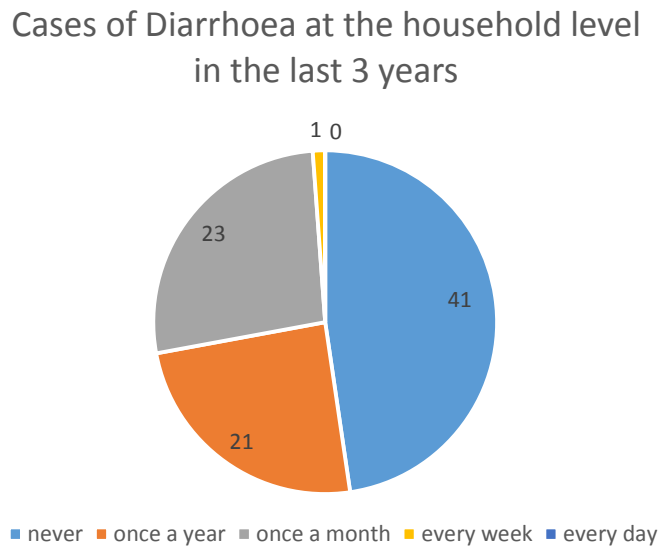


Figure 8 Number of diarrhoea cases at the household level in the last 3 years

However, the chart below (figure 4) said otherwise, that the majority of 41 households surveyed stated that they never have diarrhoea cases once in 3 years. 21 households stated that they have been affected with diarrhoea once a year in the last 3 years. 23 said that only once a month that they have diarrhoea 3 years ago, while only 1 household has been affected every week.

On the other hand, health also depends on diet, mobility of a person, behaviour and practices in maintaining and avoiding diseases including non-communicable diseases and others. So from the total household surveyed, 424 non-communicable cases have been confirmed, 32 people are heavy smokers, 91 have consumed alcohol most days of the week, 33 and an increasing number of people drink kava most days of the week, 76 have high blood pressure and 31 claims they do not have balanced diet with fruits and vegetables in a dish.

For communicable diseases, no one seems too comfortable and cannot respond to specific questions concerning the number of people in the household who have; a lung infection, tuberculosis, anaemia, intestinal worms and others, as this might lead to downscaling family status or bring shame.

But most importantly, the majority of 68% have stated that they have moderate to high confidence that their local leaders including unimwane, councilmen and other concerned officers, can work with other agencies to help the community deal with promoting a healthy lifestyle. The remaining 32% do not have or low confidence for community leaders to promote a healthy lifestyle.

Community Health

This section is very critical for social and cultural practices within the community. The preexisting structure and leadership role culturally and spiritually with the unimwane system and church groups is at the core of people's heart and ethical behaviours. It is also where people are more committed, responsible and is culturally and spiritually bonded to. This is just a very unprecedented life for the Kiribati people.

Figure 9 Statements to assess the health of the community and household survey

The government recognizes this and uses both systems to promote good practices and ways that the local citizens are beneficiaries of. One of these ways is to get consensus on communal approaches to tackle obstacles and to be more resilience to the adverse impact of climate change. As shown in the graph below it is very clear that from the surveyed households, the majority are agreeing to the statements provided to them. These statements alone could provide an overview of how the community could cope and may response to climate-related issues including, sea level, coastal destruction, and agricultural empowerment. Responses are all positives that more than 70% of sampled households surveyed are agreeing to the provided statements. Some people have disagreed to the notion that we have no control over the future, but still, more than 70% are agreed to it.

The least agreed statement is the statement on the community proactive in setting plans for the future, and this accounts for 71% which is still more than expected for the agreed consensus. In summary the community health in Abemama, as of from the household survey, is by far very active or healthy. This shows how reliable are the leaders and the good role they have played in the community. Also, it shows very good cooperation and collaboration amongst the communities in

Abemama. With this alone, any other issues stated and mentioned in the above categories, could be easily reduced or even ceased as the community health is in good shape.

ANALYSIS OF RESULTS / KEY FINDINGS

Ideally, PRA and Household Survey (HHS) are both conducted as part of the IVA for the following reasons: PRA provides qualitative or narratives of the Household survey conducted. It also gets a broad perspective and vulnerabilities at the community level, and it encourages preparedness, ways to adapt and to respond to climate change impacts and disaster risks in a collective effort and approach.

HHS, on the other hand, is conducted to provide the quantitative component of the survey, it gives space to those who cannot find their voice in a participatory approach, and it also tends to go down to get perspectives and vulnerabilities at the household level. But more importantly, it gives an idea on the capacity of the household to prepare, withstand or to respond to the impact of climate change and disaster risks.

From the above components of IVA, the most vulnerable sector or human security objective for both PRA and HHS is water. It was very clear in the PRA result that water security is a major issue in Abemama, especially for Bangotantekabaia, Tekatirirake, Kabangaki, Tabiang, Tabontebike. The remaining villages score less than 2 which also indicates their vulnerability with water. Water is one of the major needs for human survival, and it touches other crucial sectors such as agriculture for food security, forest health, and the security of places. The PRA score of 1.64 for water security indicates that an urgent treatment and response to this highly vulnerable sector is required.

In addition to the water sector, it was assessed that 61% of the surveyed household depends on underground water (wells) while the remaining 39% on rainwater. The blackish of water mentioned is heavily stressed on underground water as an impact of sea overtopping, prolonged drought, and other. However, from those who have depended on underground water, 66% have not always cover their wells nor have a raised well's wall. This also leads to blackish of water and other related issues with the water sector, and therefore, should every person with wells a passionate to cover and to protect their wells proper, it could minimize or even address this water issue of blackish.

The second critical issue on Abemama is Energy security with a score of 2.06. Tabiang, Tabontebike and Reina are the three most affected villages with energy security. Energy source in Abemama is mainly solar energy. Only church groups owned fuel generators, but it has been problematic with a frequent short supply of fuel in the atoll. The main issue with energy security in most of the villages is they do not have a capacity in both technical/knowledge and financial to fix or to repair solar kits. However, training on such skills could cater for this problem.

All other sectors/ Human Security Objectives (HSOs) except Community Health and Forest Health, are fall in a less than 2.5 category, which indicates vulnerable (not highly vulnerable but still vulnerable). As each village have different vulnerability rates with different HSOs, the village with the most vulnerable is Tekatirirake with a score of 1 for coastal health. Tekatirirake have encountered a severe coastal issue. A common problem with coastal health not only in Tekatirirake but also to other villages is erosion due to building seawalls and mining. This is also proved in the household survey result. In figure 1 under the Household Survey Section, it was shown that the second most significant problem or issue to brackish of water is coastal erosion. A broad and comprehensive assessment, especially on coastal erosion is highly required from the concerned sectors.

However, most of these mentioned issues could be addressed possibly at the village or household level should they have the support. This was indicated from the positive response to statements provided to assess the capacity of the household and community to adapt to climate change impacts and disaster risks (figure 9 under Household Survey Section). Community Health is one of the least vulnerable HSO in a scoring sheet in both PRA and Household survey. So this concludes that Community Health is very promising in setting future strategic plans for better adaptation measures to the adverse impact of climate change and disaster risks.

In conclusion, to utilize promising health of the community as mentioned above, the government and the concern sectors should build on this and encourage the momentum as observed. A collective effort by the local and concern sectors; could prepare Abemama to any climate change and disaster impacts. It also could allow Abemama locals to be able to adapt and to respond to climate change-related issues including sudden onsets.


TE MAURI TE RAOI AO TE TABOMOA