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**IMPLICATIONS OF CLIMATE CHANGE FOR THE
LIVELIHOODS OF URBAN DWELLERS IN KIRIBATI**

A thesis

submitted in fulfilment

of the requirements for the degree

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ABSTRACT

As a result of climate change, coastal erosion, sea water intrusion into the fresh water lenses, destruction of trees that are important sources of food, medicines and building materials, and the destruction of settlements due to higher king tides and storm surges, accompanying higher mean sea levels, are threatening the sustainable survival of human societies on the atoll islands of Kiribati. Climate change is also having detrimental effects on important cultural heritage including customary practices, traditional knowledge and native languages. The people have continued to live with the physical changes to the landscape, vegetation and water supply, despite significant deterioration in the quality of the water, and the loss of important traditional plants and trees that are used for ornamental, constructional, and medicinal purposes.

The Kiribati government, along with governments of other countries comprising low-lying atolls and reef islands, has placed considerable emphasis on strategies to manage problems caused by climate change, especially the prospect of higher sea levels. Population and urban development pressures have further compounded existing problems associated with climate change. Land shortage and increasing population on South Tarawa have made the climate change issue more critical. This thesis examines the contemporary environmental issues linked with climate change and its impacts on the livelihoods of urban dwellers of Kiribati.

The focus is on the country's two main urban areas: South Tarawa in the Gilbert group and Kiritimati in the Line group. The study assesses the dependence of urban dwellers on their urban environment as well as examining their increasing vulnerability to climate change. The study concludes that there is a need for further consultation and discussion between the government of Kiribati, non-government organizations, private institutions, church institutions and the local people, as well as with interested overseas development partners and major financial donors, to plan strategies not only to provide for better living conditions for the current population but, more importantly, to ensure the islands are able to sustainably support the existence of the people now and in years to come.

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ACRONYMS

ADB	- Asian Development Bank
APTC	- Australia Pacific Technical College
AU	- Auckland University
AusAID	- Australian Aid
BPC	- British Phosphate Commission
BPoA	- Barbados Program of Action
BTC	- Betio Town Council
CBD	- Convention on Biological Diversity
CCA	- Climate Change Adaptation
CISRO	- Commonwealth Scientific and Industrial Research Organization
CoG	- Church of God
COP	- Conference of Parties
DRR	- Disaster Risk Reduction
ESCAP	- Economic and Social Commission for Asia and the Pacific
EU	- European Union
FPSPK	- Foundation of the Peoples of the South Pacific Kiribati
FTC	- Fisheries Training Centre
GDP	- Gross Domestic Product
GEF	- Global Environmental Facility
GEIC	- Gilbert and Ellice Islands Colony
GIA	- Guano Islands Act
GPS	- Global Positioning System
ICFP	- International Conference of Family Planning
ICZ	- Intertropical Convergence Zone
IPCC	- Inter-governmental Panel on Climate Change
JICA	- Japan International Cooperation Agency
JTFC	- Japan Tuna Fishing Corporation
KANI	- Kiribati and Australia Nursing Initiative
KAP	- Kiribati Adaptation Programme
KDB	- Kiribati Development Bank
KHC	- Kiribati Housing Corporation
KJIP	- Kiribati Joint National Action Plan

KNP	- Kiribati National Parliament
KPC	- Kiribati Protestant Church
KUC	- Kiribati Uniting Church
KSSL	- Kiribati Shipping Services Limited
KWASP	- Kiritimati Water and Sanitation Project
LDC	- Least Developing Country
LDS	- Church of Jesus Christ of the Latter Day Saints
LMS	- London Missionary Society
MELAD	- Ministry of Lands and Agricultural Development
MGD	- Millennium Development Goals
MIRAB	- Migration, Remittances, Aid and Bureaucracy
MLPID	- Ministry of Line and Phoenix Island Development
MOH	- Ministry of Health
MPA	- Marine Protected Area
MPWU	- Ministry of Public Works and Utilities
MRF	- Material Recovery Facility
MTC	- Marine Training Centre
MTDS	- National Medium Term Development Strategy
NAPA	- National Adaptation Plan of Action
NASA	- National Aeronautics and Space Administration
NDS	- National Development Plan
NPO	- Native Passage Ordinance
NZAID	- New Zealand Aid
PAC	- Pacific Access Category
PICs	- Pacific Island Countries
PIFS	- Pacific Island Forum Secretariats
PIPA	- Phoenix Island Protected Area
PIS	- Phoenix Island Scheme
PUB	- Public Utilities Board
RC	- Roman Catholic
RERF	- Revenue Equalisation Reserve Fund
RSE	- Recognised Seasonal Employer
SAPHE	- Sanitation and Public Health Environment
SDA	- Seventh-day Adventist Church

SIDS	- Small Island Developing States
SPCZ	- South Pacific Convergence Zone
SPMS	- South Pacific Marine Services
SPREP	- South Pacific Regional Environmental Protection
SWM	- Solid Waste Management
TCC	- Tarawa Climate Change Conference
TUC	- Teinainano Urban Council
TWSP	- Tarawa Water and Sewerage Project
UN	- United Nations
UNDP	- United Nations Development Programme
UNESCO	- United Nations Educational, Scientific and Cultural Organization
UNFCCC	- United Nations Framework Convention on Climate Change
UOW	- University of Waikato
USP	- University of the South Pacific
WB	- World Bank
WHO	- World Health Organization
WSSD	- World Summit on Sustainable Development

CHAPTER ONE

INTRODUCTION: THE CHALLENGE OF CLIMATE CHANGE

Our experience and those of other low-lying island countries in the Western Pacific indicates that something is wrong when rows of trees and coastlines are progressively being washed away with time.

(Tong, A. (2011) Republic of Kiribati)

1.1 INTRODUCTION

The environment we live in has experienced many physical modifications and is still in a dynamic state of change (Tompkins et al. 2005: 10). These changes are caused by a mix of natural events and cultural activities imposed by nature and humans. For centuries the main ways humans altered their landscapes was through destruction of forest and use of fire. Since the industrial revolution, they have had the power and technology to extract and consume resources, produce waste, and modify the environment in which they live (Barnett and Campbell 2010).

In their quest for survival, humans have invented technologies to extract whatever they required from the environment, thus modifying the physical landscape (Tompkins et al 2005). The continuing modifications of the physical environment have not only supported human survival but have critically undermined the natural environment that has for ages provided sustenance for the human population. One significant concern has become the effect of human activities on the natural balance of the heat in the earth's atmosphere. During the 20th century the earth has been heating up at an unprecedented rate. This is caused by the increasing concentration of greenhouse gases (GHG) in the atmosphere which enhances the greenhouse effect that causes global warming (Hay et al 2003: 8). Even though climate change has been recognised for some time, it was during the late 1980s that it gained international attention as an issue of great concern (Barnett and Campbell 2010: 8).

Climate change, sometimes referred to as global warming, has become a very important economic, environmental and political issue in the early 21st century. Global assessments of climate change have consistently agreed that it is affecting the entire planet. However, there will be regional variations as some parts of the

planet experience different impacts from other parts (Barnett and Campbell 2010; Tompkins et al. 2005). Climate change is expected to cause the oceans to warm and expand resulting in a rise in sea level (Hay et al. 2003: 21).

The recent Inter-governmental Panel on Climate Change (IPCC) Working Group (WG1) Assessment Report (AR5) report stated that the concentration of greenhouse gases (GHG) has increased and the atmosphere and ocean have warmed since the 1950s and causing the amount of snow and ice to diminish and sea level to rise. This warming has caused the rate of sea level rise since the mid-19th century to be larger than the mean rate during the previous two millennia. More specifically, it was indicated with high confidence that during the period from 1901 to 2010, global mean sea level rose by 0.19 to 0.21 m. Similarly, the mean rate of global averaged sea level has risen by 1.7 (1.0 to 1.9) mm per year between 1990 and 2010, 2.0 (1.7 to 2.3) mm per year between 1971 and 2010 and 3.2 (2.8 to 3.6) mm per year between 1993 and 2010 (IPCC 2013: 6).

Other research also confirms that global mean sea level will continue to gradually rise thus posing concern about its impacts on the livelihoods of inhabitants residing in coastal areas and, more specifically, on low-lying atolls and reef islands (Barnett and Campbell 2010; Hay et al. 2003/2013; Tutangata 2005, World Bank 2000). Sea level rise projections require examination of ocean thermal expansion, the melting of glaciers and ice gaps and terrestrial water storage. As observed by the global climate models, the patterns of regional distribution of sea level indicate that the rise will not be geographically uniform.

Projections of sea level rise by the Pacific Climate Change Science Program (PCCSP) indicate it is expected to be similar to the global average. Deviations among predicted models make regional estimates uncertain. However, current projections show sea level is expected to rise during this century (Australian Bureau of Meteorological and CSIRO 2011: 9), thus making the low-lying atoll countries like Kiribati, Tuvalu, Tokelau and the Marshall Islands at risk.

The Intergovernmental Panel on Climate Change (IPCC) Working Group WGII Assessment Report (AR5) (2014) and WGII AR4 (2007) both confirm that "...the

threats of climate change and sea level rise to small island are very real” (IPCC 2014: 3), as they have small land masses that are surrounded by ocean and are located in regions that are most prone to natural hazards (IPCC 2007, 2014). Many small island developing states (SIDS) in the Pacific, including those where all of the land area is in the form of coral atolls and reef islands that are barely a few metres above sea level, have poorly developed infrastructure and limited natural and economic resources. They also display characteristics such as limited land size and exposure to external shocks which make them vulnerable to climate change (Mimura et al. 2007; Castalia Strategic Advisors 2009).

Countries made up of low-lying coral islands, like Kiribati and Tuvalu, have already experienced changes in sea level and sea surface temperatures which, in turn, have affected storm surges and king tides (Hay et al. 2003). Some of these events have become more frequent as a result of climate change even though the inhabitants of these countries have made minimal contributions to the causes of global warming that have been accelerated by human activity (Barnett and Campbell 2010). On average, it is estimated that each Pacific Islander is responsible for producing approximately one quarter of the carbon dioxide (CO₂) emissions attributable to the average person worldwide (Hay et al. 2003).

Changes in natural weather variability and a rise in sea level, together with an increase in the intensity of natural disasters, have the potential to exacerbate problems associated with growing urbanisation of the local populations of Kiribati as well as other low-lying atoll countries of the Pacific. These changes are likely to cause coastal erosion; decrease productivity in fisheries and agriculture; damage coastal settlements and roads; destroy or damage coastal plants and trees used for medicinal, artefacts, and construction purposes; devastating droughts resulting in serious water shortages; and more widespread and frequent occurrence of waterborne diseases such as dengue fever, diarrhoea and skin diseases (Barnett and Campbell 2010; Connell 2013; Beck 2006; Crocombe 2001; Hay et al 2013; Hay et al. 2003: 1).

Furthermore, a progressive rise in sea level may exacerbate inundation, beach erosion, destruction of coastal vegetation, and more critically the intrusion of sea

water into underground fresh water lenses and excessive salinisation of soil (Barnett and Campbell 2010: 14; Hugo 2012; Nunn 1998). All these changes may threaten vital infrastructure and facilities that support the livelihoods of residents in urban atoll communities.

This thesis examines climate change and how it impacts on the livelihoods of urban dwellers in Kiribati. More specifically, it examines the social, economic, and environmental impacts on the urban livelihoods of the people residing in the two main urban centres of South Tarawa on Tarawa and Ronton (London) on Kiritimati in the Republic of Kiribati. It also identifies and discusses awareness and adaptation as recommended strategies to assist government, the private sector, and the general urban population in their endeavours to ensure sustainable progress and survival of the urban environments of South Tarawa and Ronton (London) now and in the years to come.

The findings of the study aims at making the general population, business community and government workers more aware of what they may encounter from climate change and also further understanding of awareness and adaptation processes on low-lying atolls as their inhabitants adjust to changes arising from climate change, in particular the rise in sea level. Similarly, the findings will assist policy and decision makers, development planners and governments of low-lying atoll countries like Kiribati as they strive to improve living conditions for their populations through economic development and to make sound and appropriate decisions that will enhance and improve the livelihoods of the urban populations in a sustainable manner.

1.2 RESEARCH QUESTIONS AND OBJECTIVES

This thesis examines the contemporary livelihoods, mobility and settlement patterns of urban residents on low-lying atoll islands in the central Pacific and how they are being, or are likely to be, affected by climate change.

1.2.1 Objectives of the study

The main objectives of this thesis are:

- a) To discuss the physical characteristics of urban environments and their importance to the livelihoods of urban dwellers,
- b) To assess the vulnerability of urban dwellers to climate change and urban related problems,
- c) To identify the social and economic impacts of climate change in the two main urban areas and their effects on the livelihoods of the urban dwellers,
- d) To examine resettlement and possibly relocation overseas as possible solutions to environmental degradation, including degradation caused by climate change, and
- e) To outline strategies for adapting to the impacts of climate change and urban related problems in the short and long term.

1.2.2 Research questions

Kiribati's two main urban centres of South Tarawa and to a lesser degree Ronton have supported more than half of the country's population for more than a decade. Such population concentration on low-lying atolls with limited natural resources is unprecedented in the history of Kiribati. The pressures on atoll resources to support urban populations of such magnitude are enormous and climate change is likely to exacerbate these pressures.

The research questions outlined below were developed to inform the examination of the degradation of the urban ecosystems and how increasing pressure from the urban population and the changing patterns of human settlements have influenced and are likely to continue to influence vulnerability of the population to environmental changes. The pressure of urban population on the limited natural resources, including ground water supplies, lagoons and ocean beaches, and locally grown foods like coconut and pandanus that support the urban livelihoods of the people is likely to intensify with climate change. Consequently, strategies to adapt to the long and short term impacts of climate change need to be linked to strategies that address the increasing urbanisation of the Kiribati population.

In this research context, the thesis addresses the following questions:

- 1) What have been the major changes in the coastal environments and groundwater supplies on South Tarawa and Kiritimati Island since Kiribati attained political independence in 1979?
- 2) How much of the degradation in the environments of South Tarawa and Kiritimati Island is due to increasing pressure of population and changing patterns of human use of the environment?
- 3) What strategies have the Government of Kiribati adopted to combat on-going degradation of atoll environments in the urban areas and how effective will these strategies be in the light of projected changes in sea level and other climate change-related developments?
- 4) How are the local populations coping with both the increasing pressure of people on the limited resources of the urban atoll environments as well as the degradation of water supplies, lagoon and ocean beaches and reefs, and the availability of fresh water and locally grown foods that supported the livelihoods of the urban population?
- 5) What are the main effects of climate change on the population and settlement patterns in South Tarawa and Kiritimati and what adaptation strategies are likely to be effective for adapting to climate change and its related impacts in the long term?

1.3 THEORETICAL FRAMEWORK

The theoretical framework that informs this research is based on an ecocentric approach to the human-environment relationship. This discourse was originally conceived by Aldo Leopold who stated that all species, including humans are inter-related in their life processes (Leopold 1949). Ecocentrism is characterized by a holistic approach in which human beings are seen as being part of nature and that nature should be respected (Dryzek 2005).

Unlike other human-environment relationship discourses of anthropocentrism, and cosmocentrism, which hold that human beings are at the centre of the world; humans are among the multitudes of living species; and the earth is just a part of

one solar system among many; ecocentrism holds that the ecosphere is inclusive of everything organic and inorganic, and rather than individual life forms is the source of all existence (Singh et al. 2010).

It also promotes a holistic approach towards the environment, politics, culture and lifestyles. Besides, it encourages people to be in awe of the world around them and control unnecessary human encroachment on the environment (Singh et al. 2010). As Kiribati is slowly experiencing problems associated with impacts caused by climate change and also from developments in urban areas in particular, it inevitably calls for the use of appropriate development approaches that will enhance economic development without destroying the atoll environment and cultural fabric that has sustained the livelihoods of urban dwellers.

Basically, there are three main theoretical concepts which inform this thesis:

- a) Vulnerability,
- b) Endogenous Development (ED) and Indigenous Knowledge (IK)
(Gorjestani 2000)
- c) Adaptation

The use of the above theoretical agendas enhances holistic consideration of climate change and its impacts on the livelihoods of urban dwellers and the urban environment. The contemporary urban growth of Pacific urban centres, and more specifically South Tarawa, has been accompanied by various development problems such as rising unemployment, growth of unserved settlements, increasing crime rates and environmental degradation which has increasingly posed national concerns (Connell and Lea 2002: 11).

Urban areas are supposed to provide opportunities to improve the livelihoods of the people compared to what they have on outer islands where the rural subsistence economy remains important but there are limited cash-earning opportunities. Additionally, there have been increasing conflicts between landowners and immigrants from outer islands over growing urban issues such as shortage of land, corruption, and government's inefficiency to address such issues which have

resulted in division in urban South Tarawa (Connell and Lea 2002). Coupled with climate change impacts caused by the rise in sea level, increases in atmospheric temperature, precipitation variability and extreme weather events, these environmental processes are making living more problematic for the urban population (Gerrard and Wannier 2013).

This thesis examines problems associated with climate change impacts and other urban related problems on South Tarawa and Kiritimati and considers prospects for sustainable urban development through urban development policy responses to enhance sustainable urban growth in the two urban areas. The primary concern is to examine the ability of the urban areas of South Tarawa and Kiritimati to sustainably support the urban growth amidst growing environmental concerns posed by climate change and urban development without completely depleting and degrading the urban environmental resources. Fig 1.1 illustrates the research path followed when conducting research work.

In Kiribati, the geomorphological characteristics of the atoll islands pose environmental concerns when it comes to the question of development. This is because the land area is very small with very limited resources to support development activities beyond what the environment could support. Miller (1996) describes resources as the supply of materials which include water, sand, trees, plants, and animals that provide support to the people. Zimmermann describes resources as things that satisfy needs and wants (Hunker 1964). As human needs and wants change, so do resources. Accordingly, if these needs and wants grow (as in the case of development), so too does the demand for resources.

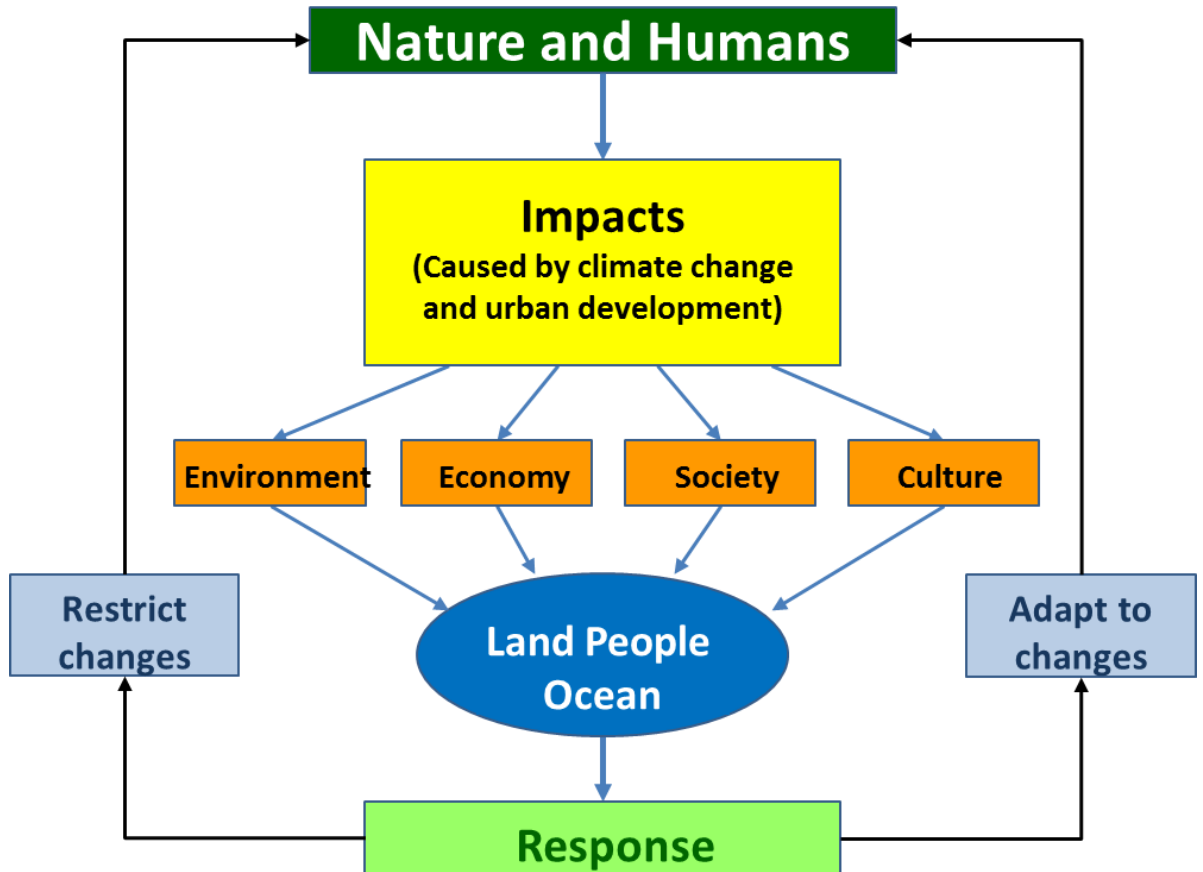


Figure 1.1 Integrated approaches used to conduct this research

(Source: Author's diagram)

Resources refers to anything existing in the environment that can be exploited for economic benefits such as plants, animals, mineral resources and energy resources (Matthews et al 2001; Miller 2000; Wehmeier 2000). The natural resources such as water, minerals, sand, trees and the like are very limited in Kiribati and harvesting these resources unsustainably will affect the urban environment as well as the economic, social and cultural livelihoods of the urban people that depend on these resources for survival. Additionally, the increasing amount of waste produced by the population and industrial production is becoming a problem due to the limited land areas for properly disposing of wastes. The porous soil poses another problem especially for chemical wastes as they can be leached through the sandy soil and contaminate the water lens that provides the main source of potable water.

1.3.1 Vulnerability

Vulnerability has many formal definitions and is sometimes associated with notions of poverty and deprivation (Barnett and Campbell 2010: 159). However, this alone does not provide an adequate definition. As stated by Chambers (1989), vulnerability is not the same as poverty like lack or want, but refers to many other factors including exposure to risk. United Nations Department of Humanitarian Affairs (UNDHA) defined “vulnerability as the degree of loss that may result from a potentially damaging phenomenon” (UNDHA 1993: 63). ReliefWeb Project (2008:57) further defines vulnerability as the “... conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards”. Cutter (1996) also defines it as the potential loss. These definitions consider the relationship between a hazard and its effects.

Other commentators define vulnerability as a social phenomenon that exposes human values and systems to a threat. Sometimes these definitions can be easily confused with the term risk. However, risk does not mean catastrophe but simply refers to the anticipation of a catastrophe (Moser 1998: 16). Based on this, climate change may be seen as an anticipated catastrophe that would cause damage to the environment and to the people who inhabit that environment.

In the IPCC Third Assessment Report (2001), vulnerability is defined as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. This refers to the vulnerable system itself such as the low-lying islands or coastal settlements and the impact on this system of flooding caused by the rise in sea level (Schneider et al. 2007: 783). Vulnerability is also a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity. O’Brien et al. (2008) point out that an individual or group’s vulnerability to climate change and climate-related disasters is influenced by a complex array of social, economic, political and environmental factors. It is not evenly distributed across and within countries. It is likely that some individuals, households, or groups will be disproportionately affected by climate change. Kiribati, being a country of

mainly small low-lying islands, is likely to be adversely affected due to its geographical characteristics, and that some groups and individuals in Kiribati may be affected more than others.

In the case of small islands in the central Pacific, vulnerability also includes their physical characteristics which make them easily affected by the interplay of such factors as remoteness, geographical dispersion, natural disasters, and a high degree of economic openness, small internal markets and limited natural resource endowment (Pratt et al. 2001: 3). Chambers explained this as "...defencelessness, insecurity, and exposure to risk, shocks and stress" (Chambers 2006: 33). Being exposed to these situations could result in the loss of people's traditional means to cope with situations like economic hardship and natural disaster thus affecting their ability to adapt to environmental and economic shocks (Beck 2006; Bryant 1993: 13).

In the case of Kiribati, any rise in sea level and sea temperature is likely to affect coastal erosion, including the loss of mangroves and coral reefs, with consequent adverse impacts on underground fresh water supplies, vegetation and marine ecosystems. On South Tarawa, where the bulk of the government's development is concentrated, urban-related problems such as resource depletion, underground water contamination, population congestion, waste disposal and exploitation of natural resources are prevalent and causing major concern for government and the urban dwellers. Even though urban-related problems are not a major concern at this stage in Kiritimati, it is important that sustainable development policies are considered and implemented in advance in Kiritimati to avoid the repetition of those problems that are currently confronting South Tarawa.

Vulnerability to climate change can be determined by three main factors:

- 1) exposure to hazards (such as rise in sea level and reduced rainfall),
- 2) sensitivity to those hazards (low elevation of the land makes fresh water lenses highly vulnerable to any increase in level of the sea),

- 3) capacity to adapt to those hazards (whether Governments, communities or individuals in small island states have the financial capacity to protect their islands from rising sea levels in the future).

A rise in sea level can become a hazard thus making the islands, and in particular South Tarawa and Kiritimati, vulnerable by affecting their potential to support their residents. Hence, there is a need to put in place development policy responses to prepare the people in advance to adapt to such hazards when the need arises in the future. Similarly, adaptation measures can help reduce vulnerability – for example by lowering sensitivity or building adaptive capacity through activities such as constructing sea-walls and planting mangrove trees along the coastal areas to protect the coastal vegetation and settlements from being affected by erosion and also protecting sea water seepage into the groundwater lens during storm surges associated with high tides accompanied by bad weather.

Vulnerability of small islands to climate change has been recognised in international declarations such as the Kyoto Protocol, Niue Declaration, Pacific Islands Forum Secretariat Agenda Item 7A, and Barbados Declaration on the Sustainable Development of Small Island Developing States. These declarations identified small islands as being very vulnerable to environmental degradation as a result of climate change. The Barbados Declaration (1994) emphasizes supporting activities aimed at helping SIDS to cope effectively and creatively with climate change, climate variability, and sea level rise.

In the context of island vulnerability, the focus has shifted to climate change as a process that is likely to threaten the very existence of societies, their cultures and their land. The President of Kiribati, His Excellency Anote Tong, clearly emphasised in his speech to the United Nations General Assembly in 2013 that the fate of the people of Kiribati, their culture, and even memories, are at stake. He explained that despite the government's and people's efforts to protect and conserve the island biodiversity in order to reduce the negative impacts of climate change, without the support of the international community the future of the Kiribati people is undoubtedly highly uncertain.

1.3.2 Endogenous Development (ED) and Indigenous Knowledge (IK)

Combining the Endogenous Development (ED) and Indigenous Knowledge (IK) approaches is considered the most appropriate way forward in pursuing long term developments in Kiribati. The emergence of the ED approach by David Millar (2005) in the early part of the 1980s was simply proposed as a reaction to the dissatisfaction with existing development models that were observed during the 1960s and 1970s. ED is described as a “development from within” model where the local population can choose which resources they would like to use for their development (Gorjestani 2000).

Further, ED plays a significant role in the conservation and management of culture and in sustainable development as it involves the local population in the planning of development strategies and management of their own areas. Additionally, ED not only aimed to produce economic growth in a country but also to achieve ecological stability and maintaining its cultural diversity. Indeed, this approach will provide development strategies that will enhance protecting the economic, cultural and ecological fabric of urban society on South Tarawa in particular as well as Kiritimati.

Indigenous Knowledge (IK) is the local knowledge that is unique to a given culture or society. Generally, it is the basis for local-level decision making in agriculture, health care, food preparation, education, national resource management, and a host of other activities in rural communities (Warren 1992). It is basically the information base for a society which facilitates communication and decision making (Millar 2005; Gorjestani 2000; Warren 1992). The World Bank (1998) explains that IK is a body of knowledge unique to a particular culture and society and is the basis of local decision making. It is a reservoir of wisdom about the cultural and environmental matters that provide the daily life of the local population and its progress throughout time (Gorjestani 2000).

The importance of IK in the development process was recognized during the Global Knowledge Conference in 1997 in Toronto when government leaders and civil society groups urged the World Bank and other financial donors to consider

drawing on IK from the local communities (Gorjestani 2000). Consequently, a global network of IK resource centres has emerged over the last 10 years with members including academic institutions, NGO's, and the individuals who have engaged in the study, documentation, dissemination, and advocacy of IK (Gorjestani 2000).

The World Bank has used IK in many of its projects in Africa and other developing countries. In Nepal, IK was used by a major donor-assisted food distribution program called the "Food for Workplace Program". It was discovered that there were major losses of food during distribution and calls for action to control the loss. Organizers of the program decided to resort to using IK. The use of a bullock cart instead of a truck for distribution of food, especially to poor communities, proved to be very successful (Gorjestani 2000).

Western technology has replaced IK and in some developing countries IK is at risk of being lost or forgotten (Warren 1992). Kiribati is experiencing the dilemma where most of its IK is slowly being forgotten by the local population. Western influences have conquered the minds of the people with its many easy to obtain commodities such as knives, pots, imported foods, clothes and the like that have simply made life more convenient for the local population. Similarly, IK that has sustained the lives of the people on remote unfertile atolls has been neglected as the local population has switched to using western commodities. This concern was also highlighted in the country report for Conference of the Parties on Biological Diversity (CPBD) and Convention on Biological Diversity (CBD) for Kiribati that:

There is need to expedite and implement resource management measures that will safeguard the deteriorating status of the natural resources for the future generations of the economy. It is essential to take into account traditional conservation practices that may be effective in the daily management of the resources (Tebano 1999:7)

1.3.3 Adaptation

Generally, adaptation is the ability to adjust to climate change, to moderate potential damages, to take advantage of opportunities or to cope with consequences of the

adverse effects of climate variability and change (Hay et al 2003; SPREP, 1999). Additionally, it refers to “... actions or activities that people undertake, individually or collectively, to accommodate, cope with, or benefit from, the effects of climate change” (Hay et al. 2003: 59). Adaptation to climate change encompasses other actions and activities necessary to take climate change effects into account. Adaptation to climate change is a continuous process that involves the adjustment of any affected society to risks that arise from climatic change or variability.

Adaptation also seeks to reduce the risks posed by the consequences of climate change. Throughout history, humans have continually learned to adapt to the changes in the environment by developing practices, cultures, and livelihoods that are suited to their local conditions (Clark and Fisher 2012). Humans have continued to respond to environmental, social, economic and technological changes. However, the potential rapidity of climate change could test the capability of humans to adapt (Tompkins and Adger 2003). In the Pacific Islands, the process of adaptation is reflected in traditional systems of resource use, including agriculture, housing styles, and settlement locations. This process is dynamic as the influences people and communities adapt to, and their personal needs and wants, are constantly changing (Hay et al... 2003: 60).

The ability of humans to cope with the impacts of climate change depends on many factors including wealth, education level, infrastructure, access to resources, management capabilities, acceptance of the existence of climate change and the socio political will of the government (Barnett and Campbell 2012; Parry, Hammill and Drexhage 2005; Hay et al. 2003). Adaptation involves strategies that people take as they respond and anticipate to any projected and actual changes in the climate (Tompkins and Adger 2003). The adaptive capacity of Pacific Islands is linked to their social and economic development capability.

Scheraga and Grambsch (1998: 87) proposed nine fundamental principles that should be considered by policy designers when compiling adaptation policies:

- 1) Climate change effects vary by region,
- 2) Climate change effects also vary across demographic groups,

- 3) Climate change poses both risks and opportunities,
- 4) Climate change effects must be considered in the context of multiple stressors and factors,
- 5) Adaptation involves cost,
- 6) Adaptation responses vary in effectiveness,
- 7) The systematic nature of climate impacts complicates the development of adaptation policy,
- 8) Maladaptation can cause negative effects that are serious,
- 9) Adaptation opportunities make sense when the effects of climate change are well realised.

Even though there are significant uncertainties as to the magnitude of climate change effects globally, it is imperative that Pacific Islands develop and implement policies and plans that will assist them to minimise adverse effects of climate variability and change (Hay et al. 2003: 60)

1.4 THE STUDY AREAS

This study focuses on the two main urban areas of Kiribati namely South Tarawa in the Gilbert Group and Ronton on Kiritimati (also known as Christmas Island) in the Line Group (see Figure 1.2).

South Tarawa (See Figure 1.3) is situated on the southern part of Tarawa atoll and includes an area stretching from Betio islet in the southwest to Tanaea in the north. Included in this area are six individual islets which were originally separated by channels but now have been connected by causeways and bridges. It has a combined total land area of about 31 square kilometres and a combined length of 28 kilometres. The islets differ in land size and width. South Tarawa has been the main urban area in Kiribati since the late 1940s and was the site of a major battle between the Japanese and Allied forces in the Second World War.

At the time of the census of the population in 1947 South Tarawa had a total population of 1,619 and most of the area between Tanaea and Betio was occupied by the traditional landowners living in villages. South Tarawa's population in 1947 accounted for just over 5 percent of the total of 31,337 living on the islands that

now comprise the Republic of Kiribati. By 2010 the population of South Tarawa had grown to 50,182 – almost half of the total population of Kiribati (103,058). The entire strip of coral from Tanaea to Betio (see Figure 1.3) is now very densely settled posing several severe development challenges for both the local and national governments.

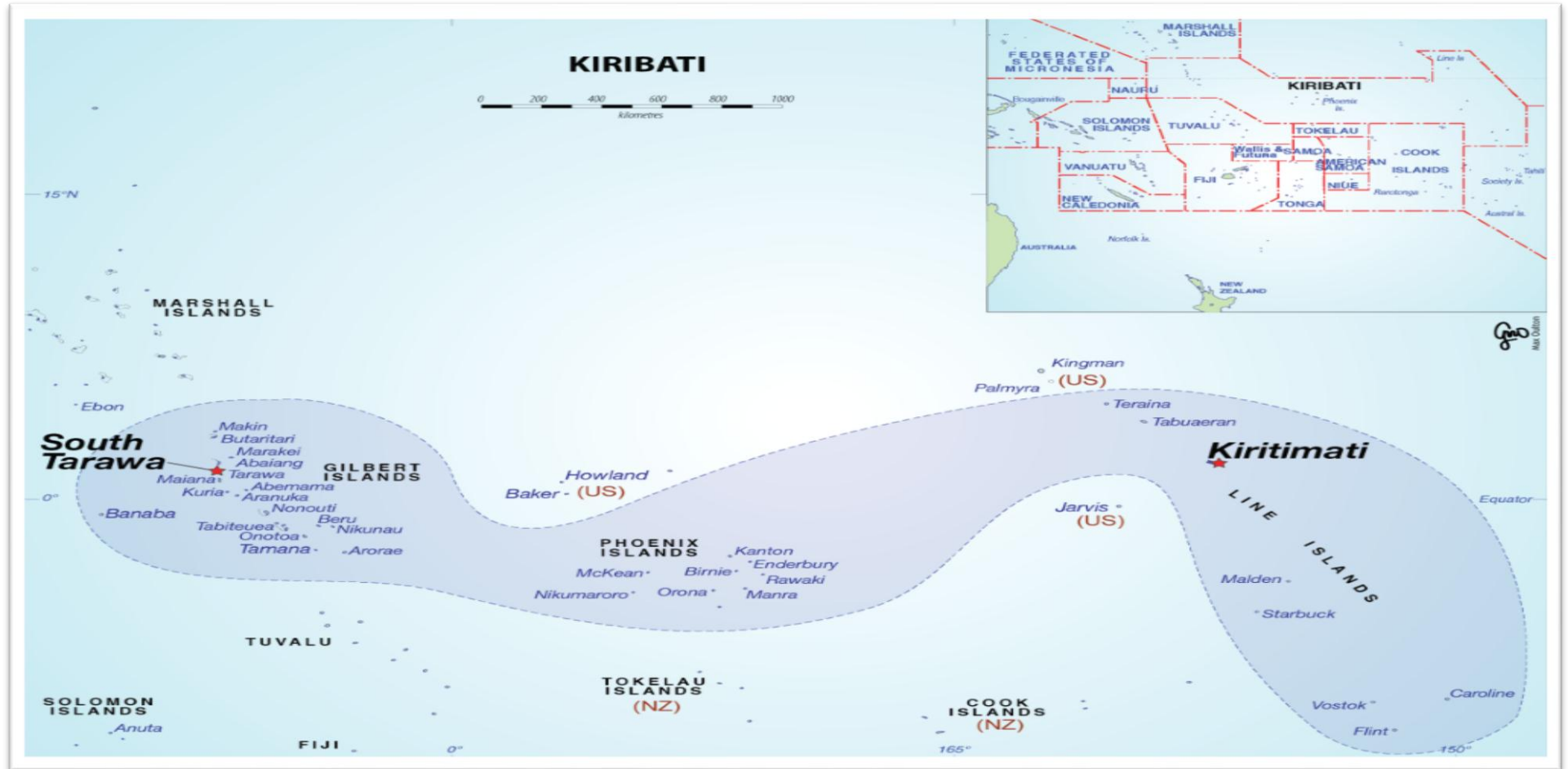


Figure 1.2 Map of Kiribati (Source: Max Oulton 2013 University of Waikato)



Figure 1.3 Urban South Tarawa (Source: Max Oulton 2013 University of Waikato)

Kiritimati is a transliteration of the English word Christmas into Gilbertese language and is the largest coral atoll (by land area) in the world (see Figure 1.4). It is situated in the northern Line Group and has a total land area of approximately 322 square kilometres. Previously, Kiritimati¹ and a number of islands in the Phoenix and Line groups were under the United States of America (USA). The islands were relinquished to Kiribati in a Treaty of Friendship that was signed in Tarawa between the Government of Kiribati and the USA in 1979 (Van Trease 1993).

After Kiritimati became a part of Kiribati, Ronton served as the main administrative area as well as main sea port while Banana is the location of the international airport and residential area for civil servants. The urban area extends from Ronton to Banana. Most contemporary urban development concentrates around Ronton and Banana. Previously, Ronton and Banana served as the main urban centres. Today, Tabwakea and Main Camp have become part of the urban area (see Figure 1.4).

The population of Kiritimati before independence in 1979 was 1,265 (Government of Kiribati 2007: 146). The atoll was used for nuclear testing in the 1950s and 1960s affecting both the local population as well as the diverse bird life. Today Kiritimati is a wildlife sanctuary. The atoll's large land area, coupled with its close proximity to Hawaii and USA, provides opportunities for tourism; especially recreational fishing and bird watching. It has become a site for urban development to relieve pressure on South Tarawa and at the time of the last census in 2010 the population of Kiritimati was 5,586.

¹ After independence in 1979, Kiritimati began to grow rapidly, as a result of a government-led scheme to decentralise development away from South Tarawa (Pitchford 1981)



Figure 1.4 Kiritimati Island (Source: Max Oulton 2013 University of Waikato)

1.4.1 Environmental impacts in Kiribati

A United Nations report (1989) listed Kiribati as an endangered country in the event of sea level rise during the 21st century. Recent studies have confirmed that most settlements in small islands are located in coastal locations such as the main urban areas including the main sea ports, international airports, and centres of government activities. The National Summit on the Kiribati Development Plan and Climate Change (2011) expressed concern that observed changes linked with climate change have adversely impacted the lives of the people and that these are only the first signs of processes that are likely to increase in severity with time (Government of Kiribati 2012).

The underground fresh water lens is the main source of water for atoll residents, and such lenses are very susceptible to natural and human activities. In addition to salt water intrusion as a result of wave action, especially during spring tides, the lenses are polluted by domestic waste, particularly human effluent through improper sewage disposal (pit latrines and inadequate septic tanks), and drainage (Hay et al.. 2003: 32). As a result, poor water quality affects the health of the population, particularly children, who are especially susceptible to water-borne diseases like dengue fever and diarrhoea (Mimura et al 2007).

The Government of Kiribati has established an Environment Unit with responsibility for reporting on environmental change and associated problems (See Appendix 1). Further consideration of the environment was highlighted in the Kiribati Development Plan (KDP) for 2008 to 2011 which defined the environment as the “surrounding ecosystems, such as land, coastal areas, fresh water, lagoon water, air, and all surrounding living trees and organisms” (Republic of Kiribati 2008: 29). The importance of the environment is clearly highlighted in the KDP theme “Enhancing economic growth for sustainable development”.

The sustainable use of physical resources addresses the key issues surrounding the protection of the environment and sustainable use of the natural resources (Republic of Kiribati 2008: 5). Major progress has been seen in on-going projects including the Kiribati Adaptation Programmes (KAP) I, II and III and also the privatization

of urban renewability projects such as *Kaoki Mange* (waste recycling). All of the above on-going projects emphasise development strategies that will promote and maintain a healthy and sustainable environment and avoid excessive exploitation of natural resources.

The Government of Kiribati, with the support of aid agencies in New Zealand and Australia and the World Bank, have continued to invest heavily in programmes designed to make development on South Tarawa and Kiritimati Island more sustainable. While it is true that financial assistance is necessary to help develop the two main urban areas in Kiribati, such development projects need to be implemented in a way that will not degrade the land that continues to support the livelihoods of the urban population (Castalia Strategic Advisors 2009). It is important that aid agencies continue to invest in development projects that support sustaining a reasonable quality of life for atolls dwellers in the medium-term even if their islands might not be able to sustain human populations long-term due to environmental degradation (Bedford and Bedford 2010).

1.4.2 Population mobility

There have been many references to migration as an adaptation to natural hazards such as hurricanes, periodic droughts, volcanic activity, earthquakes and tsunami in the Pacific (see, for example Campbell, 1985, 1990, and 2010; Bedford and Bedford 2010: 93). In response to such hazards, communities have, at times, been relocated from their natural homeland to another country (Koch 1978; Campbell 2010). Campbell (2010: 32–33) explained that there are two main categories of migration in the Pacific that are influenced by climate change: and they are induced migration and forced migration.

The induced migration category occurs in locations that are facing adverse effects of climate change but are still able to support human habitation. This category is characterised by reduced subsistence and cash livelihoods resulting in migration to other countries to seek improved livelihoods. Climate-induced migration helps reduce population pressure on the affected environment and also provides

remittances to complement reduced incomes of family members in the islands (Campbell 2010: 32; Hay et al. 2003).

The forced migration category applies in situations where climate change has rendered the locations of entire communities uninhabitable (Campbell 2010: 33). In such situations, forced migration is likely to occur through relocation or resettlement of entire communities in another location. This may often result in community fragmentation, social disintegration, and the loss of traditional culture especially in the case of international relocation (Campbell 2010: 33).

During the colonial period, relocation of entire communities from one country to another was a response to economic hardship faced by certain communities². For instance, the relocation of the Phoenix Islanders in the 1960s to the Western Province in the Solomon Islands during the colonial period was implemented because of environmental hardship. Settlers from the Gilbert Islands experienced droughts, freshwater shortages and brackish and infertile soil for planting (Knudson 1977; Macdonald 2000; Tabee 2013: pers. comm). The Banaban people were relocated to Rabi in Fiji to allow the British Phosphate Commission (BPC), a consortium of British, Australian and New Zealand interests, to mine phosphate on Banaba. The resettlement of the Vaitupu people (in present day Tuvalu) to Kioa in Fiji was linked with perceived pressure of population on a limited atoll environment in the future (Bedford and Bedford 2010; Campbell 2010; 2008; Lieber 1977; Maude 1952).

Continued economic hardship, coupled with increasing impacts of climate change, will inevitably continue to encourage people from the islands to move to other countries. The major destinations for island migrants are New Zealand and Australia. This is reflected in the number of people migrating from the islands to Australia and New Zealand in search of better livelihoods. The migration policies of some countries, particularly New Zealand, have enabled people from selected island countries to migrate for temporary work or for residency. Fiji is another likely

² For more detail development of relocation in Pacific Island Communities, see collection of essays on relocation in “Exiles and Migrants in Oceania” (1977) by Michael D. Lieber (eds.).

destination for Kiribati and Tuvalu migrants as they already have established communities living on Kioa and Rabi (Lieber (eds) 1977).

The Pacific Access Category (PAC) allows for small quotas of prospective migrants from Kiribati, Tuvalu, and Tonga to be balloted every year for residence in New Zealand. Similarly, the New Zealand temporary work schemes of the 1970s and 1980s, and the recent establishment of the Recognised Seasonal Employer (RSE) work policy, not only address the persistent problem with seasonal labour supply in New Zealand (Spoonley and Bedford 2012: 149), but also provide employment opportunities for workers from Pacific Forum countries to work in New Zealand. The RSE work policy contributes to New Zealand's foreign policy objective of assisting Pacific Islanders to gain access to wage employment overseas to support their families in the islands (Spoonley and Bedford 2012: 150).

1.5 SUMMARY OF THESIS CHAPTERS

This chapter has provided an overview of the thesis. Basically the thesis examines climate change and how it impacts the livelihoods of the urban dwellers of Kiribati. Several important concepts used in the study of climate change have been introduced along with specific reference of relevant aspects of climate change and their implications for the land and the people of small islands. Changes in atmospheric temperature, rainfall, sea level and extreme natural events are likely to have significant impacts on atoll ecosystems and more critically the livelihoods of atoll peoples.

Chapter two surveys existing literature on climate change and its associated impacts on the land and the people with a particular focus on small islands of the Pacific. While there has been agreement that climate change is posing major challenges for people and environment in SIDS, there have been minimal responses to address such challenges (Barnett and Campbell 2010). This chapter explores the historical contexts of urban development in Pacific Island countries from colonization to post-independent periods with a particular emphasis on Kiribati urban centres. It identifies the adverse effects of climate change on small island urban populations and reviews what is currently being done to alleviate negative impacts.

Chapter three provides a descriptive analysis of the atolls and their urban environments. Photographs of the study areas are used to illustrate their vulnerability to climate change and in particular the rise in sea level. Having limited natural resources, coupled with other geographical factors including infertile soil, lack of surface water and the like exposes the islands to climate change and more particularly sea level rise. Increasing concentration of the population in South Tarawa has exacerbated these vulnerabilities and thus impacts on the sorts of adaptation strategies that might be adopted to adjust to environmental changes.

Chapter four discusses the different methodologies used to acquire data and information required to address the research questions outlined in chapter one. Qualitative and quantitative data were obtained using a mix of methods including an urban household questionnaire survey (UHQS), *maneaba* group discussions (MGD), in-depth interviews (IDI), as well as field observation (FO). Extensive library research and access to online articles, papers and reports relating to the study ensured both historical and recent information was obtained.

Chapter five mainly contains the analysis of data and information collected in the field on South Tarawa and Kiritimati and from secondary sources. It presents findings of research data collected from the Urban Household Questionnaire Survey (UHQS), in-depth interviews (IDI), and field observation (FO). The analysis of data and field observation discusses the environmental, cultural and economic impacts of climate change and urban related issues on the livelihoods of urban dwellers on South Tarawa and Kiritimati.

Chapter six examines the challenges of climate change to the urban environment and population of the main urban areas South Tarawa and Kiritimati. It also considers recommendations aimed at assisting and controlling the vulnerability of the urban environment and urban dwellers from climate change impacts and other urban related problems that could confront the urban populations on South Tarawa and Kiritimati.

Chapter seven reviews the findings in the light of the research questions and objectives identified in Chapter one and identifies areas for further research on

climate change and urban related problems in small island countries. Some recommendations based on the findings of the study are outlined for consideration in development of policies to address the impacts of climate change on urban areas in Kiribati.

CHAPTER TWO

THE CLIMATE CHANGE DIALOGUE AND DEVELOPMENTS

...climate change posed the most serious threat to the livelihoods, security and survival of the island nation's residents of Kiribati and the inhabitants of the wider Pacific region...and undermines efforts to achieve sustainable development...

(Joint statement by Ban Ki-Moon, Secretary General, UN, and H.E. Anote Tong. (2011) President, Republic of Kiribati)

2.1 INTRODUCTION

The rise in sea level associated with climate change has become a very important environmental and political issue in the early 21st century. Researchers, policy makers and governments have become increasingly concerned about its impacts on the livelihoods of the inhabitants residing in low-lying coastal areas and on atolls (Barnett and Campbell 2010; Field et al 2014; Gerrard and Wannier 2013; Hay et al 2013; Hay et al.. 2003; Mimura et al. 2007; Nunn 2009; Tutangata 2005, World Bank 2000). More critically countries, such as Kiribati, where most of the land area is in the form of coral atolls and reef islands that are only a few metres above sea level, are at the frontline of the global climate change debate.

These islands are particularly exposed to changes in sea level and sea surface temperatures which affect coral growth. They are also likely to experience changes in rainfall, storm surges and king tides. Some of these events may also become more frequent and/or increase in magnitude as a result of climate change even though the inhabitants of these countries have made minimal contributions to the causes of global warming that may have been accelerated by human activity (Barnett and Campbell 2010; Carr et al. 2013; Fussel 2007).

Changes in weather variability and a rise in sea level, together with an increase in the intensity of natural disasters, have the potential to exacerbate problems associated with growing urbanisation and economic development in low-lying atoll countries. These changes may also cause an increase in waterborne diseases such as dengue fever, and diarrhoea as well as skin diseases (Burton, Mustelin, and Urich 2011). Similarly, a progressive rise in sea level may exacerbate inundation, coastal

erosion, destruction of coastal vegetation, as well as intrusion of sea water into underground fresh water lenses and excessive salinisation of soils (Barnett and Campbell 2010: 14; Carr et al 2013;). All these changes may threaten vital infrastructure and facilities that support the livelihoods of residents in urban atoll communities.

This study is timely because the Government of Kiribati, with the support of aid agencies in New Zealand and Australia, European Union and the World Bank, are investing heavily in programmes that are designed to make urban development on Tarawa and Kiritimati Island more sustainable. The tension between providing for the immediate needs of growing urban populations on atolls, while at the same time preparing for possible relocation of parts of these populations in the future because of climate change-induced sea level rise and associated damage to atoll environments, is one that has not been adequately explored to date. Bedford and Bedford (2010) explain that aid agencies need to continue to invest in projects that support sustaining a reasonable quality of life on atolls that might become uninhabitable long-term because of environmental degradation. This is not an either/or situation or trade-off.

It is important for people living in low-lying islands like Kiribati to continue to have access to improved services and facilities as well as opportunities to derive a livelihood in their atoll environments and at the same time become aware that these environments may be degraded by changes in sea level which is likely to affect their livelihoods in the future. Balancing the tensions between the need for on-going development for the contemporary populations, while planning for progressive environmental damage and possible eventual relocation of people, requires new perspectives on, and approaches to, development in urban places in atoll countries.

This chapter reviews the literature on climate change as well as on the development of urban areas particularly in PICs and focuses on colonial and post-independence periods. It considers earlier and current statements of issues from published works on the science of climate change and also statements of issues from published works on impacts on populations and the land. It also considers literature on urban growth and development and its impacts on the urban population and environment in PICs

with a specific focus on Kiribati. Although the global context of climate change and urban development will be covered, the main focus is on PICs, in particular low-lying atoll countries.

2.2 BACKGROUND: KIRIBATI AND CLIMATE CHANGE

Research on climate change, both globally and regionally, has gained importance in the academic as well as political arena (Barnett and Campbell 2010; Bedford and Bedford 2010; Field 1999; Gerrard and Wannier 2013; IPCC 2007; Leatherman 1991; Mimura et al. 2007; Nunn 1998; Tutangata 2005; Warrick 2006). Relative stability of climate patterns shaped human development and prosperity over thousands of years. In fact, it influences “the food we eat, the water we drink, and the air we breathe and how modern urban areas were built” (McNeil 2009: 28).

More recent studies have recognised the dangers imposed when climate patterns change and the risks this process poses for PICs and, in particular, Small Island Developing States (SIDS) and the Least Developing Countries (LDCs) (Barnett and Campbell 2010; Carr et al 2013; Gerrard and Wannier 2013; Yamamoto and Esteban 2014). Kiribati belongs to both, the country is a SIDS and an LDC. The Kiribati Government recognizes that the limited land area it has for development, together with limited land-based natural resources, causes significant challenges in balancing the needs of the natural environment with a rapidly growing population (Pacific Island Forum 2012). The recent report of the IPCC (2014) again reiterated with high confidence the fact that sea level rise poses one of the most widely recognised climate change threats to low-lying coastal areas on islands and especially on atolls.

The Kiribati Government is also aware of the challenges that climate change poses to its development efforts, especially efforts to maintain the fragile balance between the interaction of the people and their environment (Government of Kiribati 2010). Accordingly, government, stakeholders, and the people will need to implement development strategies that will not only ensure the sustainable economic growth of the country but also ensure that the fragile ecosystems of the atoll environment are protected from climate change related impacts.

Since its establishment in 1988 the Intergovernmental Panel on Climate Change (IPCC) has continued providing independent scientific assessments and advice on important issues pertaining to climate change³. A significant feature of the IPCC is that it provides policy relevant findings from the outcomes of its analysis. In all of the IPCC's Assessment Reports the risks that climate change poses to small island countries have been identified. The First Assessment Report (1990) discussed the potential risks that sea level rise is likely to pose to low-lying areas and human settlements and Second Assessment Report (1995) included a specific section on small islands. The Third Assessment Report (2001), Fourth Assessment Report (2007), and Fifth Assessment Report (2014) all have a detailed chapter on small islands (IPCC 2014; 2013; 2007; 2005; 2004; 2001).

The work of the IPCC is viewed positively by PICs because it provides evidence that can be taken into consideration when making decisions about development of coastal areas especially on low-lying atoll islands. As specifically highlighted in the Third Assessment Report (2001), small islands, which include Kiribati, Tuvalu, Marshall Islands and Tokelau, may be the first to suffer adverse effects of climate change and their populations will probably be the first to be forced to adapt. Most PICs are already experiencing disruptive changes consistent with many of the anticipated consequences of climate change which include extensive coastal erosion, droughts, coral bleaching, more widespread and frequent occurrence of mosquito-borne diseases and higher sea levels making some soils too saline for cultivation of traditional crops (Hay et al. 2013; 2003:vi).

The IPCC WGII AR4 report (2007) confirmed that SIDS with small land masses surrounded by ocean are frequently located in regions that are most prone to natural extremes. IPCC WGII AR5 (2014) emphasized, with high confidence, the threats that climate change and sea level rise poses to low-lying coastal areas on islands and atolls given their inherent physical characteristics. Sea level rise is likely to exacerbate inundation, storm surge, erosion and other coastal hazards, which in turn may threaten vital infrastructure, settlements and facilities that support the livelihood of Pacific communities (Mimura et al. 2007). Generally, most urban

³See Section 2.4.3 for discussion of the IPCC

areas in PICs are situated on coastal lowlands thus placing critical infrastructure at high risk including health and social services, airports, port facilities, roads, vital utilities such as power and water, coastal protection structures and tourism facilities (Carr et al 2013; Nunn 2009; Hay et al. 2003:vi).

Another immediate and significant impact relates to the nature of extreme events such as flooding, tropical cyclones, storm surges and climatic variability including drought and prevailing winds which accelerate coastal erosion which may become more intense and/or occur with greater frequency. Changes in those events are likely to affect the quality of the land that supports subsistence agriculture and other important traditional food crops around the coastal areas (Connell 2013). Threats to food security are real, especially in urban areas where populations have already become heavily reliant on imported food as housing has spread onto land where food crops such as coconut, *babai*, and breadfruit are grown. Although Kiribati lies outside the cyclonic belt more frequent and severe drought coupled with salt water intrusion on fresh water lenses could further threaten the food security in the future. Notwithstanding the extensive research on climate change there have been few studies seeking to understand how people residing on SIDS adapt to environmental change in order to continue surviving sustainably in their fragile ecosystems (Barnett and Campbell 2010).

The IPCC WGII AR4 revealed that there could be a global mean temperature increase of around 0.6°C during the 21st century while the mean sea level could rise by approximately 2 mm/yr. The IPCC WGII AR5 also indicated with high confidence “...that global mean sea-level rise rates are accelerating...present severe sea-flood and erosion risks for low-lying coastal areas and atoll islands...” (IPCC 2014: 2). This sea level trend is influenced by several factors; local tectonic and El Niño-Southern Oscillation (ENSO) events. The report also notes that the Pacific has already exceeded the global average temperature increase (Mimura et al. 2007). Similarly, the South Pacific Regional Environmental Programme (SPREP 1999), together with the National Tidal Facility at Flinders University in Australia, confirm the rise in sea level (Tutangata 2005). Both reports conclude that the magnitude of such rise is likely to pose great challenges and risk to low lying islands.

There is empirical evidence from Kiribati that supports the disappearance of two small islets in the lagoon of South Tarawa. The first to disappear was *Tebua Tarawa* and more recently, in the 1990s, *Te Abanuea*. Decades ago fishermen used *Tebua Tarawa* as a resting place when fishing. Today fishermen can only skim over the islet as it lies underneath the waves. *Te Abanuea*⁴, was left without any vegetation and its bare sandy beach is now only visible during low tides. It is possible that the change in the movement of the current, due to the construction of causeways together with the gradual rise in sea level, has caused the disappearance of these two islets and this has indeed raised alarm and concern amongst the Government and the local population (Tutangata 2005).

Coral reefs are also at risk from rapid changes in sea-surface temperature, which in turn will cause coral bleaching. Rising concentrations of carbon dioxide and resulting acidification in the ocean will also impact negatively on the ability of reefs to grow in step with sea level rise. This in turn may affect the atoll morphology which depends on sediments derived from the reefs for growth (Barnett and Campbell 2010:14). Policies to sustainably manage these problems are important to safeguard total destruction of the environment that provides sustenance to the people.

2.2.1 Australian Bureau of Meteorology and CSIRO

Recent studies in the central Pacific have indicated that the climate is gradually changing causing higher temperatures, shifts in rainfall patterns, changing frequencies of extreme events and rising sea level (ABM and CSIRO 2011: 2). The climate in Kiribati varies considerably due to the El Niño-Southern Oscillation. The two main phases of the El Niño-Southern Oscillation are El Niño and La Niña. In Kiribati, El Niño events cause wetter and warmer weather conditions. For South Tarawa the wettest years' experience more than 4000 mm of rain and in the driest conditions it only receives 150 mm of rain. The other urban area, Kiritimati, experiences its wet season from January to June every year.

⁴ In 2012 *Te Abanuea* started to form again and in 2013 it became an island with vegetation

Droughts are normally associated with La Niña events and are usually severe in Kiribati. The recent drought of April 2007 to early 2009 severely affected groundwater supplies mainly in the Southern Gilbert Islands and Banaba. Most of the plants were affected and groundwater became brackish. Copra production, the main source of income for the people on outer islands, declined dramatically as a result of the drought. On Kiritimati, the period from 1950 to 2009 was significant as it experienced generally high annual rainfalls that boosted copra production (ABM and CSIRO 2011).

Daily sea levels are measured by tide gauge stations at Tarawa, Kiritimati and Kanton. Records from these stations show Tarawa's highest tides occur around September while on Kiritimati spring tides are highest near December. Sea levels are lower in La Niña years and higher in El Niño years. For Kiritimati, all of the 10 highest recorded water level events occurred during El Niño conditions while for Kanton and Tarawa eight and six of the highest levels respectively were during El Niño events. The combination of El Niño conditions and semi-annual tidal variation influences extreme sea level events (ABM and CSIRO 2011).

Surface air temperature and sea surface temperature are projected to continue increasing. These increases are due to the warming of the atmosphere as a result of greenhouse gas concentrations. The intensity and frequency of days of extreme rainfall are projected to increase resulting in the atmosphere holding more water vapour during warmer climates (IPCC 2007).

Sea level is also measured by satellite observations. According to recorded satellite data, there has been an increase in the level of the sea across Kiribati waters by 1 to 4 mm per year since 1993. Sea level rise also naturally fluctuated from year to year due to the influence of the El Niño-Southern Oscillation. Consequently, there is also very high confidence for Kiribati that the mean sea level projection will continue to increase. The rise in sea level is consistent with increasing ocean and atmospheric temperatures as a result of thermal expansion of the water and the melting of glaciers and ice caps (ABM and CSIRO 2011: 105). The rise in sea level will have devastating effects on the low-lying atoll islands of Kiribati that are mostly below four metres in elevation above sea level.

2.2.2 Kiribati National Adaptation Program of Action (NAPA)

As noted earlier, Kiribati is categorized as both a SID and an LDC and it is one of the most vulnerable countries to any adverse impacts of climate change. As a result, the Government, with the support of development agencies (especially the World Bank) has formulated the National Adaptation Programmes of Action to enable Kiribati to communicate its immediate and urgent needs for adaptation to the Conference of the Parties (COP) to the UNFCCC (Republic of Kiribati 2007). The main objective of the National Adaptation Program of Action (NAPA) is to provide a long term framework for adaptation by identifying immediate and urgent requirements that are in line with the national development and climate change adaptation strategies. It also looks at the major key sectors that affect the livelihoods of the people, especially those residing in the urban areas.

Basically, land and marine resources have always been and still are the main providers of livelihoods to the people of Kiribati. The transition from subsistence to a monetary economy in the urban areas of South Tarawa and Kiritimati has put enormous pressure on the limited environmental resources to support population growth and infrastructure development. The pressure from the population and the government for resources from both the land and the sea is increasing. “Other problems are squatters, unclear rights between landowners and land leased by the Government, enforcement of multi-layered and sector requirements of the planning system, and relaxing of tenants’ conditions for Kiribati Housing Corporation (KHC) houses” (Republic of Kiribati 2007: 12). These issues pose specific challenges to the development of South Tarawa.

It is expected that climate change may further affect the processes of coastal erosion and accretion which in turn could undermine houses, offices, roads, and the hospital that provide vital services to the urban population. Similarly, “the processes of erosion and accretion have more serious impacts in urban South Tarawa where seawall protection, land reclamation, accreted land, uprooted coconut trees by shoreline erosion, dilapidated buildings that are undermined through erosion, and sand mining form mixed features of the shoreline” (Republic of Kiribati 2007: 11).

Past efforts by the government to prevent erosion of leased lands using sea defences have proved ineffective. On South Tarawa a total of 60 sea walls were constructed in 2005 to restrict urban coastal erosion. However, storm surges and extra high spring tides have resulted in the flooding of residential areas and eroding coastal areas. It has become apparent that recently coastal land erosion has become more extensive, intensive and persistent (Republic of Kiribati 2007:11). There are areas at Nanikai, Korobu, Temaiku, and the end of the main runway at Bonriki International Airport that have been severely eroded by past major king tides. These areas have now been protected by the construction of coastal defence works to protect future impacts (see Figure 2.1).



Figure 2.1 Sea wall at Nanikai to protect coastal erosion

(Source: Photo by Author 2011)

The supply of fish stock depends on the health of the coral reefs. Shell fish are also being depleted as a result of overharvesting by the urban population. While overharvesting is considered the major cause for declining stocks of shell fish, there is also anecdotal evidence that indicates environmental factors associated with climate change are contributing to the decline.

The growth of coconut palms (*cocos nucifera*), the most common and adaptable tree on atolls and reef islands, is affected during prolonged periods of drought. Traditionally, the coconut tree provides food for the people, medicine, materials for construction of houses, as well as income from copra production. Apart from nutritional and constructional usages, it also used to mark land boundaries as well as to provide coastal defences to erosion. When coconut trees along the edges of the islands are destroyed by erosion, it reduces the size of the land as well as affecting the potential of the land to support the livelihoods of its owners.

The pandanus (*Pandanus tectorius*) is another important tree that has both nutritional and constructional value. The pandanus fruit can be preserved for use during serious drought periods. A preserved pandanus cream (*tuae*) can last for years without going bad. Besides its nutritional value, pandanus trees are also used for medicinal, construction and coastal protection purposes. Increasing harvesting of pandanus by the urban population, coupled with more intense droughts and increasing sea water intrusion have contributed to its decline, in South Tarawa.

Groundwater fetched from dug wells is the main source of freshwater for atoll dwellers⁵. In the urban areas of South Tarawa and Kiritimati, groundwater is extracted and pumped through water pipes from protected water reserve areas. Unfortunately, protecting water reserve areas from the population is not easy. Already, part of the water reserve area at Bonriki, on the ocean side, has now been settled due to the increasing pressure for land from the urban population. The new settlements will eventually contaminate groundwater lenses as a result of disposal of solid and liquid wastes on the land.

When the environment that provides sustenance to the people is affected, the health of the people will also be affected. Outbreaks of certain diseases on South Tarawa in particular have had origins in the food and water people consumed. The fatal outbreak of cholera in 1977 is associated with contaminated groundwater. Diarrhoea and fish poisoning, which are also common, are caused by contaminated groundwater and eating fish caught in certain areas on the ocean side of South

⁵ See Section 3.4.5 for a more detailed discussion of the fresh water lens.

Tarawa that were known to breed “poison fish”. High incidence of water related diseases on South Tarawa is linked to contaminated water supply. Between 2010 and 2012 approximately 36,000 cases of diarrhoea, dysentery, conjunctivitis, tinea, and ringworm were reported in South Tarawa hospital (Lal et al 2014: 14). The more intense rainfall and sea level rise that are expected from climate change are likely to increase the incidence of diarrhoea.

The NAPA recognises climate change has impacts not only on the land and resources but also the livelihoods of the people and calls for immediate responses. The NAPA identified important environmental issues and problems that require immediate attention. These include increasing population; deteriorating states of coastal zones, coral reefs, fisheries, groundwater, health and biodiversity; inadequate urban services such as water supply and sanitation; overexploitation of natural resources in urban Tarawa; and difficulty in enforcing land use management strategies and control. The NAPA proposed that adaptation is integrated into national socio-economic policy planning to ensure it is in line with national policies and provides the people with necessary knowledge to adapt to climate change related impacts in the future.

2.2.3 Kiribati Adaptation Programme (KAP)

The major programme that was established with financial assistance from the World Bank is the Kiribati Adaptation Programme (KAP) which came into existence in 2003. There have been three phases in this important program. KAP I ran from 2003 to 2005 and specifically focused on proposing and mainstreaming adaptation programs into the government’s national economic planning. There was a very successful national consultation workshop during this phase where important were identified for inclusion in the 2007 National Adaptation Program of Action (NAPA).

KAP II ran from 2006 to 2011 and the total funding for this phase was US\$5.8 million. The main focus of KAP II is to develop a systematic diagnosis of climate change-related problems that affects Kiribati and integrate them in its economic and operational planning. It also provide technical assistance to build capacity at the island community level. KAP III started in 2012 and will run to 2016 with total

project funding of US\$10.8 million. The main objective of this phase is to strengthen the ability of Kiribati to provide its people with safe drinking water and maintain the resilience of coastal infrastructure including mangrove planting schemes and construction of coastal defences like sea walls (World Bank 2011).⁶

2.3 DEVELOPMENT OF THE CLIMATE CHANGE DIALOGUE

“Contemporary concerns for the problem of climate change began when concentrations of carbon dioxide in the atmosphere were observed to be increasing in the early 1960s” (Barnett and Campbell 2010: 51). This has stimulated research to investigate the problem. During the 1970s and 1980s, scientific and media interest in climate change was developing and increasing and gave rise to the importance of climate change in the global arena.

In the Pacific, “...climate change did not suddenly cease to affect...islands once they had been settled” (Ravuvu 1993). There were important climate changes affecting the Pacific Islands during the last 1500 years. During the period between 750 and 1300 AD, temperatures were about 1°C above their present levels. Long distance voyaging in the Pacific was at its peak as the weather was suitable for open sea voyaging. Weather during this time was characterised by clear skies and low incidence of storms (Ravuvu 1993). However, this climatic condition changed around 1300 AD when average temperatures began to fall. Pacific Islands started experiencing considerably more rain than they normally experienced in earlier centuries. This change inevitably affected Pacific island ecosystems which already had been altered by human impacts (Ravuvu 1993).

This cold period ended about 150 years later and since then temperatures have slowly started to increase in most parts of the world including the Pacific Islands. The effects of higher temperatures on the islands today are more recognisable as we are living in a period when climate monitoring is more advanced. The first major conference on climate change, the World Climate Conference (WCC), was held in 1979 in Geneva. This was organised by the World Meteorological Organisation (WMO) and it inaugurated the World Climate Programme (WCP)

⁶ More detailed discussion of the Kiribati Adaptation Programmes see Section 6.3.2

which later prompted a series of workshops on climate change during the 1980s. During the workshops, it was highly recommended "...that there be a formal institution for international scientific collaboration to enhance understanding of the causes and impacts of, and solutions to, climate change" (Barnett and Campbell 2010: 52). As a result, the IPCC was formally established in 1988. The function and progress of the IPCC is discussed in more detail later in this chapter.

2.3.1 Major international conferences on the environment

In 1972 Sweden first hosted the United Nations Conference on the Human Environment which was attended by 113 delegates and two Heads of States from Sweden and India (Meakin 1992). This conference raised awareness of the important issues of the global environment which resulted in the setting up of the United Nations Environment Programme (UNEP). An important contribution of the Stockholm conference was the explicit recognition of the relationship between development and the environment.

Since 1972, other international conferences on the environment have been held which have often been followed by agreements, most of which have been ratified by participating countries. Such agreements include the 1979 Geneva Convention on Long-range Transboundary Air Pollution, 1985 Helsinki Agreement (21-nation commitment to reduce sulphur dioxide emission), 1988 Montreal Protocol on Substances that Deplete the Ozone Layer, and the 1989 Basel Convention on Transboundary Movement of Hazardous Wastes (Meakin 1992).

In 1983, the United Nations set up the World Commission on Environment and Development known as the Brundtland Commission. The Brundtland report, published in 1987 as "Our Common Future" combined the concepts of environment and economy under one term "Sustainable Development". Sustainable development aims to ensure that economic growth should not endanger the ability of future generations to enjoy the fruits of the earth (Meakin 1992).

The United Nations Conference on Environment and Development (UNCED) (1992) also known as the Rio Earth Summit of 1992 produced the "Rio Declaration"

which defines the rights of people to be involved in the development of their economies, and their responsibilities as guardians of the common environment. It also identifies humans as being at the centre of concerns for sustainable development. Small islands were recognised in that they have valuable resources such as oceans, coastal environments, biodiversity and human resources and the challenge is to ensure these resources are utilised sustainably for the benefit of the present and future generations of people. This approach is important as small islands have their own peculiar vulnerabilities and characteristics and difficulties that they encounter in their pursuit of sustainable development (United Nations 1994).

2.3.2 United Nation Framework Convention on Climate Change (UNFCCC)

The publication of the IPCC First Assessment Report, together with the establishment of the Intergovernmental Negotiating Committee on the Framework Convention for Climate Change in 1990, set the platform for the development of an international agreement on climate change known as the UNFCCC. This process was formalised during the Earth Summit (Barnett and Campbell 2010: 87). Since the UNFCCC came into existence, 195 parties (member countries) have ratified the convention and become the Parties to the Convention.

The main objective of the treaty is to work towards stabilising the concentrations of greenhouse gases in the atmosphere in order to reduce the risk of dangerous anthropogenic interference on the climate system. The treaty did not set specific binding limits to greenhouse gas emissions but provided a framework for the negotiation of important treaties (known as protocols) that set binding limits on greenhouse gas emissions (United Nations 1992). Since then, Conference of the Parties has met annually to assess progress in dealing with climate change (Chazournes 1992; United Nation 1992).

The key elements of the UNFCCC are:

- a) To collect and share information on greenhouse gas emissions, national policies and best practices;

- b) To consider strategic plans to address greenhouse gas emissions and adapt to expected impacts as well as providing finance and technology to support developing countries;
- c) To work together to prepare to adapt to possible future impacts of climate change (UNFCCC).

Article 4 of the UNFCCC contains a commitment to provide assistance to SIDS to enable them to respond to the possible effects of global warming, especially countries with low-lying coastal areas that are most vulnerable to adverse effects of climate change (United Nations 1992). This commitment also implies that the countries involved have a commitment to assist SIDS with adaptation programmes (Barnett and Campbell 2010: 89). Furthermore, assistance is also required in the areas of finance, insurance and the transfer of technology to help address SIDS' needs and concerns resulting from climate change. While the convention supports SIDS and other developing countries that are very vulnerable to climate change, there is no indication as to what form this assistance should take and how it should be achieved. As a result, SIDS have to put all of their efforts in to seeking progress on the implementation of these and the related articles of the Kyoto Protocol (Barnett and Campbell 2010; Chazournes 1992).

In 1997, during the third conference of the Parties (COP 3) in Kyoto Japan, it was decided to set commitments to reduce greenhouse gas emissions. When this commitment was formalised, it became known by the parties as the Kyoto Protocol. The principle of “common but differentiated responsibility” was used when setting the targets to reduce greenhouse gas emissions. It was highlighted in the Kyoto Protocol that while the commitment concerns every party to the UNFCCC, the developed countries should set the example by complying with the targets first as they are “... responsible for most of the historical and current emissions of gases” (Barnett and Campbell 2010: 90).

The Kyoto Protocol is an international agreement that was linked to the UNFCCC. It was adopted in Kyoto Japan on 11 December 1997 and came into force on 16 February 2005. The detailed rules of the Protocol were finally adopted during COP 7 in Marrakesh in 2001 and became known as the “Marrakesh Accord”. The main

connection between the Kyoto Protocol and the UNFCCC is that the former encourages industrialised countries to stabilize greenhouse gas (GHG) emissions while the latter commits them to comply with an agreed set of binding targets for reduced emissions. However, not all developed countries have committed themselves to the agreement. Despite regular meetings of COP, no replacement for the Kyoto Protocol has been able to be negotiated. It is becoming apparent that world's leaders are more divided than ever in their commitment to reducing GHG emissions.

Kiribati recognises the challenges that climate change poses to its development. As a result, Kiribati has become involved with the United Nations agreements which acknowledge significant challenges and problems that affect SIDS and efforts to achieve sustainable development through the United Nations Framework Convention on climate change, Barbados Program of Action and the Millennium Development Goals (Government of Kiribati 2010). Kiribati, together with other SIDS has worked tirelessly in making its concerns about climate change and its impacts on its islands heard during UN meetings and COP conferences (UNFCCC 2005).

2.3.3 Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change (IPCC) was formed to provide independent scientific advice on the impacts of climate change. It is the leading international body established by the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO) to assess scientific, technical and socio-economic information about climate change. Its main task is to inform the world community with clear scientific evidence on the state of climate change and its potential impacts on the global environment (Barnett and Campbell 2012: 58; IPCC 2004).

There are 195 member countries of IPCC and scientists from around the world contribute to the operation of the IPCC on voluntary basis. Governments of member countries of IPCC appoint the Chair of the IPCC Bureau. The operation of the IPCC is funded by the IPCC Trust Fund received from voluntary contributions.

Other sources of funding come from the WMO, UNEP and the UNFCCC. Involvement of researchers from developing countries for IPCC research activities is supported from the Trust Fund while developed countries provide funds for the participation of their own researchers. Expenditure from the Trust Fund to support the IPCC activities varies and normally lies within the vicinity of US\$5–7 million per year (IPCC 2005). Due to governments' heavy involvement in the operation of the IPCC, many of the world's outstanding and top scientists participate in the IPCC Assessments and the findings of its reports are credibly recognised in the scientific arena (Barnett and Campbell 2010; IPCC 2001).

One concern regarding the activities of the IPCC relates to the unequal representation of researchers. Of the 393 convening authors, lead authors and review editors participating in the Fourth Assessment Report, only two come from Pacific SIDS. Another major reason for unequal representation relates to the lower levels of investment in research in developing countries (Barnett and Campbell 2010: 62). Since IPCC commenced working, it has delivered a series of Assessment Reports, Special Reports and Technical Papers which have been widely used by policymakers, scientists and politicians (IPCC 2001).

The IPCC's first report First Assessment Report informed the construction of the UNFCCC. The Second Assessment Report provided climate information to negotiating parties in preparation for the Kyoto meeting. The Fifth Assessment Report (AR5) is the latest and largest detailed summary of the current situation on climate change. The findings of AR5 confirm that warming of the climate systems is unequivocal and also most of the observed increase in global average temperature since the 20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations (IPCC 2014; IPCC 2007).

One of the significant contributions of the IPCC was exposing the risks climate change poses to small island states. The growing importance of coastal change issues in relation to low-lying islands became the focus of Working Group 2 of the IPCC. This group assesses the vulnerability of the social and natural systems to climate change as well as considering options for adaptation. As a result, a chapter on Coastal Zones and Small Islands was included in the WG2 Report 1995. In the

Third Assessment Report (TAR) in 2001, a further chapter on Small Island States was included as well as chapters on Small Islands in the Fourth and Fifth Assessment Reports. The growing importance of climate change and its impacts on low-lying islands of the Pacific has gradually gained importance in the agenda of IPCC activities.

2.3.4 Alliance of Small Island States (AOSIS)

AOSIS is an intergovernmental organisation of low-lying coastal and small island countries. It was established in 1990 with the objective of getting some convergence in the voices of SIDS to address global warming. It was realised by SIDS that campaigning in international forums for climate change is better tackled through combined efforts than when managed by individual countries (Barnett and Campbell 2010). Since its inception, it has been very active in lobbying and negotiating issues relating to climate change within the UN system. One significant outcome of its work was the proposal for, and first draft of, the Kyoto Protocol in early 1994 (Davis 1996).

There are 39 member states and four observers of AOSIS (Barnett and Campbell 2010) comprising 28 percent of the developing countries and 20 percent of the UN's total membership (Davis 1996). There is no formal office of AOSIS and member countries work through their diplomatic missions to the UN in New York. AOSIS recognises dangers imposed by climate change as one of the greatest threats to the survival of SIDS and as a result, its declaration on Climate Change, highlighted the importance of finance⁷ and technological resource provisions by developed countries to small island developing countries (AOSIS 2009; Barnett and Campbell 2010; Climate Analytics 2012)

There are ongoing tensions among AOSIS members. The first involves "...those AOSIS members who are members of G77 or have aligned themselves with the G77, which holds the view that emissions reductions should be restricted to the Annex 1 parties (Developed countries), and those that are not part of the G77 (such as Cook Islands, Niue and Tuvalu) which hold the view that large developing

⁷ This is a fund to help developing countries in their adaptation work to combat climate change.

countries must also begin reducing their emissions (Barnett and Campbell 2010: 101). The other relates to the case of Singapore, a wealthy country which seeks to avoid emission reductions in compliance with the Kyoto Protocol agreement. Other SIDS argued that wealthy countries like Singapore should comply with the Kyoto agreement and reduce its emissions. There is also tension between Pacific SIDS regarding Papua New Guinea's (PNG) proposal to seek "...certified emissions reductions by controlling deforestation, and those who worry that such a scheme is unlikely to lead to any genuine reduction in emissions globally" (Barnett and Campbell 2010: 102).

2.3.5 Millennium Development Goals

The Millennium Development Goals (MDGs) are basically the eight development goals that were established by the United Nations in 2000 and became official after their adoption in the United Nations Millennium Declaration. There are 189 member states of the United Nations and 23 international organisations that agreed to adopt these development goals and declared their commitments to working toward achieving the expected MDGs by 2015. The MDGs (All Party Parliament Group (APPG) 2007: 3) are as follows:

- 1) Eradicate extreme poverty and hunger;
- 2) Achieve universal primary education;
- 3) Promote gender equality and empower women;
- 4) Reduce child mortality;
- 5) Improve maternity health;
- 6) Combat HIV/AIDS, malaria and other diseases;
- 7) Ensure environmental sustainability; and
- 8) Develop a global partnership for development.

Since the adoption of the MDGs, developing and developed countries, international organisations and agencies, and civil society have all worked to achieve them. As a result of these combined efforts, there have been some remarkable results including:

- a) Reductions in poverty so that only half a billion people remain in extreme poverty;
- b) Three million children's lives are saved every year;
- c) Four out of five children now received vaccination;
- d) More focus is now directed to maternal mortality;
- e) In 2011 about 590 million children in developing countries were attending primary schools (APPG 2007).

With regard to climate change, the MDGs address the importance of a low-carbon, more sustainable transport infrastructure, improved energy efficiency and use of renewable resources, use of more sustainable agricultural practices, and tackling deforestation and increasing re-forestation. Focusing on the above issues will improve people's livelihoods. The call to control global average temperature at no more than 2° above pre-industrial levels was endorsed. The MDGs further recognised the need to build climate change adaptation and disaster risk reduction into regional and national strategies.

The 13 years of MDGs operation have seen unprecedented progress that has resulted from a combination of economic growth, improved government policies, civil society engagements as well as the global commitments to the MDGs (United Nation 2013: 1). Despite the steady progress in the achievements of the MDGs, difficulties have been encountered by some countries while some countries achieved a great deal. This is due to the fact that some countries have low economic development while others are in conflict-affected areas. Hence, a need to review the MDGs became necessary to ensure development goals are successfully achieved. World Leaders agreed at Rio in 2012 to establish a new goal aimed at ensuring that MDGs are accomplished. Central to the new goals is the eradication of extreme poverty from the face of the earth by 2030 (United Nation 2013). This is a huge ask which demands the combined efforts of all countries involved in order that new goals are achieved.

2.3.6 The Pacific Plan

Leaders of the Pacific “...believe the Pacific region can, should and will be a region of peace, harmony, security and economic prosperity, so that all of its people can lead free and worthwhile lives” (Pacific Islands Forum Secretariat 2005: 3). The Pacific Plan⁸ is a “road map” proposed to guide long-term development plans for the Pacific as a region and endorsed by leaders of the Pacific Islands Forum Countries (PIFC) in Port Moresby in 2005. Basically, it is a master strategy, for strengthening regional cooperation and integration among member countries of the Pacific Forum. Additionally, it is a high-level framework that aims at guiding the work of national governments, regional agencies, and development partners to support the aspirations of Forum Islands and their people.

The Pacific Plan was founded on four main pillars which are designed to enhance progress in the following areas:

- a) Economic growth,
- b) Sustainable development,
- c) Good governance, and
- d) Security (Pacific Islands Forum Secretariat 2005).

Further, it was agreed by PIFC to incorporate their leaders’ vision in the Pacific Plan as follows:

- a) promote economic growth, sustainable development, good governance and security;
- b) strengthen regional cooperation and integration in areas where the region could gain the most through sharing resources of governance, alignment of policies and delivery of practical benefits;
- c) strengthen support for current programmes, develop new initiatives and advocate for the needs of the Small Island States, particularly given their

⁸ The plan has recently been reviewed by a selected committee headed by former Prime Minister of PNG Sir Mekere Mourata.

- limited capacity and fragile and vulnerable environments, including to climate change;
- d) promote and protect cultural identity, regional inclusiveness, sub-regional representations, human rights, gender, youth and civil society;
 - e) reform the Forum and the regional institutional mechanisms;
 - f) clarify Members' own understanding and appreciation of regionalism with a clear perception of the benefits and cost; and
 - g) build strong partnerships between Member countries, Pacific territories, regional and international organisations and non-state organisations (Pacific Islands Forum Secretariat 2005: 3).

The Pacific Plan encourages Pacific Islands within the Forum Secretariat to work collaboratively to address the many challenges they encounter in order to improve the living standards, increase access to economic opportunities and stimulate pro-poor growth for the general population. It does not promote a “one-size-fit-all” model of regional cooperation and encourages individual countries to pursue their own national based policies for economic development. Implementation of development activities under the Pacific Plan is pursued by Forum member countries and supported by regional agencies, development partners, non-state actors such as church groups, community groups, non-government organisations and the private sector, and other stakeholders (Pacific Island Forum Secretariat 2012).

Since the implementation of the Pacific Plan, there have been notable development achievements. While these achievements have assisted the region in many ways, the Pacific Plan is still facing challenges in its implementation. With sustainable developments to improve the livelihoods of the people, regional policies and plans have been implemented which aim at reducing serious threats to its progress. These areas relate mainly to natural disasters, waste management, climate change and water resource management. Education has also remained an important focus in the drive to achieve improved livelihoods and the well-being of Pacific peoples (Pacific Island Forum Secretariat 2012).

As to issues relating to Climate Change, the Plan “... continues to be a major focus for the region, with all CROP agencies involved, to some extent, in climate change

programmes and initiatives” (Pacific Island Forum Secretariat 2012: 12). In the area of negotiations, the Secretariat of the Pacific Regional Environment Programme (SPREP) has been very active in “... providing technical support to Pacific island countries in developing their formal commitments for greenhouse gas reduction”. Moreover, the Pacific region has been involved in actively tackling all climate pollutants and applying stringent climate warming targets (Pacific Island Forum Secretariat 2012).

Greenhouse gas reduction can be addressed through the reductions in the release of greenhouse gases at both the household and national levels which will have environmental and economic benefits (Pacific Island Forum Secretariat 2012). Further, it is expected that on-going renewable energy projects will assist in meeting mitigation commitments especially in cutting down the use of fossil fuel. Recently, there have been considerable efforts in developing policies and planning processes to support climate change adaptation projects on the ground. One of the major projects is the US\$13 million Pacific Adaptation to Climate Change programme that provides a framework for future adaptation work and development cooperation in the region (Pacific Island Forum Secretariat 2012: 13).

While the Pacific Plan advocates enhancing progress and stimulating economic growth, there were also concerns expressed by some countries of the region that it has fallen short of their expectations due to inappropriate form and content, and the lack of interest by stakeholders of the Plan (Hughes 2013). The recent review, which involved region-wide consultation, has ensured that the collective voice of Pacific peoples is heard by the international community especially with regard to issues relating to climate change.

2.3.7 Tarawa Climate Change Conference (TCCC)

The TCCC was an initiative of the Kiribati Government aimed at injecting energy into climate change negotiations in the hope of achieving a non-binding agreement to present to world leaders during the Cancun conference in Mexico in 2010. The conference was attended by 12 participating countries: Kiribati, Solomon Islands, Tonga, Maldives, Cuba, Brazil, Fiji, Japan, China, Marshall Islands, New Zealand

and Australia. There were also other countries, who attended the conference under observer status such as the United States of America (USA), United Kingdom (UK), European Union (EU), India, and France (Engelfried 2010).

The focus of the conference was simply to reinforce the urgency to address the impacts of climate change on the most vulnerable countries. The TCCC aim was to build on what had been discussed during the previous UNFCCC conferences including the Bali Declaration, Kyoto Protocol and Copenhagen Conference (Ford and Packard 2010). The intention of the conference was to ensure industrialised developed countries felt compelled to comply with the plea of Small Island States, like Kiribati, to reduce their carbon emissions (Ford and Packard 2010). The failure on the part of the Copenhagen COP to introduce a significant cut in the greenhouse gas emission was disturbing to some Pacific Islands including the atoll countries of Kiribati, Tuvalu, the Marshall Islands and Tokelau (Bedford and Bedford 2010). This could mean the total destruction of their island ecosystems long-term.

At the TCCC, the 18 point Ambo Declaration was signed by the 12 participating countries. The Ambo Declaration expressed great concern at the slow pace in the negotiation process to reach an agreed legally binding agreement to tackle climate change and its impacts on the most vulnerable countries. It also reiterated the importance of an adaptation fund to help countries that are not able to support their projects on climate change (Ford and Packard 2010). The Ambo Declaration sought to provide a pathway for further negotiations by parties of the UNFCCC during COP 16 in Cancun in Mexico. However, the Cancun conference failed to reach a binding agreement on greenhouse gas emissions. While it was not possible to progress the Ambo Declaration at Cancun Kiribati had publicly showed its concern about climate change and its likely effects on low-lying islands and their peoples.

2.4 IMPACTS OF CLIMATE CHANGE ON KIRIBATI'S ATOLL ENVIRONMENT AND POPULATION

Kiribati's Ministry of Internal and Social Affairs (2007: 3) has argued that the "... adverse effects of climate change and sea level rise present significant risks to the sustainable development of small island developing states, and the long-term effects

of climate change may threaten the very existence of some small islands...” (Ministry of Internal and Social Affairs 2007: 3). According to the IPCC WGII AR5 (2014: 2) “...current and future climate-related drivers of risk for small islands during the 21st century include sea-level rise, tropical and extra-tropical cyclones, increasing air and sea surface temperatures, and changing rainfall patterns”.

Atolls have a high ratio of coastline to land area with relatively high population densities and low levels of available resources for adaptive measures (Yamamoto and Esteban 2014). The major disadvantage of Atolls to support economic development is confined in its weak economies, financial constraints and limited expertise to respond effectively to address environmental related problems (Connell 2013). As a result an atoll’s physical environment can only support a narrow range of productive opportunities (Connell and Lea 2002: 3). Agriculture and fishing are the predominant occupations and this involves hard physical labour (Baiteke 1994). Human settlements and urban infrastructure on atolls are concentrated along the coastal areas close to the beach and include government offices, residential areas, airports, ports, and industrial areas (Mimura et al. 2007).

Due to financial constraints, foreign aid plays an important role in supporting ongoing development in Kiribati. Official development assistance from foreign donors amounted to approximately AUD\$50 million in 2007 equivalent to 68 percent of the GDP (AusAID 2010). The major development partners for Kiribati are Australia, New Zealand, Taiwan, and the World Bank. Other development partners include Japan, Asian Development Bank, UN Agencies, and Cuba. The main sources of income for the Kiribati economy are copra, fish and seaweed which generated around AUD\$5 million in export revenues in 2011 (New Zealand Ministry of Foreign Affairs 2013). However, the fluctuation of world prices for copra and fish demand support from other government revenue sources to ensure the progress of the economy.

Interest from the Revenue Equalisation Reserve Fund (RERF)⁹ has always been used to “... cushion the impact of the loss of revenue and exchange earnings”

⁹ RERF: is the reserve fund of Kiribati that was established in 1956 by the colonial administration.

(Baaro 1993: 161). The RERF was established during the colonial period with initial funds from the War Assets Fund and the General Reserve. It was meant to be a reserve for Government to "... draw funds to balance its budget when the total required expenditure exceeded the total revenue available..." (Toatu 1993: 183).

Kiribati has what is termed a MIRAB economy (Bertram and Watters, 1985) with heavy dependence on foreign aid from external donors as well as remittances from Kiribati workers on foreign ships and those who have migrated to New Zealand and other countries. Remittances provide financial assistance to families of foreign workers, especially the non-employed who depends entirely on the land and the sea for sustenance (Borovnik 2003; 2005). The implementation in 2002 of the Pacific Access Category (PAC) for migration of a small number of people from selected Pacific countries seeking residence in New Zealand provides an important avenue for people wanting to move to New Zealand from Kiribati, Tuvalu and Tonga. The other avenue is the Recognised Seasonal Employer (RSE) work policy (Spoonley and Bedford, 2012). While the RSE scheme attempts to address a problem of labour shortage in New Zealand's horticulture and viticulture industries, it is also a source of seasonal employment for Pacific villagers and some of the income they earn is remitted home to support their families (Spoonley and Bedford 2012: 149).

2.4.1 Urban water provision

While fresh water lenses are present in most parts of the atolls, not all groundwater is good for human consumption. Only certain areas have good drinking water while the rest contain brackish water that is not good for drinking. Poor natural filtration makes groundwater highly susceptible to contamination and water borne diseases (White et al. 1999). Variations in rainfall affect freshwater lenses and it is likely that an increase in this variability in combination with higher sea levels will exacerbate water stress in low-lying atolls in Kiribati, Tuvalu, Marshall Islands and Tokelau. Increased population growth will magnify safe water security issues considerably (United Nation 2013; UNICEF 2008).

Approximately 46 percent of Pacific people have access to improved drinking water while 54 percent remained unserved (approximately 5.5 million). Most Pacific

families still experience the absence of piped water to their homes with only around 13 percent having such access (Hueb et al. 2008). As a result, approximately 10 percent of deaths of children younger than five years of age are attributable to water-related causes. More critically, the delivery of water supplies in most Pacific Islands still falls below the targets required by MDG (United Nation 2013). To achieve the MDG's target is a concern as the average number of people gaining access to improved drinking water was only 67,000 per year from 1990 to 2006. In order to achieve the MDG's target, almost 370,000 people per year need to receive access to piped drinking water, something that needs the efforts of all stakeholders (Hueb et al 2008).

The recently adoption of the Sustainable Development Goals (SDG) by world leaders in September 2015 to replace the MDGs also aims at global collaborative efforts by all countries to put an end to poverty, fight inequality and injustice, and tackle issues of climate change by 2030. The 17 SDGs also includes urgent action to combat change and its impacts. The SDGs were built on the MDGs but they go much further than the MDGs in looking at the major causes of poverty and implement universal strategies aimed at improving development policies that will work for all countries and their respective people. To ensure this works, the United Nation will provide support to governments in their development plans, support progress on their SDGs target and lastly, making available UN's policy expertise to government at all levels to help in their development programmes (UNDP 2015).

On South Tarawa, "... severe water shortage threatens fast growing population... as the current rates of groundwater extraction from freshwater lens are unsustainable..." (ISF-UTS 2011: 1). Approximately 65 percent of the population of Kiribati has access to piped water although about 80 percent of outer island population still get their drinking water from open dug wells (ISF-UTS 2011). Coupled with severe water shortages and the growing urban population on South Tarawa is the declining water quality.

As most I-Kiribati¹⁰ people cannot afford the cost of a rain water tank, the only available water sources are the open dug wells besides their homes and the Public Utilities Board (PUB) piped water. Consequently, there are still urban households on South Tarawa that are still depending on dug wells for drinking despite the health risks (White 2010). What is more worrying about the use of open dug wells is the fact that freshwater lenses on South Tarawa are polluted by faecal matter from inappropriate sanitation practices, animal wastes, and graves in close proximity to wells (ISF-UTS 2011). Additionally, water related diseases, including diarrhoea caused by contaminated well water, are more common on South Tarawa than outer islands where well water is less contaminated (ISF-UTS 2011).

Upgrading of existing water reticulation systems for South Tarawa is vital and a major project to achieve this was implemented in 2001 with a loan from the Asian Development Bank. However, further improvement is required which the World Bank (WB), through the Kiribati Adaptation Project (KAP III), is currently providing assistance. A European Union supported Programme for water governance is also in progress (ISF-UTS 2011). The progress of the work has been slow but at least an attempt is being made to improve urban water provision in South Tarawa.

2.4.2 Rural to urban drift

“Over the past centuries the movement of people within and between islands has intensified in volume, increased in distance, and became more complex in pattern and purposes” (Connell and Lea 2002: 8). In the Pacific Islands, the influx of rural dwellers to urban areas has increased dramatically as a result of several factors. Rapid improvement in communication and transportation has greatly contributed to the understanding of rural dwellers in their perception of what an urban area is like (Connell 2000). The social disparities that exist between urban areas and rural areas also influenced the people. According to Crocombe (2001: 65) the movement of rural dwellers to urban areas is not only influenced by economic opportunities but also social factors which include following parents and family members who have already settled in urban areas and the like. Accordingly, urban drift is influenced by

¹⁰ I-Kiribati refers to indigenous people of Kiribati

other factors including improved medical services, modern school facilities, airports on outer islands and improved shipping services (Connell and Lea 2002). Improved facilities and services in urban areas such as better educational facilities, service sector employment, increasing bureaucracy, industrialisation and ‘modern’ lifestyles have all fuelled increasing migration. Major atoll urban centres, including Majuro in the Marshall Islands, South Tarawa in Kiribati and Funafuti in Tuvalu have become destinations for outer island migrants and have become permanent homes to a growing number of generations from outer islands (UNDP 1996).

Life on outer islands requires regular physical labour and working in the gardens and fishing in the ocean are the main activities that sustain outer island dwellers. A Papua New Guinea poet Korop (1994: 81) describes rural life as so boring, dull and isolated and one thing people wish for is the bright lights of the urban area. Fellmann et al. (1992) echoed similar sentiments that the hard lifestyles experienced in rural areas influenced people to escape for what was perceived to be a better life in town. Economic opportunities in urban areas are important to rural people where employment is restricted to subsistence farming.

In Pacific countries “contemporary urban growth has been accompanied by various development problems and growing concerns...” as a result of rising unemployment, growth of unserviced settlements, increasing crime rates and environmental degradation (Connell and Lea 2002: 11). Tensions between landowners and migrants in the face of land shortages, bureaucratic ineptitude and even corruption have all contributed to disarray and divisions amongst the urban population. Urban issues such as shortage of housing, waste disposal problems, coupled with limited land for development projects as well as housing the increasing urban population have continued to confront decision makers (Campbell 2008; Connell and Lea 2002).

2.4.3 Squatter settlements

Squatter settlements in the Pacific Islands are increasing in number and size and have resulted in overcrowding, inadequate housing, lack of water and sanitation, and the challenge in providing decent environments and employment for the poor

(UNDP 2013). The deterioration of urban living has been exacerbated by the movement of low income families to squatter settlements that proliferate around urban areas (Russell 2009). Urban accommodation is a major problem affecting towns in many developing countries (Connell and Lea 2002; George et al. 1992). Research reveals that more than 800 million people worldwide are living in extremely poor accommodation and about 100 million live without shelter in streets, doorways, under bridges or any available place (Georges et al. 1992). In the Pacific, more than 40 percent of the population (4 million people) live in overcrowded towns, squatter settlements and rural settlements (Mckay 2009).

Squatter settlements vary depending on whether they are located on state lands, customary lands or disputed lands (Mckay 2009). They are made up of households that lack legal tenure to their buildings and household plots. When people acquire a plot of land in the squatter settlements, they normally use informal arrangements where oral and written arrangements between the landowner and the occupants are made. These types of arrangement often have no legal or contractual basis (Asian Development Bank 2011).

Squatter settlements are often located on marginal lands, ill-suited for habitation. For instance, in Honiara in the Solomon Islands, squatters are located on steep slopes and are most vulnerable to landslides while in Nukualofa Tonga, they are located on former mangrove swamps making the people vulnerable to storm flooding, water borne diseases and sanitation problems (Asian Development Bank 2011). On South Tarawa, illegal occupation of land occurs on government leased lands at Betio, Bairiki, Bikenibeu, the water reserve land at Bonriki, and State land at Temaiku Bight. Overcrowded living conditions contribute to the spread of contagious diseases. For instance, outbreaks of dengue fever in the 1970s, 1980s, and 2000s were blamed on overcrowded conditions on South Tarawa (World Bank 2000). Despite increasing numbers of people living in squatter settlements, government is reluctant to remove them as it involves interfering with the traditional rights of landowners and the well-being of the families involved (Burton, Mustelin and Ulrich 2011).

Growth of squatter settlements contributes to widespread environmental damage. Air pollution from open fire cooking is caused by the use of inappropriate types of fuel including car tyres, plastics, and other items that produce pollution. Pollution from cooking causes respiratory problems especially amongst young children and women who do the cooking on open fires every day (Asian Development Bank 2011). The lack of proper toilets and waste disposal areas in squatter settlements contributes to pollution of underground water lenses from solid and liquid wastes produced and disposed of inappropriately (Mckay 2009).

Destruction of mangrove areas for building materials contributes to the decline in coastal fish which normally use mangroves as breeding places. These areas are often cleared, especially by squatter settlers, who use the wood for construction materials and for firewood. Cutting down of excessive numbers of trees for building materials, medicinal use, and for artefacts contributes to environmental damage which threatens not only the health and social well-being of the population but also economic development by reducing the productivity of the subsistence economy (Asian Development Bank 2011). Population pressures combined with uncontrolled squatter settlements have put stress on critical public infrastructure and the surrounding natural environment (Asian Development Bank 2011).

2.4.4 Urban crimes and violence

“Crime challenges the very foundations of the social order, takes a heavy toll in terms of human suffering and results in economic waste and a general deterioration in the quality of life (Brennan 1999: 16). Research shows that crime in urban areas is much higher compared to rural areas because of the greater concentration of wealthier victims and more opportunities to commit various types of crime. Urban areas also provide a more developed second-hand market for disposing stolen items from criminal activities (UNHSP 2007).

Research on crime in the Pacific shows that in large and overcrowded urban centres, criminal activity is considerable (UNHSP 2007). On South Tarawa domestic violence linked with the hardship people face is a common crime. In Bikenibeu, for example, reported cases of domestic violence have increased steadily from 3 in

2001, 8 in 2002 to 18 in 2003 (Corcoran 2006: 77). The overall reported cases of domestic violence on South Tarawa between 2002 and 2003 increased by 55 percent. The foremost cause of violence against women on South Tarawa was the high consumption of alcohol (Corcoran 2006).

Factors associated with urban crime and violence include poverty, unemployment, inequality, parental abuse during childhood, poor urban planning, rapid pace of urbanization and rapid growth in youth population (UNHSP 2007). The urban poor are the most vulnerable as they have relatively limited access to urban assets thus limiting their ability to respond to risky events. Unemployment among young people contributes to increasing urban crime and violence especially those young people living in certain areas like squatter and low income urban settlements (Noble, Pereira, and Saune 2011; UNHSP 2007). Alcohol and drug abuse among unemployed youth in low income and squatter settlements have been blamed for much of the crime and violence in urban areas.

Homemade alcohol is prevalent in urban areas and has contributed to not only theft, burglary and stealing but also to other more violent crimes such as murder and assault (Noble, Pereira and Sauna 2011). Child labour is also on the rise in most Pacific Island countries. This includes commercial child prostitution, illicit activities and hazardous work. Young girls from low-income families, especially those in squatter settlements in urban areas, tend to be most involved in these activities (Singh 2008).

Despite the risks involved in these activities, the children continued in the work mainly because of the need for money in the household. Young children from low income urban settlements were at high risk of being traded for child labour. There is growing popularity of child labour on South Tarawa and Kiritimati urban areas (Singh 2008). Urban poverty is caused by inadequate income, inequality and social exclusion and contributes to the erosion of moral values, the collapse of social structure, and the abandonment of traditional customs (Brennan 1999; Noble, Pereira, and Saune 2011).

2.4.5 Waste management and disposal

Urban waste management and disposal on South Tarawa is administered by the two urban Town Councils namely the Betio Town Council (BTC) and Teinainano Urban Council (TUC). The Betio Town Council and the Teinainano Urban Council collect solid wastes within their respective jurisdictions. Urban waste in South Tarawa is of two kinds, solid and liquid waste (Government of Kiribati 2007). The amount of solid waste for disposal is increasing due to the changing lifestyles of urban residents especially the use of non-biodegradable materials such as cans, bottles and plastics (ESCAP 2000). Inadequate methods for disposing of the solid and liquid waste, coupled with the limited land available for waste disposal, have been a major problem affecting the urban population and the environment (Bryant 1993; Government of Kiribati 2007).

Solid waste is disposed of several ways. Urban residents put their non-organic solid waste in green bags and place them beside the road for collection by the Council garbage vehicle. Rubbish collection is carried out on specified days of the week. Organic wastes are disposed by urban households in holes they have dug themselves. These areas can be used for planting bananas or other fruit trees in the future. However, most urban households are still disposing of their rubbish in the sea or sometimes by burning (Government of Kiribati 2007).

Liquid waste, such as human excreta is disposed of through septic tanks and sewerage systems. The spread of cholera in the 1970s inevitably prompted the government to introduce the sewerage system which disposes human waste through outlets into the sea at Betio, Bairiki and Bikenibeu. Only Kiribati Housing Corporation (KHC) houses were connected to the sewerage system. Private houses and other KHC houses that have not been connected to the sewerage systems use the septic tank system. PUB operates a vacuum tanker for desludging KHC houses as well as private septic tanks when needed (Government of Kiribati 2007).

Urban solid waste is disposed of in landfills. The main objective for using landfills as dump sites is for land reclamation in the long term. Landfills are all protected with sea walls which are not sealed thus leachate is a potential problem to the

coastal environment. Besides, these landfills are used as a loosely managed disposal site as they are not regularly covered. The only activity carried out on the landfill is the spread and compaction of disposed rubbish by bulldozer (Government of Kiribati 2007).

Besides the Betio Town Council (BTC) and the Teinainano Urban Council (TUC), the Kaoki Mange (Kiribati Solid Waste Management) (KSWM) provides a recycling activity which is strongly supported by the government. The main objective of the KSWM project is to clean South Tarawa. The operation of the KSWM is managed by Kiribati Recycling. It has a Material Recovery Facility and Container Deposit system at Betio. Rotten and unused vehicles and machinery are deposited in the KSWM facilities where they are later sent to foreign buyers of scrap metals. Empty drink cans and plastic bottles are also disposed for recycling purposes. People collect these drink cans and plastic bottles and sell them for recycling. The project not only assists in cleaning South Tarawa but also provides opportunities for unemployed urban residents to generate income (SPREP 2013; Government of Kiribati 2007).

Both BTC and TUC have conducted awareness programmes in regards to proper ways to dispose of rubbish. However, most households still prefer their own methods such as disposing of rubbish in the sea or burning it instead of putting items into bags for collection by garbage trucks. The use of the beach and the bush for defecation is still the most used method by urban residents. These methods in the long term could have adverse impacts on the environment.

2.5 CONCLUSION

Research has indicated that the impacts of climate change are likely to be particularly severe on low-lying atolls and reef islands. Despite the numerous international conferences very little by way of positive outcomes has been achieved from the dialogue about climate change to date. In the case of Kiribati, development since the 1940s has focused on South Tarawa. As the population becomes more concentrated in South Tarawa, its demands for resources such as building materials, medicinal plants, and local foods has slowly destroyed

important trees such as coconuts, pandanus and breadfruit that also provide food for the urban people. Excess harvesting also affects the carrying capacity of the land to provide resources for the population in the long term.

Even though Kiribati may not be financially capable of supporting its adaptation programmes for dealing with possible impacts from climate change in the long term, one solution is to seek external assistance from donor countries and agencies including the World Bank, and Asian Development Bank, and also from countries like Australia, New Zealand, Taiwan, Japan and other countries that have provided assistance both in kind and money. Seeking overseas technological assistance to provide more efficient and effective adaptive strategies is appropriate to ensure people can continue to live sustainably on their islands. Programmes to address problems associated with climate change are important to ensure the survival of the Kiribati population and their atoll islands now and in years to come.

CHAPTER THREE

KIRIBATI - BACKGROUND

...Nature endowed these islands with limited resources, but the people were content and developed ways of making the best possible use of them...the most important natural resources were the land and sea, which together satisfied the subsistence requirements of the inhabitants.

(Kirion and Karaiti 1992: 20-21)

3.1 INTRODUCTION

The 33 coral atolls that comprise the Republic of Kiribati, are located astride the equator in the Pacific Ocean (See Figure 3.1). The islands that compose the atolls are small in land area with very limited natural resources. All but one (Banaba, also known as Ocean Island) are low-lying with a maximum elevation of four metres above sea level. The huge area of ocean across which these coral islands are scattered is the most promising resource available. The people of Kiribati, like many other inhabitants of small islands in the Pacific are as much people of the sea as people of the land (Hau'ofa, 1993). They are renowned for their traditional navigation skills and fast sailing canoes and since inhabiting these naturally resource poor islands more than 3,000 years ago (Lewis, 1972), have utilized whatever available resources they could obtain from the land and sea to sustain their day to day lives.

Prior to the arrival of Europeans, I-Kiribati resided in dispersed village communities and followed regulations mandated by the *unimane* (old people) (Tabokai 1985: 259). The land provided shelter, food and medicine, while the sea was “a source of spiritual and physical satisfaction, an arena for recreation, medium for travel and adventure and a source for basic necessities such as medicine and construction and also food” (Teiwaki 1988: 3). The traditional uses of the resources from the land and sea are still being practised today despite the inevitable processes of social change. However, sustained intervention in the lives of I-Kiribati by explorers, whalers, missionaries, and colonialists, inevitably brought changes to indigenous society that have had both positive and negative effects on the local population as well as on the terrestrial and marine environments

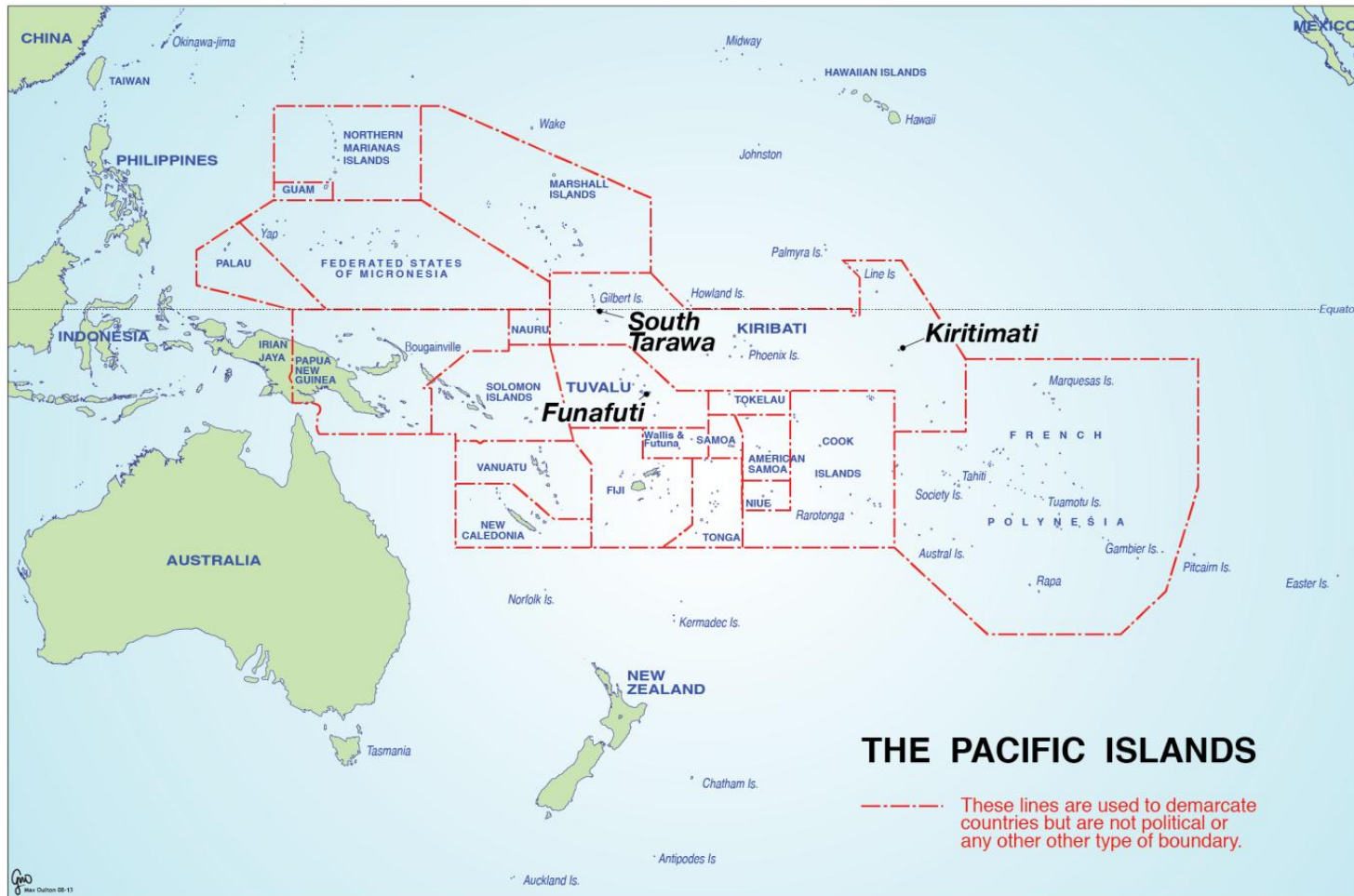


Figure 3.1 The Islands of Kiribati in the Pacific Ocean (Source: Max Oulton 2013 University of Waikato)

The development of urban centres on South Tarawa and more recently on Kiritimati has influenced the migration patterns of I-Kiribati as well as the way they live. The change from subsistence to a monetary economy in the urban areas has influenced the way residents in the towns derive commodities for their livelihood from the environment. Traditionally, any surplus acquired in the subsistence economy from the land and sea was normally shared with neighbours and families. In a monetary society, any surplus acquired from the land and sea is sold for the purpose of generating income for the family. This has put pressure on the way people extract resources which in turn affects the potential of the urban environment to sustainably support increasing demands from the growing numbers of town dwellers.

The concentration of population on South Tarawa in particular, and to a lesser extent on Kiritimati, has placed considerable strain on urban services and amenities. Problems associated with rapid growth in the populations living in towns have been exacerbated by insufficient investment in urban infrastructure and services especially since the end of the colonial period. They are magnified further in the atoll environment of South Tarawa, due to extremely limited land areas, scarcity of natural resources and environmental fragility. More critically, the adverse effects of climate change, and in particular the rise in sea level, have compounded urban related problems. It is imperative for policy responses to be put in place to ensure the islands and the people of low-lying islands are sustainably protected from climate change impacts in the long term (Burgess et al.. 1997; Crocombe 2001; Tutangata 2005).

This chapter contains a brief review of Kiribati and its towns and provides an introduction to several of the major issues, fresh water provision, waste management and land degradation, which make urban areas on atolls vulnerable to adverse effects of climate change in the short and long term.

3.2 PEOPLE AND LAND

The people of Kiribati are Micronesian. Archaeological findings indicate that the islands were initially settled by early Austronesian speaking people before the first century AD (Talu et al. 1992: 12; Van Trease 1993). Catala (1957) suggested that

the archipelago of the Gilbert Islands was situated on the edge of the three ethnic groups Micronesia, Polynesia and Melanesia, and believed that the Kiribati islands form a bridge between these ethnic groups and their affinities bring them closer to the Micronesian group. The present population of Kiribati displays an inter-mixing of the populations of varied origins is and reflected in its considerable diversity. Notwithstanding the diversity, there are some common elements to Kiribati customary traditions and practices. In the next section an origin myth for Kiribati, which has relevance for responses amongst some I-Kiribati to talk about islands disappearing below the sea with climate change, is outlined. This is followed by a brief description of a key cultural institution, the *maneaba* (meeting house), and a review of some critical dimensions of the customary land tenure system.

3.2.1 Nareau, the creator

In the beginning there was nothing, only *Nareau* (the spider) who was floating in space alone and sleeping. While floating alone in space, he heard someone calling his name. When *Nareau* opened his eyes he could not see anything. *Nareau* slept again and while sleeping his name was called again for the second time. He opened his eyes to see who was calling but there was no one around. For the third time he went to sleep again and to his surprise his name was called again. He answered and asked who called his name. There was silence, *Nareau* was alone in space. He looked around to see if someone was hiding, but there was no one around. However, when *Nareau* looked down, he saw something floating.

The sealed object floating below him in space was *Te Bomatemaki*¹¹. *Nareau* was curious about *Te Bomatemaki* and descended and stood on it. With his tail known as *kaweten bukin Nareau* “the barb of the spider” he walked on *Te Bomatemaki* and chanted to open it. He repeated the same process four times. But after completing the chanting he noticed that it did not open. However, after putting out his tail, he noticed a hole on *Te Bomatemaki*. He put his hand inside and felt water. He took sand and water, combined them and formed *Na Atibu* (stone). He then put the *Na Atibu* back into the hole on *Te Bomatemaki* and demanded that *Na Atibu* lie with *Nei Teakea* (emptiness) to produce *Nareau Tekikiteia* (*Nareau* the Wise). As a

¹¹ *Te Bomatemaki*: Used in the Kiribati legend to refer to the earth and the sky sealed together.

result of this union and as demanded by *Nareau* the creator, *Nareau* the wise came into being. *Nareau* the wise was inside *Te Bomatemaki* while *Nareau* the creator was outside (Beiabure, Teraku and Uriam 1992: 2).

While *Nareau* the wise was inside *Te Bomatemaki*, he found it difficult to move around inside as it was so low. *Nareau* the wise then asked *Nareau* the creator what to do about his situation inside. *Nareau* the creator ordered him to lift it up to give him space to move around. When completing this, *Nareau* the wise was ordered to complete the task of creating the islands. When *Nareau* the wise had lifted the upper portion of *Te Bomatemaki* higher than before, he could see bodies, spirits, lying beneath the cover and called this cover *Robungini Karawa* (the darkened image of sky). *Nareau* the wise had to raise the cover higher in order to go to the stiff bodies and break parts of them to make them move around. He also chanted words to make them able to speak. When they began to speak he gave them names (Beiabure, Teraku and Uriam 1992: 3).

After *Nareau* the wise had separated the earth and the sky, crowds of spirits could now move freely and began to converse. The only thing lacking was the light that was not bright enough. So *Nareau* the wise consulted *Nareau* the creator about the solution to the problem and was advised to kill his father *Na Atibu* as his body could produce sufficient light. *Nareau* the wise complied with the advice and slay his father *Na Atibu* and laid him down with his head facing the east. He pulled out his right eye and threw it to the eastern portion of the sky and it became the sun. He did the same procedure to his left eye and threw it to the western sky and it became the moon to help the sun to give light. He also took his ribs and threw them into the midst of the sky and the shattered minute particles became stars.

Nareau the wise then took his father's right hand and threw it northward and ordered that it became the northerly wind and be associated with strong winds, rain and bad weather. He then performed a similar ritual with the left hand to the southward and ordered it to become the southerly wind which shall be associated with light winds and calm days. He declared the days to be times to labour for food. *Nareau* performed the same ritual to the right leg and threw it westward and ordered it to become the westerly wind and to be associated with rough and stormy weather.

The last was his left leg and threw it eastward and said to become the easterly wind and to be associated with fine days for navigation. *Nareau* the wise in concluding his task of creation gathered all intestines and threw them upwards and these later became people. The spine and the remnant of flesh and skin remained and changed into *Te Kaintikuaba*¹² the first of all lands to be created.

3.2.2 The legend and the climate change debate

The legend of creation explains how islands were formed by *Nareau* for the people to live on. *Nareau* also provided the islands with the weather pattern that ensure the islands are protected from climate events such as tropical cyclones. Interestingly, the geographical location of Kiribati outside the cyclonic belt seems to confirm this aspect of the legend of creation. Empirical evidence also confirms that Kiribati has never experienced devastation caused by tropical cyclones. Similarly, the islands have never experienced tsunamis and earthquakes that normally affect other neighbouring Pacific countries.

However, according to the legend, there is going to be one disaster that will affect the islands of Kiribati in the future. It will be in the form of water coming from under the ground and flooding some parts of some islands. According to IDITR22, “...I have heard of this legend when I was young...it was shared to us in the *maneaba* by our *unimane*...now I can see that maybe it is about the rise in sea level...” The effect of this event is not devastating and it will not last very long. The legend confirms that *Nareau* will not interfere and will leave it to naturally take its course on the islands. Interestingly, people will not be affected and only some part of the islands that will be flooded will be affected. Most of the older participants interviewed during field work on South Tarawa and Kiritimati felt that this welling up of water is likely to be connected to the rise in sea level. While most people in Kiribati are aware that the sea is rising slowly, especially during high tides, people are not very concerned about this. They are more concerned about the

¹² Te Kaintikuaba: A tree that was the home of the spirits who with *Nareau* made the islands of Kiribati.

potential of the islands to support the livelihoods of their children and grandchildren in the future.

3.2.3 Culture

Kiribati has a well preserved culture that is very distinct and passed orally from generation to generation. Each island has certain cultural traditions that every person is expected to adhere to. A significant cultural tradition in Kiribati society is the *maneaba* tradition. The *maneaba* is a large thatched roof construction (See Figure 3.2) usually found in every village. The *maneaba*¹³ is centrally located where people can meet for different occasions. It is a traditional meeting house where the elders (*unimane*) of the village consult and make decisions regarding the progress and welfare of the people in the village. Maude (1977: 11) explains the traditional functions of the *maneaba* as:

...The [*maneaba* is the] focus of the whole social life of the community, in it were held all discussions concerning peace or war or any of the other innumerable concerns affecting the common weal; it was the Law Court, where offenders against customary norms were tried, and disputes heard and arbitrated by the Old Men; and the centre for the many ceremonies and feasts of a formal character, ...



Figure 3.2 Traditional Kiribati Maneaba, Eriko Village, Beru Island

(Source: Photo by Author 2015)

¹³ Detailed analysis regarding the customs and traditions about the Kiribati maneaba see Maude (1963 and 1977). Also see “The Maneaba System” by Tabokai, N. (1993) Van Trease, H. (ed.) *Atoll Politics The Republic of Kiribati*.

Grimble (1989: 199) also mentioned that all functions conducted in the *maneaba* had to be carried out in “accordance with a fixed and rigid ceremonial”. Each *kainga* (family) in the village has a *boti* (sitting place) in the *maneaba*. People’s entitlements to a *boti* in the *maneaba* are based on their patrilineal affiliations throughout Kiribati. During meetings in the *maneaba*, everyone is expected to sit in their *boti*. Besides, each family had their traditional duty to perform in the *maneaba*. The *maneaba* duties and privileges were the sacred inheritances of the various families which took their seats in the *maneaba*. Anyone who performs any function that did not belong to their family would be liable to sudden and mortal sickness as he/she has offended “*kamatauninga*” – the *maneaba*. (Grimble 1989)

Today, especially in the urban centre of South Tarawa, the *maneaba* is used for many purposes in addition to those of the past. While the cultural function is still retained, especially on outer islands, the political, spiritual and social functions are growing in their importance. The political functions include a venue where people discuss ideas and regulations issued from the central government in South Tarawa as well as being a gathering place for election campaigning. The spiritual functions include church activities such as meetings and worship. The social functions include accommodating new forms of entertainment such as movies, playing cards and bingo and “island nights” (Tabokai 1985: 259).

Overall, it was the culture of respect to the old people and the decisions they make under the roof of the *maneaba* that enabled the Kiribati people to maintain unity and development in their traditional society prior to becoming a colony. Even after independence, the importance of the *maneaba* in decisions regarding the smooth running of every village and community remains important and respected by the people.

3.2.4 The traditional concept of land ownership

Traditional land ownership system in Kiribati was enshrined in the local custom. According to the Kiribati culture, land carries significant importance in the life of an I-Kiribati. Land (*teaba*) provides life (*maeu*), home (*mwenga*), and identity (*kinakiu*). People depends on everything their land provides for their day to day

living. Strictly speaking, the land provides the livelihoods¹⁴ for the people. Therefore, land is not only something that people owned but it means more than that, it provide food, shelter, clothing, medicine, artefact, and identity. Traditionally, land right is not transferable to a non-family member. However, only in certain cases when land can be transferred to another family member. When this happens, it will be done according to strict traditional protocols. However, during the colonial periods, some aspects of traditional land rights were modified by the colonial administrators to give them right to acquire land.

The traditional land system differed slightly among the islands especially in the northern, central and southern parts of Kiribati. During the colonial era when the traditional land systems was changed, there was little control over the alienation of land and it was then possible for non-natives to acquire land through sale or as a gift from the local people. This enabled the early missions like the Roman Catholic Church (RC) and the London Missionary Society (LMS), today known as the Kiribati Uniting Church (KUC), to acquire land through purchase for the purpose of establishing mission headquarters. Similarly, early expatriate traders also used this system to acquire land for residential and business purposes (Lodge 1986).

The traditional land tenure system which allowed the alienation of land caused concerns and resulted in the introduction of laws to control the sale of land to non-natives. The Resident Commissioner for the then Gilbert Islands, Telfer Campbell, proposed the implementation of the lands registration system to safeguard the acquisition of traditional land by non-native people. The processing of this law took quite some time and as a result Mr. Campbell was not able to complete the task. However, it was Arthur Grimble who revitalised the work managed to persist until the work was completed in 1956. The Land Register in Kiribati is important as it shows the names of all land owners of every piece of land in Kiribati. In this regard no one can claim ownership of any land apart from the ones written in the Land Register.

¹⁴ In the context of this study, livelihoods refers to the capabilities of the urban environment to provide traditional resources such as food, medicines, materials for constructions and the like to sustain human existence.

The new system simply replaces the old system in which the role performed by the *unimane* in adjudicating matters relating to the use of land was changed. In the new system, all matters pertaining to land are dealt with in the Court of Law and in accordance with the provision of the lands code of the Native Lands Ordinance Chapter 61. Magistrates in the Lands Court are vested with the jurisdiction to hear all cases pertaining to land ownership in Kiribati.

Ownership of customary lands in Kiribati is obtained through two main avenues; “inheritance” or “acquired”. Inherited ownership is when the next of kin in the family, usually the children, inherit lands from the parents. The oldest male in the family receives more land than the younger children in the same family. Where there is no male in the family, the oldest female receives more land than the younger members of the family. Both men and women inherit land rights from both of their parents. A second form of inheritance is when an issueless person dies. In this case the deceased lands are given to the nearest kin. This form of inheritance is known as the *mwinititi* (issueless) (Tito et al. 1992: 21).

When land is acquired, the ownership of the said land is transferred to someone outside the family circle. The recipient is usually someone from a different *kainga* and the land is given as a gift or compensation. In such situations, the land may revert to the family that owns the traditional rights to the land when the recipient passes on as the family of the recipient cannot claim ownership. Today, land ownership can be acquired through land purchase from the traditional owner/s provided written or verbal consent by all owners of the land is provided in the Court of Law that deals with the purchase of the said land. Prior to the introduction of the Lands Code, local people were free to do whatever they wanted to do with their land and resources in it. Lands were never sold though and only given as gifts or compensation to members of other families (Lodge 1986).

Land could also be acquired through other avenues including as gifts in appreciation of personal favours, for adoption or care-taking, as compensation, or as a result of such special relationships as those between a woman and her husband’s uncles. In special relationships, *aba n tinaba* was transferred to a woman in appreciation of a favour from an in-law relationship. These favours were normally the garlanding of

an uncle during special functions in the *maneaba* in the presence of other old people. The more traditional form of land acquisition was *te bora* where a man would give a piece of land after he had slept with his nephew's wife (Tito et al. 1992: 22). While the cultural process of inheriting land through *te aba n tinaba* and *te bora* may look immoral in the eyes of an outsider, they are culturally acceptable in Kiribati society.

3.3 HISTORICAL DEVELOPMENT

The geographical isolation and remoteness of the islands suggests they were the last to be “discovered” by Europeans (Grimble 1989). The lack of natural resources offers limited attraction for long stays and residence. Early European visitors were not advocates of change in any form; even when the traders arrived, their concern was only to change a few economic procedures and to establish demand for a limited range of exotic commodities (Onorio 1992; Van Trease 1993). The colonisers and the missionaries were the real catalytic agents of change. The former did have a lot of influence on the customary law and the way the islands were governed from the 1880s. The latter's influence was more on converting the people from their traditional lifestyles to adopt a Christian way of living (Baraniko et al. 1992; Etekiera 1992; Grimble 1989).

3.3.1 Early contacts

The first non-indigenous person to come in contact with the Kiribati islands was Commodore John Byron in early 1765 on HMS “Dolphin”. Later contacts with the other islands in the group took place in 1788 by Captains Thomas and Marshall while sailing from Sydney to China (Connell and Lea 1998; Macdonald 1982). Visits by outsiders were not frequent mainly because the islands did not offer attractions for permanent occupation as the soils are poor with limited resources (Crocombe 2001; Van Trease 1993: 5).

The arrival of the missionaries played an important role in changing the way people lived. They were known as the “good people” (Takaio 1992: 85). Through their new teachings people began to wear clothes and abandoned their traditional way of

living. Through the influence of the missionaries, many Kiribati people accepted Christianity and were converted to the teachings in the Bible. Today the majority of the people identify as belonging to one of the many religious groups which include the Roman Catholic Church, Kiribati Protestant Church (KPC), Seventh-day Adventist Church (SDA), Church of Jesus Christ of the Latter Day Saints (LDS), Baha'i, Church of God (COG) and other smaller denominational groups like Islam that have only recently come to Kiribati.

Following these early influences, more frequent contacts occurred with traders arriving with intentions to recruit workers from the Gilbert Islands to work as labourers overseas. The arrival of traders introduced new commodities such as tinned food, tools and weapons which islanders soon developed a liking for including the sharper steel knife that quickly replaced the traditional toddy knife made from shell sharpened with pumice stone and shell adzes. Later, steel fish hooks replaced wooden and bone hooks and cotton replaced leaves for clothing (Takaio 1992: 65).

3.3.2 Political development

The search for a headquarters for commercial activity started before formal colonisation. Butaritari (northern Gilbert Islands) became an important commercial centre for the islands and was made an interim base for the Gilbert group from 1893 to 1898 (Maude and Doran 1966: 276). In 1892 the islands were declared a British Protectorate (Connell and Lea 1998: 3) by Captain Davis who was of a firm opinion that the headquarters would remain on Butaritari. The geographical advantage of Butaritari was the easy access of its lagoon, a good anchorage site and a better rainfall than other islands.

The High Commissioner for the Western Pacific, Sir John Thurston, did not share the same view and was more in favour of Tarawa becoming the capital. Through his influence, the headquarters was moved from Butaritari to Tarawa in 1896 and remained there until 1908 (Maude and Doran 1966) when phosphate was discovered on Banaba (Ocean Island) and the colony's headquarters was again moved, this time to Banaba, and remained there until 1941 (Talu et al. 1992). The

disadvantage of Banaba was it did not have an easily accessible underground water source as on raised coral islands the water table is much deeper below the surface. The only water source available on Banaba was from the underground caves which have limited water capacity (Sigrah and Stacy 2001). While the headquarters was on Banaba, economic development on Tarawa grew steadily. When the new High Commissioner, Sir Arthur Richards, visited the islands during his term in office and saw the improved development in the economy on Tarawa he proposed the return of the headquarters which was relocated back to Tarawa in 1947 (Maude and Doran 1966).

Besides Tarawa and Banaba, other islands were also considered. Abemama was one island that was strongly considered as a possible site for the headquarters. The geographical position of Abemama in the centre of the group provides easy access to serve the islands in the north and south. Similarly, its consolidated landmass, a good lagoon with a good anchorage, together with a good underground water source makes it an ideal site for the headquarters. The only disadvantage was the entrance passage to its lagoon that was considered dangerous.

Consequently, the proposal to relocate the colony headquarters to Abemama after the Second World War was withdrawn (Van Trease 1993: 3). The headquarters of the colony remained on South Tarawa until Kiribati attained political independence in 1979. Since then, it has been the capital and main administrative, communication, and commercial centre. During this time, Kiritimati was never considered for the headquarters as it was never a part of the Gilbert Islands. Development of Kiritimati started after independence and was made the headquarters for islands in the Line and Phoenix groups.

3.4 PHYSICAL GEOGRAPHY OF THE ISLANDS

There are three main groups of islands in Kiribati: the Gilbert group which includes Banaba (Ocean Island) in the west, the Phoenix Islands and the Line Islands in the far-east (Asian Development Bank 1997: 17). The distance between the most westerly situated island and the most easterly situated island is approximately 4000 kilometres (ABM and CSIRO 2011: 95). As noted earlier, the 33 coral islands are

no more than 4 meters above sea level, with the exception of Banaba with a highest elevation of 78 meters. The total land area of Kiribati is approximately 811 square kilometres scattered over a huge area of approximately 3.5 million square kilometres of ocean. Of the total land area of Kiribati, Kiritimati has a land area of 388.4 square kilometres, nearly half of the total land area of the country, while Banaba is 6.3 square kilometres (Fairbain 1992: 1).

3.4.1 Climate

Kiribati is located in the dry belt of the equatorial oceanic climate zone of the Central Pacific. The weather is characterized by a mean daily temperature ranging from 26 to 32 degrees centigrade (Asian Development Bank 1992: 127). Basically there are two main seasons, the wet and dry. The wet season is locally called *Aumeang* and the dry *Aumaiaki*. The *Aumeang* comes around November to May while *Aumaiaki* lasts from June to October. In fact the peak of the wet season is in January and the lowest mean rainfall is in October. Kiritimati's seasonal cycle is slightly different from the Gilbert Islands due to its geographical location being 2000 km to the east. The wet season in Kiritimati comes in January to June with the dry weather from July to December (ABM and CSIRO 2011: 97).

The rainfall pattern is influenced by the movement of the South Pacific Convergence Zone (SPCZ) and the Intertropical Convergence Zone (ICZ). The SPCZ and ICZ spread across the South Pacific Ocean stretching from the Solomon Islands in the west to the east of the Cook Islands and across the equator (ABM and CSIRO 2011). Rainfall in the Gilbert group is variable both yearly and among islands ranging from 1,000 mm for islands situated near the equator to 3,000 for the wetter islands in the north. For the islands in the Phoenix group, rainfall ranges from 1,000 mm to 3,000 mm while on islands in the Line group the rainfall varies among islands. Kiritimati has an average of 700 mm while Teraina has 4,000 mm per year. Islands that experience frequent droughts normally receive rainfall of 200 mm or less per year during these periods. These islands are mainly in the central and southern part of the Gilbert group (Republic of Kiribati 2012).

Additionally, the wet period, associated with El Niño events, brings a lot of rain while the dry periods, associated with La Niña, brings drought. Wet periods usually come with strong westerly winds that sometimes cause damage to important food trees like coconut palms. During high tides rough seas together with strong winds can destroy the coastal areas and vegetation. Winds normally blow from the north-east and south-east and provide natural cooling from the hot sun. From June to November, the wind comes from the south-east while during the wetter periods from December to May, the winds come from the north and east. During westerly storms, strong winds, showers and squalls occur from the north-west to south-west. Tropical cyclones are rarely experienced due to the location of the islands within five degrees either side of the equator (ABM and CSIRO 2011).

3.4.2 Soil

The landmasses are generally small in size, fragmented and remote and are mainly in the form of coral atolls formed of limestone bedrock. Most islands are flat with the limestone bedrock overlain by a thin layer of sandy soil and coral rubble with very limited vegetation. With the exception of Banaba, with its deposits of phosphate, the soils on all other islands are uniformly poor with very limited nutrients necessary for plant growth and are among the most infertile in the world (SPREP 1992: 6).

The soil is comprised mainly of highly alkaline coral debris and sand and silt-sized particles of limestone and are limited in most of the trace elements, including iron, manganese, copper, and zinc, required for plant growth (Thaman 1990). They also have very low water-holding capacity, little organic material, and few macro and micro nutrients apart from calcium, sodium, and magnesium (Thaman 1990: 6; Wilson 1994: 4). The activity of soil micro-organisms is limited and the level of organic materials is low because of the soil's coarse textured nature and rapid rainfall infiltration. These factors make the practice of agriculture on the islands problematic (SPREP 1992). Apart from having poor soil, other environmental factors such as the harsh sun and salt spray from the sea also make plant growth difficult.

3.4.3 Vegetation

Because of the physical nature of the islands, the vegetation is limited to those plants that are naturally capable of surviving in harsh environmental conditions. Only shrubs and plants that can withstand salt spray and harsh climatic conditions are found in coastal areas (Teunissen, Ubaitoi and Powell 1995). A limited range of terrestrial vegetation exists on most islands with considerable variation in condition according to the density of human habitation. Coastal vegetation is more dominant due to the presence of human settlements on the central parts of the atoll islets and is much influenced by the harsh climatic conditions of atoll islands. The dominant vegetation present is the coconut palm mixed with scrub and scattered pandanus, other plants which can survive in the harsh and infertile atoll environment. The flora and fauna are extremely limited with only 66 indigenous plant species (Thaman 1990: 6).

Nevertheless, a number of crops can survive in the very harsh and infertile soils are found on the islands. *Te nii* (*cocos nucifera*) is the dominant plant grown with a mix of scrub and scattered plantings of *te mao* (*Scaevola sericea*), *te uri* (*Guettarda speciosa*), *te ruku* (*Ipomoena* sp), and *te itai* (*Calophyllum inophyllum*). *Te kaina* (*pandanus tectorius*), also known as the pandanus tree, is a tree with edible fruit that grows well together with *te mai* (breadfruit), and *te banana*, that are usually found grown close to human settlements. The *babai* (*Cyrtosperma chamissonis*) is only grown in pits dug into the water table and filled with compost and on South Tarawa is only found from Teoraereke to Tanaea (Wilson 1994). *Te tongo* (mangrove species *Lumnitzera littorea*) is found along the beach on the lagoon side of some islands (Teunissen, Ubaitoi, and Powell 1995). Flowering plants are found around residential dwellings and are used traditionally for making flower garlands for special ceremonial occasions.

3.4.4 Natural resources

As will already be obvious, the islands are endowed with limited resources and the people have learned to adapt to a harsh environment (Thomas 2003). The coconut and pandanus are probably the most important traditional plants for the people. The juice and flesh from the coconut are used for drinking and food while other parts of

the tree are used for a range of purposes. The spathe of the coconut palm can be tied with *te kora* (local string) and the sap *karewe* (toddy) collected in a coconut shell. The *karewe* could be boiled to make a syrup *kamaimai* which could be used to mix with water for drinking. The *karewe* could also be left to ferment and to make *kaokioki* (sour toddy), an intoxicating drink.

Coconut palms also provide materials for constructing houses, for building canoes, and making weapons for warfare. In addition, many parts of this tree can be used for medicinal purposes to treat different types of diseases. Traditional healers know exactly the part of the coconut palm to use to cure certain diseases such as coughs, fevers, stomach sores and the like.

The pandanus, *te kaina*, was another important traditional tree that was exploited to the full. The ripe fruit was utilised to make traditional foods called *te kabubu* and *tuae* which could be used for immediate consumption or stored for future use. The leaves were used for weaving mats and for thatch while other parts of the tree have uses as medicines and dyes. Traditional skirts for dancing and for other culturally important occasions were also made from pandanus leaves. The long straight trunk of the pandanus tree is an important post for the *maneaba* and *te auti* (local house).

Apart from these important trees, other natural resources such as minerals are very limited. The only available mineral resources include sand, gravel, limestone rock aggregate, guano deposits, deep-seabed polymetallic manganese nodules and cobalt-rich crusts (Teiwaki 1988). In addition to the above minerals, there are still some unmined deposits of phosphate on Banaba left after the British Phosphate Commission (BPC) ceased mining operations in 1979. Wind, water and wave-driven coastal processes on the coral limestone materials have caused the accumulation of deposits of sands and coral rubble of varying textures along the coastal areas of the islands (Teiwaki 1988). These have provided a natural barrier protecting many coastal areas from the actions of the sea.

Other important resources, that are not yet fully explored and utilized, come from Kiribati's vast area of ocean covering five million square kilometres. The ocean is relatively rich in marine fauna which includes about 600 to 800 fin-fish species and

marine flora such as weeds and sea-grass. The marine resources are likely to become Kiribati’s main hope for subsistence and commercial economic development. Common species of crabs, clams and sea cucumber include: *aaii* (*Bigus lastro* – coconut crabs), four giant clams (*te kima* (*Tridacna gigas*), *te were* (*Tridacna squamosa*), *te neitoro* (*Hippopus hippopus*), *nouo* (*Strombus luhuamis*), *te bun* (*Anadara uropigmelana*)), sea cucumber (*Holothuria* sp.), pearl oyster and many more (Teiwaki 1988).

3.4.5 Hydrology

Rivers and lakes do not exist on coral islands and only a number of small freshwater and saline ponds and swamps are found on some islands. The islands have underground water lenses (see Figure 3.3) where the fresh water is hydro-statically balanced on the surface of the salt-water (Ghyben – Herzberg principle) which permeates the limestone (Chang 2000; White et al. 1999). Underground water and rain water are the main sources of fresh water. Banaba has water in the caves and well water is not available. Not all groundwater is good for human consumption as in some parts of the islands well water is brackish. Only certain areas of the islands provide good well water for drinking. Replenishment of the groundwater lens depends solely on rainfall (SPREP 1992).

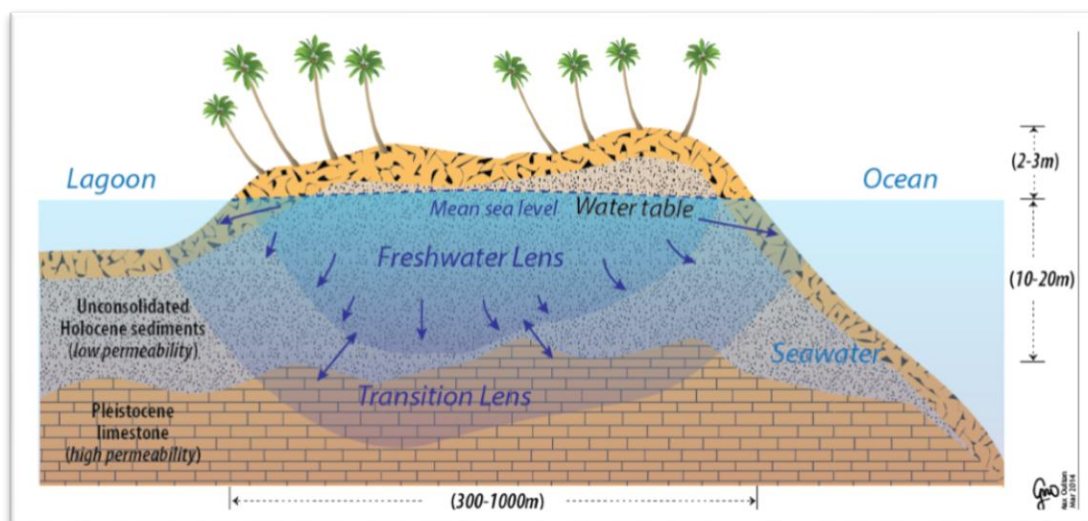


Figure 3.3 Underground freshwater zone of an Atoll

(Source: Max Oulton 2014 University of Waikato)

Sources of fresh water for drinking on the islands are confined to the underground water lenses. Wells are dug into the fresh water lens and people fetch water from it for drinking and for other domestic uses. Rainwater is another water source but only for those with permanent homes fitted with rainwater catchments. Traditional houses with thatched roofs cannot collect rain water during rainy days. While rainwater is the best source of water, it is not reliable as drought is common in Kiribati. Similarly, well water in some parts of the islands though having low levels of salinity, is still not safe for drinking due to the high levels of contamination. Development and human activity contribute to the contamination of ground water in areas that are densely settled.

3.5 SOCIAL AND ECONOMIC CHARACTERISTICS

The extremely limited physical resource base combined with scarcity of skilled workers and entrepreneurship, has posed serious development constraints since attaining political independence. The economy of the country is mainly subsistence with approximately 80 percent of the population still engaged in fishing, seaweed cultivation and copra cutting. Approximately 14,000 people are formally engaged in paid employment (Government of Kiribati 2012) most of which is provided by the Government. Privately owned companies and businesses as well as different religious organizations also provide limited paid employment opportunities. Limited natural resources and the pressure from increasing population are critical issues confronting Kiribati.

3.5.1 Demography

A significant milestone was reached in 2010 when for the first time in Kiribati history, more than half of the country's total population resided in its two main urban areas; South Tarawa and Kiritimati (Republic of Kiribati 2012; Corcoran 2014). When the first official census was conducted in 1931 the population was only 29,671. More than a decade later in 1947 the population had increased to 31,423. Two decades later, the population was 56,213, double the initial figure in 1931. By 1985 the population reached 63,883 and in 1995 it was 77,658. Five years

later in 2005 the population had reached 84,494 and the 2010 population census reported a further increase to 103,058 (Kiribati National Statistic Office 2012; 2011).

3.5.2 Urban areas

Prior to independence, when Kiribati was administered together with Tuvalu as the Gilbert and Ellice Islands Colony (GEIC), South Tarawa served as the colony's main administrative area as well as the main centre for economic development. The bulk of the colony's development has always focused on South Tarawa. The same development trend has occurred following independence when South Tarawa became the national capital and main urban area. The other urban area is Kiritimati. The first I-Kiribati arrived on Kiritimati in 1941 to work on planting coconuts and cut copra (Langston 1993). Urban development on Kiritimati is recent and slow. It started when the USA ceded control of the islands to Kiribati during independence.

3.5.3 South Tarawa

The urban area includes six individual islets extending from Betio to Tanaea on the southernmost part of Tarawa atoll (Figure 3.4). Originally the islands were fragmented and separated by channels but they now have been connected by causeways and a bridge. The longest causeway extends from Betio to Bairiki. Urban South Tarawa has a total land area of approximately 400 ha and a combined length of 28 kilometres. It is estimated to possess 43 per cent of the total land area of 920 ha of Tarawa Atoll. Most of the islets are small and narrow. In some parts the distance from the lagoon to the ocean side is less than 200 metres. The island has an average height of approximately four metres above sea level.

Initially, Betio, Bairiki and Bikenibeu were classified as urban areas. Betio served as the main port and commercial centre while Bairiki was the main administrative headquarters and residential area for the colony. Bikenibeu caters for medical services, education and agriculture. The construction of an international airport at Bonriki added the area into the urban boundary. Despite the fact that the South Tarawa land area is fragmented and composed of small scattered islets, the availability of a readily accessible port was an important factor that influenced the

decision in selecting the future location of the Colony headquarters (Bedford 1968). Since independence, the focus of development in terms of economic and political activities has been on the urban area of South Tarawa.



Figure 3.4 South Tarawa Urban Area

(Source: Max Oulton 2013 University of Waikato)

3.5.4 Kiritimati urban area

Kiritimati (refer to Chapter 1 Figure 1.4) is the largest coral atoll by land area in the world and is located in the northern Line Islands. Its land area comprises approximately 388 square kilometres (Government of Kiribati 2008:10). It comprises over 70 per cent of the total land area of Kiribati. Geographically, it is approximately 3200 kilometres away from the national capital South Tarawa.

Kiritimati is located in the equatorial dry belt and rainfall is low most times of the year. It has on average 873 mm of rain per year and sometimes it can be as low as 177 mm. During the dry periods, many of the flats and ponds can dry up. Between May and April during the wet season, abundant downpours can result in total rainfall of over 2,500 mm. Although it sometimes experiences plenty of precipitation, little is retained in the soil due to its porous carbonate rock, thin soil, and the absence of dense vegetation cover (Butcher-Gollach et al. 2007).

The flora and fauna of the island consist mainly of those species that are adaptable to drought. The natural vegetation is mainly low shrub land and grassland and coconut plantations are the main woodland of the island. Most plant species of economic value are introduced and are found around settlements, former military sites and roads.

Unlike South Tarawa, Kiritimati is slowly developing and gradually is becoming an important urban area for islands in the Line and Phoenix groups. The Government of Kiribati is well aware of the importance of Kiritimati as an urban area and is committed at the national level to develop Kiritimati as a growth centre. This requires well planned and coordinated development with the land, infrastructure and services to provide for existing and future population growth (Asian Development Bank (ADB) 2009).

Kiritimati was discovered on Christmas day in 1777 by Captain James Cook. Prior to its discovery, the island was not inhabited by people. Early settlement started in 1882 by workers recruited to work in coconut plantations and fishing. The United States claimed the islands under the Guano Island Acts of 1856, due to the presence of guano on the island but little mining was conducted (Van Trease 1992). The island was occupied by Allied forces during World War II and the first airstrip was constructed to serve the US Army Air Force weather station. The airstrip also served as a refuelling facility for planes travelling between Hawaii and the South Pacific.

In 1979 the US Guano Islands Act claim was relaxed and the USA ceded the islands by the Treaty of Tarawa that was signed between the United States of America and Kiribati and ratified in 1983. The Kiribati Government also agreed, in connection to the Treaty of Tarawa, to consult the US Government in matters relating to third party access to the islands for military activities. Further, it gives the US Government, in consultation with the Kiribati government, the right to construct facilities on Canton, Enderbury, and Hull Islands in the Phoenix group (Van Trease 1992: 6). In the 1950s the island became an important site for nuclear weapon testing. The United Kingdom conducted its first hydrogen bomb test there in 1957. Subsequent tests were conducted by the United States later through to 1962 with 22 successful nuclear detonations.

There are four main villages on the island three of which are within the urban boundary (See Table 3.1). Ronton (also known as London) is the main administrative area where most of the urban services and amenities are situated. Tabwakea serves as the main urban residential area. Banana caters for air services at the Cassidy International airport and also provides a residential area for civil servants. Poland, situated on the far western end of the island, caters mainly for non-employed people who are involved mainly in a semi-subsistence type economy; copra cutting and fishing. The main sources of income on Kiritimati are copra, tourism, seaweed and fishing.

Table 3.1 Main urban villages of Kiritimati and population

No	Main Villages	2010 Population
1	Ronton (London)	1879
2	Tabwakea	2311
3	Banana	955
4	Poland	441
	Total	5586

(Source: Kiribati National Statistics Office 2012)

3.6 URBAN ENVIRONMENT AND DEVELOPMENT

Development of urban areas is crucial to enhance the livelihoods of the I-Kiribati population. Todaro (1994: 35) explained development as:

...a multidimensional process involving major changes in social structures, popular attitudes, and national institutions, as well as the acceleration of economic growth, the reduction of inequality, and the eradication of poverty...

Development is a necessary condition for the improvement in the quality of life of the people. Basically, according to Todaro (1994: 39) there are two main objectives for development:

- 1) To increase the availability and widen the distribution of basic life sustaining goods which include food, shelter, health, and protection, and
- 2) To improve the levels of living by providing higher incomes, more jobs, better education aimed not only at enhancing material well-being of the people but also to generate greater individual and national self-esteem.

However, despite efforts to develop urban areas in terms of services and amenities, it is important to note that many urban environments have limited potential to support all aspects of development due to the lack of natural resources, limited land space for further development as well as lack of capital and technology.

3.6.1 Urban development

The Kiribati government inherited all existing facilities from the outgoing colonial administration at the onset of independence. However, a disadvantage of this process was that there were parts of the infrastructure that required immediate upgrading and maintenance. There was also a need to establish new vital facilities and services to facilitate urban development. Work on important services was identified as a priority.

Upgrading work on the Betio (Figure 3.5) wharf to facilitate shipping services was implemented in 2012. The construction of airports on all outer islands in the Gilbert group to improve air services and operations was also carried out. In addition, upgrading of the existing runway at the Bonriki International airport was implemented to serve bigger planes like the Boeing 737 operated by Fiji Airways and Nauru Airlines. The construction of more Government offices to cater for an increasing number of civil servants, more urban housing, and the upgrading of the main hospital were also implemented after independence.



Figure 3.5 Main Wharf at Betio

(Source: Photo by Author 2012)

Through time, work on other vital elements of infrastructure was implemented including the sealing of the entire road from Betio to Tanaea and the construction of new office blocks at Bairiki. Toward the end of the 1980's, the construction of the Dai Nippon causeway that connects Betio with the rest of South Tarawa was completed. The Dai Nippon causeway replaced the ferry service that operated between Betio and Bairiki. It also provides easy and cheap access between Betio and the rest of South Tarawa unlike before where people had to pay when they wanted to travel from Betio to the rest of South Tarawa and vice versa.

More recent developments include the upgrading and extension of the existing wharf at Betio to cater for larger container vessels as well as improving the processing of containers from the ship to the wharf. The wharf will be extended toward a deeper part of the lagoon where larger container vessels will berth and offload containers more quickly onto trucks. The current system where containers are transported from the vessel by barge to the wharf is expensive and increases the cost of imported commodities. Other developments include the upgrading of the road from Betio to Tanaea and the Bonriki International airport runway and terminal. The above development projects are still ongoing.

Different government ministries and departments, as well as private entrepreneurs and non-government organisations, provide services and employment opportunities for the urban populations on South Tarawa and Kiritimati. South Tarawa and to a lesser extent Kiritimati have become the nerve centres for industrial, commercial, residential and administrative development, thus creating enormous pressure on the limited and fragile urban environment. The concentration of population and development on South Tarawa and Kiritimati has resulted in the urban environment becoming degraded and the natural resources becoming depleted (Wilson 1994).

3.6.2 Urban demographic trends

During the colonial period, population movement between outer islands and South Tarawa was restricted by the Native Passenger Ordinance (NPO). The NPO required travellers from outer islands to apply from the colonial headquarters for approval to come to South Tarawa (Bedford 1968; Itaia 1992; Itaia 1983). The advantage of the NPO was that it controlled the movement of outer island dwellers to South Tarawa and the urban population on South Tarawa remained low. When the NPO law was relaxed in the 1960s, the movement of outer island people to South Tarawa increased and the urban population quadrupled between the censuses in 1947 (1,671) and 1963 (6,101). The NPO ensured that South Tarawa, having a comparatively small town, would avoid urban problems that other large urban areas have gone through. In 1968 Bedford (1968: 50) also expressed concern when he stated:

Migration from outer islands to South Tarawa has accounted for the major portion of this rapid population increase and most of the contemporary problems are resultant upon the inability of the urban area to absorb such rates of expansion.

The colonial administration was encouraged in the 1960s to put in place a strategic plan to monitor and control the movement of people to South Tarawa (Bedford 1968). It was considered necessary to control population movement from outer islands because South Tarawa, as we have seen, has a peculiar physical topography and limited opportunities for settlements and employment. Unfortunately, the bureaucracy did not consider the advice to be necessary to the development of the country and took no action on it. Consequently, a decade later in the 1970s,

approximately a third of the population had congregated on South Tarawa which was already experiencing significant environmental stress including shortage of urban space and the provision of urban water (Bedford 1968; Bedford and Bedford 2010; Connell and Lea 2002).

Improved urban services and infrastructure and the improvement in air and sea transportation have influenced internal movement of the population. Movement of outer island dwellers to urban areas occurs mainly in search of services, amenities and economic opportunities that are not readily available on outer islands. This has caused the growth of urban related problems including population congestion, shortage of land, increased water demand, and waste disposal problems (Connell and Lea 2002; Forbes 1998). Compounding these problems are impacts caused by climate change. The gradual inundation of some coastal urban areas, especially on South Tarawa, has affected some urban settlements and natural resources. Pressure for land to cater for further development has been greatly affected by the growth in urban population on South Tarawa in particular.

Since independence population movement from outer islands to South Tarawa has accelerated. Statistics show a dramatic increase in urban population on South Tarawa since 1947 from 1,671 people to over 50,000 in 2010 (Figure 3.6) (Kiribati National Statistics Office 2012). The trend of urban population growth appears to show no sign of decreasing. The movement of population has taken a new direction where people are moving from South Tarawa to Kiritimati. This is what is termed urban to urban movement. The movement of population to Kiritimati is recent, starting after independence, and is characterised by two main factors. The first involves civil servants on transfer from the Gilbert Islands to Kiritimati and secondly those from South Tarawa seeking a new life on Kiritimati.

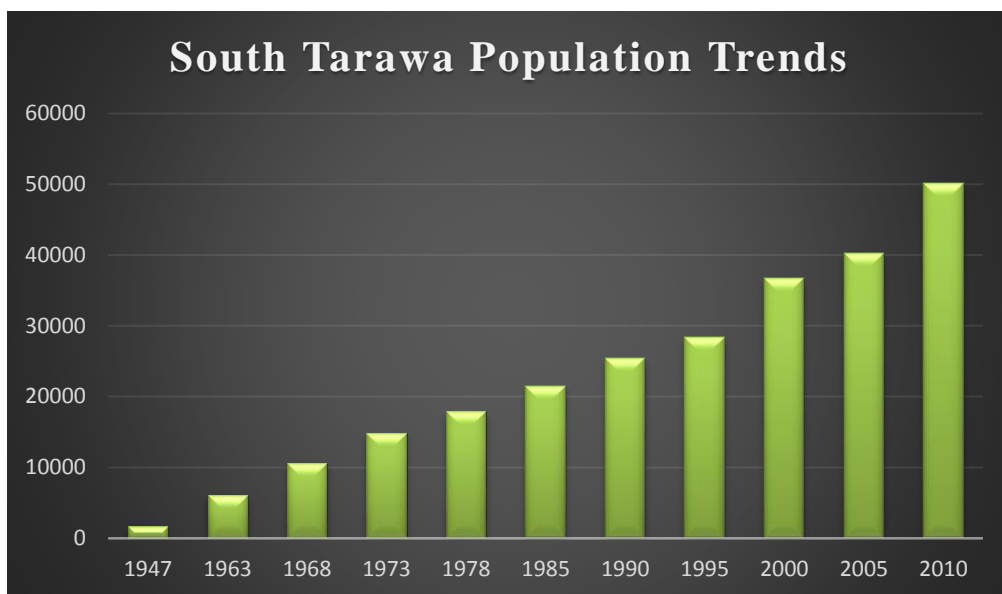


Figure 3.6 South Tarawa Population Trend from 1947 to 2010

(Kiribati National Statistic Office 2011)

The people residing on South Tarawa as well as others on outer islands perceive Kiritimati as an island with better economic opportunities due to its large land mass and close proximity to Hawaii and mainland USA. Another influencing factor relates to the overcrowded living conditions on South Tarawa where people are finding it hard to secure land. Statistics reveal that the trend of urban population in Kiritimati has increased dramatically from just 52 people in 1947 to 5,586 in 2010 (Kiribati National Statistics Office 2012) (See Figure 3.7).

3.6.3 Urban water developments

Numerous investigations have been conducted on South Tarawa since the 1960s to identify areas that have good reserves of underground fresh water. The first survey was carried out by Kirk, Grundy and Partners during the 1960s mainly to help improve the supply for the urban areas of Betio, Bairiki and Bikenibeu (Kirk, Grundy and Partners 1961). Later studies were conducted by Wilton and Bell and Dobbie and Partners (1967) and in 1973 by Mather to test and measure the water levels and chemistry at certain parts of the island. Further studies were carried out by Jacobson and Taylor during the 1980s, White et al., in 1999 and Falkland in 2002.

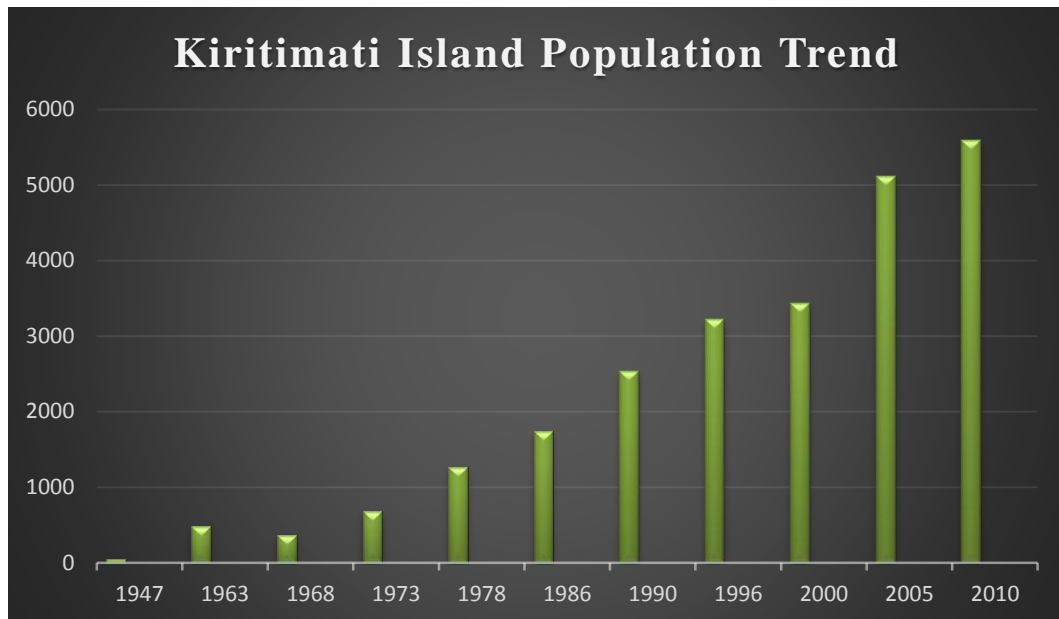


Figure 3.7 Kiritimati urban population from 1947 to 2010

(Kiribati National Statistic Office 2011)

These studies focused on exploring ways to improve existing water reticulation systems that produce and supply urban water to the rest of South Tarawa. They also considered solutions to improve the flow of water from the source to all urban outlets. The study by Jacobson and Taylor (1981) proposed Bonriki and Buota as the main water reserve areas to supply urban water. Another proposal considered Tabiteuea and Abatao in North Tarawa as potential areas to source fresh water from to meet the growing urban water demand from South Tarawa. This proposal is still being considered by the Public Utilities Boards (PUB) that manages urban water provision in consultation with Government.

Negotiations with indigenous landowners are currently in progress to gain access to *Tabiteuea* and *Abatao* lands for the purpose of identifying and extracting underground water for urban use. As indicated above, land in Kiribati is very important and to gain access to obtain anything from it (e.g. collect coconut, timbers, medicines from plants and trees, sand etc.) requires traditional protocols where landowners are approached in person. In the past, this traditional approach was normally accepted by landowners. However, as people are becoming more monetary minded, some landowners now demand payment for the use of anything

from their land. This has placed strain on the Government and Public Utilities Board (PUB) in particular when it comes to accessing more lands for extracting water for urban use.

Initially, the following areas were identified on South Tarawa as having good underground water reserves; *Bonriki* 750 m³/day, *Buota* 250 m³/day, *Teaoraereke* 150 m³/day, *Abatao* 200 m³/day, and *Tabiteuea* 150m³/day (Jacobson and Taylor 1981). Unfortunately, only the *Buota* and *Bonriki* reserves are currently being used while *Abatao* and *Teaoraereke* have been abandoned due to pressure from the landowners wanting land for settlements. The *Tabiteuea* water reserve was never used and negotiations are still in progress between PUB and landowners for approval to extend extraction of water from it for use in South Tarawa. Several studies have been conducted on water sources on Kiritimati to identify the main freshwater lenses there (Falkland 1983, Falkland and White 2007). Kiritimati has two types of water lenses known as the major and minor water lenses and they are found in different locations (see Table 3.2). The major lenses are the main water reserves where water is currently extracted from. The minor lenses contain good groundwater reserves but have not been used intensively.

At present, urban water for residents of Kiritimati comes from piped reticulated water, rainwater, and domestic wells. Piped reticulated water is accessed from the Decca, Banana and Four Wells lenses. The provision of water for urban residents falls under the institutional responsibility of the Ministry of Line and Phoenix Island Development (MLPID). The Decca and Four Wells lenses supply water to Ronton and Tabwakea while the Banana lens supplies water to Banana and Main Camp (where the Captain Cook Hotel is located) (Jones and Merz 2007).

Table 3.2 Main freshwater reserves on Kiritimati

No	Locations of water lenses	Major Lenses	Minor Lenses
1	Decca	√	
2	Four Wells	√	
3	Main Camp	√	
4	Banana	√	
5	New Zealand Airfield	√	
6	Tabwakea		√
7	North West Point		√
8	Poland		√
9	Area between Poland and Paris		√

(Source: Asian Development Bank 2009; 2006).

Groundwater is extracted using solar and wind energy to pump water to raised tanks where it is chlorinated and distributed through water pipes to different parts of Kiritimati. Despite recent improvements to the current water system, urban water supply on Kiritimati is still experiencing problems. High operating costs of the current water system and the low revenue it receives, as a result of inefficiency of billing and collection, limits the sustainable operation of the system in the long term (Lal et al 2014). Unaccounted system water loss through leakages as a result of deteriorating infrastructure and through illegal connection and poor maintenance also affects the provision of urban water.

Work on improving the existing piped reticulated water system in Kiritimati was conducted in 2003 by the Kiritimati Water and Sanitation Project (KWASP) with

funding from AusAID. Further improvement work is currently in its preparatory stage with funding expected from a loan from Asian Development Bank and the Government of Kiribati (Jones & Merz 2007). The objective of the Water and Sanitation project is to improve the development potential of Kiritimati as an urban centre. Additionally, it is expected that this project will improve the general health of the urban population as well as providing a 24 hour supply of water to urban households, businesses and Government offices.

Work on improving access to safe water in Kiritimati as well as Kiribati as a whole is in line with the Government of Kiribati commitments to address the Millennium Development Goals (MDG) 7 – Ensure environmental sustainability - to half the people without sustainable access to safe drinking water and basic sanitation by 2015 (APPG 2007: 51). Maintaining a constant supply of water to the urban populations on South Tarawa and Kiritimati remains a challenge. The existing water system is far from providing sufficient and efficient urban water provision. While water restrictions help maintain a constant supply of urban water to urban residents, there is likely potential risk of contamination from the backflow of the water into the empty pipes during the times when water flow is closed.

3.6.4 Urban squatter settlements

The movement of people between islands, especially between rural to urban areas, in the Pacific has contributed to the development of urban social problems and growing national concerns. The problems include unemployment, growth of informal/squatter settlements, increasing crime rates and environmental degradation (Connell and Lea 2002). In fact, "... almost all urban places are unable to provide adequate employment, shelter, security, infrastructure and services to the growing urban population..." (Storey 2006: 6). Squatter settlement in the Pacific has a long history, but recent growth reflects growing poverty and the lack of alternatives for a greater proportion of urban residents.

Squatting has become a significant social problem affecting South Tarawa. Since independence, South Tarawa in particular has experienced a dramatic increase in squatter settlements as a result of the increasing inflow of migrants from rural areas

(Itaia 1983). Limited land on South Tarawa has resulted in rural migrants seeking residence on unused Government leased lands in Betio, Bairiki and Bikenibeu that have not been developed. According to Itaia (1983), several factors relating to the lease agreements of lands by Government need further clarification.

Unused Government leased lands have been the main influencing factor for the rising number of squatter settlements in South Tarawa. This relates to the landowners right to the leased lands as most landowners perceive that any accretion to their leased lands belongs to them and not the Government. The Government argues that any natural accretion to leased lands remains theirs until the expiration of the lease agreement. Resulting from this misunderstanding, landowners of Government leased lands have continued to provide consent to outer island immigrants to settle on accreted Government leased lands.

Similar trends are experienced in other Pacific Island Countries (PICs) where “...there is a clear trend towards urbanization with very high growth rates ... this has resulted in a rapid growth of informal settlements...” (Storey 2006: 8). Itaia (1983) also noticed that most of the people living as squatters on South Tarawa were migrants from outer islands. When these people first arrive on South Tarawa they seek accommodation with their relatives who often live in Government housing.

In most cases, new immigrants will approach *kain Tarawa* (indigenous people of Tarawa) and seek their consent to temporarily move to any portion of their unused lease land. Squatting on unused Government leased lands started in the 1960s and has intensified. Initially, squatter settlements started on accreted and unused Government leased lands at Temakin and Takoronga on Betio. Today, squatter settlements have spread to Bairiki, Nanikai, Bikenibeu, and even to water reserve land on Bonriki.

The traditional cultural practice of *bubuti*, to request something from someone, makes it extremely difficult to turn down requests especially when someone asks for accommodation. As a result almost every outer island migrant to South Tarawa has secured accommodation on unused Government leased lands. While the

agreements were for temporary residence, most outer island migrants have decided to reside permanently on South Tarawa. Squatter settlements are easily identified as houses have distinctive flat roofs and are built mainly of local and imported materials with no interior toilet or bathroom. Securing accommodation in squatter settlements is easy as it only involves the landowner's consent without following the normal process through the Land Department for a formal lease or sub-lease agreement.

Increasing numbers of urban people seeking alternative accommodation is due to the inability of the Kiribati Housing Corporation (KHC) to provide sufficient housing to meet the growing urban demand. KHC provided approximately 1,300 urban houses on South Tarawa in the early 2000s but there was still a need for another 1,100 houses which KHC was unable to provide (Eritai 2003). Private homes have helped to fill the gap for housing need but still are not able to satisfy the demand. The lack of existing urban housing to support the growing urban housing demand is a major cause of the establishment of squatter settlements on South Tarawa (Connell and Lea 2002).

The disadvantages of squatter settlements are that houses are built in very close proximity to each other which often results in undermining family privacy as well as causing health and social problems relating to overcrowding. They also lack basic amenities including PUB water taps and sewerage systems. Some squatter homes share electricity through extending wires from a family or friend's home close by that is connected to electricity. Most squatters continue to use well water for drinking and for other domestic use. Despite having to boil well water for drinking, people's health is affected. Diarrhoea is a common sickness affecting younger children and is often caused by drinking well water (Wilson 1994).

Overcrowding in squatter settlements also contributes to other environmental and social problems. Heavy drinking and fighting is common as most people are unemployed. As most houses are open without rooms, privacy is non-existent. Of significant concern is the change in the nutritional patterns where most people in squatter settlements consume less nutritious imported food like tinned meat, white flour, white rice, sugar, and instant noodles, because they have no access to land to

collect food or plant trees for future use. Hence they depend entirely on food from the store.

The increasing demand for accommodation on South Tarawa, by both outer island immigrants and *kain Tarawa* (people from Tarawa) has prompted landowners to demand the return of their leased lands that were declared water reserve areas. The demand for urban land was also prompted by the demand for accommodation by the increasing urban population. This has eventually resulted in landowners and outer island immigrants encroaching on government water reserve lands. Despite the government efforts to stop the illegal encroachment on water reserve lands, no positive outcome has been seen (Corcoran 2014).

More recently, another settlement was established on the ocean side of the Bonriki water reserve land. The new settlement is known locally as “*te kawai ae boou*” (the new road settlement). The land is a part of the water reserve that provides water to urban South Tarawa. Since the PUB water reticulation plants started operation in the area, the whole water reserve land was never used for any other purpose except to supply urban water. Lately, when demand for land for settlements has intensified, landowners made submissions to Government to use part of the Bonriki water reserve land.

For unknown political reasons, Parliament approved the use of part of the *Bonriki* water reserve. The area designated for use is only on the ocean side of the road that runs from the end of the causeway that connects Tanaea to Bonriki right to the end of the airport runway to Temaiku side. Additionally, there are restrictions in place for new settlers not to use or collect any resources on the other side of the road facing the runway. This is to ensure that contamination or pollution of the water reserve is controlled.

Squatter settlement is not a problem on Kiritimati as everyone has access to land as it is owned by the State. People who want to live on Kiritimati have to apply for a lease from the Government. There are two main types of lease: residential leases and business leases. Due to the large land area of the island, competition for land is not a concern.

Population movement to South Tarawa will continue to impact on the size, pattern, and volume of squatter settlements. Coupled with climate change impacts, this process will continue to pose concerns for the Government and residents of squatter settlements. Policies should be put in place to address issues facing residents of squatter settlements to improve services and amenities to ensure their quality of life is maintained.

3.6.5 Urban biodiversity

Millennium Development Goal (MDG) 7, Ensure Environmental Sustainability, targets the integration of sustainable development into policies and programmes that focus on reversing the loss of environmental resources. MDG 7 indicates that “environmental degradation is commonplace in many parts of the world, as increased numbers of people struggle to feed themselves” (APPG 2007: 48). It is likely that as population increases, the pressure on the urban environment will intensify.

The Government of Kiribati has recognised the importance of sustaining the biodiversity of the urban areas to ensure the wellbeing of the people is maintained. This is reflected in the theme of the Government Development Plan 2008 to 2011, “Enhancing economic growth for sustainable development”. More specifically, the development plan focuses on ensuring the protection of the environment which includes the “surrounding ecosystems such as land, coastal areas, fresh water, the lagoon, air, and all surrounding living trees and organisms” (Government of Kiribati 2008: 29). A similar focus on enhancing economic growth for sustainable development is also highlighted in the current Kiribati Development Plan (KDP) 2012-2015. The importance of the environment was reiterated and the national development priority is to:

...facilitate sustainable development by responding to and mitigating the effects of global climate change and through approaches that protect island biodiversity and supports the reduction of environmental degradation by the year 2015... (Government of Kiribati 2012: 43)

The Environment Act 1999 (See Appendix 4.1) was enacted with the objective of providing for the protection, improvement and conservation of the environment of the Republic of Kiribati (Ministry of Environment and Social Services 2000: 1). The objective of the Act is to ensure that the environment is protected from any form of development that will cause harm or destroy the biodiversity. Economic development in urban areas, in particular South Tarawa, together with pressure from the urban population can adversely affect biodiversity. Human activities such as cutting and removing trees and land clearing to make way for infrastructure often result in destroying vegetation and resources.

When materials for constructing houses such as gravel, stones and sand are harvested unsustainably, it can affect coastal areas and destroy important traditional resources used for medicinal and ceremonial purposes. To avoid complete destruction of those areas, their protection using technological methods is necessary. Important trees like pandanus that are culturally used for medicines and ornamental purposes as well as food are becoming extinct as a result of urban development (Thaman 1993).

World War II had devastating effects especially on important trees that have significant traditional values. Some old war relics can still be found around South Tarawa on the land and some on the reefs (Figure 3.8). Most are very old and rusty and may have contributed to contaminating groundwater during rainy seasons when pollutants from the rust leached through the porous soil. While the two town Councils, Betio Town Council and Teinainano Urban Council have no immediate plans to remove (or perhaps restore) rusted and abandoned war relics on South Tarawa, their presence in the urban environment poses some concerns which have not been carefully considered.



Figure 3.8 War relics on Betio

(Source: Photo by Author 2013)

Crucial to the protection of urban biodiversity is the extent of human and economic development activities. While the Government fully supports activities and policies that control and limit any destruction of both terrestrial and marine resources, there is evidence that urban resources are not managed and catered for sustainably. As a result, looking for medicinal plants and trees on South Tarawa is hard for the local people as is finding local construction materials to build local houses as most of the good trees have been destroyed to provide space for urban infrastructure and development.

3.6.6 Waste management and disposal

As experienced in other developing countries, waste management and disposal in the main urban areas of Kiribati is a real problem. The Kiribati State of the Environment Report (1994) highlighted solid waste disposal as an increasing concern by both the Government and the urban population. A major cause of the concern is the changing eating patterns of urban dwellers to western imported food

stuffs instead of locally grown food (Wilson 1994) which has caused the accumulation of imported packaging and wastes from used food stuff like tins, bottles, aluminium and plastics (Finnigan 2011; Mohanty 2010; Mohanty 2007; UNEP & SPREP 2000).

The Kiribati UNCED report (1991) also mentioned solid waste disposal as a major problem in urban areas where the bulk of the population resides. It further explains that this will cause hazards and provide breeding sites for mosquitoes, flies, rats, and stray animals like dogs and cats. This situation became worse in the late 1990s and early 2000s when the influx of imported goods increased. In addition, decaying unused machinery such as cars, buses, motorbikes, and engines, together with construction materials coupled with the shortage of land for disposing urban wastes, has further complicated the waste disposal situation.

Urban waste disposal and general rubbish collection on South Tarawa and Kiritimati is administered by the respective town Councils. Urban residents placed their household rubbish near the road side for collection by the Council rubbish trucks at certain times of the week. Most of the rubbish collected is cardboard, paper, plastics, tins and the like while food wastes and other edible wastes are given to pigs. Waste from households, industries, and retail outlets are collected by Council (Finnigan 2011).

Due to the limited land on South Tarawa, certain allocated areas are used as rubbish dumping sites. The main rubbish sites are at McKenzie point, West Bikenibeu; *Nanikai* Causeway, Tabonkabauea, Red Beach, and North West Betio (Figure 3.9). Other landfills along TUC are used as dump sites. These dumps are simply pits protected by sea walls along the lagoon areas of South Tarawa. On Kiritimati the main rubbish dump is on the lagoon side north of *Tabwakea*. Due to the huge landmass of Kiritimati, disposing of waste is not considered to be a major issue at this stage.

Approximately 6,900 tonnes of solid waste are generated annually on South *Tarawa* alone and about 38 percent of this is collected by Council (Finnigan 2011). About 75 percent of this waste is organic, mainly composing of garden wastes and fibrous

materials such as coconut, pandanus, and breadfruit leaves. These wastes were generated by households, business, government offices and schools (Finnigan 2011).



Figure 3.9 Red Beach Rubbish Dump

(Source: Photo by Author 2012)

Human excreta are disposed of using septic tanks and the sewerage system. Only KHC houses together with some private houses in *Betio*, *Bairiki* and *Bikenibeu* are connected to the sewage system. The Public Utilities Board (PUB) caters for human excreta. Private homes use septic tanks while many urban people defecate in the bush and beach contributing to pollution

The method used to dispose of rubbish is simply to collect it and dump it at the rubbish dump. Rubbish is not sorted nor treated when dumped. Consequently, dump areas can become hazardous areas when wastes like glass, metals and other sharp materials are disposed. The other possible effects concern contamination of freshwater lenses by leachate from nearby dumps.

Recently, Government has supported recycling activities. The Kiribati Solid Waste Management Project, locally known as “*Kaoki Mange Project*” (KMP) (Figure 3.10)

was established to address waste problems. Originally it was initiated and managed by the Foundation of the Peoples of the South Pacific Kiribati (FSPK). It was also supported by a number of external donors including UNDP. The main objective of the recycling project was to help clear rubbish on South *Tarawa* that was hard to remove and dispose of used vehicles and machinery, engines and the like. A Material Recovery Facility (MRF) and a Container Deposit System have been established. Recycling products are taken to the “*Kaoki Mange*” yard where they are crushed and put in containers and shipped to Australia and India. The recycling project is progressing satisfactorily and Government and the current recycling contractor are considering extending the project to include steel and tin cans and other recyclable products (Government of Kiribati 2007).



Figure 3.10 *Kaoki Mange* Recycling Depot at Betio

(Source: Photo by Author 2012)

3.6.7 Urban social issues

Moving into an urban area changes people’s lifestyles. The impacts of westernization on the urban population of South *Tarawa*, and to a lesser extent Kiritimati, have played a major role in modifying the cultural and social values and

norms of people. Urban lifestyles influences the way people live, eat, act and socialise.

The change from a mainly subsistence lifestyle to cash economy characterized by urban living means that employment becomes important as money enables people to afford shelter, food, and other urban services and amenities. This is unlike outer island lifestyles where everyone owns their own house and has access to family lands and also the sea to rely on for daily sustenance. As important local foods like *babai*, *te kaina* are hard to obtain in urban areas, residents there have been forced to change their dietary patterns and imported goods have become the main food consumed.

The scarcity of urban land has influenced the high level of dependence on imported processed foods such as rice, flour, and sugar (Asian Development Bank 2013) which have become staples instead of the locally grown and more nutritious foods like breadfruit, *babai*, pandanus and fresh fish. The changes in diets not only make people neglect their traditional foods but also are causing increasing incidence of diseases such as diabetes, hypertension, malnutrition and cardiovascular diseases.

As a result, traditional skills in planting *babai* as well as skills in building local houses and canoes are no longer practiced. Because the traditional skill of planting have been neglected, there is increasing dependence on imported foods that only those who have money can afford (Asian Development Bank 2013). Another factor that has caused the urban population to neglect the use of local food is urban economic activities such as clearing land for development

These processes also affect the availability of other local resources such as firewood, medicinal plants and construction materials. Even the indigenous population finds it hard to cultivate *babai* and pandanus and other local food plants and trees as most of their family lands are currently under long term lease to Government. Besides, urban dwellers have to secure wage employment in order to have the means to buy food from the store as local food becomes hard to obtain from the land. However, not everyone who has come to live in South Tarawa is able to secure wage employment. It was indicated by IDITR21:

When my parent moved to Betio when I was young, I remember my father has to wait for nearly a year before he was able to secure work at the wharf...even today finding work is not easy on South *Tarawa* as both the government, the private, and the business sectors are not able to provide jobs for everyone.

Outer island migrants often have limited formal education and technical skills. In order for them to survive in an urban monetary society, they have to engage in informal activities to generate income. The types of informal activities they engage in include selling of garlands in the streets on government pay-days and selling donuts, salted fish and other easily obtained and cooked food. Others engage in selling *kaokioki* fermented toddy. Unfortunately, the disadvantage of selling *kaokioki* is that people drinking it usually end up causing trouble in public places. Social unrest resulting from drinking *kaokioki* is common in public and informal settlements on South *Tarawa* where consumption is high.

Another concern relates to families where both the father and mother are engaged in wage employment. This is especially prevalent for those on middle or low wage incomes who find it difficult to survive economically on a single wage due to the extra family members they have living with them apart from their immediate families like their children and parents. In such situations, parents often abandon their traditional parental obligations to their children and delegate it to either their own parents or any other senior unemployed family member that resides with them.

While the young people have adopted a new way of life after school, adults have also adopted new lifestyles that inevitably affect both the employed and unemployed adults. Included here are after-work pastime activities where adult men and women play cards, bingo, and drink *kava*. *Kava* comes from the root of a *kava* tree (*piper methysticum*) grown in Fiji and other Pacific Islands. The root is dried under the sun and later pounded into fine powder form and then mixed with water. It produces a drink with sedative properties which will make the body numb when consumed. It also has a calming effect on the body.

These activities involve money and time. People spend money playing cards or bingo instead of spending it on fresh foods like cabbage and fruits. Instead of using their afternoon free time with children or going out reef fishing, they spend with

friends drinking *kava*. This urban lifestyle has economic and health implications. Firstly, money is spent on entertainment that will only be enjoyed by one or two members of the family instead of purchasing or saving the same amount for future use for the benefit of the entire family.

Secondly, people's health may be affected especially when they spend the whole night drinking *kava* instead of resting. While no medical research has been conducted on the effects of *kava* drinking in Kiribati, empirical evidence suggests that over-consuming coupled with less sleep is likely to cause social and health problems in some people. It has been observed that people involved in cases such as rape, teenage pregnancies, and even suicides include those who under the influence of either *kava* or *kaokioki* consumption (Government of Kiribati 2007).

Negligence of traditional culture is another major urban issue. When people leave their homes on outer islands, the skills they normally performed as part of their daily life are no longer used. These include cutting *karewe*, planting *babai*, ocean fishing, building *te maa* (fish traps built with coral stones on the ocean side of the island), and building local houses and canoes that are still used on outer islands. Even traditional duties in the *maneaba* are no longer performed as most *maneaba* on South Tarawa are either church *maneaba* or group *maneaba*. The younger urban generations are disadvantaged in this regard, as they are not able to acquire important traditional skills they would have acquired had they stayed in their village.

While urban living may bring changes that normally improve the well-being of the people, not everyone who comes to urban area secures the so called "improved lifestyles" they anticipated. The reality of the situation is that only a few, normally the ones who have the skill and the know-how in certain areas, are absorbed into the system while the majority continue the same lifestyle they had back in the village. The only difference is that their place of residence is now in the urban setting which comes with several significant challenges. The desire for wage incomes will continue to influence outer island people to seek residence in an urban centre. At the same time, the urban area will face increasing challenges in meeting for the demands of new immigrants.

3.7 CONCLUSION

The growth of urban areas on South *Tarawa* and *Kiritimati* Island has provided an essential component of economic development and improved the urban people's standard of living. Urban living has provided opportunities that were not greatly available on outer islands where development is less obvious. While urban areas provide more economic opportunities for the urban population, there are also economic costs that could affect both the urban environment and the population if development is not implemented in a sustainable way.

It is apparent that the social and economic attraction of urban areas continues to encourage movement from the outer islands. More importantly, improved urban services and amenities have undoubtedly raised the social and economic status of the urban population. Consequently, the increasing concentration of the population and associated infrastructure development has created enormous strains on the fragile atoll urban environment.

It is important to manage the development of urban areas sustainably to protect and avoid future destruction of the urban ecosystem and its biodiversity. Strategies for environment protection include sustainable development to ensure the protection and safeguarding of the urban environment from human and natural activities. This indeed warrants cooperative efforts at all levels of decision making in the Government as well as the non-government institutions, church, village and local communities.

In whatever form development takes the environment and the social fabric of the urban society must be considered as the capital necessary for the development of present and future urban generations. The future well-being of the Kiribati people rests solely on the combined effort of the Kiribati people and international community to work collaboratively in initiating and implementing strategies to protect the islands from any future effects associated with human activities and climate change.

CHAPTER FOUR

RESEARCH PROCEDURES: THE METHODOLOGY

...Research generates new and reliable knowledge and therefore data should demonstrate new understanding based on reason and evidence....

(Walsh 1996)

4.1 INTRODUCTION

“In its broadest sense, research ... results from a series of decisions we make as researchers ... and these decisions flow from our knowledge of the academic literature ... the research question we want to ask ... our conceptual framework and our knowledge ... of the different techniques ...” (Clifford and Valentine 2003:1). One very important component of research is the methodology it utilises in collecting information and data that are relevant to the research topic being pursued. The focus of this chapter is the methods used to collect information and data relating to impacts of climate change on urban environments including the urban populations of low-lying atoll islands with particular reference to South Tarawa and Kiritimati Island.

Generally, methodology defines what activities the research will include, how to proceed, how to gauge progress and what constitutes success of the research (Walsh 1996). The research upon which this thesis is based entails both qualitative and quantitative methodologies for the purpose of acquiring reliable data and information. These methodologies are relevant for understanding the research problems and issues. Gathering relevant data and information utilized the following main approaches:

- 1) A survey of existing literature (including government, non-government, and international agency reports, policies, laws etc.). An internet search to access recent reports and articles and library resources was also employed.
- 2) Fieldwork was carried out on South Tarawa in the Gilbert group and on Kiritimati Island in the Line group in Kiribati.

Consulting the local population about their experiences is important as “climate change is a very complex phenomenon that can only be grasped within society by action of mediation...between layman and scientist” (Grottendieck 2012: 24). Basically, climate change can evoke images for the people in high islands which are quite different from those for people living on low-lying atolls.

Urban residents in South Tarawa and Kiritimati are the main participants in this research. Their individual experiences of the changes taking place on the land they occupy provide important data for this research. Such changes include: coastal erosion, resource destruction, and underground water contamination due to direct (urban development) and indirect (climate change) human activities. The research also obtained from the participants the methods they have used, whether traditional or contemporary, to enable them to continue living on the land they occupy and to stop this land from becoming increasingly degraded by climate change.

The chapter also describes how the research was conducted, including how it was designed. It includes discussions of the study areas and outlines some limitations of the research.

4.2 RESEARCHERS BACKGROUND

As an I-Kiribati and having been raised and lived most of my life on South Tarawa, I do have some advantage when it comes to pursuing this research. My knowledge of the people and the island made the field work easy. I have witnessed many physical changes taking place on South Tarawa not only as a result of increasing settlements on available urban land areas but more crucially resulting from severe high tides and king tides caused by climate change. Similarly, my existing networks with my relatives, together with the people I know in the various government departments on South Tarawa, were important in enhancing the progress of my fieldwork. More importantly, my understanding of the Kiribati culture is a very important component in enhancing the collection of relevant data and information in the field. Hence, my research work on South Tarawa progressed well with only minor drawbacks.

My other field area, Kiritimati, is a new island to me as I have never been there before. However, this was compensated by utilizing my family members who have lived on Kiritimati all their lives. More importantly, my accommodation and travel costs on the island were solved as I stayed with them and also used their car for travelling on the island to collect information and data. Their familiarity with the people and the island made my field work much easier than I initially anticipated.

When it comes to the question of conflict of interest, this did not happen as all my participants in the field were not related to me in any way. Even if there was a need in the field to collect information from my family member, I would have used one of my research assistants to do it. This is to avoid influencing the participant who happens to be my family member to give the answer I want. To the best of my knowledge, the collection of information and data during my field work were done without compromising the integrity of this thesis.

4.3 CONCEPTUAL CONTEXT OF RESEARCH METHODOLOGY

“Research is a logical and systematic search for new and useful information on a particular topic...it is a search for knowledge...” (Rajasekar, Philominathan, and Chinnathambi 2006: 1). Data collected in a research project should demonstrate new understanding based on reason and evidence (Walsh 1996). The methods utilised in research help us to identify samples, collect data, and find solutions to problems. Therefore, identifying appropriate methods for a research project is vitally important for ensuring information and data collected are reliable and relevant to the topic.

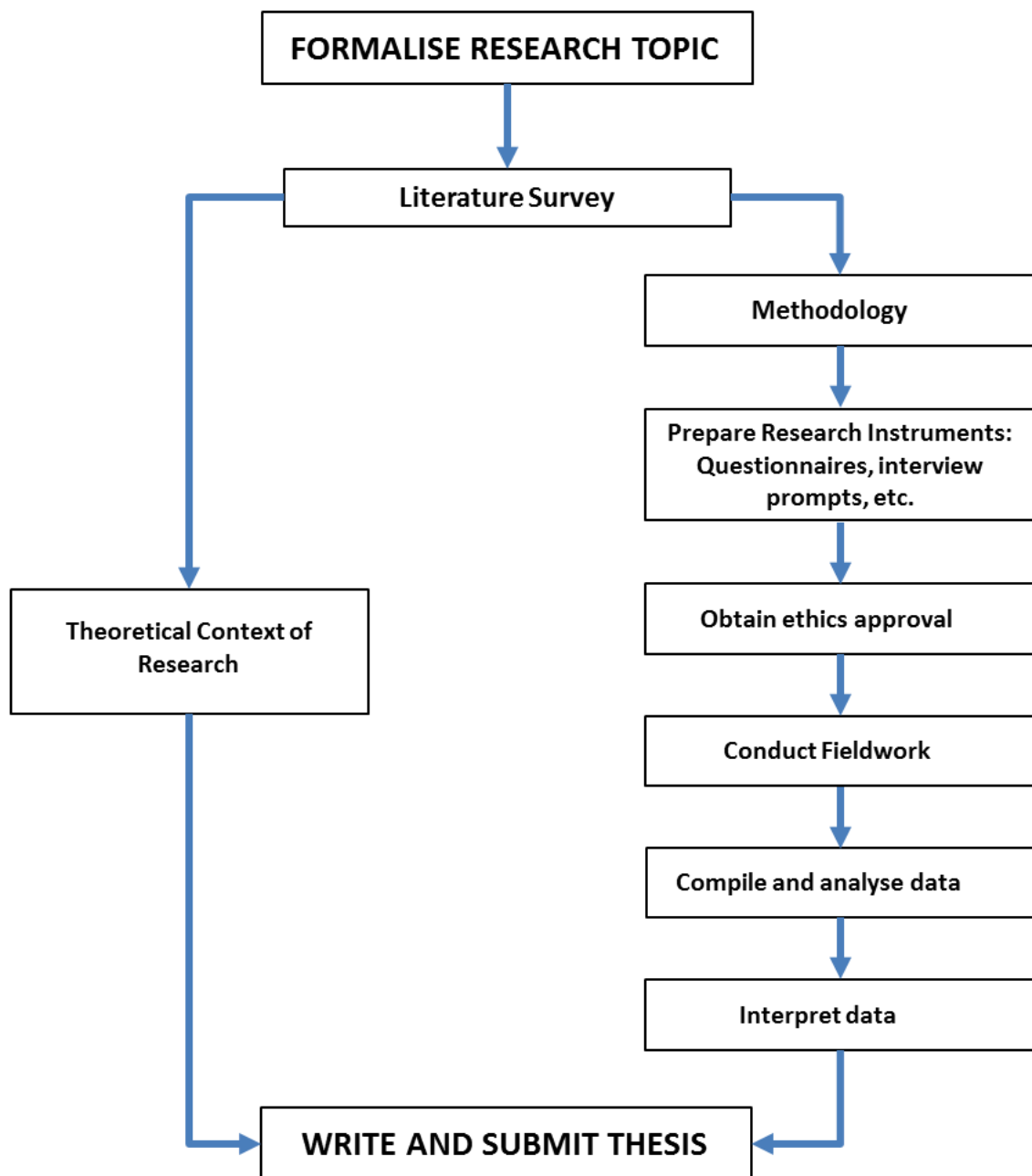


Figure 4.1 Research Process Flow Chart

(Source: Author's flow chart)

The flow chart (Figure 4.1) shows the research process which consists of a number of closely related activities. It explains the research process taken by the researcher which involves the formalisation of the research proposal followed by the collection of secondary and primary data through literature survey and field work. When data

have been collected they were then compiled and analysed. Qualitative and quantitative methods are both employed in this study and this is appropriate in that they complement each other. Ritchie and Lewis (2003: 15) highlighted that "... qualitative and quantitative research should not be seen as competing and contradictory, but should instead be viewed as complementing strategies appropriate to different types of research questions and issues"

Four main phases were followed to ensure good progress of the research:

a) Phase 1: Develop and write Research Proposal

This phase involved preparing the research proposal document. Work included literature and internet surveys and then writing the proposal. It also included writing and submitting an application to the University of Waikato Human Research Ethics Committee for approval to conduct the proposed research. Approval was received in 2010.

b) Phase 2: Literature review

The literature review serves the purpose of positioning the current study in the context of the "...ongoing dialogue [about the research area]", and assists in providing a framework within which the results of this study can be compared with previous studies (Creswell 1994:37). As Freides (1973: 1) notes, a survey of the literature "functions as a system of communication among scholars in the field, providing a means for them to carry on the discussion necessary to their work" (Freides 1973: 1).

Researching the literature was conducted in three libraries in New Zealand and Fiji: University of Waikato library, Auckland University library and the University of the South Pacific library. Information was also obtained from Oxfam New Zealand's resource centre in Auckland, the ILO's Office for Pacific Countries in Suva and from several Government Ministries in Kiribati.

c) Phase 3: Logistics and Field Work

This phase involved the preparation of documents for use in the field work especially the questionnaires and field notebooks. Field work on Tarawa was completed between January and May 2011 and in 2012. Two periods of field work

(3-4 weeks each) were completed on *Kiritimati* in 2011 and 2013. Arranging funding for field work took some time because it is expensive to get to Tarawa and Kiritimati from New Zealand. Support was received from the University of Waikato Geography Programme and two research programmes funded by the World Bank and the Ministry of Business, Innovation and Employment (New Zealand) that were addressing the participation of Kiribati in the Recognised Seasonal Employer (RSE) scheme in New Zealand. Accommodation in the field was provided by relatives and family members.

d) Phase 4: Data Analysis and Writing

This phase involved analysing the data and information collected during the field work on South Tarawa and Kiritimati. Data from the urban household survey were coded and transferred into a database that could be manipulated on an Excel spreadsheet as pivot tables. Information collected in detailed interviews was transcribed into English and analysed manually with reference to key themes of relevance to the research questions dealing with urbanisation and climate change.

4.2.1 Qualitative research

Qualitative approaches attempt to increase our understanding of the social world and why things are the way they are and why people act in the ways they do. As Maanen (1979: 520) notes, qualitative research is “...an umbrella term covering an array of interpretive techniques which seek to describe, decode, translate and otherwise come to terms with the meaning...of...naturally occurring phenomena in the social world”. Scholars including Bryman (2012; 2008), Cassell and Symon (1994) and Creswell (2003) explain that qualitative research methods allow the researcher to modify the nature of the research in response to the changing nature of the context. Qualitative methods are particularly useful for exploring problems that require depth of insight and understanding, especially when explanatory concepts are considered (Robinson 1998: 409).

Qualitative research is concerned with questions about: why? how? and in what way? In the context of this study, such questions include: how might a rise in sea level affect the urban environments and populations of South Tarawa and Kiritimati?

Is there evidence that sea level rise is already affecting the urban environment and population? How do urban residents in Kiribati perceive climate change and its impacts? Personal observation, key informant interviews and focus group discussions can all yield very valuable data of relevance for addressing the research questions (Creswell 2003). Where it is necessary to show how events and patterns unfold over time qualitative evidence often conveys a strong sense of change and flux (Bryman 2012: 402; 2008).

During the field work field observations (FO), in-depth interviews (IDI) and group discussions in the local meeting houses (*Maneaba*) (MDG) were the main qualitative methods used to obtain information from the urban populations. These methods allowed were sensitive to the traditions, culture and values of I-Kiribati and allowed their thoughts, intentions, actions, beliefs and day to day experiences about a particular issue to be discussed and recorded appropriately (Creswell 2003). Also “local observations and perceptions of change were elicited through a layered methodology that was couched within ongoing participant observation” (Lazarus 2009: 31). What people experience and perceive about climate change and how it affects their day to day living is vital information for this research topic.

4.2.2 Quantitative research

Quantitative research, “in very broad terms ... may be described as entailing the collection of numerical data ... and having an objectivist conception of social reality” (Bryman 2012: 160). Basically, this method is about quantifying relationships between variables. It is concerned with questions about: how much? how many? how often? and to what extent? Collected data and information from an urban household questionnaire survey (UHSQ) are presented using tables and graphs. This approach may involve an in-depth, longitudinal (over a period of time) examination of an event or series of events which require the collection of data, analysing information and reporting the result (Baxter & Jack 2008). In such an approach, conducting several periods of field work on both South Tarawa and Kiritimati was appropriate to ensure data collected are reliable.

More importantly, the researcher will gain a better understanding of how and why the instance occurred and what might become important to consider more closely in future research. For instance, the responses of urban households to the UHSQ regarding their experiences on South Tarawa and Kiritimati made it possible to assess how long respondents had been living in a particular area which influenced their awareness of issues in that particular area.

4.2.3 Field work

Most of my field work was conducted in the two main urban centres, South Tarawa and Kiritimati, and participants in my research were all urban people¹⁵. Most of them had spent many years in their respective urban settlement. Their experiences through interaction with the environment influence their perceptions of changes in the area where they are living. Winchester (2000) also argues that the understanding and knowledge that individuals and groups use in constructing the environment and interpreting events are important.

The field work schedule was as follows:

- 1) South Tarawa – 21st January to 17th March 2011
- 2) South Tarawa – 19th April to 19th May 2011
- 3) Kiritimati – 15th November to 7th December 2011
- 4) South Tarawa – 30th April to 17th May 2012
- 5) Kiritimati – 2nd to 16th January 2013

In addition, two other trips to South Tarawa were made in 2015 and 2016 to see the extent of the king tide that affected South Tarawa in 2015 and other changes that have taken place since my last visit during my field work. The main reason for multiple visits to South Tarawa and Kiritimati was to confirm whether information and data collected during the initial visit remained relevant and reliable. A few changes were noticed especially in the progress of some development on South Tarawa and Kiritimati. For instance, during my initial visit to South Tarawa in 2011,

¹⁵ In the context of this thesis “urban people” refers to individuals who have lived on South Tarawa and Kiritimati for a period of more than a year and live within the urban boundary e.g. for South Tarawa (from Betio to Tanaea) and Kiritimati (from Ronton to Banana and including Poland).

development on the extension of the Betio Jetty was mentioned to me when I interviewed people in the Ministry of Finance.

During my next visit in 2012, I noticed that the work on the extension of the Betio Jetty to accommodate bigger container ships had commenced. Similarly, during my first field work visit to Kiritimati in 2011, work on the re-sealing of Cassidy International Airport was just starting. During my second visit in January 2013, the re-sealing of Cassidy International Airport runway had already been completed. In 2015 besides the severe damaged of the Dai Nippon causeway that connects Betio and Bairiki, progress on the upgrading work on the roads on South Tarawa was making good progress and is expected to complete by middle of 2016.

On Kiritimati there were also some changes in the views of the urban population during interviews on the two visits. During the second visit the younger people were more open during the Maneaba Group Discussion (MGD) in expressing their individual views regarding their response to migrate to bigger countries should the rise in sea level reach a point where the land becomes no longer habitable. I noticed during the MGD that more people, especially the youth, are ready to move anytime while the older people still maintain that they are not willing to move at all. The numbers of participants involved in the UHSQ in South Tarawa and Kiritimati are shown in Figure 4.2.

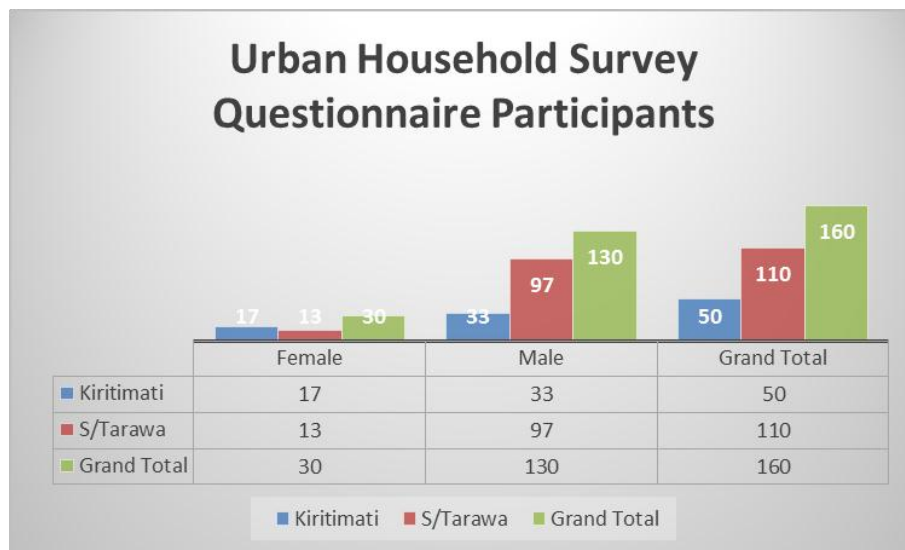


Figure 4.2 UHSQ Survey

(Source: Author’s Survey 2012)

4.2.4 Urban Household Survey Questionnaire (UHSQ)

Questionnaires are “... an important tool ... to acquire information about the characteristics, behaviours and attitudes of the population...” (McLafferty 2003: 87) that is not available from published sources. The UHSQ included a mix of closed and open-ended type questions. The advantage of the open-ended ones is that they allow respondents to express in their own words the fullest possible range of answers that better represent their “true” viewpoints. Another very important aspect of open-ended questions is that they provide qualitative information that can be analysed with qualitative methodologies (McLafferty 2003: 89 - 90).

The UHSQ (see Appendix 3.A) was administered to 160 households, 110 on South Tarawa and 50 on Kiritimati. Prior to distributing the UHSQ to household heads as well as conducting the in-depth interviews (IDI) every participant was given detailed information about the research. Their individual rights when answering the UHSQ were also explained. When they had given verbal assent to participate, a consent form (Appendix 3.B) was given to each participant to sign. When consent was obtained, the UHSQ was administered. Participants were given the UHSQ to fill in in their own time and the forms were collected from them after three or four days. When the UHSQ forms were distributed, every participant were thoroughly explained regarding the contents of the forms to avoid problems when filling the forms.

A purposeful sampling technique was used to identify households and people to participate in the UHSQ and IDI. My familiarity with South Tarawa, especially where civil servants and non-civil servants lives makes it easy to find the people that meet the household participant criteria. Three main criteria were considered when identifying household participants. They were:

- 1) The level of income and type of house occupied by participants;
- 2) The settlement area where the participants lived;
- 3) The number of years the participants had spent in the urban area.

Income-level categories were based on type of employment and the evaluation of the type of house occupied by participants in the UHSQ. The three main income-level categories were:

- a) Employed: those who work in the government, private business, and church,
- b) Self-employed: those who have income generating activities such as retail stores, bus operators, fishing, seafarers etc.,
- c) Non-employed: those not engaged in any formal income generating activities

(Note: wives of seafarers are categorized under self-employed as the remittance they received is considered income to support the family)

For government workers, income level was identified using the grade of house participants occupied. The Kiribati Housing Corporation (KHC) provides different grades houses for civil servants. A and B grades houses are mainly for high income employees, the C and D are for the middle income and the E and F are for the low income civil servants.

Additionally, some government employees who are not able to secure a house from the KHC either stay in their private homes or rent houses. The types of houses available for rent in the urban areas are made of permanent materials and are either fully or partly furnished. Therefore, it is possible to roughly identify the level of income for urban participants on the basis of the grade of house they live in. However, there are exceptional cases where high income employees live in their own houses. These houses are typically built of local materials, partly local and permanent materials or permanent materials. In order to identify the level of income in such cases, the use of family property, such as cars, trucks, and other family owned properties that are identifiable besides the house were used to determine the income level of the household. In some cases, the local knowledge of the researcher about the area and the people was vital.

On South Tarawa, participants were selected from areas between Betio and Bonriki. On Kiritimati, household participants came from Ronton, Tabwakea, Main Camp, and Banana. The geographical position of Poland on the other end of Kiritimati

made it impossible to include it in the study. As for the number of years people have lived in the urban area, three main categories were used (Figure 4.3):

- a) those who have lived for less than 20 years in the urban areas of South Tarawa and Kiritimati;
- b) those who have lived between 21 to 40 years in the urban area;
- c) those who have lived for more than 41 years in the urban area.

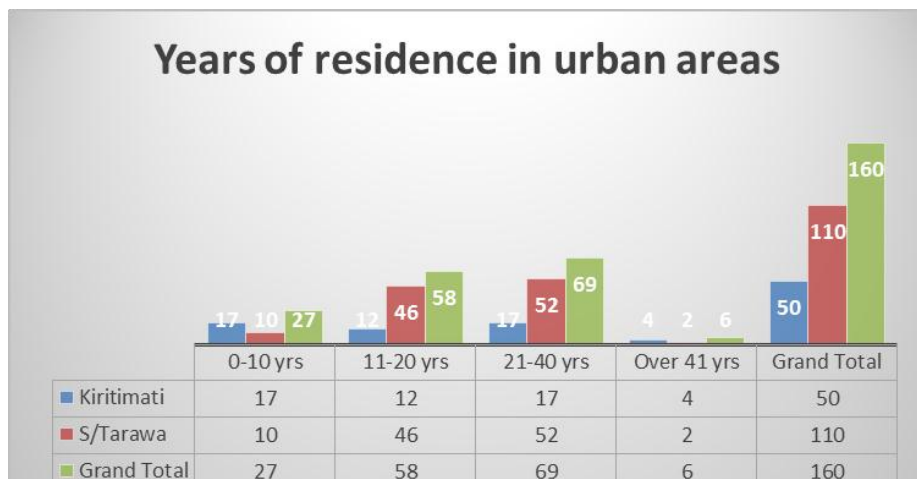


Figure 4.3 Years of residence in urban areas

Source: UHSO 2012)

Kiritimati the same criteria were used to identify participants for the UHSQ. Because the researcher was not familiar with Kiritimati, especially with the urban people, a guide (a close relative who was born and raised on Kiritimati) was used to help identify participants using the criteria mentioned above. Household participants for the UHSQ for South Tarawa and Kiritimati are from all islands from the Gilbert group. Even UHSQ participants in Kiritimati still identify with their home islands in the Gilbert group. Interestingly, Kiribati people will always maintain their traditional link with their home islands despite having lived away from them for a very long time.

Table 4.1 shows the home islands of the participants in the research. It was indicated by those interviewed that one important traditional link to their home island is the right to their family lands. For instance, when a Kiribati person moves to another country, his/her right to any land they own in Kiribati will continue to be legally recognised. Their interest in the land/s will only end when they decide to transfer

the ownership to other members of their kainga, or they sell or bequeath their land to another person.

Table 4.1 UHSQ participants' home islands

ISLAND	Kiritimati	South Tarawa	Total
Makin	7	1	8
Butaritari	7	1	8
Marakei	9	5	14
Abaiang	10	6	16
Tarawa	26	11	37
Maiana	5	2	7
Kuria	6	1	7
Abemama	9	4	13
Aranuka	1	0	1
Nonouti	4	2	6
Tabiteuea	6	4	10
Beru	3	3	6
Nikunau	2	3	5
Onotoa	6	2	8
Tamana	6	2	8
Arorae	1	1	2
Banaba	1	0	1
Kiritimati	1	1	2
No response	1	0	1
Total	50	110	160

When completing the UHSQ, individual households were asked to select their own head to fill the questionnaire. It was discovered that women who were chosen to be the head of the household were usually the ones employed and main breadwinners for the family. In some cases, women household heads were wives of seafarers who were not at home during the time the UHSQ was administered. Consequently, out of the 160 urban household participants, 30 (18.75 per cent) were women. Furthermore, women who identified themselves as household heads were often employed by either the government or private sector. Usually male household heads were the oldest male in the house. Interestingly, the status of the males in regard to whether they are employed or not, is not considered when choosing a household head. This is because culture dictates that males are usually the head of the household.

It was interesting to note that the majority of the research participants on South Tarawa were from outer islands. Only 26 were *kain Tarawa* (indigenous people of Tarawa) (refer to Table 4.1). However, *kain Tarawa* participants were often older people who had lived in different areas within the boundary of South Tarawa during their lives. In fact six participants, all *kain Tarawa*, three from Betio, one from Bairiki and two from Banraeaba, were over 60 years of age and had interesting recollections of the changes that have taken place on South Tarawa since they were young. They also witnessed the devastation of the islands, especially Betio, during the fierce fighting of World War II between the Americans and the Japanese.

The urban areas that were covered during the field work on South Tarawa included Betio, Bairiki, Nanikai, Teaoraereke, Banraeaba, Eita, and Bikenibeu only. Twenty households each for Betio, Bairiki and Bikenibeu and fifteen each for Nanikai, Teaoraereke, Banraeaba, and Eita were contacted for the purpose of administering the UHSQ.

4.2.5 In-depth Interviews (IDI)

“Communicating with people is an excellent way of gathering information. Interviews ... are about talking with people but in ways that are self-conscious, orderly and partially structured” (Longhurst 2003: 118). According to Dunn (2000:

51), interviews are verbal interchanges where one person, the interviewer attempts to elicit information from another person. There are three main types of interviews:

- a) Structured interviews follow a predetermined and standardised list of questions and these questions are always asked in the same order,
- b) Semi-structured interviews are conversational and informal in tone and allow for an open response in the participants' own words rather than a 'yes or no' type response. This type of interview usually involves some degree of predetermined order but it still maintains flexibility in the way issues are being addressed by the informant,
- c) Unstructured interviews are where the conversation is actually directed by the informant rather than by the set question or prompts.

This study employed the semi-structured type of interview to allow the respondents to explain what they think about climate change and its effects on the urban population. Two main procedures used to identify and classify research participants for the IDI. The first relates to the status of the participants and the other the age criterion. Five main types of status were used as a criteria to identify participants for the IDI namely 1) Kain Tarawa (indigenous people of South Tarawa), 2) Outer Island Immigrants, 3) Civil Servants, 4) Youths, and 5) Unimane (old people) (See Table 4.2). For Kiritimati number one is not used as there are no indigenous people of Kiritimati. Getting people from this different status is important to ensure that the views from different residents are obtained.

Names of all IDI participants were not used, instead abbreviations for each participants is used. To identify in-depth (IDI) participants for South Tarawa and Kiritimati the following are used: IDITR for South Tarawa and IDIKR for Kiritimati with a number. For South Tarawa, it will have numbers 1 to 30 while Kiritimati 1 to 20. The number follows the people I interviewed from the first to the last, for instance, the first IDI participant for South Tarawa will be known as participant IDITR1. The same thing happens to the next 29 participants. The same procedure applies to participants for Kiritimati.

Table 4.2 Status Description of IDI Research Participants

Status of Participants	South Tarawa		Kiritimati	
	Male	Female	Male	Female
Kain Tarawa	6	1	0	0
Outer Island Immigrants	4	0	5	1
Civil Servant	8	2	7	1
Youth	2	1	3	0
Unimane	5	0	3	0
Total	2	4	18	2

(Source: UHSO 2012)

Young people were considered to have ages from 20 to 30, the middle age group from 30 to 49 and the old people were over 50. Participants for the interview were also purposefully selected to give these groups similar representation. Most important was the numbers of years the participant had spent in the area. The categories used are 0 to 10 years, 11 to 20 years and over 20 years in the area. For the IDI, 50 participants were involved (See Table 4.3). More participants from the 30 years age group and over were involved from South Tarawa and Kiritimati. This was purposefully done as the older the participant and the longer he has lived in a particular area is likely to be more knowledgeable of it. The experience and knowledge of individuals is crucial in explaining the changes about the place they live in.

Table 4.3 Characteristics of In-depth Interview (IDI) Participants

Age of Participants	South Tarawa			Kiritimati		
	Male	Female	Total	Male	Female	Total
20 to 30 years	2	1	3	2	1	3
30 to 49 years	12	3	15	8	3	11
Over 50 years	7	5	12	4	2	6
Total	21	9	30	14	6	20

(Source: UHSO 2013)

4.2.6 Narrative Approach (NA)

Another method I used in the field in-conjunction with the in-depth interview (IDI) to collect information from the people was the narrative approach. This approach is based on collecting stories and experiences from individuals surrounding a specific situation. For the purpose of this research it is to collect information on people's understanding on climate change and its effects on the lives of the people mainly in the urban areas. The types of narrative used are life histories and oral histories (Creswell 2013). They were collected from those who had lived their entire lives in the urban areas of South Tarawa and Kiritimati.

This narrative approach involved a casual visit to a relative's home. It is easier to get information from people you know than those you don't know. I was able to visit 20 homes, 14 on South Tarawa and six on Kiritimati, who have lived in these areas most of their lives. During our conversations, I raised the issue of climate change and asked what they think of it; how it affects their lives now and what are their long term plans to adapt to its impacts. I discovered that people were quite open to talk to me about how they perceive climate change and especially its impacts on their day to day lives.

4.2.7 *Maneaba* Group Discussion (MGD)

Maneaba Group Discussions (MGD) use the focus group approach where “a group of people, usually between ten to thirty and even more people, meet in an informal setting to talk about a particular topic that has been set up by the researcher” (Longhurst 2003: 119). The researcher is usually the facilitator who keeps the discussion focussed on the topic but otherwise allows the group to explore the subject from as many angles as they please. Focus groups usually meet for one or two hours and a key characteristic is the interaction between members of the group (Longhurst 2003: 120).

During the MGD at Betio, Bikenibeu and Kiritimati, the researcher leads out in the discussion and provides every participant the opportunity to share what he/she thinks about the topic in a casual manner. The *maneaba* is a meeting house where people of the village gather for special functions (see chapter 3 section 3.2.1 on cultural traditions). The use of the *maneaba* as a venue for the MGD is appropriate as Kiribati people consider the *maneaba* an important traditional meeting place. According to Kiribati culture people respect any calls to attend meetings in the *maneaba* (Grimble (1989:197). Therefore, it is always likely that any meeting convened in the *maneaba* is attended by many of the people within the community.

According to Bryman (2012: 501), “focus groups typically emphasize a specific theme or topic that is explored in depth”. More specifically, “... with a focus group the researcher will be interested in such things as how people respond to each other’s views and build up a view out of the interaction that takes place within the group” (Bryman 2012: 501). Importantly, focus groups offer “... the researcher the opportunity to study the ways in which individuals collectively make sense of a phenomenon and construct meanings around them” (Bryman 2012: 504). Researchers conducting focus groups normally undertake their work within the traditions of a qualitative approach. Despite its popularity, it is by no means a new method. Previously, it has been used in market research where it is used for such purposes as testing responses to new products and advertising initiatives.

Following the focus group approach, the *Maneaba* Group Discussion (MGD) (based on the Kiribati *maneaba* tradition) was adopted in this study with the prime purpose to provide opportunity for the general population, regardless of age, to have their say about climate change in their own words. In this study MGD were used to explore people's views on the impact of climate change on the livelihoods of urban dwellers. MGD provides the place for people to discuss what they think about the issue/s in question. During all of the MGD I conducted on South Tarawa and Kiritimati, I usually started the discussion by introducing myself and then presenting my traditional gift before starting the discussion with the people. Traditional protocol in the *maneaba* is very important to be considered prior to commencing any form of activity.

Three MGD were conducted during the field work. Two were conducted on South Tarawa and one on Kiritimati. On South Tarawa, MGDs were conducted in Betio and Bikenibeu. On Kiritimati, the MGD was held in Ronton. My initial task involved arranging with *unimane* (old man in charge) to obtain approval to use their *maneaba*. The use of the MGD is appropriate as it combines traditional and modern approaches in organising a meeting with the people.

As anticipated, the attendance at the MGD was good. Over sixty people attended and half were females, there were representatives from the youth, middle ages and the old people. My main task during the discussion was to explain the purpose of the meeting and then to provide time for anyone to share what he or she knew about climate change and its effects on South Tarawa. Three main themes relating to climate change were outlined before the discussion started:

- 1) What do you know about climate change?
- 2) Is climate change affecting your livelihood and if yes in what way?
- 3) Do you know any traditional approach you could use to enable the urban people to live on these islands now and in years to come?

During the MGD, everyone present was allowed to express what he/she thought about climate change and its impacts on the urban population. Obtaining the general views of individuals in their own words about climate change is crucial and very

important to this study. Bryman (2012) also explained that taking the views of participants into consideration positioned the researcher closer to the social reality of the participants, thus reducing the gap between reality and representation in the research.

The MGD approach targeted all people living within the vicinity of the MGD venue. In order to attract as many people as possible to attend several methods were used to get the message to everyone in the area. The first approach was the use of word of mouth where I approached leaders of different youth groups and church groups, as well as the old people's association within the area to pass the information about the MGD to all their members. Briefly, the message that was passed around by leaders of each group was an invitation to anyone who has concerns about climate change to attend and share what they have to say.

The other method was the use of posters which I put around the area for people to see. Consequently, the two methods were successful and this was reflected in the attendances during the MGDs. The MGDs involved explaining the main objectives of my research, highlighting information relating to climate change and its effects on the livelihoods of the urban population. Then I provided the rest of the time for anyone to share what they knew about climate change. The three MGD's were all successfully administered and generated much discussion. The meetings all lasted more than two hours.

4.2.8 Field observation

Observation "... entails the relatively prolonged immersion of the observer in a social setting in which he or she seeks to observe the behaviour of members of that setting..." (Bryman 2012: 273). It involves a researcher spending time being, living or working with people or communities in order to understand them. Information is collected via field notes and photographs during field observation (Bryman 2012: 133).

My familiarity with South Tarawa made the field observation easy. I had not been to Kiritimati before but, after making a visit field observation became easier. Both

islands share similarities and differences and both display similar geomorphological characteristics of atolls; having poor soil types, limited natural resources, limited wild life, and poor vegetation. However, Kiritimati has a much larger land area and much smaller lagoon than Tarawa.

One obvious activity I noticed during my field work on both islands was the destruction of resources by human activities. A very common one on South Tarawa is the harvesting of sand and gravel from the beach and shorelines for urban construction purposes. Such extraction makes coastal areas vulnerable to erosion by the sea, in particular as sea levels rise. The most affected areas are along the lagoon side on Tarawa close to the bridge on the Betio-Bairiki causeway. Even though the government, through the Lands Department, issues licenses to permit people to collect sand and gravel from designated areas for construction purposes, such effort is wasted as most people continue to harvest sand and gravel illegally.

4.2.9 Analysis of data

The data analysis stage is fundamentally about data reduction as "... it is concerned with reducing the large corpus of information that the researcher has gathered so that he or she can make sense of it" (Bryman 2012: 13). Data collected during the field work on South Tarawa and Kiritimati were suitably coded and transformed from the Urban Household Survey Questionnaire (UHSQ). These data were later transferred into suitable tables and these are discussed in chapter five. The tables provide information on the responses of urban people to the changes in their residential environments.

The objective of the UHSQ was to seek responses of the urban people to specific issues they encountered through their interaction with the urban environment. More specifically, the questionnaire sought to find out whether land and marine resources that normally support the urban population demands including food crops, sea food and underground water are still in sufficient supply to support such demands. It also endeavoured to obtain information relating to impacts of climate change on the environments and whether residents considered these impacts affected the urban environment's potential to support the population in the future. The overall

analysis of the research data indicated a common concern about the extent to which climate change had impacted negatively on the urban environmental resources that sustain the livelihoods of the urban population. These findings are discussed in chapters five and six.

4.3 RESEARCH PROCEDURES AND ETHICS

The development of an effective research design is an important component in conducting good research. During the progress of this research, traditional protocols during field work on South Tarawa and Kiritimati, as well research ethics in conjunction with the Human Research Ethics Committee procedures and general principles of the University of Waikato, were strictly complied with.

There were some challenges in designing and implementing the research. The first relates to the unavailability of required data on climate change on low-lying atolls and in particular Kiribati. Most of the current studies on climate change in Kiribati have been conducted by outsiders and while their findings were useful, views expressed were based on western concepts and sometimes hard to relate to the local situation. Very few I-Kiribati scholars have carried out research in Kiribati hence there is a very limited pool of literature by local people available for use by other researchers. More work is required in this area to ensure sufficient literature by I-Kiribati is available for use in future studies.

The second relates to limited funding. As a private student, most of my funding came from two main sources. The first was from the University of Waikato PhD research funds that are provided specifically to support travel for field work and to attend a conference that is relevant to the topic of the study. The other comes from research grants managed by a staff member of the University of Waikato who fully supported all financial aspects of my study from day one until its completion. Both forms of financial support have enabled me to pursue and complete this study without worrying about the financial aspects.

Thirdly, obtaining data and information from participants during the field research often encountered problems particularly in relation to the language used in the

questionnaire. To ensure that all participants understood the questionnaire well, as it was written in English, I took time to explain the questionnaire thoroughly to every participant before I left the questionnaire with them to fill. It was interesting to see that in all of the 160 urban households that agreed to participate in the UHSQ, there is always someone in the house who spoke and understood English. The main reason for having the questionnaires written in English is that it is easier to enter the results and not having to translate the results first before entering them in the pivot table.

When distributing the UHSQ, I visited the 160 household participants with my research assistant to ensure I obtained their consent to participate as well as to ensure they were very clear about what to do. I also had them to sign the consent form before they formally participated in the UHSQ. One week was given to them to fill the questionnaire on their own without my presence or that of the research assistant. At the end of the first week, my research assistant will go to every household involved to collect the questionnaire. During this time we encountered minor problems when a number of household participants did not complete fill the questionnaire. These participants were given another week to finish. It was good to see that they managed to complete their questionnaire at the end of the second week.

The main reason for leaving the questionnaire with them to fill in their own time was to ensure the answer they wrote was not influenced by me or my research assistant. When I came to analyse my field data it was discovered that some of the participants that had not answered some of the questions. However, when I enquired about this from the participants concerned, they said that they preferred not to answer the questions that they had not answered. I respected their decision and just left the unanswered questions blank when entering the result in the pivot table. Each participant was given time to seek clarification of any section/part of the questionnaire from the researcher or research assistants who assisted in administering the questionnaires.

Interestingly, when I approach the selected urban households on South Tarawa and Kiritimati that I consider to have met the criteria's to participate in the UHSQ all agreed to participate. This was encouraging as quite a number of these selected

urban households were people I do not know personally. The main form of communication with all my research participants is Kiribati as both the researcher and research assistants are native Kiribati speakers. This makes my research work less time consuming.

Few minor limitations were encountered during the field research. These include transportation and accommodation. With transportation, I used my family car for my field work instead of using public transport thus relieving the transport problem. Accommodation was provided by my family on both South Tarawa and Kiritimati. I only contributed food and fuel for the car I used. The larger land mass of Kiritimati demands the use of reliable transport in order to cover the whole urban area which includes areas from Ronton to Banana. Mobility on South Tarawa during field work was not a major problem as the landmass was smaller and there is no shortage of minibuses traversing the area between Betio and Tanaea.

There were no problems encountered when administering the UHSQ in the urban areas. Every household I visited was very friendly and approachable. Being a native of Kiribati, there is no cultural obligation to obtain approval before visiting people in their respective homes. This indeed makes field work easier for the researcher. To comply with ethical procedures, every household participant was informed of the objectives of the research and what was required from them when they agreed to participate. It was encouraging to see that every household approached for the purpose of participating in the UHSQ and IDI voluntarily agreed to take part.

As for the *Maneaba* Group Discussions, compliance with certain cultural protocols was required including presenting special gifts to the owners of the *maneaba* where the meeting was held. According to Kiribati culture, there are two main types of gift that need to be presented by people who want to use the *maneaba* but are not members of the said *maneaba*. The presentation of such gifts has to be performed prior to the start of the meeting. They are known as “*te mweaka*” and “*te nouete*” (Koa 1993: 108).

Te nouete is presented to show respect and appreciation to the host of the function for the invitation. This is normally done when one, two or more people were invited

to attend a function and it is usually the recipients who present *te nouete*. As to *te mweaka*, the cultural objective is to introduce someone to the spirit of the place that is being visited in order to acquire blessings and protection during the visit. The gifts for both presentations can be in the form of cash and tobacco (Koa'e 1993: 107 – 108). When I conducted the MGD, *te mweaka* (AUD\$100) was presented to the old man in charge of each of the *maneaba*.

4.3.1 Research Assistants

During the duration of my field work on South Tarawa and Kiritimati, research assistants were recruited to assist. Two research assistants for South Tarawa and one for Kiritimati. Two were females and one male and were my own relatives who have just completed their form seven studies and are not engaged in any formal employments. I only provided bus fares and lunch when they work with me. Apart from that they were just helping me. The two research assistants on South Tarawa helped me in collecting the UHSQ from the scattered household participants. The one for Kiritimati assisted in showing me around the island and helping to show me where civil servants live and those not working. Additionally, they also can help explain to urban household participant's section/s of the UHSQ that they are not clear with.

4.3.2 Research procedures for participants

All data and information generated from the research are treated as confidential and used only for the purpose of writing this thesis and for other academic purposes including paper presentations at conferences, seminars, and workshops, and for any published academic papers and the like. Identities of participants will not be revealed to the public at all. Electronic copies of personal information are protected using a password known only to the researcher to ensure anonymity of every participant in this study and confidentiality of their data. Additionally, all other collected information and data will be kept for a period of five years from the date of completion of this research before they are destroyed.

4.3.3 Limitations of the research

This study encountered some limitations. The first relates to the lack of literature on climate change in Kiribati. Even though the government provides access to relevant documents relating to climate change in Kiribati, these documents were mainly concerned with government strategies relating to policies and practices to address anticipated climate change impacts. There is an absence of literature by I-Kiribati authors on climate change. Most available secondary literature on climate change in Kiribati has been authored by non-I-Kiribati scholars and researchers. Credit is due to these people for taking time to carry out studies on climate change in Kiribati. Their work has provided the motivation for me to carry out this research work. However, there is still a need for more I-Kiribati to consider pursuing studies and research on climate change in Kiribati in the future. The personal experiences of I-Kiribati of the islands together with the data and information they would obtain from the local people when conducting their research work will be very relevant and important when considering future strategies to address issues resulting from climate change.

The second limitation relates to the financial aspect of the study. Most of the funds were provided by generous staff of the University of Waikato in addition to \$3000 fund provided for by the university for PhD candidates. Consequently, strict adherence to the research timetable was paramount to ensure the progress of the research did not compromise the financial budget. As a result, prolonged stays in the field for the purpose of collecting data beyond what was budgeted for was not possible.

The other limitation relates to the geographical remoteness of the field sites from New Zealand. Getting to South Tarawa and Kiritimati involves a one night stopover in Fiji. This incurred accommodation and food expenses in Fiji prior to reaching the field site. Consequently, travelling to either of the field sites; South Tarawa or Kiritimati, took two days. The distance and remoteness of the field sites are further compounded by exuberant airfares. One advantage though is the fact that being I-Kiribati and having some family members residing in the urban centres of South

Tarawa and Kiritimati partly catered for accommodation, food, travel and other field work expenses.

The reserved human nature of I-Kiribati people is another aspect of concern before conducting the field work especially on Kiritimati which the researcher had not previously visited. However, this limitation was resolved by utilising a family member who was born and had lived all his years on Kiritimati to assist in this regard. As it turns out, the first field work on Kiritimati only requires the assistance of a family member. During the second field work, the researcher was able to move around freely using a family member vehicle.

4.3.4 Ethical issues

“Ethical issues cannot be ignored, as they relate directly to the integrity of a piece of research and of the disciplines that are involved” (Bryman 2012: 130). Discussion about ethics brings us into a realm in which the role of values in the research becomes an important topic of concern. As explained by Bryman (2012: 130), such concerns focus around issues such as:

- 1) How should researchers treat the people on whom they conduct research?
- 2) Are there activities in which researchers should or should not engage in their relations with research participants?

There are also other useful classifications of ethical principles that must be considered when conducting research. These principles tend to revolve around certain issues that occur in different forms. Bryman (2012: 135 – 144) highlights these principles as follows:

- 1) Harm to participants: harm can entail a number of facets-physical harm; harm to participants’ development; loss of self-esteem; and stress.
- 2) Lack of informed consent: this means that prospective research participants should be given full information about the research in order to make decisions as to whether or not they wish to participate.

- 3) Invasion of privacy: “the right to privacy is a tenet that many of us hold dear, and transgressions of that right in the name of research are not regarded as acceptable” by research participants. This is connected to the notion of informed consent where research participants agree to participate in the research,
- 4) Deception: this occurs when researchers represent their work as something other than what it is.

After completing my field work on South Tarawa and Kiritimati, it was good to see that no potential risks had arisen that could have affected the progress of data collection. This was mainly due to the fact that I was cautious to avoid any possible confrontational situations with my research participants. The right of every participant was always been paramount and respected during the duration of this research (See Appendix 4.1). Furthermore, every participant was advised, prior to their participating in the research, that the information they gave me would be treated as confidential and only used for my thesis research and associated papers and presentations.

4.5 CONCLUSION

This chapter has discussed the main approaches used to collect data to address my research questions regarding climate change and its impacts on the livelihoods of urban dwellers in Kiribati. Traditional protocols deserve recognition because Kiribati people are not always easy to approach especially when someone not related to them visits them in their home. Culturally, in Kiribati when someone visits a home whose occupants are strangers to the researcher, traditional protocol is observed. Hence, during the duration of this research, traditional protocols were always observed.

The research was designed to obtain data and information relating to environmental change and its impacts on the livelihoods of urban dwellers in Kiribati. To ensure the collection of reliable data relevant to the research topic, the use of appropriate methodologies was crucial. The main limitation related to the unavailability of information on climate change particularly for the urban area of Kiritimati. Despite

the limitations from lack of data and information for certain aspects of the research, the availability of secondary data from the field helped fill gaps in data availability.

CHAPTER FIVE

CLIMATE CHANGE AND THE URBAN ENVIRONMENT

... climate change was the greatest moral challenge of our time, and the world could not afford the consequences of inaction...

Anote Tong, Kiribati President (United Nations 2009)

5.1 INTRODUCTION

Their very limited natural resources have always posed considerable challenges to their inhabitants seeking to survive on the atolls of Kiribati. The geographical remoteness of these islands in the middle of the Pacific Ocean, coupled with the lack of economic resources, made the islands unattractive for long term settlement by the early European explorers except for a few beachcombers who sought islands where they could hide, traders who were looking for coconut oil, and the missionaries who pursued local people to convert (Maude 1989). The indigenous inhabitants have, for centuries, continued to survive and have increased in numbers. Through time, people have acquired traditional skills for constructing houses, building outrigger canoes, cultivating *babai*, and fishing in the lagoon and open ocean. These traditional skills for survival have always been important in the Kiribati culture up until the present (Baiteke 1994:1).

For centuries, land has always been an integral part of the Kiribati culture. It provides food, material for construction of houses and canoes, medicines as well as being a source of spiritual and psychological satisfaction (Teiwaki 1988). Even though the land is impoverished with sandy and calcareous soils and unfavourable climate, agriculture and fishing remain the predominant activities. The way of life is not easy and involves hard physical labour.

The local people are well aware of the limitations of growing food and crops in the atoll environment because of the lack of important nutrients in the soil to support plant growth. Therefore traditional skills are important and each family has to ensure that these skills are passed on to their children when they are old enough to establish their own family. These skills have enabled the survival of the inhabitants

for centuries and hence it is important to respect traditional skills and practices even though they may lack formal scientific basis (Baiteke 1994:8).

Of significant importance in Kiribati culture is the cultural norm where people are expected to live within the limited resources provided by the atoll environment. Traditionally, people were expected to extract what they required from the land and sea for their families' daily needs. Any excess harvesting of food from the land and fish from the sea was shared with neighbours. Unlike the competitive individualism that characterizes the more modern urban society today, sharing and cooperation characterized the Kiribati traditional system.

The IPCC WGII AR4 report (2007) confirmed that Pacific Island Countries (PICs) are frequently located in regions that are most prone to natural disasters. They have poorly developed infrastructure and limited natural, human and economic resources and also display characteristics such as susceptibility to external shocks which exposes them to climate change (Mimura et al 2007). The internal movement of the population from outer islands to South Tarawa has concentrated sewage, garbage and other toxic wastes (Cocklin and Keen 2000).

Similar concerns about climate change impacts were highlighted in the IPCC AR5 report which indicated with high confidence that “sea-level poses one of the most widely recognized climate change threats to low-lying coastal areas on islands and atolls” IPCC WGII AR5 (2014: 2). Extreme sea-level events will cause severe sea-flooding and erosion of low-lying areas and atoll islands. They will also exacerbate inundation, storm surge, erosion and other coastal hazards, which in turn will pose risks to vital infrastructure, settlements and facilities (Mimura et al 2007). Economic hardship is likely to result from these diverse effects and would become a key factor in exacerbating impacts on urban human health (Barnett and Campbell 2010; Hay et al 2003: vi). Additionally, underground water lenses have been affected; most have shrunk and have become salty, thus affecting the growth of vegetation (Tutangata, 2005). The dwindling of natural resources together with the need for more land space is becoming of great concern for future policy and decision initiators and implementers in Kiribati.

The traditional system ensures that everyone receives a sufficient share of the resources as well as maintaining the limited natural resources, from the sea and the land, and that they are not overexploited by a few individuals for short term gains (SPREP 1994). These traditional skills and knowledge have ensured the survival of the Kiribati people on the atoll environment despite having poor and limited resources. This chapter discusses the responses of the participants in the urban household survey questionnaire, in-depth interviews, and *maneaba* group discussions. Other important and relevant data and information obtained during the field works were also discussed. The findings are discussed under three main themes:

- 1) Perceptions of climate change,
- 2) Major issues affecting urban livelihoods, and
- 3) Concerns about climate change.

5.2 LOCAL PEOPLE'S PERCEPTIONS OF CLIMATE CHANGE

In order to identify both past and current impacts of climate change on the urban environment, the people who have lived there are the best informants. People's past experiences provide an avenue to understand what impacts have occurred on the land in the past and whether these changes might have been due to climate change. Castree (2005: 186) observed that:

...accurate knowledge of the biophysical world is a desirable (and achievable) thing...and the wider public are willing audiences for researchers who can offer their 'expert' insight into the 'real nature' of natural and humanly altered environments.

This section examines participant's perceptions and understandings of climate change. It discusses what they think climate change is all about, how it has impacted their lives and the land they settled on, and how they have managed to cope with its impacts in their day to day living. It also discusses whether climate change has impacted on the land in the past (during the colonial period) and whether the present (independence to the present) has improved or worsened.

5.2.1 General views of the people on climate change

Most of the research participants have heard about climate change and were aware of what it is about although there were also a number of misconceptions. Mass media played an important role in making the general population of Kiribati, especially those in urban areas, aware of climate change and its implications for the islands and the people. The older participants' understanding of the Kiribati legend regarding Nareau and the protection of the islands (see Sections 3.2.1 and 3.2.2) also played an important part in influencing them to accept the fact that climate change is affecting the islands.

Additionally, urban residents on South Tarawa seems to think that climate change is one of the main factor that contributes to the creation of existing urban issues such as coastal erosion, salinisation of groundwater lens, and the destruction of coastal resources. According to IDITR25 he stated that "...the rise in sea level during high tides has caused the many problems that we face today on South Tarawa...especially erosion of land at Bairiki and Temaiku". Similarly, IDITR28 also confirms that "...every time during high tides, we normally don't use our well water because it becomes very salty...and I don't want my children to get sick..."

It was clear from the responses that the views of participants about climate change differed in their explanations. Some older participants related the biblical flood (Genesis) with the rise in sea level while others with the work of Nareau and in particular the legend of the four winds. The younger participants' explanations include what they have learned in school and through mass media about climate change. However, they all agreed that climate change is about the rise in sea level and the increase in the heat of the sun. During the IDI and MGD participants explained climate change as:

...the weather pattern is changing a lot, we now experience more bad weather, and as a result it causes the rise in sea level and also the sun is getting hotter now not like what we used to in the past (MGDBE)

...the level of the sea is rising during high tide because the sun is getting hotter now that's why we are experiencing this now (IDITR4)

In summary, participants explained climate change as changes in the weather patterns, the sun becoming hotter and the rise in sea level. One important factor mentioned was the spiritual aspects where older participants explained climate change as a form of a curse by God. According to one participant:

God is punishing the people for their sins because they have continued to kill, steal, and fight each other...he's not happy with the people (IDITR1)

The other factor, highlighted particularly by the older participants, was that the issue of climate change was related to the legend of Nareau and the protection of the islands from natural disasters. Figure 5.1 shows that 80 percent of the participants from South Tarawa were aware of the legend (many in the over 41 age category) and the protection of Kiribati while 20 percent indicated they were not. For Kiritimati participants, 64 percent acknowledged knowing the legend.

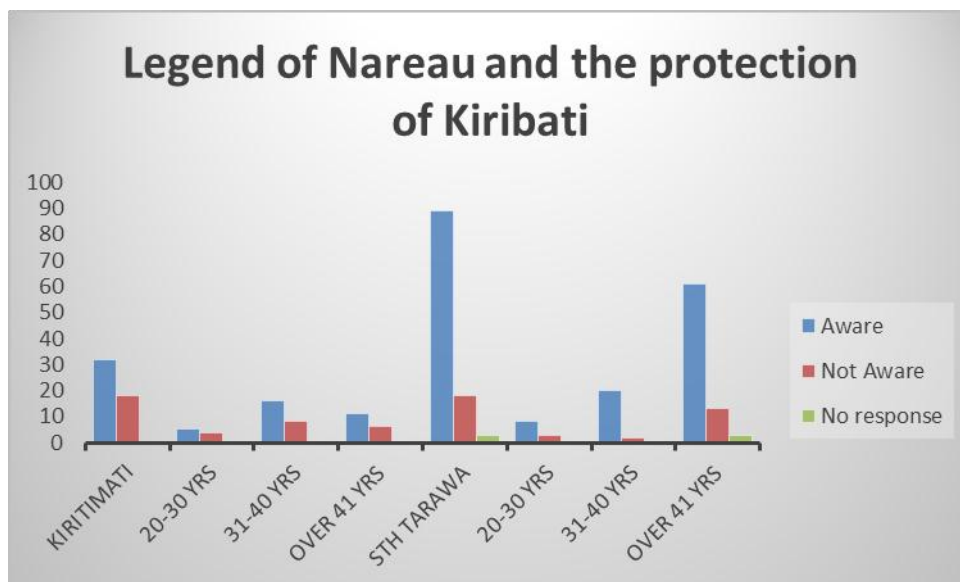


Figure 5.1 Legend about protecting the Kiribati islands

(Source: UHSQ 2012)

In summary, the legend talks about Nareau the ancestral god of the Kiribati people holding back the great winds from the four corners of the universe so they would not affect the islands of Kiribati. However, there will be a time when something will come from under the ground, and according to this legend Nareau will not interfere with it as he believes the people will know how to deal with it. The older participants explained that when they were young the *unimane* used to share in the *maneaba*, during traditional functions, the legend of Nareau and his work of creation. According to IDITR16:

I can still remember when our *unimane* shared the story of *Nareau* during special functions in our village *maneaba* about how he protects our islands from natural disasters...they said that something is going to come from underneath our islands...I used to think that this is going to be a mountain coming up...but now I'm convinced that it's going to be the rise in sea level

According to the responses from South Tarawa approximately 60 percent acknowledged knowing the legend of Nareau and interestingly most of these people were over 41 years of age while about 20 percent were from the 31 to 40 years group. For Kiritimati over 20 percent (over 41 years of age) acknowledged knowing the legend and over 30 percent from the 31 to 40 years of age (See Figure 5.1). Again most of these older participants confirmed that they heard the legend when they were young back in their home islands during special functions in the *maneaba*.

The legend was not as well known amongst the younger participants on South Tarawa and Kiritimati, probably because most of the younger participants have not been brought up on their home islands where this cultural practice was normally carried out. Today, most *maneaba* on South Tarawa are used for religious and social activities and rarely for traditional functions. Tabokai (1985:259) also explained that the *maneaba* is now "...being used more and more as a community centre...and accommodates such new forms of entertainments as movies, bingo and "island nights" with string bands".

5.2.2 Changes to the weather pattern

The local people on South Tarawa and Kiritimati have experienced changes to weather patterns and are becoming worried that these changes have in many ways

affected the potential of their atoll environment to support them. This concern was expressed by the people involved in the UHSQ, IDI and MGD in both urban areas. The result of the UHSQ for South Tarawa showed more than 90 percent of the participants considered there had been changes in weather patterns stating that the days are getting hotter than they were used to in the past. Similar results were also revealed by Kiritimati UHSQ participants where more than 80 percent stated they have experienced hotter days there (See Table 5.1).

Table 5.1 People’s views on climate change

Particulars	Sth Tarawa	%	Kiritimati	%
1. What people think about weather pattern:				
a) Cooler	0	0	2	4
b) Hotter	107	97	41	82
c) Don’t know	3	3	7	14
	110	100	50	100
2. What people think about the sea level:				
a) Higher now	107	97	40	80
b) Same as before	1	1	2	4
c) Don’t know	2	2	8	16
	110	100	50	100
3. Impacts on the urban environment:				
a) Coastal erosion	88	80	27	54
b) Frequent droughts	0	0	12	24
c) Water salty	22	20	4	8
d) Birds decreasing	0	0	7	14
	110	100	50	100
4. Will sea level affect potential of the land to support livelihoods of the people:				
a) Yes	104	95	38	76
b) No	6	5	12	24
	110	100	50	100

(Source: UHSQ 2012) (Key: Sth – South)

Participants from both South Tarawa and Kiritimati also explained that during high tides, the level of the sea was higher than what they used to see in the past. Responses to the UHSQ also showed that high tides today are usually accompanied by rough seas that damage coastal areas. During the IDI at Eita village, it was explained to me that:

Two rows of coconut trees on my land have been destroyed during high tides...I have moved my cooking house from where it was originally built because the land has been badly eroded during high tides (IDITR14)

5.2.3 Major impacts on the land and resources

The IPCC WGII AR5 (2014), recognized the fact that climate change in small island nations, which include Kiribati, has serious negative effects especially on socio-economic conditions and bio-physical resources. The Kiribati National Adaptation Program of Action (NAPA) also explained that climate change and its impacts have exacerbated environmental problems which pose challenges to the development of the country. Storm surges and extra high spring tides have caused flooding and erosion which threatens existing urban infrastructure such as roads, and buildings which are required to be protected (Republic of Kiribati 2007).

Similar problems were also revealed by the responses of South Tarawa and Kiritimati UHSQ participants. It was indicated that coastal erosion of the land and increasing salinity of groundwater were the major impacts of climate change on the urban environment of South Tarawa while for Kiritimati coastal erosion, frequent droughts and others were listed as major impacts on the urban environment (See Table 5.1). It was indicated by South Tarawa participants that the rise in sea level is likely to affect the potential of the urban environment to support the population in the long term.

During high tides and more critically “king tides” most coastal areas on the ocean sides of the islets that comprise the atoll have experienced erosion and destruction of coastal vegetation. For Kiritimati, about 80 percent of the participants agreed that sea level rise is likely to affect the potential of the urban environment to support the population and development in the long term (see Table 5.1). For instance, Figure

5.2 shows the remains of a home at Temaiku, South Tarawa that was completely destroyed by the sea during high tides in 2012. The owner of the house explained his family had moved twice on the ocean side of their land before moving to the lagoon side. The major reason for taking this action was simply because part of the land where they built their house was eroded badly.



Figure 5.2 Temaiku home completely washed away by the sea

(Source: Photo by Author 2012)

Field work on South Tarawa in 2011 and 2012 also shows frequent and intense damages to not only coastal areas but also to human properties. The king tides of 2012 and the recent king tide in March 2014 all had similar impacts on both humans and urban infrastructure (refer to Figure 5.3). Flooding of the land with sea water during king tides impacted almost everything on the land. Groundwater that provides the main source of water for atoll dwellers is the most at risk from both salinity increase and contamination from human activities. In most areas around South Tarawa today, water fetched from dug wells around homes is no longer hygienically suitable for human consumption due to the level of salinity and contamination from human activity on the land.



Figure 5.3 Flooded home on South Tarawa during the 2012 King Tide

(Source: Photo by Author 2012)

The recent king tides of 2015 has also caused severe devastation to some parts of urban South Tarawa. One of the worse affected part was Betio, especially the areas on the lagoon side of the Betio hospital. Surprisingly, the intensity of the waves from the lagoon has pushed a small ship from the lagoon to the land adjacent to the main hospital and damaged the sea wall in that area. (See Figure 5.4). Other areas were also badly damaged like part of the Dai Nippon Causeway close to Bairiki as well as areas on the ocean sides of Betio and Bairiki.



Figure 5.4 Damaged of the sea wall during the 2015 king tides

(Source: Photo by Author 2015)

Residents living near the hospital confirmed that the sea flooded most parts of the hospital as well as the road where the ship finally rested on. When the tides was at its peak, it reached the hospital wards that were situated close to the lagoon side. Even though the sea wall was strong constructed using cement to withstand the forces of the waves during the king tides, it was not high enough to stop the sea from flooding the land. This is one major concern by the urban residents, those who live in government and private houses, and close to the lagoon and ocean side that during high tides that is associated with rough seas has always caused flooding of the land where they built on by sea water.

5.3 ISSUES AFFECTING URBAN DWELLERS LIVELIHOODS

Since independence, rapid economic and infrastructural changes started to impact not only the way people lived, but also the patterns of movement of the island people. The intensity of movement of people from outer islands to urban South Tarawa, the national capital and main urban centre, has continued to increase without showing signs of decreasing (Connell and Lea 2002). The importance of Kiritimati as an urban centre serving islands in the Line and Phoenix groups is also

increasing and has recently attracted migrants from the overcrowded areas of South Tarawa in particular. Political independence has seen an increase in bureaucratic and service sector employment which further expanded the urban services and functions and economic dominance of the major urban centres encouraging more urban drift.

5.3.1 Population movement

The growth in urban population, on South Tarawa and to a lesser extent Kiritimati, has resulted in mounting pressures on limited existing urban services and infrastructure, traditional family structures, and on the dwindling limited natural resources. It also places considerable strain on the traditional social systems (Connell and Lea 2002, UNDP 1996). Consequently, it leads to the intensification of urban environmental and social problems as demand for space and resources by the urban dwellers increases. Population concentration and its effects on the resources were raised as major concerns by some participants in the IDI on Betio. According to IDITR21:

Population on Betio has increased and is becoming a major problem to us landowners...before we used to harvest green coconuts from any trees but now there is hardly any coconuts on trees as people harvest them even before they get matured...even now we cannot find young trees for cutting toddy as all toddy trees are used by people from outer islands

Additionally, the growth of the urban centres in terms of activities and population has further put pressure on existing urban infrastructure, services and the local environment (Bryant 1993) and it is likely that the rise in sea level caused by climate change is likely to worsen the urban problems on atolls. This problem was evident in the case of South Tarawa where pollution both of the land and lagoon fringing the urban area was obvious. Land shortage is major concern not only for the government but also the landowners who have become strangers on their island. IDITR5 explained this well when he stated:

In those days before this island became the capital, we used to live on our land and each family's house was built quite a distance from each other, and there was a lot of unused lands...today there is hardly any

space on Betio to build on, our land is full of houses and we now have no more land to build on.

5.3.2 Factors influencing the movement

The neglect of outer islands in Kiribati for development has influenced the movement of people from outer islands to especially South Tarawa and recently to Kiritimati. This aspect of movement is further discussed in Chapter Six. Two main groups of factors were identified in this study to have influenced the movement of people between the rural and urban areas: attraction and repulsion factors. The attraction factors relate to the “urban conveniences” on South Tarawa and a lesser extent Kiritimati such as perceived better housing standards, improved transport services, availability of modern health and education services, and the provision of employment opportunities which are not readily available on outer islands. According to IDITR22:

There are better things on South Tarawa like modern school facilities, medical services, more entertainments like night clubs, and more job opportunities than my home island (IDITR22)

Consequently, the modern lifestyle and improved facilities on South Tarawa attract outer island people to move. I-Kiribati people in the past travelled to explore other islands and to expand their power and territory. The same Kiribati nature is still evident today but now limited to exploring new things in the urban areas. According to IDITR12 “lifestyle on South Tarawa is easy, you just turn the switch on and you can listen to the radio, watch movies on TV, boil water, cook rice using electricity...life is so easy unlike what we were used to in our village”

The repulsion factors relate to the “outer islands’ boring and traditionally dictated lifestyles” which bind people to observe, without questioning, traditional village and family obligations such as attendance at all *maneaba* functions (village traditional obligations), fishing, cutting toddy and cultivating *babai* (family obligations). Another related factor includes the limited opportunities for cash income generation. During the IDI, participant IDITR11 explained his experience on his home island:

Life on my island was not easy, I usually woke up early in the morning to cut toddy then go fishing and in the afternoon collect coconut for copra and later work in my *babai* pit...this is not an easy task...this is why I decided to leave my home island

It was also indicated by UHSQ participants that business, education, employment and other opportunities were the major factors that influenced outer island dwellers to move to urban areas (see Table 5.2). Education was indicated as the major influencing factor that encourages outer island people to move to South Tarawa. They indicated that school facilities and resources (e.g. computers and libraries) in outer island schools, including the junior secondary schools, were poor compared with schools in urban areas. The non-availability of reticulated electricity on the outer islands limits the use of computers and other school resources that require the use of electricity to situations where a generator can be used. Many Kiritimati participants indicated availability of jobs as the main factor that influenced them to move there. Approximately 50 percent of the UHSQ respondents indicated education as the reason for moving to South Tarawa while for Kiritimati about 46 percent moved for work (see Table 5.2).

Opportunities for work outside the subsistence sector on outer islands in Kiribati are very limited. The Island Councils and different church organizations provide limited work opportunities for people. Apart from this there are some private business people operating small scale retail outlets and other business ventures. For Kiritimati, other reasons such as seeking access to better land to settle, were also important drivers of migration. Kiritimati's large land area, unlike the overcrowded urban condition on South Tarawa, was given as an important reason for people to seek a new life there. According to IDIKR4:

Kiritimati is owned by the government. This is why I moved here in the early 2000s to look for land to live on as the land I used to live on South Tarawa was very small and overcrowded

The fact that lands on Kiritimati are state owned means that extracting resources from the land, especially copra, is not restricted. People on Kiritimati are free to collect anything from the land except in areas with sign-posted ponds where the fisheries department breed *baneawa* (milk fish) for export. Apart from this, people are free to harvest milk fish from the other ponds as well as fish from the sea and

coconuts and other resources from the land. The abundance of fish and coconuts, together with other resources from both the sea and land, has greatly influenced migration to Kiritimati from South Tarawa.

A number of settlements have been established in different parts of Kiritimati away from the main villages by families seeking a new home. The main income-generating activities in these settlements are copra cutting and fishing. People who live in these settlements are happy that they have land to settle on and resources to support their livelihoods. A migrant to Kiritimati shared his experience during the IDI on Kiritimati:

This land is rich in resources...even though I cut copra every day, there will always be coconuts to cut the next day. I can't cut copra on Betio as there are hardly any coconuts even on the trees...when I go fishing I just fish from the beach and I usually catch plenty fish (IDIKR12)

During the IDIs and MGDs outer island immigrants gave several reasons for leaving their home islands. The majority of the people who are now residing on South Tarawa followed their parents when they moved to the urban area. More than 50 percent of the participants said following their parents was the major reason for coming to South Tarawa while for Kiritimati about 40 percent blamed the non-availability of employment on their home island (See Table 5.2). Many of the children who travelled with their parents to South Tarawa while they were young have not returned to their home islands. As explained by IDITR15:

I was very young when my parents moved to Betio...since then I have lived here all my life...I have returned to my home island once to visit my grandparents but did not stay there long...I really don't know my island well and to me Betio is my home island.

Table 5.2 Major reasons for migration in Kiribati

Particulars	Sth Tarawa	%	Kiritimati	%
1: Reasons for moving to urban areas:				
a) Business	5	5	5	10
b) Education	54	49	13	26
c) Employment	23	21	23	46
d) Others	28	25	9	18
	110	100	50	100
2: Reasons for leaving home islands:				
a) Follow parents	59	54	16	32
b) Medical	4	4	4	8
c) No Work	19	17	19	38
d) Others	28	25	11	22
	110	100	50	100

(Source: UHSQ 2012)

Improved sea and air transportation in Kiribati has also played an important role in making the movement of people between islands, particularly from outer islands to urban areas, easier and faster. Shipping services are currently provided by the government owned Kiribati Shipping Services Limited (KSSL) as well as some privately owned shipping companies. The majority of outer island people still use sea transportation as it is much cheaper. Air services between islands in Kiribati, mainly islands in the Gilbert group, have also witnessed considerable improvement with the construction of airfields on all outer islands.

Outer islands in the Line and Phoenix groups have no airfields except Canton and Fanning; however airfields on these islands have not been in use for quite a long time. Kiritimati used to have four different airfields, however all with the exception of the Cassidy International are no longer in use. A weekly international service is currently provided to Kiritimati from Fiji and Hawaii by Fiji Airways. Due to the distance between South Tarawa and Kiritimati, the cost to travel by boat to Kiritimati is almost equivalent to the cost of the air ticket.

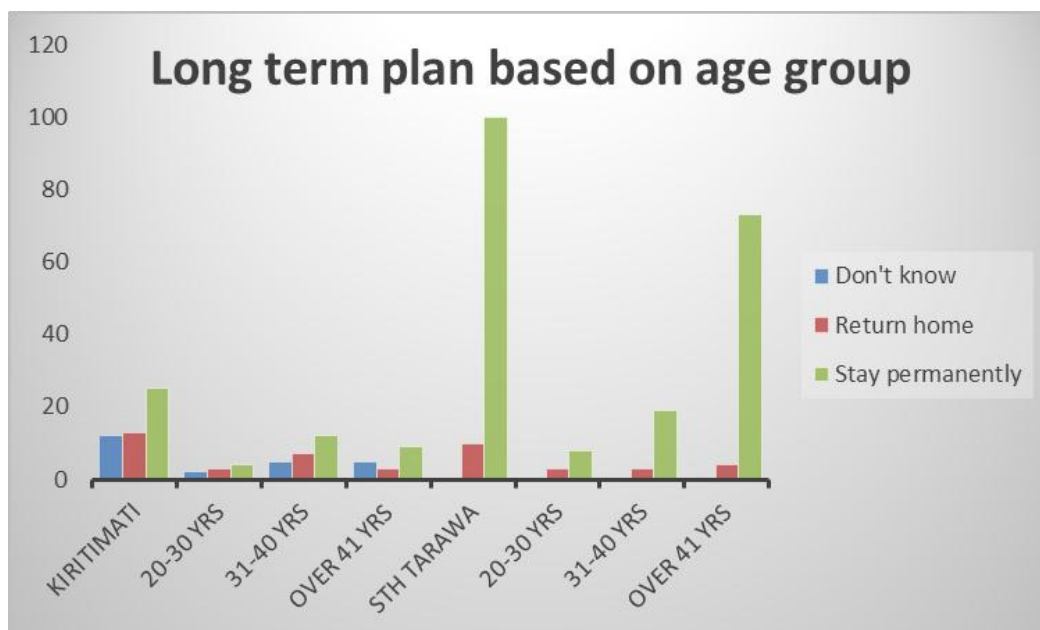


Figure 5.5 Migrants long term plan based on age group

(Source: UHSQ 2012)

It was also interesting to note from the responses of participants in South Tarawa especially that most have made up their mind to stay permanently in town (see Figure 5.5). This compares with only 50 percent for Kiritimati although they have not been on the island for as long as those on Tarawa. It was also noted that 24 percent of the participants from Kiritimati were not sure what they would do in the future. These participants were those employed by the Kiribati government and were not sure whether they will continue to work there or be transferred to South Tarawa later. Urban migrants during the IDI also indicated that they viewed South Tarawa, in particular, as their permanent home. Participant IDITR17 explained:

All my children were born on Tarawa and I have bought this land and built this house for all my children...all my children are working here and some have married...I have no house on my home island so I don't have any plans to return to my home island in the future...where I am settling on now is home for me and my children

Another important factor that influenced people's decisions was the well-established homes they have established on South Tarawa. Many people who moved to South Tarawa and secured a job have acquired a piece of land from *kain Tarawa* and built their new homes. Some have, after their retirement, used their Kiribati provident fund entitlement to establish a small business for their family.

Economic opportunities in the urban areas have also influenced urban dwellers in their decisions. A similar reason was also highlighted in the response of IDITR23:

Since I moved here from my island, I started a small fishing business...first I used my canoe and fishing net and the money I received I managed to save and bought a wooden boat and a small Yamaha engine...now my business is growing and earning good profit for my family...I have also started this small retail shop beside my house...my home is here not my home island

The majority of the outer island migrants in South Tarawa have established themselves there and returning to their island would require another new start. When people do decide to return to their island they need to build a new home and this involves time and finance.

5.3.3 Urban settlements and accommodation

Most urban accommodation in the towns is built from imported materials unlike the locally built houses on outer islands. Accommodation for urban workers, especially government employees, is provided by the Kiribati Housing Corporation (KHC). Besides the KHC, the Betio Town Council (BTC) and Teinainano Urban Council (TUC), as well as the private sector, provide accommodation to urban dwellers. Urban housing, especially for government employees, has become a major concern because demand exceeds the number of available houses provided by the KHC. As a result civil servants have opted to secure housing from people who provide long and short term rental accommodation. Other people have taken a more practical approach by securing a piece of land, or illegally squatting on government undeveloped leased land, and building their own houses on it. IDITR24 explains:

When I started work in the early 1980s, housing was not a problem...but now it is very hard to secure a house...most government employees today have opted to buy a piece of land to build their house on and commute to work from there...other workers live with their relatives who have already secured a house

Table 5.3 Types of urban accommodation

Particulars	Sth Tarawa	%	Kiritimati	%
1. Where employee lives:				
a) KHC	50	45	20	40
b) Rented House	10	10	9	18
c) Private House	50	45	21	42
	110	100	50	100
2. People per household:				
a) 1 to 3 people	3	3	2	4
b) 4 to 7 people	104	94	29	32
c) More than 8 people	3	3	19	64
	110	100	50	100
3. Types of building materials				
a) Local material only	1	1	3	6
b) Imported material only	94	85	32	64
c) Mixed material	15	14	15	30
	110	100	50	100

(Source: UHSQ 2012)

An increasing number of urban residents are living in their own homes. Providing long term leased plots on Kiritimati is not a concern for the government as all land on that atoll is state owned. Urban accommodation on South Tarawa for government employees is not sufficient to cater for all workers and as a result many have acquired lands from *kain Tarawa* and built their own private houses. Apparently, government plans to construct more houses for urban residents but this will be difficult due to the shortage of land on South Tarawa.

As indicated by the UHSQ participants, only 45 percent live in government houses while the rest live in their own houses or rent accommodation. The same thing happens in Kiritimati where only 40 percent live in government houses while the rest live in their own houses and rental houses (Table 5.3). Land shortage on South Tarawa was realised in the early 1980s when Itaia (1983) indicated one of the main problems facing the KHC was the limited availability of land. Today, the government faces a similar situation when it comes to building more infrastructure.

The Kiribati National Parliament (KNP) building has been built on accreted (reclaimed) land on the lagoon side at Ambo. The construction of high rise apartments, to solve the urban housing shortages, unfortunately is not encouraged as the structures cannot be supported by the sandy soil of Kiribati. Consequently, by the late 2000s the KHC only managed to provide 1,115 houses on South Tarawa. A further 102 were added later making a total of 1,217. Most of the houses built in the 1960s and 1970s are in very poor condition and require urgent repair and maintenance (Kiribati National Statistics Office 2012).

To help the housing problem on South Tarawa, a further 62 climates high density housing units well suited to tropical are being built to improve the health of the people as well as eating the overcrowding problem (New Zealand Ministry of Foreign Affairs and Trade 2013). Two areas in Bairiki were cleared in early 2015 when old houses were demolished, and the construction of new houses started. It is expected that the houses will be ready for use in 2016. This is part of New Zealand's financial aid to Kiribati.

According to the 2010 Population Census, the average household size for South Tarawa and Kiritimati is seven people (Kiribati National Statistics Office 2012: 31). Ninety-four percent of the households surveyed in South Tarawa had four to seven persons living in their house (Table 5.3). Kiritimati households seem to have more people living in one household simply because most people have relatives staying with them while they wait for approval of their lease plot applications.

The situation on South Tarawa is different as relatives without a home will continue to stay with their hosts until they manage to acquire land to build their house. However, there were people who, even though they were not able to secure full time employment, managed to secure land through the help of their own families and friends who know *kain Tarawa* who can provide land for them. Usually these people, despite having no formal employment, have worked hard while living with their relatives selling food like donuts and home baked breads and having other small scale income generating activities which have allowed them to save money for future use. Other people have children working as sea-farers on overseas shipping companies which has helped them to pay for the land on South Tarawa

(Borovnik 2006). Some people who have moved to South Tarawa live with relatives, who do not have jobs. These people often end up living in squatter settlements as consent to secure a place in such settlements is easy to obtain and is cheap. As a result, more and more urban people are seeking accommodation in squatter settlements.

5.3.4 Urban water source and provision

The main sources of drinking water for urban residents are piped water, rain water and well water (Table 5.4). The Public Utilities Board (PUB) provides piped water for urban residents on South Tarawa while the Kiritimati piped water supply falls under the institutional responsibility of the Ministry of Line and Phoenix Island Development (Jones and Merz 2007). The Public Utilities Board (PUB) operates a water reticulation system which pumps ground water from Bonriki and Buota water reserves through infiltrated galleries to water treatment plants for chlorination. After raw water is treated, it is pumped to various over-head tanks located at different sites throughout South Tarawa.

The number of urban houses connected to the reticulated water system increased from 2,000 in 1995 to 3,500 in 2005 (ADB 2008). For Kiritimati piped water is accessed by approximately 85 percent of the population (Jones and Merz 2007). The on-going Kiribati Adaptation Program (KAP) is working on improving the urban water system for South Tarawa and it is expected that the provision of water will improve with more houses having good access to piped water when the program is completed in 2016.

The use of well water is becoming less important on South Tarawa due to the high levels of contamination in the most densely populated areas of Betio, Bairiki, Nanikai and some areas of Bikenibeu caused by pit latrines, leaking septic tanks, pig waste, and industrial waste (Jones and Merz 2007). As a result very few households on South Tarawa use water from their dug wells for drinking. Approximately 87 percent indicated they have dug wells (Table 5.4). They only use it for washing and bathing. As explained by IDITR6:

I used to drink from my well before but now it's no longer safe to drink from it...I now only used it for washing clothes and bathing. The main reason for not using it is because it is very brackish and also the colour of the water has changed it's not as clear as before.

Respondents to the UHQS expressed similar concerns about the quality of reticulated urban water on South Tarawa saying it is becoming polluted and more salty. By comparison, on Kiritimati well water was not a major concern as people said it was still good for drinking. A recent estimation of ground water sustainable yields, assuming a demand of 100 litres per person per day, for the two urban areas shows that the South Tarawa urban population is over two-and-a-half times the maximum urban population able to be sustainably provided with water (Table 5.5). Not surprisingly, PUB has taken measures to ration the provision of water to urban residents (White 2007). The situation in Kiritimati is different as people are still using dug wells for drinking and domestic use hence about 80 percent of participants have dug wells beside their house (See Table 5.4). Kiritimati water provision is still below the maximum population estimate and hence the quantity of available water is not a major concern at this point in time.

Table 5.4 Urban water source and supply

Particulars	Sth Tarawa	%	Kiritimati	%
1. Main source of water				
a) PUB	83	75	38	76
b) Own Tank	17	16	7	14
c) Well water	10	9	4	8
d) Others	0	0	1	2
	110	100	50	100
2. Households with dug wells				
a) Yes	96	87	40	80
b) No	14	13	10	20
	110	100	50	100
3. Concerns about water supply and quality:				
a) Yes	103	94	26	52
b) No	5	5	24	48
c) No response	2	1	0	0
	110	100	50	100
4. Main water concerns:				
a) Becoming salty	87	79	17	34
b) Polluted	13	12	14	28
c) Other	10	9	18	36
d) Don't know	0	0	1	2
	110	100	50	100
5. Concern about future water provision:				
a) Drought	8	7	15	30
b) Population	97	88	23	46
c) Others	2	2	12	24
d) Don't Know	3	3	0	0
	110	100	50	100

(Source: UHSQ 2012)

Table 5.5 Estimated sustainable yield

Island	Estimated sustainable yield (m³/day)	Estimated maximum population	Present Population (2010)
South Tarawa	2000	20,000	50,182
Kiritimati	2000	20,000	5,586

(Source: White 2007; Kiribati National Statistics Office 2012)

People are starting to become concerned about the future provision of fresh water. In the UHSQ (Table 5.4) factors such as drought were also mentioned alongside the level of salinity and pollution of well water. However, the major concern for both South Tarawa and Kiritimati participants was the impact of population pressure on provision of water. This was highlighted by participants in the IDI and MGD:

...water is our main problem because our main source of water is the PUB piped water...however PUB water is now rationed so when the water is on in our area we will collect as much water as we could...but because we don't have enough containers to store water in, we always run out of water before water on our side is opened again...as a result we have to use our well water even though it's polluted...we have no other source of water (IDITR10)

Water is a major concern on Betio and so too in other parts of South Tarawa as most wells have become very polluted and salty that people have abandoned using them for drinking...in the past we drink water from our wells on Betio but now we don't...only people with rain water tanks collect rain but those without rain water tanks they can't...the PUB water is not reliable as they now rationed water to certain areas during the week (MGDBE)

According to respondents, one of the major concerns relates to the operation of the existing water reticulation system which at times does not provide sufficient water for the people. Over extraction of fresh water in the Bonriki and Buota reserves has been the major contributing factor to the salty taste in the piped water on South Tarawa. As stated earlier, the main water reserves at Bonriki and Buota are not capable of supporting the increasing demand for urban water. Unless other water reserve areas are identified, the level of salinity in piped water will continue to increase.

The following are the main factors that were identified by participants during the IDI and UHSQ as the main causes of concern about the future provision of urban water supply:

- a) Increasing urban population
- b) Contamination of underground water by human and industrial waste
- c) Climate change – rise in sea level and frequent occurrences of droughts both of which affect underground fresh water lenses
- d) Improper waste disposal methods affecting the taste of water
- e) Vandalism of water pipes by urban residents, especially those in squatter settlements
- f) The inability of the Public Utilities Board to provide constant urban water supply – limited finance and local expertise
- g) Insufficient water catchment at homes (IDI and MGD 2012)

Water supply has been identified as one of the most critical problems confronting the population on South Tarawa and, to a lesser extent, those living on Kiritimati. Prolonged periods of drought on South Tarawa in the past have affected the supply of rain water for tanks. Government has placed considerable effort into maintaining and upgrading the existing water reticulation system on South Tarawa to produce sufficient water for the urban population (Castalia Strategic Advisors 2009). However the supply of water still faces problems. Some households at Eita and Banraeaba still use well water for drinking and domestic use. The intensity and frequency of king tides, as well as other climate change-related problems have slowly affected groundwater especially by making it more brackish.

On Kiritimati the main concern with urban water provision relates mainly to the efficiency of the current piped water system which frequently fails to provide water constantly. As to the quality of well water, this sometimes can be affected by prolonged periods of drought. When this occurs the water becomes brackish. However, when the wet season comes the taste will become good again. Climate

change related factors, especially the rise in sea level, could severely affect the quality of ground water. Increasing urban and human activities on the land could also potentially affect the quality of groundwater.

5.3.5 Energy provision and usage

The PUB caters for the provision of electricity 24 hours a day. Electricity is provided to all areas of South Tarawa and some parts of North Tarawa. Every electricity consumer is metered to monitor the rate of consumption. Charges for electricity consumption are paid to the PUB. During the colonial administration, electricity was supplied from the main power station on Betio while a smaller power station at Bikenibeu catered for emergencies at the hospital during power blackouts. The Bikenibeu power plant was closed during the 1980s after a long court battle by the land owners. Another power plant was built at Bikenibeu which, since its completion, has been the main power plant for South Tarawa. For Kiritimati, every centre has its own generator that provides electricity 24 hours a day.

Urban residents stated that electricity is important as it not only provides light but also enables them to generate income through small scale business. For instance, people with deep freezers will make ice blocks and sell them while fishermen keep their catch when they return from fishing late in the evening. The frozen fish will still be fresh when sold the next day in the fish market.

Due to the high cost of electricity, the majority of the urban households use kerosene stoves and open fires for cooking. South Tarawa UHSQ responses indicated that about 90 percent of households use kerosene stove in cooking compared to approximately 50 percent on Kiritimati. Open fires accounted for a further 38 percent on Kiritimati where the supply of firewood is much better than on South Tarawa.

Table 5.6 Power and consumption

Particulars	Sth Tarawa	%	Kiritimati	%
1. Homes connected with electricity:				
a) Connected	107	97	41	82
b) Not connected	0	0	8	16
c) No response	3	3	1	2
	110	100	50	100
2. Methods of cooking:				
a) Electric stove	2	2	1	2
b) Gas stove	7	6	3	6
c) Kerosene stove	98	89	26	52
d) Open fire	3	3	19	38
e) Others	0	0	1	2
	110	100	50	100

(Source: UHSQ 2012)

On Kiritimati the most common types of fuel for fires are dried cut trees, coconut husks and leaves, cardboard, and copra bags and car tyres. The disadvantage of using dried cut trees is that some of the trees have important traditional uses such as for construction and medicines. The common trees that people said they used as fire wood include breadfruit, coconut, *kanawa*, *uri* and others (*te mao*) which all have important traditional values. Some households on Betio explained that the productivity of their breadfruit trees has been severely affected after they started cutting branches for use as firewood. Concern about the availability of firewood was also raised during the IDI as well as by participants in the MGD:

most important trees on Betio like *te nii*, *te kaina*, *te mao* and *te uri* are hard to find today as people have continued to use them for firewood...people normally cut the branches and sometimes the whole tree and dry them under the sun for use as firewood (IDITR2)

the shortage in supply of firewood on South Tarawa has forced people to use anything they can find and use as fuel for their fires...people have even used car tyres and live trees for firewood on Betio in particular (MGDBE)

The use of live trees like *te uri* and *te mao* has led to these important traditional trees being hard to find today. I-Kiribati residing between Bairiki and Bikenibeu have also indicated with great concern that they are experiencing a shortage of medicinal trees as a result of their consumption as firewood. The shortages in both available firewood as well as medicinal plants will worsen as the country's population continues to urbanise, especially on South Tarawa. IDITR22 explained that "...it is now hard to find medicinal trees around Bairiki and Betio because people are just cutting any trees that they could find for their fire woods..." This problem is likely to worsen in the future when the remaining coastal trees become affected by the rising sea.

5.3.6 Waste and disposal

On South Tarawa, human excreta have been disposed using two main methods. Previously during the colonial period, the *kainakotari* (beach house) was used. This was the communal latrine constructed over the lagoon for use by residents occupying the D, E, and F type grade houses as well as by the occupants of the labour lines. The *kainakotari* was abandoned during the outbreak of the cholera epidemic in 1977. The septic tank system is the other system which is still in use today. Grade A, B, C and modified C type houses have built-in toilets and use septic tanks. Government houses with septic tanks have been linked into the sewerage system that was installed in the 1980s. Other private houses with toilets connected to septic tanks were upgraded to the sewerage system during this time. The sewerage system was installed in the three main urban centres; Betio, Bairiki and Bikenibeu.

Results of the South Tarawa UHSQ show about 56 percent use the sewerage system while 23 percent using the septic tank system for disposing human excreta. The remaining 21 percent either used the beach, bush and other methods to dispose of excreta. Similar results were revealed in the Kiritimati UHSQ where approximately

66 percent were using the septic tank system while 12 percent were connected to the sewerage system. The UHSQ results also confirmed that people still prefer to use their traditional method to dispose excreta on the beach and in the bush (Table 5.7).

The major disadvantages with septic tanks is that they cannot be guaranteed to always be sealed as sometimes cracks can occur and waste seeps into the ground and contaminates the underground water lenses. Wells that are close to the septic tanks can easily contain contaminated ground water making it unsafe for human consumption (ADB 1996). The sewerage system also can pollute certain places in the sea where waste is being disposed. With the sea being the main provider of food to the people, the disposal of sewerage into the lagoon renders several places in South Tarawa unsafe for fishing.

Table 5.7 Main disposal methods

Particulars	Sth Tarawa	%	Kiritimati	%
1. Methods used in disposing urban human wastes:				
a) Beach	14	13	3	6
b) Bush	9	8	4	8
c) Septic toilets	25	23	33	66
d) Sewerage	62	56	6	12
e) Others	0	0	4	8
	110	100	50	100
2. Common methods of disposing households wastes:				
a) Backyard	3	3	5	10
b) Beach	3	3	1	2
c) Burn	0	0	8	16
d) Bury	5	4	1	2
e) Collected by Council	2	2	29	58
f) Feed pigs	97	88	3	6
g) Others	0	0	3	6
	110	100	50	100
3. Methods of disposing tins, cans etc.:				
a) Recycle	27	25	11	22
b) Collected by Council	83	75	17	34
c) Dispose anyhow	0	0	3	6
d) Others	0	0	19	38
	110	100	50	100

(Source: UHSQ 2012)

Urban households on South Tarawa and Kiritimati use different methods to dispose of their waste. The results of the UHSQ showed the main methods used in disposing of waste are: feeding it to pigs, burying it, putting it in backyard, leaving it on beaches and using council disposal. On Kiritimati the order is: council disposal, burning, backyards, feeding pigs, beach and bury (Table 5.7). Most of the urban

household waste is food left overs which is used to feed domesticated pigs. Other waste like bottles, cans, papers and the like are taken to the recycling plant at Betio and collected by the Councils (Table 5.7). The other common method is burying and burning waste. Lack of available land for disposal of waste has been a major constraint facing the urban people. The lack of understanding about disposing of waste appropriately contributes to pollution of the ground water lens. This was revealed in the responses to the UHSQ where majority of the UHQs participants still dispose their household wastes in their backyards.

Recycling of wastes has become widespread on South Tarawa and Kiritimati. About 30 percent of participants in the UHSQ indicated they used the recycling facility at Betio for disposing of tins, plastics and bottle wastes from their homes while more than 20 percent on Kiritimati also recycle their waste. IDI participants also highlighted the importance of recycling as shown below:

Previously I used to dispose empty tins and bottles anyhow, on the beach or in my backyard...but now I use the Council for bottles and tin foods and the recycling bin at Betio for empty aluminium tins (IDIKR8)

5.3.7 Other aspects of significance in the urban environment

Concerns have been highlighted about the current pace of development and especially the need to integrate environmental considerations into the economic planning of the country (Republic of Kiribati 2012; Wilson 1994). The Kiribati government acknowledges the importance of the environment and its resources in the Environment Act 1999. Generally, the main objective of the Act is to safeguard the natural environment from any act or development that could destroy or harm resources. It also provides for consents for development that affect erosion such as causeways, sea walls, and land reclamation and also addresses litter and groundwater pollution control.

The importance of the urban environment was also revealed in the UHSQ where over 90 percent of participants from South Tarawa indicated they are very much dependent on the urban environment for resources to sustain their livelihoods. A similar result was revealed for Kiritimati where over 80 percent also rely on the urban environment for resources (See Table 5.8). This response clearly shows that

the urban dwellers in Kiribati are still much attached to their land as it provides everything to support their survival.

Table 5.8 Importance of the urban environment

Particulars	Sth Tarawa	%	Kiritimati	%
1. Dependent on urban environment: a) Yes b) No	106	96	43	86
	4	4	7	14
	110	100	50	100
2. Important land resources: a) Coconut tree b) Breadfruit c) Banana d) Pumpkin	69	63	31	62
	32	29	13	26
	4	3	3	6
	5	5	3	6
	110	100	50	100

(Source: UHSQ 2012)

Specifically, “urban environment” refers to the natural resources availability within the urban area that the urban population could utilize for their day to day living. These resources include coconut trees, breadfruit trees, banana, and the like that not only provide food but also building materials, and medicines to sustain the livelihoods of the urban people. As Table 5.8 indicates, coconuts and breadfruit remain important locally grown foods for people in the urban areas despite the reduction in their availability on South Tarawa. It is noteworthy, however, that even though *babai* and pandanus were important local food sources, they are no longer cultivated on Betio and other parts of South Tarawa as a result of clearing land for urban development and the pressure from the urban population for construction materials. Banana and pumpkin are slowly becoming important foods for the people on South Tarawa (eight percent) and Kiritimati (12 percent)

Periodically, shortages in the supply of certain imported staple foods such as rice and flour have resulted in people going back to their local food supplies including breadfruit. Because *babai* is no longer cultivated in most of South Tarawa, it is not

readily available for use when the demand for it occurs. When breadfruit is not in season, pressure on food supplies intensifies. When there is a shortage of imported food, people on South Tarawa will buy *babai* from Abaiang, which has a daily return ferry service to Tarawa.

5.3.8 Marine resources

The ocean is a provider of food for most I-Kiribati as well as being a source of great spiritual and physical satisfaction. Their closeness to and familiarity with the ocean has enabled I-Kiribati to develop special skills for acquiring resources from the sea. The results of the UHSQ as well as the IDI and MGD also revealed the importance of the ocean to sustain the livelihoods of the people (see Table 5.9).

According to the recollection of several *unimane* during the MGD at Betio, the people used to harvest *te ikari* (bone fish) on Betio during the full moon. Other fish like *te rereba* (trevally) were also harvested at certain times of the moon phase. However, as population intensified, the harvesting of fish changed where people harvested at any time. The same concern was also echoed by participants during the IDI on Betio where one respondent explained:

... before we usually caught *te aua* [mullet] and *te ikari* ... on the lagoon side... sadly this is no longer possible today due to the pressure from the urban people who have continued to harvest fish anytime using smaller sized fishing nets (IDITR18)

Table 5.9 Importance of marine resources

Particulars	Sth Tarawa	%	Kiritimati	%
1. Households using reef fishing:				
a) Yes	101	92	26	52
b) No	9	8	24	48
	110	100	50	100
2. Households using ocean fishing:				
a) Yes	25	23	35	70
b) No	84	76	15	30
c) No response	1	1	0	0
	110	100	50	100
3. Households using lagoon fishing:				
a) Yes		96	34	68
b) No		4	16	32
	110	100	50	100
4. Most harvested fish:				
a) <i>Ikanibong</i>	53	48	15	30
b) <i>Te aua</i>	7	6	1	2
c) <i>Baneawa</i>	0	0	31	62
d) <i>Ikari</i>	9	8	1	2
e) <i>Ninimai</i>	41	38	2	4
	110	100	50	100
5. Causes for fish decline:				
a) Uncontrolled harvesting	14	13	23	46
b) Population demand	94	85	15	30
c) Others	2	2	12	24
Total	110	100	50	100
6. Methods to control decline:				
a) Control harvesting	76	69	32	64
b) Ban undersize catch	33	30	11	22
c) Others	1	1	7	14
Total	110	100	50	100

(Source: UHSQ 2012)

Lagoon fishing is becoming an important source of income for the unemployed people in both South Tarawa and Kiritimati (Table 5.9). Households that engage in this activity usually sell fish to employed people in the government and private sectors. An important factor that makes lagoon fishing popular amongst the urban population is that the method was easier and cheaper to use. It only requires a fishing net or fishing lines and hooks. During bad weather and rough seas, it is still safe to fish in the lagoon. IDITR11 explained that “...lagoon fishing is the safest as even during bad weather I can still go fishing using my fishing net and still catch fish...”

Some Kiritimati people also harvest *baneawa* (milk fish) which breeds both in the lagoon and in fish ponds. Harvesting *baneawa* was mainly for commercial purposes. People salt and sun-dry milk fish and sell it to people on Kiritimati and some send dried *baneawa* to South Tarawa to sell. The major reason for people not engaging in ocean fishing is the expense involved. Ocean fishing requires a boat with an engine and fuel to take people to the fishing grounds. People engaged in ocean fishing are required to have two engines in case of emergencies and a Global Positioning System (GPS). Different types of fishing gear are required including special fishing rods with lines and hooks to catch bonito.

It was also indicated by research participants that *te ikanibong* (red snapper), *te aua*, *baneawa*, *te ikari*, and *ninimai* (Gerres sp.) were the most harvested fish species by the urban people (Table 5.9). For South Tarawa the *ikanibong* and *ninimai* were most harvested through lagoon fishing while harvesting of the *aua* and *baneawa* were declining and *ikari* is becoming scarce. Sadly, as explained by the old men on Betio during the *maneaba* group discussion, the *ikari* was no longer seen during certain times of the phase of the moon (season) on the ocean side. The major reasons for the slow disappearance of the *ikari* were over-harvesting and the construction of causeways. People can still harvest *ikari* today but only by using a net in the deeper parts of the lagoon. *Baneawa* is also becoming hard to catch in the lagoon. The Fisheries Department breeds *baneawa* in ponds located at Temaiku close to the Bonriki International airport.

As a result of population pressure on marine resources, the availability of fish is becoming a concern mostly in South Tarawa. Population pressure and uncontrolled harvesting of fish have been the major causes for the decline in fish stocks (Table 5.9). The majority of the South Tarawa participants indicated that population was the major cause of the decline, while Kiritimati participants blame the uncontrolled harvesting of fish as the major reason. Kiritimati participants also gave the increasing use of modern fishing gear as a reason for the reduction in fish stocks. It was indicated by IDI participants that using modern fishing gear also affects fish availability:

Most urban people today prefer to use the small size fishing net and this has resulted in the decline in fish stock especially in the lagoon where people mostly harvested fish from (IDITR20).

5.3.9 Health and treatment

The health of the population is an important indicator in any country and Kiribati is no exception. The Ministry of Health provides free medical services to the people through the four main hospitals; the Nowerewere General Hospital on South Tarawa, Betio hospital, Tabiteuea Hospital on Tabiteuea North and Kiritimati hospital on Kiritimati. Nowerewere hospital, Betio and Tabiteuea hospitals serve the health needs of the population in the Gilbert group while Kiritimati hospital serves the health needs for the Line and Phoenix people. There is no private health practice in Kiribati. Health services on outer islands are provided by different village clinics. Major health cases are referred to the main hospital on South Tarawa. Diagnosed problems that are beyond the capability of local medical practitioners are referred overseas (Kienene 1993).

Urban dwellers have experienced changes in lifestyles which have, in many ways, affected their health. Adopting western lifestyles has meant that people rely more on imported food stuffs than locally grown foods. This has caused increased prevalence of diseases such as diabetes, hypertension, and heart diseases that require medical treatment. The UHSQ showed diarrhoea and flu as being the most common type of diseases affecting the urban population on both South Tarawa and Kiritimati. It was indicated by South Tarawa participants that diarrhoea (more than 40 percent) and flu (over 60 percent) were the main diseases affecting the people.

Similar results were seen for Kiritimati where about 90 percent confirmed diarrhoea and flu as the major diseases affecting the urban population (see Table 5.10).

Table 5.10 Health issues and treatments

Particulars	Sth Tarawa	%	Kiritimati	%
1. Common diseases in urban areas:				
a) Diabetes	1	1	3	6
b) Diarrhoea	37	33	19	38
c) Flu	70	64	23	46
d) Hypertensions	1	1	3	6
e) Others	0	0	2	4
f) No response	1	1	0	0
	110	100	50	100
2. Main causes for diseases:				
a) Overcrowding	22	20	11	22
b) Unhealthy lifestyle	12	11	30	60
c) Water related	76	69	9	18
	110	100	50	100
3. Remedy for sick people:				
a) Hospital	102	93	40	80
b) Local medicine	8	7	10	20
	110	100	50	100
4. Availability of medicinal plants:				
a) Easy to get	0	0	33	66
b) Becoming extinct	24	22	0	0
c) Rare	13	12	7	14
d) Short supply	73	66	10	20
	110	100	50	100

(Source: UHSQ 2012)

The change in lifestyles for people residing in urban areas, especially South Tarawa, has seen an increase in the prevalence of these diseases. The results also reveal that these diseases are food and water related. During one of my interviews on Betio, I

was told that refined food such as white sugar, white rice and white flour have been the leading causes of diabetes and hypertension amongst the local people of Betio.

As stated by one participant during the IDI:

Our people have abandoned their locally grown food especially *babai*, pandanus, toddy, and fish and changed to consuming mostly imported tin food like tin fish, tin meat, sugar and flour...as a result most of our people today get sick easily as a result of the food they eat, we never get these diseases in the past. (IDITR2)

Not only has the change in the food eaten contributed to people getting these diseases but they are also caused by the way of life people have adopted. This includes people spending more of their time doing less work; watching television, playing cards, bingo, and drinking kava¹⁶. The high rate of smoking amongst the population also contributes to people getting heart and lung related diseases. The abandonment of local activities like fishing, cutting toddy, and cultivating *babai* have all contributed to the prevalence of these diseases.

The 2010 population Census gave the population density on South Tarawa at 3,180 persons per square kilometre and, unsurprisingly South Tarawa is experiencing overcrowding problems caused by population growth. Overcrowding places strains on urban resources such as water and food crops. The results from the UHQS also indicated overcrowding, unhealthy lifestyles, and water problems were considered to be the major contributing factors for people contracting diarrhoea and flu (Table 5.10). Lal et al (2014) also indicated that the outbreak of diarrheal diseases on South Tarawa was caused by overcrowding of people, especially during celebrations such as independence, Christmas and New Year gatherings. During the IDI on Betio, IDITR6 explained that:

Diseases like flu and coughs are easily spread because people in our area here live very close to each other...in our area here, when someone gets the flu or cough it will spread quickly to us and our neighbours and people in nearby houses...diarrhoea is very common here and this is because of the water we drink...it is getting very brackish that's why people especially young children gets diarrhoea easily.

¹⁶ Kava is a drink made from the root of the pepper tree. Kava is imported from Fiji and is becoming an important drink for people after work and during weekends.

Most people prefer to seek treatment in the hospital as it is free. Local medicine is also available but more people prefer the hospital. According to IDITR15 “...even though I still believe in our local medicine...I still prefer to seek medical help from our hospitals as they have more advanced equipment to detect my sickness and medicines to cure my sickness...” More than 90 percent of participants from South Tarawa indicated seeking treatment from hospital and 80 percent for Kiritimati (Table 5.10). It was also interesting to note that some participants still prefer to seek treatment using local medicines. However, such remedies are now becoming hard to obtain. On South Tarawa, most of the medicinal trees have either been destroyed or have been collected for use in local medicines by other urban people. The UHQS also indicated that for South Tarawa the availability of local medicines is in short supply and others have slowly become extinct. For Kiritimati the situation is different medicinal plants are still easy to obtain (Table 5.10).

5.4 CONCERNS ABOUT CLIMATE CHANGE

The President of Kiribati, Anote Tong, in his address to the United Nations in 2009 prior to the Copenhagen Conference of the Parties to the UNFCCC Summit declared that “... climate change is a challenge of our time ... and the people of Kiribati have already felt the impacts of it ... and it would worsen with time” (United Nations 2009). The President further highlighted the Kiribati Government’s desire to maintain its homeland and sovereignty despite fears of climate change impacts on the fragile atoll islands. During the UHSQ, IDI and MGD major concerns were also raised by participants about the rise in sea level and the ability of their low lying islands to support human existence in the long term.

In its efforts to ameliorate climate change impacts, the Kiribati government has included heads and representatives of Churches, representatives of *unimane* associations from all islands, mayors and clerks of Island Councils, representatives of women and youth organizations, managers of state owned companies, and representatives of non-government organizations and the community at large in their discussions and dialogue on issues of national importance to guide its development process. This is an important step where the voice of the people needs

to be heard. The dialogue examined possible future adverse effects of climate change on the land, population, water supply and food supplies.

The government has realised that climate change is slowly taking its toll on the land and affecting the potential of the environment to sustain the livelihoods of the people. Concern about this was best summarised in a statement by one of the IDI participants:

... today we are experiencing more frequent bad weather usually during high tides resulting in the destruction of our coastal vegetation and land areas...in the past we used to experienced bad weather during December and January but now it is very unpredictable...and our islands have continued to be affected badly (IDITR19)

The people are concerned that most islands, with the exception of Banaba, are low-lying atolls no more than four metres above sea level. They have no mountains to run to in case the sea rises higher than the level of the land. Despite the possibility that the islands might not be liveable in years to come as a result sea level rise and effects on water supply, there are people who are prepared to reside on these islands until they disappear. When participants were asked about their long term plans amidst threats from climate change, three main responses emerged: 1) those who wanted to stay, 2) those who wanted to migrate and 3) those who had not yet made up their minds (Figure 5.5).

Over 70 percent of the respondents in South Tarawa indicated they wanted to migrate to another country while 24 percent wish to stay on the island no matter what happens. In comparison only around 40 percent of Kiritimati participants stated they are prepared to migrate to another country while more than 50 percent would stay regardless of what happens (Figure 5.6). Those intending to stay are mainly older members of the population while those wanting to migrate are mainly the younger people. Similar responses were also given by participants in the IDI on South Tarawa and Kiritimati:

I am not prepared to migrate to another country as I don't know how to survive in a new country...I am sure Kiritimati will not be totally affected by the rise in sea level in the future...even if it's going to be affected by the rise in sea level I will still not move to another

country...if we all do something now to protect this island, it will not be affected in the future (IDIKR15).

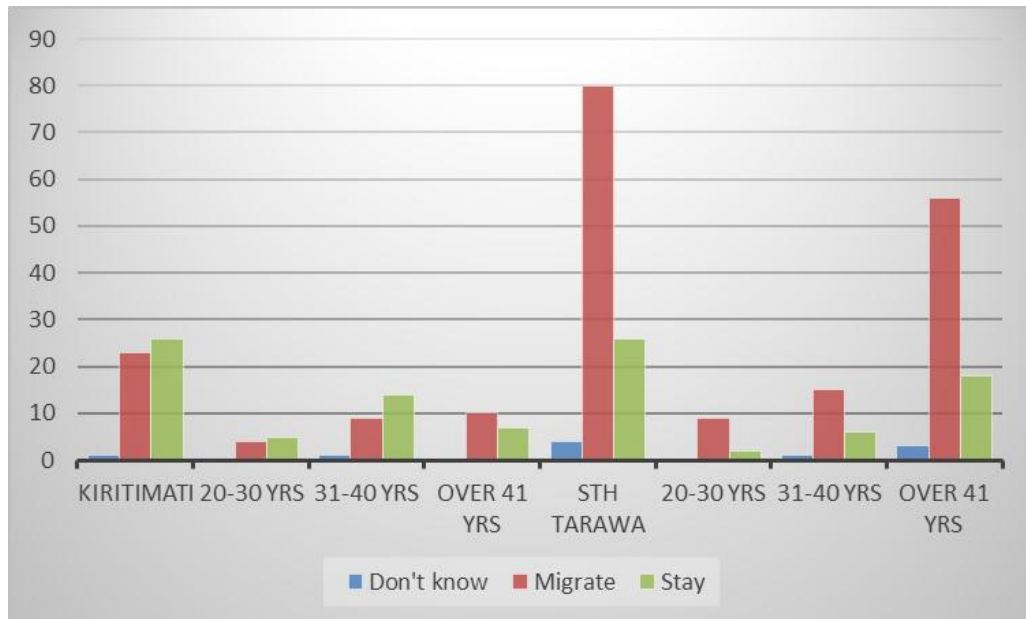


Figure 5.6 Future plans for urban residence

(Source: UHSQ 2012)

Another interesting factor that was echoed by participants in the IDI was their concerns about their children in the future. They were worried about the potential of the islands to support the livelihoods of those opting not to migrate. Consequently, participants have urged the revival of the Kiribati traditional culture so that their children will be able to use it in the future should the need arise. The following are two responses of participants in the IDI in which they explained their concern about their children and the importance of protecting the islands:

I am not scared of the rise in sea level but I am concerned about the future of my children on their land...how they will survive if our islands are going to be affected by the rise in sea level (IDITR2)

...we are people of the sea...we can always survive even when our islands are going to be affected by the rise in sea level in the near future...in the past our people have used our traditional skills to survive climate related events by building sea walls to stop erosion of coastal areas and vegetation...we can use these same skills to survive anticipated climate change impacts (IDITR15)

It was also indicated by participants that the people and the government should put in place strategies to protect, if not all, at least, some islands to ensure the survival of those people who don't want to move to another country. Concerns were also expressed during the IDI and MGD about people who wanted to migrate to another country and the difficulties they are likely to encounter in the new destination. As one participant in the IDI at Betio explained:

I am not prepared to leave my island and go to a new land that I am not used to...I know I belong here because I own a land...if I move to another country I will lose everything I have especially my land and I cannot tell whether I will live in peace or face problems from the people in the new land...I will be better off staying on my island and perish with it than move to a completely new land (IDITR22)

Another major concern that was raised by participants during the MGD in both South Tarawa and Kiritimati was the government's commitment to protecting the islands from climate change. Recommended strategies, based mainly on participants' responses in the UHSQ, IDI, and MGD, will be discussed in detail in Chapter Six. It is important to stress that participants were already aware of potential difficulties that they could encounter when migrating to a new destination. People who opt to remain on the islands, despite growing impacts from climate change, and those who opt to stay will likely encounter difficulties and it was felt the government should to put in place strategies to ensure the livelihoods of these people are maintained in the long term. Despite the uncertain future of the islands as a result of climate change, I-Kiribati have continued to hope that the islands will not become completely affected by the rise in sea level in the near future.

It was evident from the general responses of research participants that protecting the islands is an important solution they want to pursue to ensure the islands are able to continue to support the livelihoods of the people in the long term. The importance of land to the people is very clear in the following responses:

Our land is our life...we obtain food from it, it provides shelter for us, we get healing from it, and also receive spiritual power from it...when our land is destroyed by the rising sea...it will affect not only our home

but most critically our life...this is one thing I do not want to see happen to me in the future” (IDITR10)

I believe it is time to do something to protect our islands from future impacts of climate change...this calls for everyone to work together including landowners, different churches, youth groups, village groups, NGOs and the government to work together to find ways to protect our islands...I don't want to become homeless in the future (IDITR25)

5.5 CONCLUSION

One of the major problems facing not only the government but also urban residents relates to the shortage of urban land. Early migrants from outer islands were fortunate to have secured land on South Tarawa from *kain Tarawa* and the government. Unfortunately, increasing demand from the growing urban population on South Tarawa has exhausted the availability of land. These problems not only affect the people but more critically the government which is unable to pursue further development due to urban land shortage. The situation is further complicated by the squatter settlements on government leased lands. Pressure on urban water provision is another critical problem affecting the people and government. The water reserve areas are experiencing problems in maintaining constant water supply as the ground water lenses have been over-used.

Another problem associated with the increasing urban population is the sewerage system and disposal facilities. Limited finance and equipment together with land shortages for disposal sites makes this issue complicated to address. Consequently, people have been disposing of their household and other wastes on the beaches, in their backyards and other available places. While the councils have made efforts to address this problem, very little has been accomplished to date.

While the economic, environmental and social issues associated with rapid urbanisation have dominated planning in South Tarawa and to a lesser extent Kiritimati, climate related problems are becoming critical and require urgent attention by both the government and the people. Coastal erosion and groundwater problems have become major climate related issues. Addressing these requires not only the planning but also the finance to implement recommended strategies. The

government, with a limited annual budget, is unable to provide satisfactory solutions to address these issues.

The people have shown concern over climate related issues, especially the rise in sea level, due to the geographical makeup of the islands. I-Kiribati through their responses to the UHSQ have recommended that the government work together with the local people in looking for workable solutions to address climate related problems. Reviving and using traditional knowledge is one important approach to consider as I-Kiribati have special skills that can assist protect islands from the climate change.

There is sufficient evidence based on recent studies that given the inherent physical characteristics of small islands there is high level of vulnerability due to multiple stressors, both climate and non-climate. Therefore, the future of the islands and their people depends on what the decision makers decide to do now, not tomorrow. While finance and technology may become the major obstacles facing the government and the people in their pursuit for strategies to combat climate change and population related problems, seeking external assistance is one option that could be considered.

This was highlighted by the IPCC AR5 (2014: 2-3) which pointed out that the "... ability of small islands to undertake adaptation and mitigation programs and their effectiveness, can be substantially strengthened through appropriate assistance from the international community". The future of Kiribati as a country is very much dependent on appropriate strategies by the government and the people to ensure they continue to be able to support human populations and their livelihoods in the long term. The next chapter outlines the range of responses that may be adopted in Kiribati to deal with the pressures facing the country's urban populations.

CHAPTER SIX

DISCUSSION: OPTIONS FOR THE FUTURE

The effects of climate change may fall heavily on communities in Pacific Island countries...It is essential that research, planning, negotiations, and the development of appropriate funding mechanisms begin as soon as possible, because it will take considerable time to find the least disruptive solutions.

(Campbell 2010: 47)

6.1 INTRODUCTION

This chapter discusses what the local population see as major issues affecting their islands. It also explains their views on possible options that decision makers in Kiribati could consider in their development plans to ensure the survival of the people and their land from the challenges they expect to encounter from climate change and associated rise in sea level. Based on the responses of research participants during the IDI and MGD three important issues were identified. The first is the perception of people on the problems that are affecting the land and its resources from which they derive their livelihoods. The second relates to the issues caused by environmental factors such as climate change and sea level rise and how they will affect the urban livelihoods.

The concern is what they think should be done to minimise the impacts of these problems to safeguard the survival of the people on their islands. Hence, the discussion explores these issues and climate change from the eyes of the local population. The discussion also considers both past and present frameworks to help ease problems associated with increasing population pressure, ongoing urbanisation and limited options for economic development.

Contemporary climate related problems are discussed along with their effects on the land and the people. Finally, based on the results of participants' responses during the IDI and MGD, proposed adaptative strategies are recommended to assist decision makers and development planners in Kiribati and possibly other atoll countries to combat environment-related challenges in their towns and on the livelihoods of their people.

6.2 CONTEMPORARY ISSUES IN URBAN AREAS

...our main problem on South Tarawa is the lack of available land as most of the lands have been used by the government and occupied by the people...the people have exploited the natural resources from the land as well as the sea in order for them to survive...the government should look into this problem (IDITR22).

This problem has been realised by government and since the 1970s, the Kiribati Government has been initiating and implementing environment related programmes such as the Environmental Impact Assessment, Climate Change Adaptation Strategy, Solid Waste Management and Conservation Areas, National Adaptation Program of Action and Kiribati Adaptation Projects to name a few were established to ensure the country's land and marine resources are utilized sustainably. Most research participants have also mentioned their concerns relating to the unwise use of the resources and the protection of the environment. According to IDITR3,

...it is important for the government and the people to consider doing something now to help protect our land and sea resources from becoming totally destroyed as result of increasing population and more critically climate change...I don't want my children to live with this fear in their mind... (IDITR3)

Other recent programs including the upskilling of the young people, Phoenix Islands Protected Areas and land purchase in Fiji are geared at ensuring that the people are resilient in the face of future climate change-related impacts as well as the islands capable of withstanding future impacts of climate change. IDITR13 also raised important feedbacks regarding the future of our people and their land when he explained that:

“...the recent policy of our government to train young people so that they can find work abroad is a good move...however there will still be some people who will not want to move...these are the people that our government needs to consider and provide a home for them here”

6.2.1 Contemporary climate related problems

Despite the growing dialogue on climate change and its impacts on the people and the land they occupy, not everyone shares the same views on climate change and its anticipated impacts. There are those who are still sceptical and do not accept that

climate change is happening and contributing to the many environmental problems that are experienced today. While most research participants accepted the fact that climate change is affecting the islands in many different ways, there were also few who think that God can provide a solution to the problems imposed by climate change. According to IDITR21,

...I am not sure as to whether I believe that climate change will completely destroy our islands in the future...I am a Christian and I believe that God will provide the solution to our problem if we trust in Him...

Interestingly, most participants accepted that climate change is responsible for the growing climate related problems, especially the higher levels of the sea during high tides and king tides, warmer temperatures, and the increased frequencies and intensities of bad weather. It was discovered that most participants believe that climate change contributes to the many environmental problems that our people are experiencing today. As stated by IDITR28,

Eventhough I am a Christian, I know that the problems we face today are partly the result of what we have done to the environment...especially the bigger countries who are polluting our environment...we all have a responsibility to look for solutions to ensure our long term survival on our islands...

It is interesting to note that the majority of the people in Kiribati are aware of the environmental changes and their impacts on the land and the people. This was evident in the responses of the participants in the IDI and MGD when the majority indicated that already they have experienced problems as a result of climate change. Participant IDITR2 explained,

From my own experience, I can see that the main problem with climate change is not about the heat of the sun but about the rise in sea level during high tides and king tides...part of my land on the ocean side was severely eroded during recent high tides just this year...and despite our family effort to protect our land, the sea is stronger and as a result we have to move our houses to this side of the road.

The recent drought, from 2007 to early 2009, that affected the Gilbert group severely affected the water supply. It also turned ground water very brackish making it unhealthy for human consumption. Copra production was also severely

affected and this caused a significant decline in income for those in the mixed cash-subsistence economy sector. Surface air and sea temperatures for islands in Kiribati including South Tarawa and Kiritimati are projected to continue to rise. (Australian Bureau of Meteorology and CSIRO 2011; Government of Kiribati 2009). Similar concern about increasing temperature was also mentioned by most research participants during the IDI. As explained by IDITR16 he stated that the temperature is becoming a problem especially when they collect sea shells on the mud flat during low tides.

...our people can feel the heat when they collect shell fish during the day...before they could start collecting shell fish when the tide goes out and stay until the tides started to come in...now they will only spend one hour or more at the most as they cannot bear the heat...this has inevitably reduced the amount of shell fish they collect for their family...

Similarly, drought on Kiritimati usually affects the resources that provide income for the people. According to IDIKR6:

Several years back, when the drought affected this island, copra production and milk fish harvesting were severely affected and resulted in heavily impacting the livelihoods of those people whose source of income was derived from these resources

Since 2000, people have noticed an increase in sea level during normal high tides compared to what they were used to in the past. As explained by IDITR30, "...high tides these days are much higher than what I used to see before...now during any high tides the sea usually reaches my cooking house...this just started in the early 2000s". In recent times, king tides are even higher and destructive when accompanied by bad weather. Increasing sea level also increases the effects of storm surges, flooding of the land by sea water, damage to coastal defences and infrastructure such as causeways as well as causing severe coastal erosion. The recent king tides in late February 2014 caused severe damage to the main causeway that connects the densely populated urban islet of Betio and the main islands of South Tarawa (See Figure 6.1).

Even though the people have no formal instruments to monitor the impacts of climate change, there was agreement amongst the participants during the field work

on South Tarawa and Kiritimati islands, that climate change is responsible for the growing climate-related problems experienced on the islands. Their experiences, obtained through personal observation, have provided them with mental images of the things that have occurred on their island. Everyone I interviewed agreed that the weather is now getting hotter than what they were used to in the past as well as the sea level being higher during high tides. As explained by IDITR14, “...before when I went out fishing in the sea I usually stayed until late in the afternoon...now I return before midday as the heat of the sun is so strong...”



Figure 6.1 Damage of Dai Nippon Causeway by King Tide 2014

(Source: Photo by Tom Redfern 2014. Used with permission).

Similar problems with the water was mentioned by IDITR7 who stated that “...before you can use soap easily when you wash or bath with the PUB tap water...but now it is very hard to get the soap to lather with PUB tap water...”

Similar concern is not only affecting the urban population on South Tarawa and Kiritimati but includes outer islands as well. Abaiang, one of the outer islands close to the main island, has experienced such severe erosion that one of the villages had to be entirely relocated further inland as the previous location is now covered by

the sea. A delegation from the Kiribati Government has visited the village to discuss approaches to properly assist the people settle in their new location. Similar problems are being experienced on other outer islands and the Government is working to ensure the people and the islands are protected from future anticipated climate-related impacts.

For the Government and people of Kiribati, any slight rise in the level of the sea as a result of climate change could easily cause serious damage to the entire country (with the exception of Banaba). Even though the people have lived on these islands for millennia and have experienced high tides associated with bad weather that have caused severe coastal erosion and destroyed coastal vegetation, what the people are experiencing now is much worse than their past experiences. IDITR19 also indicated similar understanding when he explained that,

...in the past our people used to experience strong winds (westerly) accompanied by rough seas...and caused coastal erosion and destroyed coastal vegetation especially coconut trees...but the frequency was not as what we are experiencing now...no doubt the weather must be changing.

Erosion of coastal areas will continue to threaten existing infrastructure such as roads, houses and offices, on South Tarawa. While Kiritimati also experiences erosion in some areas, the huge land mass provides people the option to move to other areas should the need arises. This is not the case on South Tarawa as there is not much land available for people to move to. Sadly, land erosion is destroying important traditional resources such as coconuts and other trees that have medicinal and cultural significance. As explained by IDITR10,

Our culture dictates that our land is life to us...this is why every person owns a land...we get healing from it, and also get spiritual power from it...when our land is taken away by the rising sea...it will affect our survival as a people in the long term

Besides problems resulting from climate-related impacts is the issue of overpopulation caused not only by natural increase but more critically by rural to urban migration. As discussed earlier in chapter 3, internal movement of people to South Tarawa was controlled by the Native Passage Ordinance. However, since this was relaxed people from outer islands started migrating in numbers to seek

opportunities that were not available on outer islands. Since then, the population has grown dramatically resulting in South Tarawa becoming overpopulated. Even *kain Tarawa* (indigenous people of South Tarawa) find it hard to survive on their own land as all their lands have been used by either the government or by the new immigrants. As explained by IDITKT18,

...there are too many people from outer islands coming to South Tarawa and as a result the demand for land is high...before we have few houses around our area...since the early 1990s people started coming to build houses and now houses are built so close to each other that we hardly have privacy...

A similar conclusion was reached by the MGD participants on Betio when they explained that,

Overpopulation is the major problem especially on Betio and Bairiki today and landowners and those not working are the worse affected...it is sad to see that the government has no plan to help ease this problem...and with erosion of our lands as a result of climate change (rise in sea level) the situation is getting worse (MGDBE)

It was also indicated by an officer in the Lands Department during my field work that one of the main problems the government is facing relates to overpopulation. Most of the government's unused leased lands have been occupied by squatters who have no place to live on.

6.2.2 Vulnerabilities of urban environments

I have already pointed out that the average heights of islands in Kiribati are no more than four metres above sea level except Banaba. They are generally small in land size, fragmented and very isolated from the rest of the world. Due to the size and elevation of the islands, settlements are situated close to the beach on both the lagoon and ocean sides of the islands. As the islands are low and narrow there really is no high ground that the people could build on. . . “...I have come to accept the fact that our islands are very small and very low...they can easily be destroyed by high waves, very strong winds and even earthquakes...they are very vulnerable to any natural disasters...but it is my home and I love it...” (IDITR12). Despite the fact that Kiribati is located outside the cyclonic belt, the frequency and intensity of cyclones in the ocean area close to islands in Kiribati usually generates waves that

damage coastal areas of some islands. People have continued to experience extensive coastal erosion, not only of the beach but also of the land on which they live affecting their homes and important vegetation (See Figure 6.2).

The islands have and are continuing to experience increasing frequency of bad weather with associated increased wave heights which place increased pressure on the shoreline and coastal defences such as sea walls. It was indicated by urban residents in Eita village on South Tarawa, that during high tides and especially king tides, high waves break over coastal lands and sometimes their houses were flooded by the sea affecting human settlements and vegetation.



Figure 6.2 Houses flooded by the sea in Eita Village during high tide

(Source: Photo by Author 2013)

Waves of five metres in height have been recorded around Tarawa atoll. More recently, in some parts of South Tarawa, ocean waves upon reaching the beach were as high as 3.5 metres and waves of this height have destroyed parts of the land they struck. During the IDI at Temaiku, a participant recalled the effects of the 2011 king

tide when a wave surge covered the whole area where they were living. He explained that:

The water reached our house so fast that all we could do was stay on our *buia*¹⁷ and wait for the sea water to stop moving inland and watched hopelessly as the sea carried our belongings with it...when the water stopped moving inland, we went down and collected them and put them on our *buia* (IDITR7)

Infrequent rainfall, non-availability of surface water like rivers and lakes coupled with infertile soil limits the number of plants and trees on the islands which has been exacerbated by overuse of these resources. As a result locally built houses that use *te kaina* material are declining. Urban people are using imported materials for construction of their houses. An IDI participant from Betio discussed the same problem and said:

In the past, we usually used local materials for constructing our houses. Pandanus is the best local material to use but today it is very hard to find pandanus around Betio and as a result we have to go to North Tarawa to get pandanus. It is an expensive exercise as we not only pay for the material but also the transport to take it here (IDITR11)

Similarly people are experiencing the loss of materials for traditional medicines:

Today, medicinal trees around the island are very hard to find because of the demand from the population...before it was easy to find the root of the pandanus tree for use to cure fever in children...today it is very hard to find it as so many people have been collecting it every day for similar medicinal uses (IDITR22)

Already people on South Tarawa, in particular, have expressed concern about the frequent high tides accompanied by rough seas as they usually affect not only the coastal areas but also the ground water lenses, coastal vegetation and breeding sites for marine fish that provide the main sources of food for the urban population. Urban residents, who reside close to the beach and who normally use well water for

¹⁷ *Buia*: a raised floor local house usually built beside the main family house and normally used for eating, relaxing and sometimes for sleeping.

drinking, have now come to appreciate that during high tides they have to avoid using water from their wells as the level of salinity is high.

Our house used to be on the lagoon side of the main road before but we had to move our houses here, about a year ago, because our land was severely eroded during high tides and sea water flooded our cooking house and other local material sleeping houses...also we have stopped using water from our well as the taste is very salty and we cannot even use it for bathing and washing clothes (IDITR6)

The salinisation of well water during high tides was uncommon in the past. While human activities play an important role in affecting the supply of important resources to support human needs, climate change is likely to contribute to making the situation worse. The limited land area and poor natural resources together with the low elevation of the urban area of South Tarawa make it vulnerable to any climate change-related impacts in the long term.

6.2.3 Importance of land tenure

The Kiribati tradition dictates land is an important possession owned by the *kainga*, the major land-holding group. Access to family land indicates wealth, prestige and social security. However, land tenure can be affected in many ways and as a result impacts the livelihoods of the people. In recent times, the passing ownership of lands between families and to non-family members has contributed to the many lands problems experienced today especially on South Tarawa. Prior to western intrusion into Kiribati society, land ownership had been the major underlying factor in all levels of warfare between different *kainga* who wished to consolidate their landholdings or to defend and secure their right to land. Traditionally, the confiscation of land in the Kiribati legal system was a punishment for murder and other severe offences (Tito et al 1992: 21). Apart from rights to land, *babai* pits, fish traps and fishing grounds were also rights held by different *kainga* (Lambert 2000: 165). As confirmed by most research participants, people's right to their land is a very important aspect of the Kiribati culture. IDITR21 also confirms this when he stated:

...my culture provides everyone the right to a land as well as *babai* pits...on some islands the right to a fresh water pond and a fish trap was

also included...therefore even without money we still can survive from the resources we can obtain from our land and the sea.

In Kiribati, the cultural property concepts of real estate (land, *babai* pit and fish traps) are owned by members of a certain *kainga*. The transfer of any property that is owned by a given *kainga* requires the creation of a new social relationship with the *kainga* which will receive the transfer of the property (Lambert 2000: 165). These special relationships are *tabetabe/natinaki* (adoption), *aba ni kuakua* (land offered to someone from another *kainga* in appreciation of a personal favour), *aba n nenebo* (land given to compensate for personal loss and damage), and *aba n tinaba* (land offered in exchange of sexual favours). Apart from the transfer of land to another *kainga* for special reasons, such as *te ma* (fish trap), and *te rua* (*babai* pits) other properties can also be given through other traditional means (Tito et al 1992). IDITR18 also explained the importance of traditional ownership and how they can be transferred to other members of a different family:

...our traditional properties and knowledge have been passed down from generation to generation and our duty is to keep them within our family members...however we can transfer some to other family members through traditional means such as cultural adoptions, compensation, and the like...apart from that we cannot give them away anyhow...but today people have sold their rights to their lands and other traditional properties in exchange for money.

Culturally, it is the responsibility of each *kainga* to ensure their lands are kept clean and *babai* pits cultivated. Land boundaries are also kept visible so people know which area of the land is theirs. It is culturally unacceptable for member/s of another *kainga* to collect coconut and other resources from another *kaingas* land or *babai* pit. Every member of the *kainga* was vested with the responsibility to look after and defend their land from unexpected aggression or encroachment from other *kainga*. Protecting the rights to the land is important as explained by IDITR12 when he stated that:

...even today the importance of land ownership can still be seen during the Lands Court boundary determination when arguments and sometimes a fight, between the different families involved, can easily occur during the court proceedings... as a result police officers were normally involved during boundary determinations...

Interestingly, every member of the *kainga* knows exactly the boundaries of the land they own. Land boundaries are usually marked by a big cut/mark on trunks of coconut trees, by larger stones planted along the boundary of the land, and with coconut trees planted together along the boundary of the land from the lagoon to the ocean side. Traditional boundaries today are still important and used. According to IDITR5, "...our traditional boundaries are hard to be removed...boundaries used on my lands in North Tarawa used the cutting on the trunks of coconut trees that mark the boundary of my land with the adjacent landowner..."

Today, land boundaries on South Tarawa have been surveyed and entered into the Cadastral System which is kept in the Lands Division (see Figure 6.3). This system is more reliable when it comes to determining the boundary of disputed lands. The traditional system of identifying land boundaries is not always reliable as landowners sometimes can move or destroy land boundaries. The new Cadastral system reinforces the importance of land ownership in the Kiribati culture.

The influence of the western monetary economy has slowly eroded the traditional way of land transfer particularly in the urban area of South Tarawa where money has become increasingly important. On South Tarawa, in particular, *kain* Tarawa have allowed the transfer of their lands by sale in exchange for money. As a result, lands within the urban boundary of South Tarawa are now owned mostly by people from outer islands that have come to reside permanently. The Kiribati Government has allowed some of its leased lands that have not been developed, to be sub-leased by individuals and private businesses. The sub-leasing of Government leased-lands to some people has caused *kain* Tarawa (landowners of leased lands) to be unhappy especially as they too have no land on which to settle on South Tarawa. This same concern was also explained by IDITR21 when he stated,

...since the colonial period, our people on Betio were moved to "*kawan* Betio" (Betio village) at Temakin as all our lands on Betio were leased by the government...this village is now overcrowded...yet we cannot move to unused parts of our leased lands as the government has already sub-leased them to the different churches and people on Betio...I am not happy with what our government has done to my land.

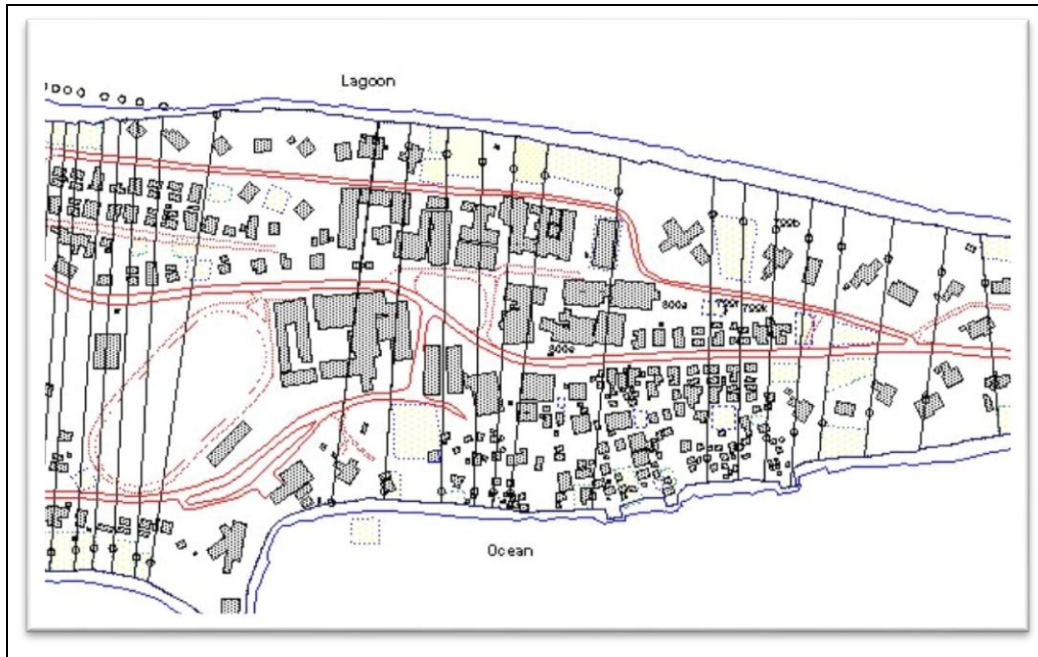


Figure 6.3 South Tarawa Cadastral System: showing an example of surveyed boundaries of land plots and identified by unique plot numbers. All land plots are marked by lines extending from the lagoon side to the ocean side of the island. (Source: Ereata 2003)

Similarly, IDITR18 also explained: “... we have no land on South Tarawa to live on as all our lands are leased by the government... we are like immigrants from outer islands who have no land to build on”.

The concern relating to land ownership and land shortage issues, especially on South Tarawa, has now become more problematic with population pressure and the increasing frequency of coastal erosion as a result of sea level rise. In some parts of South Tarawa this situation is worse and the Government, with very limited funding, finds it hard to help in providing assistance to help protect the most vulnerable lands in order to solve the issue of the shortage of urban land. A recent study by Biribo and Woodroffe (2013) indicated that South Tarawa has increased its land size by approximately 450 ha as a result of continuing development-related reclamation work. However, despite this increase in the land size, it is still not sufficient to remedy the urban land shortage problem that urban South Tarawa is currently experiencing. Additionally, the concern indicated by the Biribo and Woodroffe study was also mentioned by participants during the IDI and MGD who discussed increasing extraction of gravel and sand. As participant IDITR18 stated:

...it is sad that today we cannot find gravel on the ocean side of the land we live on...before we used to collect gravel and put it around our house for decoration purposes...the disappearing of gravel was the result of uncontrolled collection of gravel and sand by both the business and private people (IDITR18)

The extensive mining of sand and coral blocks has caused sand loss and disruption of sediment movement and shoreline erosion in some areas and accretion in others. Even though natural processes, sea waves and currents, affect coastal lands and shorelines, Duvat et al (2013) explains that normally when one area of the coast is eroded it is likely that another area will be accreted. However, when coastal sediments are removed from the system accretion becomes less likely.

Traditionally, it is the sole responsibility of the landowners to ensure their land is protected from any unexpected disturbances whether it be natural or human activities. The increasing rate of coastal erosion on South Tarawa has resulted in the Government being unable to provide protection for all its sub-leased lands. Similarly, some private land owners whose lands have been affected by erosion are also not able to protect their land from the forces of nature. As a result, erosion has affected some areas around South Tarawa and is likely to continue if nothing is done to stop it.

Basically, traditional land rights in Kiribati can be lost in two ways; through cultural and environmental processes. The cultural process involves the commercialisation of lands for the purpose of generating income. This process affects land owners, especially on South Tarawa, who sell their lands to outer island immigrants. As discussed earlier in this chapter, some *kain Tarawa* today are experiencing shortages of land as most of their lands have either been leased by Government or sold to outer island immigrants. Today, most of the people who own land on South Tarawa are not *kain Tarawa*. As stated by IDITR10,

...even though I have no more lands on Betio left for me to use, in a way I am happy as I have helped my government and most importantly the people from outer islands who have no land and have come to me and requested for a piece of land on Betio to settle...it is my culture to provide for them as they have no land here.

The environmental process involves changes to the land caused by climate change and the rise in sea level. These processes causes destructions not only to the land but more critically the natural resources that provides livelihoods for the people. It also undermines the traditional rights of *kain Tarawa* to their land. As explained by IDITR2,

...the frequency and intensity of severe high tides accompanied by rough seas has inevitably eroded coastal areas of our leased lands and destroyed trees and other important vegetation...if this continues then we could lose not only our right to our land but also the income we get from the lease from the government.

Consequently, these two processes are likely to pose inevitable challenges to the discourses on traditional land rights in the urban area of South Tarawa in the future. Land ownership on Kiritimati is not likely to be so affected as all lands are State owned except for lands allocated to people for settlement at Tabwakea village.

6.2.4 People and their land

Kiribati people believe that *Nareau* divided the supernatural world into three parts; the sky, earth, and ocean. Initially, the ocean was inhabited by spirits that later transformed into fish and other resources. The mythological relationships between the ocean and the earth resulted in the development of a spiritual relationship between the people and the ocean and land (Teiwaki 1988).

Extraction of resources from the land and ocean involves rituals and norms that require strict observance by I-Kiribati people. However, most of these strict observations are slowly disappearing and at the same time people neglecting them and are no longer observing them. As also pointed by IDITR2, " ...our culture dictates important skills and procedures that we need to adhere to when harvesting resources from our land and sea...unfortunately this is no longer practised today... ", and according to IDITR21, "...it is now hard to find ripen breadfruits on our breadfruit tree as our family harvested the fruits even before they ripe on the tree...". Similarly, our fishers must have the skills for fishing otherwise a good catch is not guaranteed. Sadly, commercial fishing has become important especially to those unemployed resulting in harvesting lagoon fish uncontrollably in order to generate income for the family.

It was also indicated by the IDI participants that the cultural relationship between the people and their environment is vital and still practised today although it has been somewhat modified by western influence. The inclusion of money in the way I-Kiribati utilize their resources has inevitably affected their relationship with nature. The concept of greed has influenced the way the people relate to their environment especially when it comes to ensuring that they only extract what they need from the environment. Specifically, greed involves the over use of traditional resources beyond what is needed. Traditionally, when there is a need to harvest green coconut, only what is needed is harvested.

Additionally, when mature coconut trees are cut down for use in house and canoe building, young trees will be planted to replace them. A similar approach is used when harvesting other resources like babai, breadfruit, pandanus and the like for consumption. This concept is becoming neglected by the young generation today. Most participants during the IDI also stated their concerns about exploiting the natural resources and the growing importance of money over local traditional resources.

The young generation today have not practiced our culture in the way they use resources from the land. When they cut trees down they do not replace them by planting one or two trees...when they climb a coconut tree to look for green coconuts, instead of just taking the mature coconut, they just take all they could find on the tree including the young ones, and when they clean the land they just cut any tree they find on the land ... they are destroying our resources (IDITR20)

According to most IDI participants, the people of Kiribati were self-sufficient and depended entirely on the two major resources; terrestrial and marine. They had a well-preserved culture and tradition which was very distinctive and well adapted to the harsh atoll environment with limited resources. An important aspect of this culture concerned a cultural system whereby people are expected to live within the limited resources provided by the atoll environment. It involves the preservation of food for future use especially in times of bad weather. Each *kainga* (family) was expected to store food for use in times of bad weather and drought periods. Foods that are preserved include fish (salted and dried), coconut (dried), *babai* (dried), and

toddy juice extracted from the coconut tree (boiled or fermented). The importance of food preservation was explained by participant IDITR13 when he stated:

In those days when my dad returned from fishing my mother would take the big fish and cook it for our evening meal. The rest she would salt and then bake them in the local earth oven. The next day she would put them under the sun to dry them. When they are dried she will keep them in the box. During bad weather when my dad cannot go fishing, she would take some of the dried fish and boil them and when they are soft we would eat them

When people go out fishing, it is culturally important that they fish for the needs of their family for that day only and any excess catch is either shared with neighbours or is preserved for future use. I-Kiribati will always eat fish during good and bad weather. Their traditional skills have enabled them to eat fish in every meal. Today people sometimes miss fish in their meal simply because they either do not have the skills to preserve the flesh or are not practising this skill.

It was also indicated during the IDI by most participants that the preservation of food for future use is an important aspect of daily life in Kiribati as people are aware that the atoll environment is limited in its potential to support human existence especially during times of bad weather or droughts. The skill of food preservation is still practiced on outer islands today while in the urban area it is slowly becoming abandoned.

Another aspect of the culture that was also discussed during the IDI and was seen to be very vital and helpful in times of disaster is the skills and knowledge the people have in understanding the signs in the sky which tell of good and bad weather. These skills prepare people in advance for any expected bad weather. It was highlighted during the IDI that early preparations for any expected bad weather usually reduces the severity of effects on human property and natural resources. As explained by IDITR24:

When I was young, I remember an old man in my village who is an expert in the weather forecast...interestingly, he will never tell the people what the weather will be but does things around his house that will tell the people what the weather is going to be. When he put his copra out [to dry], it's going to be a sunny day, when he did not put his

copra out it will rain, and when he tied a rope from his house to a coconut tree near his house it means a storm is approaching

It was also pointed out during the IDI that people are only getting weather updates from the radio. This is due to the fact that the only government owned television station has been closed due to financial difficulties. Therefore, those who cannot afford a radio will be disadvantaged. “Before when the television was still working, we always got daily updates after the news...and because we love watching we are always aware of the weather situation” IDITR26.

It was also noted in the response of some participants in the IDI that the gradual transition from a subsistence to a monetary economy has also influenced the mind-sets of the people, from being communally minded, where they share any surplus resources they have, to market oriented; where they trade any surplus resources they have for cash income. The change in the mind-set of people is more obvious in the urban centres, where cash economic activity has become an important aspect of urban living.

Interestingly, it was also highlighted by participants during the IDI that certain fruit trees such as pandanus and breadfruit are seasonal and during fruit bearing times the harvested fruits will exceed the amount the people could utilise. Under traditional practice, the people will harvest the ripe fruits during the season and process them for future use. It was also explained that the process for pandanus involves cooking the fruit using stone ovens and when cooked the cream is extracted from the fruits.

The extracted cream looks yellowish in colour and sweet in taste. The final process involves drying the cream under the sun which normally takes two or more days. The dried pandanus cream is called *tetuae*, and it can be kept without going bad for more than a year. As explained by IDITR4 “...the preservation of pandanus fruit not only provides food for us during times of food shortages especially during droughts and prolonged periods of bad weather but also enabled us to use excess fruits from the pandanus during its bearing season instead of wasting them...”

A similar process is applied to the breadfruit during its harvest season. However, with breadfruit, the fruit is harvested before it is ripe for processing. The people usually know the season from the number of fruit on the tree. Usually, during the breadfruit season, all of the breadfruit trees will bear fruit at the same time. During this time the people will start harvesting the fruit and process them for later use. The fruit will be cut into small pieces, boiled and then dried under the sun for two or more days. The dried breadfruit is locally known as the *kamau ni mai* and they can be preserved for later use. It was also pointed out during the IDI that traditional processed foods like *tetuae* and *kamau ni mai* were also used by the Kiribati people for long open sea travel in the past.

The customary practices of *kainga* were also mentioned during the IDI where a cluster of households from the same family staying together is important when it comes to the use of the land and sea resources. It was a traditional practise in the past that each *kainga* had its own lands and designated reef areas and one was only allowed to harvest resources from the lands and sea areas to which they were entitled. Harvesting from other *kainga* lands was strictly not allowed and anyone found in breach of this would be called *te tia kimoa* (thief or stealer). It is very shameful in the Kiribati culture to be known as *te tia kimoa*. Only in exceptional cases can a member of a *kainga* have privileges in other *kainga* land and sea areas because of inter-marriage or adoption.

As explained during the IDI, this cultural system ensured that resources were harvested sustainably for use by each *kainga*. Additionally, the number of people in the village where the different *kainga* lived was relatively small and hence competition for resources was not a concern. This cultural system of *kainga* ownership of lands and designated sea areas ensured a mutual relationship between humans and their environment in terms of harvesting resources from the land and sea. The system also ensured that everyone receives sufficient resources as well as ensuring that scarce resources were not overexploited for the short term gain of only few individuals.

It was also explained during the IDI that the influence of western culture, where the monetary system is widely used, has undermined the mutual relationship that once

existed between the people and their environment. This situation is more critical in the urban area of South Tarawa where the land and reef resources are very limited and the population is concentrated resulting in the increased harvesting of land and marine resources. Consequently, urban people are faced with shortages of materials for medicines and house construction as well as a decline in fish and shellfish stocks. Population pressure on the environment has inevitably affected the availability of once relatively abundant resources.

...during the 70s and 80s we could easily collect green coconuts from any coconut tree...we also cut toddy...now it's hard to find a young coconut on a tree and also there's hardly any available coconut trees for cutting toddy...most of our toddy trees have been cut down (IDITR7)

It was also explained that the shift from subsistence to a market system has played a crucial role in changing the way people normally relate to their natural environment. More crucially, the negligence of the cultural relationship between the people and the land and sea environments. As also indicated by participants during the IDI that in the Kiribati culture people are expected to live within the island resources provided by the atoll environment in order not to compromise the potential of the atoll environment to support the needs of the population. The system of community subsistence simply ensures that all members of the family receive sufficient resources and at the same time protects the limited resources from becoming over-exploited.

6.3 FRAMEWORK FOR CLIMATE CHANGE PROGRAMMES

Based on the responses of participants during the IDI as well as the MGD, two main conclusions were identified. The first relates to the people who are prepared to do everything in order to continue living on South Tarawa and Kiritimati. The second are those people who are open for the option of migrating to another country as they fear the worse impacts of climate change in the future. Besides, it was seen that the worse affected is South Tarawa due to its limited landmass together with overpopulation unlike Kiritimati that has a huge landmass. As explained by the following IDI participants, they both confirm that living their home is not going to fully remedy the problem they now experienced with the rise in sea level. As stated below:

I'd rather stay and do something to protect my island from becoming totally inundated by the rising sea level...if I migrate to another country how will I survive in an environment that is totally new to me. (IDITR13)

...this island is very big...all it needs is to develop the infrastructure so that it will be able to accommodate more people...going to another country requires money, qualifications, and others which I don't have so I am not leaving Kiritimati...I will stay here and hope my children will not want to migrate also in the future... (IDIKR11)

It was also revealed by research participants from Kiritimati that they are more concerned with the improvement to their water system and not much concern about erosion of their land. As stated by IDIKR13, "...my main concern is with water...the current water reticulation system is not working properly...I think it needs renovation and upgrading of the system..." It was also clear from the responses of Kiritimati participants that the large landmass of the island has the potential to develop the infrastructure in order to make living comfortable for the people.

However, while some people want to stay and others move to another country, the important factor that comes out clearly especially from the South Tarawa research participants is that urban South Tarawa is vulnerable to any urban related problems resulting from urban development and population pressure and climate change. Additionally, the Kiribati government is also aware of the vulnerability of the islands to population pressure as well as climate change related problems and has already looked into it.

The government's initial national document released to the United Nations Framework Convention on Climate Change in 1999, explains the country's vulnerability to climate change. This statement focused on the potential adverse impacts of sea level rise including sea water intrusion to groundwater lenses, reduced groundwater quality and quantity, and coastal erosion and inundation. The document emphasised the melding of traditional practices in agriculture and extreme weather event practices. It also included a list of projects planned by the Kiribati government to address adaptation needs.

As indicated by the responses of research participants and from government documents, the government is well aware of the exposure of Kiribati and as a result initiated and established policies, like the National Adaptation Program of Action (NAPA) (2007) and KAP I, II, and III (in conjunction with the World Bank) to combat impacts related to climate change. The inclusion of the Environment in the Ministry of Environment, Lands and Agricultural Development, emphasised the importance of the environment to the government. Similarly, the enactment of the Environment Act in Parliament in 1999 with further amendments in 2000 also supported the relevancy and importance of protecting the environment by government.

This section discusses research participants recommendations together with past and current programmes initiated and implemented by the government with the hope to address issues of climate change related problems as well as provide solutions. The government and the people have always been concerned about anticipated climate change impacts thus prompting the President to become vocal in international conferences and meetings when climate change issues are discussed.

When the United Nations General Secretary, Mr Ban Ki-moon, visited Kiribati in 2009, he was very concerned with what he witnessed. In a joint statement with the President of Kiribati, they expressed their concerns and stressed that "...climate change poses the most serious threat to the livelihoods, security, well-being and survival of the peoples of Kiribati and the Pacific, and that it undermines their efforts to achieve sustainable development goals" (United Nations 2011- available at un.org/sg/STATEMENTS/index.asp?nid=5483). They also reaffirmed the urgency for global reduction in greenhouse emissions as well as reiterating the provision of adaptation financing to assist the implementation of adaptation programmes to combat impacts of climate change on the local populations of low-lying islands.

6.3.1 National programs for climate change

It would appear from the reaction of most countries, especially the developed countries, that climate change is a slow and gradual process and there is still a long

way to go before people could feel its adverse impacts. Unfortunately, the current experiences of low-lying islands such as those in Kiribati are completely the opposite of this (Mimura 1999; Mimura et al 2007). The frequency and intensity of high tides that are accompanied by bad weather is becoming a major problem confronting not only the government but also the people that have lived their entire lives on the once tranquil islands. Consequently, the Kiribati Government is committed to providing policies and programs to assist the country and the people in their preparation for the anticipated impacts of climate change, more particularly the rise in sea level.

In terms of disaster preparedness, the National Disaster Act 1993 provides procedures to deal with disasters when they occur. The Environment Act 1999 was established with a focus to enhance the resilience of the people and their property and to ensure that there are minimal risks to natural and human systems (Government of Kiribati 2007: 8). The Office of the Beretitenti (Office of the President) administers the responsibility for strategic risk management as well as coordinating the Kiribati Adaptation Programmes. The implementation of the Environment Act by the Ministry of Environment, Land, and Agriculture Development ensures the control of any "... adverse impacts of development and on pollution from wastes and other discharges" (Government of Kiribati 2007:9).

As a result of on-going National Consultations together with technical reports provided by the different Government Ministries, a broad range of immediate and urgent needs for adaptation have been identified for the government to act upon. A series of National Consultations were held in 2003, one in the Gilbert group and the other in the Line group. As explained by IDIKR8, "...the government has started involving people from Kiritimati in government's workshops and meetings that plan and propose strategies and policies to address climate change and other immediate problems confronting our islands..."

Other series of workshops were convened separately in 2005 for the purpose of reviewing project documents that were already identified in the NAPA. Following on from the 2003 National Consultations was the 2005 series of National Consultations which involved participants from the different Island Councils,

together with NGOs, and registered faith based institutions on South Tarawa. The objective of the consultation was to collect the views of the general population through their respective representatives. These were compiled as projects and incorporated in the NAPA for implementation. The lists of proposed project activities are listed below:

- 1) Water resource adaptation,
- 2) Simple well improvement,
- 3) Coastal zone management and resilience enhancement for adaptation,
- 4) Strengthening environmental, climate change information and monitoring,
- 5) Project management institutional strengthening for NAPA,
- 6) Upgrading of meteorological services,
- 7) Agricultural food crops development,
- 8) Coral reef restoration, monitoring, and stock enhancement,
- 9) Upgrading, restoration, enhancing resilience of coastal defences and causeways, and
- 10) Enabling effective participation of Kiribati at regional and international forums on climate change (Government of Kiribati 2007: 37-38).

The general objectives of these projects were mainly focusing on protecting the resources to ensure the survival of people in the long term. This same concept was also indicated by IDITR28 when he stated "...it is important to teach our children at the home the importance of looking after and protecting our environment...because if we don't then it will affect the resources that provide food to us..." Similar objectives were considered in Development Plans. A more recent development by the Kiribati government to address climate change was the Kiribati Joint Implementation Plan on Climate Change and Disaster Risk Management (KJIP) (Republic of Kiribati 2014). The KJIP is discussed in detail in section 6.3.3.

6.3.2 Kiribati Adaptation Programs (KAP)

The Kiribati government, in its endeavour to address strategies relating to climate change adaptation, has adopted a Climate Change Adaptation Policy and Strategy with the following objectives:

- a) Kiribati should be mentally, physically, and financially well prepared to deal with whatever climate trends and events the future may hold;
- b) This should be achieved through a nationally co-ordinated, participation-based adaptation programme carried out by official and private agencies; and
- c) External financial assistance should be obtained to meet the costs of the national adaptation programme (Republic of Kiribati 2007: 6).

In conjunction with the Climate Change Adaptation Policy and Strategy and its objectives as stated above, the Kiribati Adaptation Programme (KAP) was initiated by the Kiribati government to address the rising risks from the effects of climate change. MGD and IDI research participants mentioned the importance of putting in place programs to ensure people are ready to cope with anticipated impacts of climate change. As pointed out by IDITR24,

...it is important for our government to consider and put in place strategies to help our people during times of trouble...like what to do when there's a tsunami alert...like the last time during the tsunami alert, we just don't know what to do.

There are three phases of KAP which is administered by the Office of the President. KAP I, basically the preparation phase, commenced in 2003 and was completed in 2005. KAP II which commenced in 2006 and completed in 2011 was the pilot implementation phase. KAP III commenced in 2012 and is expected to be completed in 2016. The development of the KAP I, II, and III are generously supported by the World Bank (WB), Global Environmental Facility (GEF), AusAID, NZAID, UNDP and a parallel project by the EU (Republic of Kiribati 2011; 2010).

The main objectives identified for the Kiribati Adaptation Programme include:

- 1) Improving water supply management,
- 2) Coastal management protection measures such as mangroves re-planting and protecting public infrastructure,

- 3) Strengthening laws to reduce coastal erosion, and
- 4) Population settlement planning to reduce personal risks.

The above identified objectives of the KAP were also discussed and mentioned during the MGD and IDI. Research participants on South Tarawa and Kiritimati emphasised repeatedly the importance for government to consider providing assistance for urban people who live in private permanent homes to get their rain water catchments. As explained by IDITR22, “...I hope the government will consider helping people like us who cannot afford to buy a water tank...like providing one or two tanks to permanent building houses and we repay by weekly or monthly instalment...we have experienced rain everyday but it’s just wasted as we don’t have a tank to collect rainwater...”

KAP I initiated the process of mainstreaming adaptation into the national economic planning of the Kiribati government and identified priority pilot investments for phase II. KAP I also included a national consultation for the preparation of the 2007 National Adaptation Program of Action (NAPA). Its main objective was to help minimise the vulnerability of Kiribati to climate change, climate variability and sea level rise. Generally, KAP II was a continuation of KAP I. Five broad components guided its development

- 1) Policy, planning and information,
- 2) Reducing vulnerability of the coastlines including public assets and ecosystems,
- 3) The development and management of freshwater resources,
- 4) Providing technical assistance to build capacity at island and community level, and
- 5) Project management (Republic of Kiribati 2011).

It also developed and demonstrated a systematic diagnosis of climate-related problems, designed and implemented cost effective adaptation measures and continued the integration of climate risk awareness and responsiveness into economic and operational planning (Republic of Kiribati 2011; 2005). Basically, two major achievements were the mangrove re-planting scheme and sea wall

construction. Numerous locations on South Tarawa were identified as very vulnerable to sea level rise and requiring protection from further erosion in the future. KAP II has constructed sea walls at four main locations that were identified as very vulnerable to the effects of the rise in sea level namely:

- 1) Ambo-Taborio Causeway,
- 2) Bairiki-Nanikai Causeway,
- 3) Korobu road, and
- 4) Bonriki Airport Runway.

KAP II was also successful in the mangrove re-planting scheme when it planted about 37,000 mangrove seedlings on Aranuka, Butaritari, Makin, North Tarawa and South Tarawa. Already South Tarawa has lost about 60 percent of its mangroves since the 1940s (World Bank 2000). Further loss of the remaining mangroves would allow storm surge and sea spray to erode coastal areas and damage plants. The work was supervised by the Kiribati Environmental Conservation Division. This scheme also contributes important habitat for marine life and helps filter nutrient runoff from the land as mangrove roots tend to have the capacity to absorb nutrients and reduce pollution impacts on the sea.

The importance of mangrove planting was also raised during the MGD in Bikenibeu where IDITR23 explained that "...in the past mangroves on the lagoon side of Eita protected the area from erosion...but when people started to cut them down for use as building materials the area on the lagoon side adjacent to the Moroni High School experienced severe erosions..." The scheme has proven not very costly on the part of the government as local people assisted in the re-planting program. The purpose of involving the community in the re-planting scheme was to gain the support of the people and to make them feel that they are part of the program. The mangrove re-planting scheme also provided support to the national initiative as outlined in the Kiribati Development Plan 2008 – 2011 and the Kiribati National Biodiversity Strategy Action Plan 2006-2011 (Republic of Kiribati 2012; 2008).

The re-planting of mangroves not only provides protection of the land from further erosion but also improves the livelihoods of the people (See Figure 6.4). The other

cultural importance is that mangroves provide important resources for the people like building materials for local houses as well as dyes for handicrafts and for use in local medicines, although such use would need to be sustainably managed. It also contributes to the renewal of the ecosystem by protecting coastal areas and enhancing food security by providing breeding grounds for fish and crabs which are important sources of protein for the people. As pointed out by IDITR16, “...catching mullet at Eita lagoon side is hard now...and I suspect the main reason was because their breeding ground, the mangrove trees, has been removed completely...”

KAP III is a five-year project that seeks to strengthen Kiribati’s ability to provide people with safe water and maintain resilient coastal infrastructure by extending on the work implemented in KAP I and KAP II. KAP III also focuses on supporting the Kiribati National Adaptation Program of Action (NAPA) and the Kiribati Development Plan which identify improving the management and provision of safe water and the strengthening of coastal resilience as national priorities (Government of Kiribati 2012; 2007).



Figure 6.4 Mangroves planting at Bonriki village

(Source: Photo by Author 2013)

KAP III aims at:

- 1) Improving water management through the installation of groundwater pumps, roof rainwater catchments, reducing piped water leakages and waste, protecting water reserve areas, and improving the long-term planning for local level water management to ensure cleaner and safer drinking water,
- 2) Protecting against coastal erosion through the construction of coastal defences such as sea walls and mangrove planting scheme at priority locations,
- 3) Strengthening government and community capacity to manage the effects of climate change and natural hazards via supporting the development and adoption of a national Coastal Management Policy together with the development and implementation of locally managed Adaptation Plans
- 4) Supporting and assisting the Government in managing, monitoring, and evaluating the Program (Government of Kiribati 2012, Government of Kiribati 2010).

The second aim for KAP III above was also mentioned by participants of both the IDI and MGD. According to IDITR13, "...government should look for funding to help protect erosion of our coastal areas on South Tarawa, especially Bairiki and Nanikai as they have been badly affected..." Since the implementation of KAP III, there have been two positive developments with the urban piped water provision including the rehabilitation of existing piped water on South Tarawa and improvement of the Buota Water Reserve. Work on these projects was made possible through funding from Australia amounting to AUD\$15 million which is to be delivered over three years from 2012 to 2015 (Government of Kiribati 2013)

Roads on South Tarawa have been undermined by the rising sea level and coastal erosion (Government of Kiribati 2013). Through government initiative, work on the rehabilitation of the South Tarawa main road has already started and expected to complete this year (See Figure 6.5). Upgrading work will provide more than 50 percent of the total population with improved road access to important places like hospitals, airports, schools and the like.



Figure 6.5 Newly upgraded road with pedestrian footpath at Taborio, South Tarawa (Source: Photo by Author 2016)

Work on improving the urban piped water supply has improved the provision of water as a result of a joint operation between the Public Utilities Board and KAP III. Initially, two main water reserves served the urban population with water, namely the Bonriki Water Reserve and Buota Water Reserve. The Buota Water Reserve ceased operation in 2008 when the Tanaea Bridge collapsed. At this time, the pump station at the Buota Water Reserve was disconnected from the power source ceasing the operation of the pump. When power was disconnected, the pump station was vandalised. It was during this time when the pumps were not operating that major work on relaying the pipes and rehabilitating the station was carried out.

Buota Water Reserve normally provides about 300 cubic meters of water per day to urban residences. The Bonriki Water Reserve provides about 1600 cubic metres of water per day. During the period when the Buota Water Reserve was not operating, the Bonriki Water Reserve was overused extracting more water than its sustainable level. After the rehabilitation work on the Buota Water Reserve, water supply to urban residences on South Tarawa has improved by 20 percent. Besides the Buota Water Reserve rehabilitation work, two other freshwater projects were conducted with positive outcomes. The first involves the installation of four new rainwater harvesting areas and two infiltration gallery sites in North and South Tarawa. The second involves the detection and repair of leaks in groundwater pipes from Buota to Betio.

KAP III was also mandated to build skills within communities so they can manage effects of climate change and natural hazards by supporting education programs, facilitating the preparation and implementation of locally managed adaptation plans, strengthening institutions and building and maintaining stronger infrastructure. It also provides supports to the Government's National Adaptation Program of Action and the Kiribati Development Plan, both of which have identified the provision and management of water and the strengthening of coastal resilience as national priorities for Kiribati.

KAP III work on improving water provision is still on-going and is scheduled for completion in 2016. So far the work is progressing well and hopefully, upon completion, the urban area of South Tarawa will have an improved drinking water

reticulation system and coastal defences. In a recent discussion between the Kiribati Government and the World Bank (WB) and AusAID regarding Kiribati's existing strategies, policies and action plans and on-going initiatives on Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR), two main priority areas were considered namely:

- 1) Water resources management, and
- 2) Coastal resilience (Republic of Kiribati 2011).

These two priorities were also identified in the NAPA and also in on-going pilot programmes with Ministry of Public Works and Utilities (MPWU), Ministry of Environment, Land, and Agriculture Development (MELAD), as well as other Government agencies. The main objectives of the two priority projects on water and coastal resilience were to strengthen the resilience of Kiribati to adjust to future impacts of climate variability and climate-related hazards. Additionally, they aim at reducing impacts of droughts, storm surges and coastal erosion on the quality and availability of freshwater resources and the livelihoods of coastal communities (Republic of Kiribati 2011). Additionally, the importance of water management and coastal resilience was also raised and considered by participants during the IDI and MGD. As explained by IDITR22, "...I have started building my sea wall as my well water is always affected during high tides...sometimes when the sea is very rough, waves from the lagoon will reach my well...so I'm working on protecting my well as well as my houses from the sea..."

Water problems are caused by pressure from increasing population and urban activities and the inefficiency of the reticulated water system. The Public Utilities Board that operates the water supply system for the urban areas of South Tarawa faces several problems in its efforts to supply drinking water. These relate to tardiness in the payment of monthly water bills, the limited supply of water from the sources at Bonriki and Buota water reserves and the numerous leakages in the reticulated system. The need to ensure constant supply of water from the source and improving leakages in the reticulated system are significant areas to address.

6.3.3 Kiribati joint implementation plan for climate change and disaster risk management

Another important and recent milestone in the government's move to address anticipated future impacts of climate change on the land and the people was the development of the Kiribati Joint Implementation Plan (KJIP) following consultations with regional and local advisory groups and it is considered "...a key vehicle for integration of climate change and disaster risks into all sectors, thus promoting a holistic approach that involves the cooperation of Government, civil society and the private sector" (Government of Kiribati 2014: 9). Additionally, it complements earlier strategies such as the National Disaster Risk Management Plan (Government of Kiribati 2012) and the National Framework for Climate Change and Climate Change Adaptation (Government of Kiribati 2013).

The KJIP is a nine year plan that runs from 2013 to 2023. Its main vision is to ensure that "I-Kiribati unique culture and identity are upheld and safeguarded through enhanced resilience and sustainable development" and its goal is "to increase resilience through sustainable climate change adaptation and disaster risk reduction using a whole of country approach" (Government of Kiribati 2014: 9). Similar concern was mentioned during the IDI and MGD where participants discussed the importance of keeping limited resources from becoming exploited not only by the people but also the government. As explained by IDITR6,

...because of our limited resources, our culture has always dictated the importance of the "take and replace" concept when it comes to the use of our resources...this concept simply tells us when we cut one coconut tree or breadfruit tree we must plant two or more to replace the ones we cut...in doing this we will be protecting our environment from becoming exploited...and in return we will always have resources to harvest from.

The government of Kiribati has also recognised issues resulting not only from development and population pressure but also from climate. As a result, it has included climate change and disaster in specific government programmes such as "...water and sanitation, health and environment, and also into policies relating to fisheries, agriculture, labour, youth and education" (Government of Kiribati 2014: 9). Government's budgetary commitment since 2011 shows a total of AUD 83

million (almost 16 percent of the national budget) allocated to programmes on climate change alone. A further AUD 90 million (approximately 17 percent) was also allocated to disaster risk management programmes. The budgetary allocation simply reveals Kiribati's commitment to ensuring climate change is effectively addressed to help ensure the people are resilient when coping with future impacts. The overall gross cost to implement KJIP from 2013 to 2023 is estimated at AUD103.1 million (Government of Kiribati 2014: 9).

The main strategies and key actions for KJIP are:

- 1) Strengthening good governance, policies, strategies and legislation,
 - 2) Improving knowledge and information generation, management and sharing,
 - 3) Strengthening and greening the private sector, including small-scale business,
 - 4) Increasing water and food security with integrated and sector-specified approaches and promoting healthy and resilient ecosystems,
 - 5) Strengthening health-service delivery to address climate change impacts,
 - 6) Promoting sound and reliable infrastructure development and land management,
 - 7) Delivering appropriate education, training and awareness programmes,
 - 8) Increasing effectiveness and efficiency of early warnings and disaster and emergency management,
 - 9) Promoting the use of sustainable renewable sources of energy and energy efficiency,
 - 10) Strengthening capacity to access finance, monitor expenditures and maintain strong partnerships,
 - 11) Maintaining the sovereignty and unique identity of Kiribati, and
 - 12) Enhancing the participation and resilience of vulnerable groups.
- (Government of Kiribati 2014: 40).

While the outcomes from the KJIP are still to be seen, the importance of the plan shows Kiribati's full commitment to address the main issues of climate change and to ensure that the government and the people are resilient in their responses to

impacts. In his opening remarks, President Tong emphasised the vulnerability of his country to climate change and the high priority of his government to “...consider measures to cope with these impacts...” (Government of Kiribati 2014: 5).

6.3.4 Upskilling of human resources

The Kiribati government is fully aware of the possibility that migration could become an important adaptation strategy for Kiribati to consider in the near future should the rise in sea level severely affect the potential of the islands to support human existence. In order for Kiribati to become mentally and physically prepared for any climate related problems in the near future, it is important to ensure its human resources are internationally qualified to secure employment abroad. In line with this strategy, the Kiribati Government, with external assistance from Australia, has engaged in long-term strategies geared at preparing the people to migrate should the need arise. The Government has termed this the “long-term merit-based relocation strategy”. However, this approach is likely to benefit the educated ones who are able to secure employment in other countries. The uneducated and the poor will find it hard to migrate (Connell 2013).

Similar understanding was raised and discussed during the MGD and IDI where some participants accepted the fact that some people will find it easy to migrate to another country while others will find it hard due to the lack of working skills and education. As a result most participants agreed to encourage the young generation to make every efforts to pursue any line of studies that suited them. As indicated by IDITR12,

...it is our duty as parents of today to encourage our children to work hard in school and ensure they finish and get some sort of qualification, either academically or technologically...so that when they want to migrate in the future at least they have a qualification that they could use to get them a job in their new home.

The upskilling of mainly younger people in Kiribati is vital to ensure they are prepared to compete in international labour markets (ESCAP 2007). This concept was clearly echoed by the Kiribati President in his address to the United Nations General Assembly that should the need arise for his people to migrate as a result of

climate change, he wants them to “... migrate on merit and with dignity” (Tong 2008). When the people move to another country, they should be qualified to contribute in the work force because they have the skill and the knowledge to carry out the particular work they engage in.

As a result, the Government of Australia in partnership with the Kiribati Government is supporting two major programs for Kiribati to help on this which include:

- a) Bilateral Kiribati – Australia Nursing Initiative (KANI); and
- b) Australia Pacific Technical College (APTC) program.

KANI provides scholarships to Kiribati students to study nursing in Australia. Upon completion of their studies, any students wishing to remain and work in Australia are allowed subject to having a job. Students under this scholarship are not bonded to return and work in Kiribati after completing their nursing program providing they are able to secure work in Australia with a view to remitting money to their families back in Kiribati to help them prepare for possible future impacts from climate change among other benefits.

The other, Australia Pacific Technical College (APTC) provides training for Kiribati, as well as other Pacific islands, is also a part of this initiative. APTC operates different campuses within the Pacific region where selected students from Kiribati and other Pacific countries are sent to pursue training for different technical qualifications. APTC offers courses in carpentry, mechanics, electrical, cookery and hospitality that are recognised in Australia and New Zealand (AusAID 2008).

6.3.5 Phoenix Islands Protected Areas (PIPA)

One important contribution Kiribati could afford to promote in terms of the conservation and preservation of the environment is the establishment of a protected area. In order to succeed in this approach, Kiribati has to sacrifice some of its islands. Accordingly, the Kiribati Government, in partnership with the New England Aquarium and Conservation International (CI) over years of joint scientific and

discussions formed the PIPA. This will become Kiribati's only Marine Protected Area (MPA) and one of the largest marine protected areas in the world. It is a significant marine conservation effort particularly as it is established by a Least Developed Country (LDC). Funding and technical assistance are catered for by GCF and CI's Pacific Island Program (Phoenix Islands Protected Area 2014; Conservation International Pacific Islands Program 2011).

The protected area (see Figure 6.6) encompasses 408,250 square kilometres with only 28 square kilometres of this being land area. The Phoenix group of islands, situated between the Gilbert and Line groups, comprises eight atolls, only one of which is inhabited. It is known as an oceanic wilderness and represents one of the world's last intact oceanic coral archipelago ecosystems. The PIPA is very remote from permanent settlements thus providing an opportunity to protect habitat for species and ecosystem. The significance of its coral reef is that it represents what reefs really looked like a thousand years ago before the presence of humankind's impacts such as coastal development and pollution (Phoenix Islands Protected Areas 2014; Alling et al 2007).

PIPA provides protection for terrestrial habitat as well as safeguarding nesting habitat for seabirds. It also protects rare traditional species of plants that have cultural and medicinal significance which are also becoming endangered by over-exploitation. Travelling to islands in the PIPA from South Tarawa, the capital of Kiribati, normally takes a week or more depending on the weather. Their remoteness from the outside world makes them important natural breeding grounds for numerous nomadic, migratory and pelagic marine and territorial species. Consequently, they have become unique natural laboratories for the study of reef growth and other important aspects of atoll ecosystem studies (Alling et al 2007).

In one of my interview with a civil servant during the IDI, he explained the importance of governments commitments to PIPA, "...this will show developed countries, who are the main polluters of our global environment...and despite our lack of finance and technology we are still prepared to sacrifice what we have to show our commitment to protecting our pristine natural environment...we hope that this will challenge them to do something similar..." (IDITR24).

The establishment of PIPA demonstrates Kiribati's commitment to international treaties and conventions and provides an opportunity to show how conservation and sustainable development are mutually supportive in development agendas. Further, as is explained in the core principles of PIPA, it aims to conserve biodiversity, promote sustainable use of resources and to ensure equitable access to land and

marine resources. It also reaffirms Kiribati commitments to the Convention on Biological Diversity (CBD) (Government of Kiribati 2010).

In line with the commitment of Kiribati to UNFCCC, PIPA has become an important natural Climate Change Research Laboratory to understand impacts caused by climate change on atoll islands that have not been inhabited. Besides, as a party to the World Summit on Sustainable Development (WSSD), PIPA helps Kiribati to meet its commitments to the MDGs; in particular, MGD 8 on environment and sustainability (Phoenix Islands Protected Areas 2014).

The establishment of PIPA will not only help Kiribati but also the world as a whole. Firstly, it shows the importance of living sustainably which can be achieved by making efforts to preserve terrestrial and marine resources by allocating a major area for conservation purposes. While resources are important for development purposes, it is important they are utilised in a sustainable manner to ensure future generations can continue to benefit from the same resources. Another important aspect of PIPA is that it demonstrates to the rest of the world, particularly countries that are responsible for climate change, that it is everyone's duty to ensure we look after the environment we live in.

Apart from the preservation and conservation of both marine and terrestrial resources, as well as becoming an important UNESCO World Heritage site, the Government plans to make PIPA a world class eco-tourism centre. The establishment of Kanton as an administration centre where PIPA staff will be stationed also will serve as a centre for eco-tourism. This will generate income for both the Government and the people who work in the eco-tourism centre. When PIPA is fully established and operational, it will attract bird watchers and those interested in corals and marine life. Through PIPA, Kiribati is committed to preserving and conserving the atoll environment.

6.3.6 Contractual overseas employment

Seasonal and contractual employment abroad provides work opportunities for people who are not able to secure employment in Kiribati. Remittances from overseas employed I-Kiribati to their families at home are very important as they

not only help families financially but also the economy. Migration also provides the opportunity for Kiribati people to get used to living in other countries that are totally different in their climatic conditions and lifestyles from what they are used to in Kiribati. More critically, in the event of climate change and particularly sea level rise affecting the potential of atolls to support human habitation, an increasing number of people could be seeking residence in other countries. Therefore, early engagement of I-Kiribati in overseas employment is important as it provides them with opportunities to acquaint themselves with lifestyles in other countries.

The Marine Training Centre (MTC), a locally-based institution that trains young I-Kiribati for employment on overseas vessels is an important provider of overseas employment for the Kiribati people. It is an internationally recognised maritime training institution that is approved to offer merchant marine training courses. The course involves 18 month training programmes for deck, engine, and catering ratings, ships officers, and upgrading and refresher courses for ratings. The intake of MTC has increased from 150 to 200 places recently. Since 1967, MTC has trained about 4,500 seafarers who have secured jobs at different times in mostly German Shipping Companies on container, bulk, and gas carriers (Ministry of Labour Human Resources Development 2011). The MTC has assisted in training and providing recognised qualifications to our seafarers, some of them have migrated to New Zealand after securing permanent seafarers work there after completing their contracts with the German Shipping Companies.

South Pacific Marine Services (SPMS), with its offices in Kiribati and Hamburg, Germany, is the main maritime industry partner that provides employment for MTC graduates. SPMS provides 1500 positions on board different foreign vessels. Approximately a thousand Kiribati seafarers are currently employed by SPMS. Basically, there are two traditional criteria under which a seafarer is obliged to remit money. The first is for the *roo or maeu* (a monthly support for the family) and the other the *bubuti* (a request from a close family member). Borovnik (2003) shows that remittances were sent to immediate family members, wives, parents and

children of seafarers. Other extended family members (uncle, aunty, and cousins etc.) can receive remittances when they send their *bubuti* (request) to a seafarer¹⁸.

Te maeu (money sent to wife or family) is usually a monthly remittance automatically deducted from each seafarer's salary. The *bubuti* is when a close family member of the seafarer, usually an uncle or aunt or sometimes a brother or sister, requests financial assistance. The *bubuti* is usually to help in special family functions such as weddings, birthdays, and funerals. Additionally, the growing importance of education as a springboard to higher living standards has also become another important reason for families to seek financial assistance from family seafarers (Borovnik 2003). According to the Population Report (2012), of the 16,043 households in Kiribati, about 6,735 reside on South Tarawa and 857 on Kiritimati and of these about 1,203 households on South Tarawa and 57 on Kiritimati receive remittances from seamen working abroad. Another 1,078 households on South Tarawa and 159 on Kiritimati receive remittances from other sources such as family members working in other countries (Kiribati National Statistics Office 2012: 168).

Families of seafarers are easily identified based on the type of properties they have. Usually homes of seafarers are built of permanent materials. Some also have established small income generating activities such as small retail outlets, bus services, and a small fishing industry. Remittances from seafarers have contributed enormously to the economy of Kiribati. The importance of remittances was also discussed during the IDI and according to IDITR22, he explained "...we also receive income from our son who is currently working on a German ship...the money he sends back to us we use to buy materials to build our permanent home and also our food..."

The Fisheries Training Centre (FTC) is a government owned institution established in 1989 to train young I-Kiribati people to work on local and international fishing vessels. Initially, it was under the umbrella of the Marine Training Centre (MTC)

¹⁸ For more information on remittances by Kiribati seafarers see Borovnik thesis: Borovnik, M. 2003. *Seafarers in Kiribati – Consequences of International Labour Circulation*. PhD Thesis, University of Canterbury, Christchurch.

but in 1995 moved to Bikenibeu and occupied the old Tungaru Central Hospital premises. FTC is a division of the Ministry of Labour and Human Resource Department (MLHRD) and fully funded by the Kiribati government as well as some external donors such as the Japan Tuna Fishing Corporation (JTFC) and the Japan International Co-operation Agency (JICA). The plans to transfer the operations of the FTC back to Betio and to have the MTC and FTC working together in their training activities has already started.

Since its operation, FTC has focused on training programs at regional and international levels. Its focus is on enhancing fishing knowledge and skills of young I-Kiribati to work safely and in harmony on board multi-cultural vessels. So far, FTC has produced over a thousand graduates, who have managed to secure employment on different fishing vessels including purse seiners, pole and line and long-line vessels. An important aspect of FTC is that it trains the people in an area where they are culturally confident and knowledgeable.

Kiribati people are known to be people of the sea¹⁹. Traditionally, the sea has always been a provider of resources for a variety of purposes for the people. The importance of the resources from the sea has naturally equipped the people with different skills in harvesting fish. Basically, there are several fishing methods the people use in the lagoon, on the reef and in the deep ocean. Lagoon fishing involves the use of nets and the collection of shell food from the mud flat. Reef fishing also involves fish netting as well as fish traps (*ma*), spear fishing on the reef slope, and night fishing. Deep ocean fishing requires skill in navigation in the open seas to enable fishermen to return to land after the fishing trip.

Even though all Kiribati people know how to get fish from the sea, there are certain families who are more expert in certain fishing skills such as ocean fishing, spear fishing, net fishing, trolling or pole and line fishing. FTC generally trains students in deep ocean fishing skills which are similar to the skills that I-Kiribati people have. All graduates of FTC have been offered work on foreign fishing vessels abroad.

¹⁹ Sir Arthur Grimble also mentioned in his writings that Gilbertese people were a sea people who possess traditional skills that enable them to travel between their islands as well as harvesting resources from the sea (see Grimble, R. 1971. *Migrations, Myths and Magic from the Gilbert Islands*. Routledge, London).

The advantage of people trained in the FTC is that when they decide not to return to work on foreign fishing vessels, the fishing skills they have acquired can be utilised for the benefit of their respective families.

Some FTC graduates have established local small scale fishing companies and utilise the skills they have acquired to provide fish for the local markets, mainly in the urban centres of South Tarawa and to some extent on Kiritimati. Whether FTC graduates are employed on foreign fishing vessels or have established their own family fishing industry, income is generated to support the family. The importance of acquiring and improving fishing skills has many advantages including improving the livelihoods of the people. This was also mentioned during the IDI where participants want to suggest to the Kiribati government to consider allowing young people who are not good academically to join the FTC to learn the skills in fishing. As pointed out by IDITR22,

...there is a need to help our young people who are not good in the classroom to train in other technical skills such as carpentry, plumbing, electricity and even in fishing...we can use our fishing school to train those interested in fishing.

6.3.7 Recognised Seasonal Employer (RSE) Scheme.

The Kiribati government policy to send I-Kiribati to work in the RSE scheme is helping people who have no secure employment. The RSE work policy aims at facilitating the need for additional workers from abroad to work in the horticulture and viticulture industries in New Zealand to meet labour shortages in these industries. The RSE came into effect in April 2007 and initially aimed to recruit workers from mainly Pacific countries. There was a total of 4,486 workers recruited between 2007 and 2008 and this had increased to 7,009 in 2011 and 2012 (International Labour Organization 2013). Basically, the major objectives of RSE are to:

- 1) Facilitate recruitment of overseas workers to fill labour shortages in the horticulture and viticulture industries in New Zealand,
- 2) Contribute to the development of the Pacific Islands by providing temporary, circular migration opportunities to Pacific Island countries, and

- 3) Curb labour shortages and immigration overstayers in New Zealand through the recruitment of labour from Pacific countries (ILO 2013).

In line with New Zealand development initiatives for Pacific countries, Kiribati benefits greatly from the RSE, not only in terms of enhancing close relationships with New Zealand, but more importantly from the economic benefits the people receive. Most of the returning RSE workers have confirmed that the savings they brought home have helped their families in many ways. According to Taaneti (Pers. Comm 2013), "...I received a good salary while working in New Zealand under the RSE scheme...the money I sent home from my salary really helps my family financially... I am ready to go back and work again when they call us back to work in the future..." Apart from helping in the day to day needs of the family especially with the purchase of imported food from the shops, it also helped with other family financial commitments such as school fees, family weddings and birthday functions. Most of the RSE workers have continued returning to work in the same farm or vineyard and are quite adjusted to working in the New Zealand environment.

The wages RSE workers earn in New Zealand are far better than those received by employees of the Government in Kiribati. Even though part of their salary was deducted every pay day to reimburse their recruitment expenses such as airfare and accommodation, what is left is still enough to save for their use back in Kiribati. In terms of economic development for Kiribati, the remittances that RSE workers remit to their respective families boost the monetary economy. Similarly, RSE provides employment opportunities to those people who are not able to secure local employment in the government and private sector.

Another important contribution of RSE to those involved is that it enables them to become accustomed to the lifestyle and weather in New Zealand before deciding to seek residence in fear of the growing threat imposed by climate change and the rise in sea level. Similar understanding was also indicated by Taaneti (Pers. Comm 2012),

...I am thinking of applying for residence in New Zealand under the PAC, and if I am lucky to be selected, it will be easy for me to secure work as I know some of the employers in the vineyards and other

orchard farms...also I will find it easy to adjust to the New Zealand lifestyle as I am already used to it when working for the RSE.

While this may not be one of the objectives of RSE, it is likely in the long term that people will have to make decisions as to whether they stay in Kiribati or move somewhere else in the event of climate change and the rise in sea level. Securing permanent work may be easier for those who have already gained experience working in New Zealand on schemes like the RSE.

6.4 ADAPTATION STRATEGIES: VIEWS OF THE PEOPLE

This section explains the views of the research participants during the MGD and IDI. Most of the views were discussed in line with what the Kiribati government has implemented and is planning to implement as strategies to address issues resulting from climate change and urban development on South Tarawa and Kiritimati. It is important to note that the formulation of adaptation strategies to assist low-lying atoll States is paramount to ensure the long term survival of I-Kiribati. Existing capacity must therefore be restructured to efficiently meet the immediate needs for sustainable development and integrated management.

At the same time, adequate and appropriate assistance from the international community is required to implement sustainable development plans to ensure small islands survive future impacts of climate change. This notion was widely discussed by research participants in the MGD and IDI where they continue to emphasise the important of securing international assistance to assist in strategies to address climate change impacts. Seeking financial and technological capacity from external sources is recommended to ensure the implementation of proposed strategies that are appropriate for the Kiribati situation and which the country is unable to afford. This is to ensure the Government is able to pursue whatever adaptation strategy they consider appropriate for the long term survival of Kiribati and its people.

The recommendations below are only based on the responses of participants in the urban household survey questionnaires (UHSQ), in-depth interviews (IDI), and from the general responses of participants in the maneaba group discussions (MGD) during the field work conducted on South Tarawa and Kiritimati in 2010, 2011, and

2012. The following are only recommended strategies to assist decision makers both in Government and Non-government sectors in their efforts to propose appropriate strategies to assist in their adaptation endeavours. It should be stressed at the outset that whatever is discussed below are just recommendations for consideration by those concerned and are not necessarily the solutions to the climate change problems.

As already mentioned earlier, it is clear from the responses of participants in this study that generally there are three main groups of people when it comes to what to do in the event of climate change. The first group comprised those who wanted to migrate because they fear the worst will happen to them and their children in the future and the second are those who do not want to move but stay and do something to help them survive on their atoll environment in the long term. The third group, which is only a few, seems not so sure of what to do now and hope as time moves that they will make up their mind as to whether to migrate or stay. Hence the recommendations are mainly addressing strategies to protect the islands and for those who want to move to another country as a result of climate change. Based on the responses of participants, three main strategies were identified and compiled:

- 1) People want to protect their islands from future impacts of climate change especially the rise in sea level,
- 2) Traditional skills and knowledge need to be revived to assist people survive on the limited atoll resources, and
- 3) External relocation to ease pressure on the shortage of land and the dwindling natural resources will be necessary.

The concern about climate change impacts and the importance of the land to the people was discussed widely during the field work. It was evident from the discussions that land is very important to the people and seeking strategies to help protect the islands is paramount to them. Participants in the MGD on Betio stated:

Our major concern now is about losing our islands to the rise in sea level, our Kiribati culture dictates that our land is our identity, if we have no land we have no culture and we are not a people anymore...so it is important to work together to ensure our islands survive the future impact of the rise in sea level (MGDBE)

Another participant in the IDI on Kiritimati voiced an interesting concern in which he tried to include his spiritual faith in his response. He stated:

I don't want to migrate to other countries now as I believe Kiritimati is big enough to withstand the effect of the rising sea...we have to work together to protect our islands...I have faith in God that he will look after our islands... (IDIKR11)

Similar concern was echoed by a participant in the IDI on South Tarawa in which he averred that whatever is going to happen to Kiribati in the future he will not move.

I will not leave my island...if the rise in sea level is going to destroy my island in the future I will stay and die like a man on the land I was born raised on...this is the land of my ancestors (IDITR4)

This kind of statement showed that there are people who are not prepared to abandon their islands regardless of what will happen in the future as a result of climate change. There were also participants who are quite educated and are very aware of climate change and its impact on small island countries who have been very critical about other countries contribution to climate change. They argued that had every country been mindful of the importance of the environment and controlled their pollution, the world would have not experienced what we see now. As a result of what is happening it was suggested that:

Countries who are responsible for causing climate change should be held responsible to help countries who are badly affected by the impacts of climate change especially the rising sea level...they are not the only people who live in this planet and free to do whatever they wanted to do (IDITR3)

Some participants indicated the importance of reviving traditional skills and culture especially as population pressure on the resources is inevitable. The *unimane* are concerned about the activities of young people, especially when it comes to harvesting resources from the land and also the sea. During the discussion participants voiced their concern that:

Reviving our Kiribati skills and knowledge regarding harvesting of our limited land and sea resources is very important and our young people need to know this so that they will not waste the resources, this will

ensure our long term survival on our islands...our forefathers have used these skills in the past and it has helped them survive, we must do the same (MGDBE)

It was also indicated there was concern that population pressure on the urban environment is becoming critical and needs to be managed and controlled. The proposal of relocation to help ease this problem as a result of overpopulation together with anticipated climate change related problem was widely discussed during the interviews (IDI) and *maneaba* group discussions (MGD). Participants in the MGD on South Tarawa explained:

Our islands are becoming overcrowded especially the urban area of South Tarawa and to ease the pressure on the environment, population needs to be controlled and one way is to move some people to another island or country, and hopefully able to find work in their new place to support their family as well (MGDBI)

It can be seen from the general responses of participants during the field work that they wanted to do something to protect their islands. The following are their complied proposals to help protect the islands from becoming uninhabitable including preventing ground water from becoming salty, managing resource harvesting, and reviving traditional skills. The prime objective of the proposals is to help the islands to become capable of withstanding future impacts on the land and resources in the event of the rise in sea level. Two major themes were identified in the interviews and discussion group and are called in this study as:

1) Social approaches, and 2) Technical approaches.

6.4.1 Social approaches

This strategy is about preparing the people for anticipated climate related impacts, in order to contain effects on the urban environment and the people. As highlighted by IDITR2, "...our government needs to prepare our people to face the impacts of climate change...they should tell our children in school, tell our people during church services, and through our *unimane* in the *maneaba*..." It was also suggested that the Kiribati Government ensure the urban areas continue to support their populations in the long term. These include a) facilitating the movement of people both internally within Kiribati and externally to other countries through internal and

external relocation (IER approach), b) reviving traditional environmental knowledge and skills (TEKS), and c) reducing population growth through family planning.

6.4.1.1 The IER approach

During the MGD and IDI, it was interesting to note the lengthy discussions by the South Tarawa participants on the many urban related problems that they have experienced there. Kiritimati have not really experienced what urban people on South Tarawa are experiencing. South Tarawa research participants have suggested plans that could help to ease existing urban problems on South Tarawa by 1) extending the urban boundary to North Tarawa and 2) by considering the establishment of another urban centre for the Gilbert group or decentralising existing urban services to outer islands. These proposed strategies include moving some of the urban population of South Tarawa to another area as congestion is one of the major urban problem confronting South Tarawa. Similar concern has been repeatedly emphasised by participants including IDITR6 when he stated,

...something needs to be done urgently by government to address the congestion problem on South Tarawa...it's about time to extend the urban boundary to North Tarawa...this is the only available solution that I can see now.

At the moment both the government and the urban land have and continue to face considerable problems supporting the livelihoods of the urban people due to the fast decline of important traditional resources. It is not hard to see that overcrowding and congestion on South Tarawa are two major problems that continue to affect not only the government and the new immigrants from outer islands but also *kain Tarawa*, who find it hard to secure land for their increasing family numbers. As a result of limited land and resources, private houses have been built in close proximity to each other making traditional family privacy difficult to observe. Even the landowners whose lands were leased by government find it hard to find land to live on. As explained by IDITR18 that:

...before independence our people on Betio lived in the middle of the island while coastal areas were used for canoe sheds...since

independence and until now people have started settling in coastal areas as a result of increasing infrastructural developments and land space becoming scarce...we cannot find a place to build on now.

Because of overcrowding problems, contagious diseases such as influenza and diarrhoea are easily spread especially affecting children. This same concern was also indicated by IDITR8 who observed that, "...diseases are easily spread as we live very close to each other...and also because people don't have proper toilets and use the beach instead...this also helps the spreading of the diseases..." The spread of contagious diseases was also raised and discussed during the MGD on Betio:

Today diseases like fever, coughs and running nose are easily spread because houses are very close to each other...so when family in this has the flu it will not take long before their neighbours will get it...this was not the case before when houses were built quite far from each other (MGDBE)

The IER approach would involve a step-wise movement of people, first those employed by the Government to move to areas in North Tarawa that have not been settled to ease the current overcrowding problem. The other proposal is to grow another island in the Gilbert group as an urban centre. The establishment of another urban centre will be considered in more detail in the technological approach. This is not a quick fix solution but it is intended in the long term to solve the overcrowding, congestion and shortage of land problems on South Tarawa. Having Kiritimati as another urban centre in Kiribati is important in this proposal. However, Kiritimati is already serving the islands in the Line and Phoenix group as their main urban centre. This proposal was strongly suggested during the MGD as well as by individual participants in the IDI for both South Tarawa and Kiritimati. Shown below are some suggestions by participants from South Tarawa and Kiritimati relating to the same issue:

The government should look at relocating some people to another island as this island is overpopulated...we have other islands in the Line and Phoenix groups like Kiritimati...why not send some people there (IDITR21)

The government should talk with landowners on North Tarawa to use some of the lands there that are not used yet...build residential houses there and move government workers to stay there...also consider connecting all the islets with bridges so that people can travel freely

between South Tarawa and North Tarawa...this is the only way to solve this overcrowding problem on South Tarawa (IDITR18)

However, it is important before such an undertaking is implemented that the people who are likely to be involved, both in the long and short term, are properly consulted and made aware of the objectives of the relocation and, especially important, facts about what they expect to see when the proposal proceeds. The same applies to the landowners at the destination who will need to be fully and properly consulted, and perhaps compensated, before the implementation of a relocation programme. In the case of islands in the Line, this is not a problem as all lands there are State land.

6.4.1.2 Traditional Environmental Knowledge and Skills

One of the most popular issues that was raised and discussed by research participants in the MGD and IDI was the traditional culture of Kiribati in dealing with the natural resources. According to the people during the MGD, one of the major urban problems is the growing rate of unsustainable harvesting of the natural resources by the urban population. This has prompted the people to revive their traditional methods of harvesting resources. Hence, the support for TEKS (Reviving Traditional Environmental Knowledge and Skills). This may be seen as a win-win approach to adaptation as TEKS are likely to have contemporary relevance even if climate change impacts were not to eventuate. Such knowledge and skills are important for the day to day survival of the people. Similar understanding was explained in Agenda 21, Chapter 17 which stated:

...The development and application of traditional knowledge to improve the capacity of countries to implement sustainable development should be fostered.

A similar concept was also explained by IDITR23:

...our people have neglected their traditional culture especially the skills in fishing and planting which our forefathers have used to enable them to survive on our limited resource islands...reviving these skills should be encouraged by our government so that the unemployed people will still be able to find food in the sea and on land despite having no money (IDITR23)

This approach involves the allocation of a Government Ministry to oversee the progress of the programme and the appointment of staff tasked with the responsibility to carry out the work. Three main components may be envisaged: consultation, analysis, and implementation. The consultation stage would require organising meetings with the *unimane* from all islands in Kiribati to collect important Kiribati skills and knowledge and to identify which of these are essential for protecting the environment and resources as well as to enable people to support their families especially in times of bad weather. As explained by IDITR22,

...government should start collecting traditional skills from our old people and those with knowledge in areas relating to preserving and conserving traditional resources here and outer islands...for use in the school syllabus.

This approach could encounter cultural barriers especially when endeavouring to obtain cultural skills from families that have kept and passed down these skills among their own members. As noted, family skills are kept secret and the passing of such knowledge to people from another family is not allowed. Hence, the first thing that should be done by those conducting the programme is to ensure they stick to traditional protocols when meeting with the people for the purpose of collecting traditional skills. Similarly, it is also appropriate that meetings be held in the *maneaba* as people are more relaxed when discussing traditional skills in this customary setting.

Our old men today still have those special skills, including navigation, building houses, fishing, cutting toddy, food preservation and the like...it is time for them to teach the young people these skill now before they all disappear (IDITR8)

After collecting important skills from the people, information collected will need to be analysed to identify which traditional skills are important to protect the people and the islands from anticipated impacts of climate change. The last but not the least of the activities will be the implementation which involves the sharing of these traditional skills to the people with a prime objective to help protect the land and resources that provide the livelihoods of the people.

Several proposed approaches will be utilised when sharing the skills to the people. The first is the use of the *maneaba* where people are called to meet by the *unimane*. People always respect the call for meetings in the *maneaba*. The other involves the inclusion of these skills in the school curriculum at both primary and secondary level. This is to ensure that every young child in Kiribati gets the opportunity to learn these important skills in school. Our people in the past have survived from the limited resources that our atoll islands provide.

6.4.1.3 Population Planning (PP)

Overcrowding and congestion were highlighted in most discussions during the MGD and IDI with most participants blaming the cause as over-population of South Tarawa. As a result, participants agreed to recommend the control of urban population on South Tarawa in particular hence the formulation of the PP (Population Planning). The focus of this proposal is on making families throughout Kiribati aware of the importance of having small families that are capable of sustaining themselves in the long term. As explained by IDITR19, “...there are too many people on South Tarawa today...something needs to be done now to help reduce and control the population here...”

This recommendation was in line with the outcome of the Third International Conference on Family Planning (ICFP) which included a call by civil society leaders for governments to make family planning a priority. It further stressed that when countries commit to invest in family planning, they will experience a “demographic dividend” in their economic growth and prosperity (Population and Sustainability Network 2013). Similar understanding was also pointed out by IDITR13, “... the health department should improve their family planning techniques and encourage the young people to use family planning methods...so that unwanted pregnancies are controlled...”

A PP approach will help to facilitate and improve existing family planning programmes by the Ministry of Health (MOH), international organizations like the UNFPA and WHO and non-governmental organizations. In pre-colonial times, overpopulation as a result of uncontrolled family size has been avoided with the use

of traditional methods. While the application of these traditional methods in the modern Kiribati society is illegal, they helped to control overpopulation in the past.

The importance of improving and expanding the work in this programme is that I-Kiribati are aware of the limitations of their atoll environment and that having many children will make the situation worse. The introduction of current western methods to control family size is vital to ensure the population size is contained at a sustainable level in order for the environment to continue to support the livelihoods of the people. During the MGD on Betio the *unimane* explained that in the past people were very cautious about the limited number of lands and resources they had and as a result restricted the number of children they had. Even though modern family planning techniques were not available then, the use of traditional massage to control pregnancies was practised. Traditional massage was performed by the experts only and people knew these people.

Certain families possess the massaging skill not only to heal certain sicknesses like stomach ache, running stomach, but also to control pregnancy...in the past, family size was important because our islands have limited resources (MGDBE)

Population on South Tarawa in particular was discussed during the MGD on South Tarawa and Kiritimati. Participants are concerned that despite on-going family planning programmes the normal size family is still very high. In fact, the recent population census shows an average household having between seven to eight people per family throughout (Kiribati National Statistics Office 2012, Kiribati National Statistics Office 2005). This concern was summarized during the MGD in Betio when they stated that:

Our people are normally ashamed to visit the hospital and ask for pills and condoms...maybe the Health department needs to consider making a programme for village nurses to visit every home and discuss family planning options...in this way people will be more open to discuss the different options to take to control their family size (MGDBE)

Home visits by nurses may need to be considered by the Ministry of Health with a view to improve the family planning programme. It is anticipated that when families are visited in their homes that they will be more open to discuss their plans for their family size with the nurse rather than visiting a hospital where many people are

present. Kiribati people are cautious in sharing their family issues in public places and this could be one factor that has caused the family planning programme thus far to not successfully achieve positive results, especially in reducing family numbers.

In the event of climate change and the rise in sea level, it is expected that smaller size families will more easily make their decisions, whether they want to continue staying in Kiribati or move to another country. With small family sizes, decisions to migrate involve fewer expenses compared to larger families. This was stated by IDITR27 during the IDI on South Tarawa:

Controlling our family numbers is important especially now that climate change is slowly affecting our islands...maybe smaller families are easier to move than a large family...that's why I think it is important to encourage Kiribati people to have smaller families (IDITR21)

Additionally, smaller families will find it easier to save money for use by the family in later years, such as working to protect their houses or coastal areas from climate change related impacts. Also, distribution of family land today in Kiribati is becoming a major problem especially for larger families as the amount of family land available is getting smaller. Before, each member of a family normally received three or four pieces of land when family lands are distributed whereas today people will be lucky to receive three pieces and one or two or one piece is all most are able to receive. As also explained by IDITR30,

...my family is not that big, only three children living with us and my parents...so with the little income I receive from my work I am able to support my family...but my older brother who lives in that house has a big family...and he finds it hard to support his family with the salary he receives from his work...he use to come and asked for money from me to buy food for his children...having a big family on South Tarawa is hard to support...our young people should learn now on how to control their family size using family planning methods.

It is inevitable that while family size increases, the amount of land for a family does not change (and may indeed be getting smaller). In the case of *kain Tarawa*, especially families whose lands are leased by the Government, they distribute the rent they receive from their leases instead of land. Because all of their lands are leased by the government they have no rights to occupy any of their lands unless it

is released to them. The concept of small size family is important for *kain Tarawa* also to enable each family member to receive more shares in terms of monetary value. The same problem was pointed out by IDITR2, "...our family size has now increased and as a result our share from our parents' leased lands is becoming smaller every year...in the 90s there were eight shares, but now we have eleven shares when we distribute our leased money...maybe in five years' time it will increase again..."

6.4.2 Technological strategy

As noted from the responses of participants in both the MGD and IDI, they were also considering strategies that involves technology. As a result of what they have discussed, the following are strategies that involve different technological approaches that could be used to help preserve the islands from long term impacts of climate change, particularly sea level rise. Research participants hoped that the use of technology will enable the islands to provide, in a sustainable manner, the resources required to support the livelihoods of the population in the long term. These proposed recommendations also take into account the anticipated problems caused by climate change. Besides, on-going programmes by the Government to address environmental problems caused by climate change, the following are measures identified during the MGD and IDI that could help withstand future impacts of climate change. Three main proposals are recommended by research participants during the IDI, and MGD:

- a) Coastal Defence (CD),
- b) Rainwater Catchments (RCs), and
- c) Urban Expansion and Development (UED).

It is important at the outset to explain that the proposed recommendations are not the solutions to existing urban problems in Kiribati or the problems from climate change impacts. They are merely recommendations, as proposed by participants during the field work, for consideration by the atoll island states, especially Kiribati, to assist in their on-going preparations for future events of climate change and particularly sea level rise. Hence, the call for policies and strategies aimed at reducing their impacts on the people and the environment. The third

recommendation deals with the expansion of existing urban boundaries of South Tarawa and establishment of another urban centre which is the major strategy to adopt and will require thorough investigation by countries who consider it a good option. While this has been discussed briefly in the previous section there will also be a need for important technological inputs to make future urban development applicable and sustainable.

6.4.2.1 Coastal Defence (CD)

During the MGD and IDI, participants explained that our people in the past have always built sea walls to protect the erosion of their lands during high tides that are associated with rough seas. You can see on every island that some areas have sea walls simply because these areas are easily affected during high tides. However, now that the effects of high tides have become common, participants recommend the construction of sea walls, first in areas that are most vulnerable to the effects of sea level rise and later the rest of the islands. Building sea walls was a popular strategy among participants in the UHSQ, MGD and IDI who discussed the issue in some detail.

In the past, sea walls were used to protect our land from erosion. Our people have different ways to build sea walls, some use stones and sand and others coconut logs and leaves with sand. I remember back on my island my grandfather had a sea wall...our land was never affected by high tides and even king tides...we must learn from people who know how to build sea walls in our Kiribati way (IDITR9)

...another method they used for protecting beach erosion during high tides associated with rough seas was the lying of dried coconut leaves on the beach and tying them with a string to a post on the land...leaves acts as buffers to reduce the force of the sea when it reaches the beach and stops the beach from being taken back with the sea (IDITR12)

This approach can be done by individual landowners whose lands are not leased by the government. For leased lands it is the one who lease the land who will have to build a sea wall. Two options were suggested in this approach, 1) to use the local materials like stones collected from the mud flat as well as sand from the mud flats. Furthermore, in order to make the sea wall strong and last, the use of a cement is highly recommended to make it strong. The other option is to use cement and sand

to build a sea wall. This approach requires funding. It was recommended for government to seek assistance from the international community for funding.

Participants on South Tarawa have seen what the Kiribati Government has done through the KAP projects, hence suggesting to work on similar plan, using permanent material as it is much stronger. One advantage is that Kiribati has already begun working on coastal protection for South Tarawa through the Kiribati Adaptation Programmes (KAP) I, II, and III. KAP only focuses on protecting areas around South Tarawa that are most vulnerable to the rise in sea level. Below are suggestions by participant IDITR17:

We want to protect our land from the rising seas during high tides but we don't have the money to buy materials for it like cement etc...if our government or other donors are willing to provide the money then we will build sea walls to protect our land from erosion

IDI participants also proposed the inclusion of traditional methods in building sea walls when planning for coastal defence. A proposed sea wall plan (Figure 6.7) has been provided by the author, based on the suggestions by research participants during the IDI, for consideration by decision makers in the Government should they favour the idea of CP in their adaptation strategy. IDITR22 explained, "...I am in favour of building sea walls to protect vulnerable areas...and I want to build a strong sea wall using cement...even when we use coconut logs we can use cement to make it strong..."

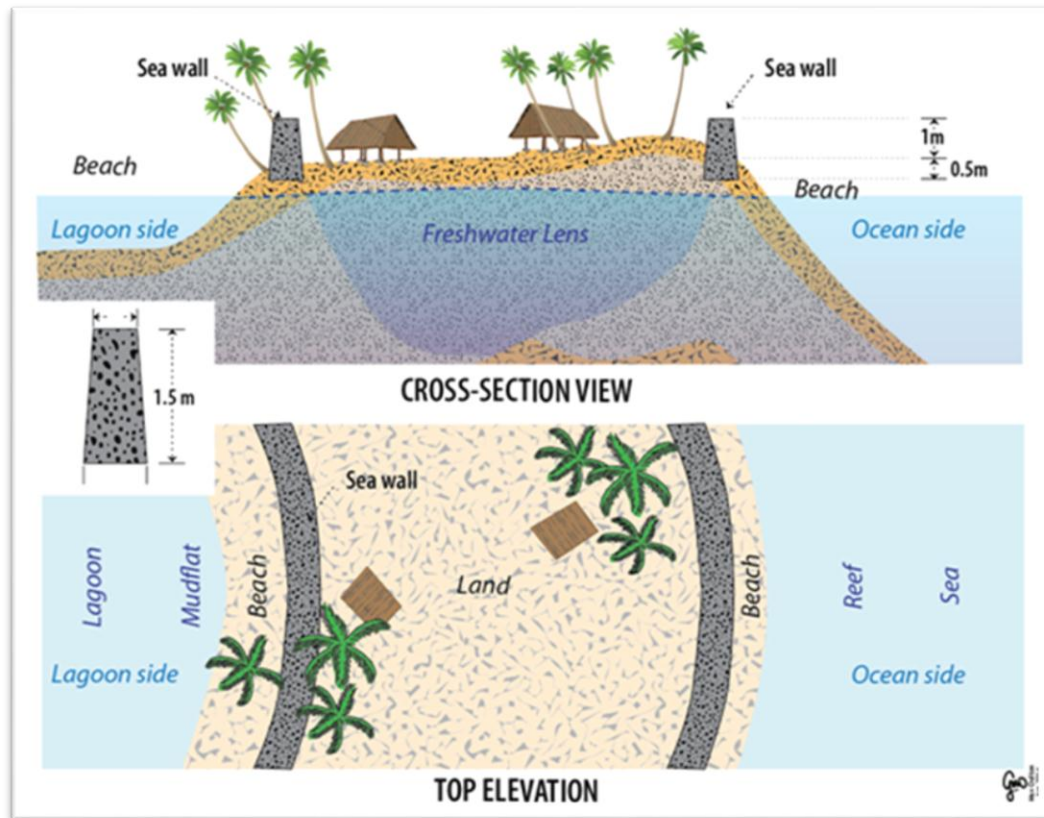


Figure 6.7 Proposed sea wall plan

(Source: Author's plan based on research participant's suggestions and drawn by Max Oulton University of Waikato)

(Note: Top and cross views of an atoll island showing the sea walls on lagoon and ocean side of the island)

It was also explained by participants during the MGD and IDI that the proposals to build sea walls were intended to increase the heights of islands by a metre with the hope that it will help save, if not all, some islands from becoming submerged underwater should the rise in sea level be higher than the island. Participants believe that the only way to save our low-lying islands is to try and raise them. Hence when building sea walls, people can start filling them with rubbish and sand.

It was also explained that the sea wall has to be built on the land adjacent to the beach and not on the beach or the mud flat. With all that has been mentioned regarding the CD, the Government is not obliged to follow every detail of the proposed plan. They are free to change or add whatever they think is appropriate for the purpose of making the plan more suitable to their requirements. It was also suggested by research participants that government prepare a proper plan for people

to follow so that everyone will build the same sea wall which can all be connected to each other should the need arises in the future.

The government should decide on the plan of a sea wall for South Tarawa for people to follow when they build sea wall on their land...and encourage all landowners on South Tarawa to follow when building a sea wall on their land...funds should be provided by the government... (IDITR16)

The purpose of the sea wall is to protect further erosion and flooding of the land during high tides, king tides and storm surge in the urban areas as well as outer islands where people live. When the urban entire area is completely sealed with sea walls then the next work will involve the filling of the land to the level of the sea wall which is about a metre. This process would be done slowly and the government with assistance from the Ministry of Works and Energy would look at possible ways to get extra soil for this task. According to participants in the IDI and MGD, two ways were suggested; one is to dredge sand from the lagoon and the second collect fill from lands that have not been used for settlements.

Both suggestions involve consultation, consent from landowners, as well as finance and equipment. It will also require engineering review to ensure its relevancy to the atoll islands. It is also likely that court proceedings will become necessary to avoid future grievances by the landowners and other interested parties. However, as explained by IDITR16, "...what we have suggested is not final, more can be added to it or removed...what we are trying to say is that we want to do something now to protect our islands so that we continue to live on them..."

It was also discussed and suggested by the MGD and IDI participants that there will be a need for finance and equipment to dredge sand from the lagoon. It was suggested for government to seek assistance from overseas development partners and also from the climate change funds for this project should the government be in favour of it. It was also vital to note the recent SIDS meeting in Samoa in September 2014 which mentioned the pledge by the Global Environment Facility (GEF) of \$250 million to fund sustainable projects in small island states over the next four years. It was also during this meeting that Kiribati's President, HE Anote Tong, sought global partnerships with those countries that are willing and prepared

to do something about climate change (Radio Australia September 2, 2014, (Australian Broadcasting Commission 2014).

It was highly suggested during the IDI and MGD for the Kiribati Government to explore obtaining funds from the GEF and other developed countries. If developed countries are genuine in their commitment to help developing countries and especially the most vulnerable ones in their endeavours to protect their countries in the event of climate change, then Kiribati can utilise these resources. Participants also emphasised the importance of working together to enhance appropriate programmes that will help protect the islands. Even with the lack of finance, the government and the people should not be discouraged.

Climate change is not our doing, it is the doing of the rich and developed countries...they need to take responsibility to help the poor countries who have very little input into what the whole world is currently experiencing with problems caused by climate change (IDITR23)

6.4.2.2 Rainwater catchments (RC)

As already experienced by the urban population on both South Tarawa and Kiritimati, water has always been a major urban issue confronting urban dwellers. This was also discussed in detail by participants during the MGD and IDI on South Tarawa and Kiritimati. The purpose of improving rainwater collection and storage is to improve the quality, quantity and sustainability of water supply for the urban as well as outer island population. Improving rainwater catchments is intended to supplement the reticulated urban water system and the well water supplies mainly urban areas. The process would require government financial assistance as well as external assistance.

A similar programme was implemented during the 1980s when the Tarawa and Water Sewerage Project (TWSP) was carried out on South Tarawa. Ferro cement type tanks were built next to permanent material houses. The TWSP was in charge of installing the sewerage systems for Betio, Bairiki and some houses in Bikenibeu as well as constructing the tanks for households who applied for it. Soft loans were provided to families who wanted a tank. However, most ferro tanks today are no

longer in use due to leakage problems caused by salt spray from the sea and heat of the sun.

Our ferro cement tank leaks and could no longer collect rain...I am now not working so I cannot afford to buy another tank...water is our main problem as the PUB taped water is not reliable...most of the time it was turned off and when that happens we will use our well water which is very salty and also smells...we need help from the government (IDITR20)

The rainfall catchment improvement raised in the research discussions follows a similar pattern but instead using tanks that are more suitable to the Kiribati climate. Polythene, fibreglass and plastic type tanks were proposed by participants during the MGD and IDI. A polythene plastic water tank seems to be the best option because it is more suited to the atoll environment where salt spray is common. A similar tank type is currently being made and distributed on Funafuti, the capital of Tuvalu, and funded from external sources, mainly the European Union, AusAID and JICA. This project started when Tuvalu experienced one of its worst droughts in 2011. The objective of the project is to improve rainwater catchment for the urban population as well as outer islands. Tanks are free but each family is required to fix guttering to their houses before a tank is delivered. Two tanks are provided free to every household in Tuvalu as part of international aid (Manoa January 2012 Pers. Comm).

A similar type of project is suggested here and participants suggested that government seek external sources to assist individual households. In addition, the government would need external funding for the equipment to manufacture the polyethelene plastic tanks on South Tarawa. Families who wished to have more than one tank could still obtain extra tanks but they would have to pay for them. The same applies to churches, companies, private organizations and the government for the permanent buildings they have. It was suggested that every permanent building should have one free tank. As suggested by IDIKR19, "...if the government can assist by providing each urban household with permanent building houses, one tank each will very much help with the water problem..." The government would also need to provide much larger tanks for its buildings to use as reserves when the needs arise in the future. Collecting as much as possible

rainwater during rainy times is important as PUB reticulated water is becoming unreliable due to over pumping of water from the source.

Water from the PUB is getting salty now...and we have stopped using it for our baby because our baby usually gets diarrhoea when we use the PUB water...we now use water from the store and our baby hardly gets diarrhoea now (IDITR14)

A similar programme would be extended to Kiritimati and outer islands when South Tarawa is completed. This is important to ensure that rain water is not wasted but harvested properly to help provide good fresh water for the population.

6.4.2.3 The urban expansion and development (UED)

Another important suggestion proposed by participants looks at providing an urban area with more land space than what is available in South Tarawa. As a result of this, the urban expansion and development of UED approach was proposed. UEA is intended to look at two development projects with the objective to improve urban living in Kiribati in the events of climate change. The first involves the extension of the existing urban boundary for South Tarawa to North Tarawa. This is a sensitive approach issue because residents of North Tarawa have already made it clear that they are reluctant to allow the urban boundary to extend into their lands.

As discussed during the MGD, people on North Tarawa are fully aware of the urban issues that are experienced by their families on South Tarawa, and hence are not prepared to see that happening to them should the boundary be extended to North Tarawa. The other most significant concern relates to the pressure on both the land and sea resources by the urban people. This includes social, economic and environmental problems such as waste disposal, pollution, water, congestion, overcrowding, squatters, drinking and drug abuse, land shortages, coupled with the rise in sea level which is prevalent on South Tarawa today. Different views were shared by participants during the IDI and MGD. The most popular views were shared below:

...another option to consider is to develop the urban centre on Kiritimati well and then move some government departments or even ministries there. Kiritimati has a huge land and is also owned by the government

so there will be no problem with using available land for development. Another option is Abaiang, it very close to Tarawa so there will be no problem with people commuting for work between these islands...also there are ferries that are operating daily between these islands (IDITR14)

Despite the fear and worries of the North Tarawa people, participants during the MGD strongly recommended the government of Kiribati to consider new approaches to ease the problem of land shortage and overcrowding on South Tarawa, suggesting the expansion of the urban boundary to North Tarawa. They are aware that there will be problems when the boundary is extended to North Tarawa but the participants strongly urged the government of the day to consider conducting proper consultation with the North Tarawa population and explain everything they are likely to encounter should the plan be implemented.

One very important proposal discussed during the MGD was for government to ensure that vital urban infrastructures are put in place in North Tarawa before the move is implemented. The proposal to extend the urban boundary to North Tarawa involves different stages. The first stage involves the building of a residential area to accommodate civil servants who are not able to secure government housing on South Tarawa because of the shortage of urban housing. Then the next stage would be up to the government of the day to look at what other urban services and amenities they consider necessary to be moved to the new urban location in North Tarawa to ease urban congestion that is currently prevalent on South Tarawa.

This proposal is important to ensure that existing urban problems that are prevalent on South Tarawa are not repeated in North Tarawa. According to literature, the problem experienced on South Tarawa today could have been avoided had both the colonial administration and the Kiribati government considered recommendations presented in the report to the Resident Commissioner for the Gilbert and Ellice Islands Colony in 1968 (Bedford 1968). As highlighted in the report by Bedford (1968: 52) stated:

...accurate and detailed land use maps of the entire area of South Tarawa from Bonriki to Betio are prepared as a basis for the physical planning of the urban area... (Bedford 1968: 52).

Unfortunately, the detailed land use map of South Tarawa was not properly followed and adhered to and as a result the main urban area in Bairiki was not well established according to the original plan. Another major issue that South Tarawa faces relates to serious population problems due to the uncontrolled movement of people from outer islands. This has caused overpopulation and the government of Kiribati is unable to repatriate outer island unemployed migrants.

Therefore, the recommended solution to extend the urban boundary to North Tarawa requires the government to approach the North Tarawa Council to discuss this move. It also suggests organising the *maneaba* meetings with all village people in North Tarawa to make them aware of the proposal and obtain their consent. It is vitally important for the government to consult all the people on North Tarawa about this programme and to explain the problems the government is facing in relation to land shortages and over-population on south Tarawa. It would also be important to discuss the economic benefits people will receive in terms of urban infrastructural developments to north Tarawa people. The government would need to explore leasing lands in North Tarawa for housing purposes and having employees commute from there. As mentioned by IDITR4,

...the government should explain to the people on North Tarawa the financial benefits they will receive from their lands when they are leased by the government for use in the development of an urban area there...this will be much better than the money they get from cutting copra from their land

The other proposal was based on the discussion of participants during the MGD on Kiritimati. MGD and IDI on Kiritimati feel that development on Kiritimati was very slow, yet it caters for two main groups the Line and Phoenix groups. Most participants proposed more urban projects for Kiritimati like improving the hospital, and renovating and building more residential accommodation for civil servants on Kiritimati. Despite the fact that Kiritimati is already serving the islands in the Line and Phoenix group as their urban area, it has very limited urban services and amenities. As explained by IDIKR13,

...even though Kiritimati is serving the medical needs for people in the Line and Phoenix groups, our hospital on Kiritimati is very small with limited medical facilities to cater for the people...every time sick

people from here were referred to Hawaii instead of our main hospital on South Tarawa as it is very far from here...I strongly propose that our government extend and upgrade our existing hospital as it is too small to cater for sick people in the Line and Phoenix group.

According to participants during the MGD and IDI, another advantage of Kiritimati is that it already has some albeit limited established urban infrastructure and services. What they see that needs to be done now is the expanding, renovating and upgrading of existing urban services and amenities. Another advantage of Kiritimati is its large land mass to accommodate excess population from South Tarawa and other outer islands of the Gilbert group. After a long period of discussion, the following are the main proposed urban development programmes that were recommended by participants during the MGD in Ronton:

- 1) Expand and upgrade existing road networks from Ronton to Poland.
- 2) Provide a central electricity supply to serve the whole islands (preferably to be built near Banana),
- 3) Distribute human settlements instead of confining settlement to Tabwakea area only (preferably to areas between Main Camp and NASA Station and away from water reserve areas),
- 4) Build a larger hospital to cater for Kiritimati as well as outer islands in the Line and Phoenix (have the hospital built on the lagoon side between London and Banana for easier access to residents of Banana and Poland as well),
- 5) Improve existing urban water system by expanding the strength and capacity of the water pumps and storage tanks for distribution,
- 6) Encourage and improve existing tourism activities in the areas of bird watching and fishing, (improve existing tourism infrastructure such as motels and hotels to international standards),
- 7) Improve local shipping and domestic air services between Kiritimati and outer islands in the Line and Phoenix groups (upgrade existing airfields on outer islands as they have not been used for a long time),
- 8) Negotiate with reliable shipping services in South Tarawa and Honolulu to provide regular and reliable shipping services between South Tarawa and Kiritimati and Hawaii and Kiritimati to address the frequent shortages of imported foods such as rice, flour, sugar, that have become staple foods in Kiribati (MGDKI).

As agreed by participants during the MGD on Kiritimati that expanding and improving existing urban services and facilities are important to ensure that future urban development and population demands are provided in advance and the problems experienced on South Tarawa are not repeated. As also mentioned by IDIKR11, "...Kiritimati is a very big island and the government should invest more here in terms of its urban development as there are so many land areas that have not yet been occupied unlike South Tarawa that is so congested..."

The urban related problems experienced on South Tarawa today have culminated from the lack of urban planning by the government in establishing sufficient and efficient urban services and amenities that could support the current population. Urban planning and management is critical in ensuring the urban area is capable of supporting urban development and population. Another important factor relating to the huge landmass of Kiritimati was explained below,

The land on Kiritimati is spacious and can accommodate the whole population of Kiribati so when it comes to the rising sea level as a result of climate change the government can move the whole population here... (IDIKR1)

The government should look for funding from other countries to help build the central area of Kiritimati by taking sand from unused land and heap it to two or more meters above the normal height of Kiritimati...and once that is done start building a concrete wall around the area... (IDIKR2)

Besides expanding existing urban facilities and services on Kiritimati, there was also something important that was raised by several IDI participants that needs mentioning. This is about the building of a large mound or bund in the centre of Kiritimati. This same concept was also proposed by Yamamoto and Esteban (2014) about the raising of islands. This would involve landfill (sand and rocks) from lands that have not been used on Kiritimati. Kiritimati is a very big island and state owned so removing soil from any land requires the consent of the government only. This proposal looks promising but would require significant further planning and investigation by the government and engineers.

Kiritimati is a big island so maybe making a higher ground in the middle of the island by taking soil from areas that are not settled and heaping

them to create a higher land somewhere in the middle of the island will no doubt solve the rising sea level problem in the future...all that is required for the work is the equipment...the material is already there, the soil from unused lands (IDIKR13)

Additionally, Kiritimati has economic potential that has not yet been fully explored by the government. One of them is the development of tourism on the island. .

Kiritimati has economic potential that has never been fully developed...I believe tourism is one of them...the government need to improve and promote tourism...invite five star developers from abroad to build more five star hotels and improve air services to two or more flights per week...this can benefit the people by providing more job opportunities on the islands... (IDIKR16)

In addition to the expansion of urban areas described above is the expansion of services and amenities provided by outer island councils to their populations. An important measure to restrict urban growth is to provide incentives for people to remain in the outer islands or perhaps even to draw back people who have left. The same understanding was shared by IDITR14, "...maybe it's about time for government to look at upgrading and developing existing facilities of outer island government stations...so that people will not want to move to South Tarawa..."

Because each outer island has an island council station, this would only require the improvement of existing services and facilities there. Participants were also aware of the financial constraints involved, nevertheless, it is important for the government to carefully seek available sources to fund such projects. Some participants during the IDI mentioned the decentralisation policy that was implemented after independence by the government where three outer islands were chosen to serve as administration headquarters for the northern, central and southern islands in the Gilbert group. Unfortunately, it was not successful and was later abandoned.

There was also some discussion on the decentralisation policy to be reconsidered by the government. With this, it requires work by government to ensure infrastructure on outer islands would be sufficient to accommodate such development. In terms of developing new nodes of development on outer islands the issue of Banaba was raised by a number of participants:

South Tarawa is overcrowded and there is not much space left for further development...maybe it is time to consider other islands that have the potential to support economic development...Banaba is one island that still has some phosphate left after the mining and could support agricultural development... (IDITR26)

The government should liaise with the Banaban landowners and obtain their consent to develop Banaba...in order to move people there in the future when other islands in Kiribati are severely affected by the rise in sea level... (IDITR6)

During the MGD and IDI it was interesting to note that Banaba is the only island in Kiribati that is likely to be only moderately affected by sea level rise due to height of the island. As a result people propose using it to settle people when all other islands in Kiribati may no longer be able to support human existence. Banaba has environmental and political problems that need to be addressed prior to commencing this programme. The first relates to the rights of the Banaban people. The second relates to the impacts of phosphate mining on Banaba that has rendered the island uninhabitable. Lastly, the fresh water sources that are confined to several caves on the island are limited. Of the problems above, the priority is obtaining the consensus of the Banaban²⁰ people to any rehabilitation work and proposed future use of the island. It was recommended that the island be leased so that landowners who are living on Rabi would receive monetary benefits from the use of their land. Some participants recommend leasing the land from the Banabans.

It was also very highly recommended by participants during the MGD for the possible rehabilitation of Banaba, the need for the Kiribati government to approach the three countries that were responsible for the operation of the British Phosphate Commission (BPC) that mined phosphate on Banaba. These countries were Australia, New Zealand and Great Britain in the consortium of the British Phosphate Commission. It was unfortunate that while the farmers of Australia and New Zealand have benefited from the phosphate from Banaba, these countries seem

²⁰ Toward the end of the 1970's, the Banabans started to return in numbers to Banaba with the hope to stop the mining. They started to destroy mining machines resulting in some of their leaders facing criminal charges. The main reason for doing this was due mainly to their disenchantment with the mining of their island. Similar experience is likely to be repeated if proper consultation with the Banabans is neglected.

to have never considered the rehabilitation of Banaba to make it habitable for the people to use after the mining. As strongly pointed out by IDITR22,

...the government should talk with the countries that mined phosphate on Banaba to fund the rehabilitation programme of the island to make it habitable again...now the island is not able to support the people as there are holes everywhere on the island after they mined the island...they have destroyed the landscape when they mined phosphate on Banaba...it's time for them to fix what they have destroyed...

When phosphate mining ceased in 1979, the BPC left the island leaving behind a completely different landscape from what it used to when they first arrived. As a result the Banabans are not able to return to their home land because it was completely destroyed (Sigrah and Stacey 2001). Even the Kiribati government is not able to develop the island. It may be considered the moral and ethical obligation of the BPC and the countries involved to ensure the island is rehabilitated so people can return and live on Banaba. As also mentioned by IDITR12,

I can still remember when I visited Banaba when it was still been mined that the island was so fertile and thick in green bushes and trees...but now it's just bare rock with holes everywhere, something needs to be done to make the island habitable again

At present most of the island is made up of holes and pinnacles making living on the island impossible. Therefore, it was highly proposed by participants that rehabilitation is a must to ensure the island becomes habitable again. There was also discussion by participants regarding a possibility for secondary mining of the leftover phosphate on Banaba. However, this would have to be discussed and finalised between the Kiribati government and the Banaban people. The importance of Banaba when it comes to climate change and in particular the rise in sea level was explained by IDIKR13 below:

We may not be able to protect all our islands...but I know we can protect some of our bigger islands...and we must tell other countries of the problem we face as a result of climate change...I believe there are generous people and countries who will be happy to help with our problem

6.5 CONCLUSION

This chapter has endeavoured to discuss the development of the discourse about climate change in Kiribati based on the views of the people obtained during the MGD and IDI, as well as to discuss on-going programmes by the Kiribati government to combat future related climate change impacts. The Kiribati government and the people of Kiribati are aware of climate change and its impacts on their fragile and vulnerable islands. The government has voiced its concern to international organizations and development partner countries through the United Nations meetings and other major international conferences of its pursuit to protect its islands from future effects of climate change.

The work is not easy and there is no quick fix solution to climate change related problems. However, as pointed out by research participants it is important not to lose hope but to continue pursuing plans to combat climate change. The President of Kiribati has continued to be vocal about the challenges facing his country in the global arena, lobbying countries, which are responsible for climate change, to become more sensitive to the plight of Kiribati and other low-lying island countries and to consider taking positive actions to reduce emissions of their greenhouse gases into the atmosphere.

While climate change is a global problem, the degree to which its impacts are affecting environments and the livelihoods of people varies among countries. Some countries will be much more badly affected than others. People in low-lying atoll countries like Kiribati will find it difficult to escape the rise in sea level as they have no higher ground to move to other than Banaba. The recent king tides in Kiribati in February 2014 proved devastating on some islands where sea water abruptly flooded some parts of some islands. South Tarawa infrastructure was affected badly, especially the roads, causeways, houses and coastal vegetation. The results of the king tides left part of the causeway that connects Betio islet and the rest of South Tarawa severely damaged. The devastation caused by king tides seem to be getting worse every year. The government and the people are concerned about the next king tide and what damage it might inflict on the land and resources that provide the livelihoods of the people.

Climate change has produced two major problems that require urgent attention to avoid further problems in the future. The first involves the islands becoming affected by the rising sea level and the second the likelihood of Kiribati sovereignty becoming questionable when most of the islands, except Banaba, become uninhabitable. As explained in Chapter 4, land in Kiribati has political and legal significance. This simply means that when one has no land, he/she has no “legal” status in the Kiribati traditional community. Traditionally, land rights in Kiribati provide traditional status to be an I-Kiribati. Assuming that climate change will eventually cause the submergence of all atoll islands and making them uninhabitable by the people in years to come, then the question of Kiribati’s legal status as a nation might be challenged.

While this assumption is yet to be seen in the future, it is vitally important that plans are put underway to ensure islands in Kiribati survive possible future impacts of climate change especially the rising sea level and continue to support the people now and in years to come. This calls for urgent action by the people and government of Kiribati to consider improving the resilience of not only the people but also the land that supports the livelihoods of the people. Improving coastal defences in vulnerable areas is important to ensure the protection of infrastructure and the lives of the people. The rehabilitation of the raised limestone island of Banaba is important and appropriate to address.

Consideration and adoption of recommended cultural and technological strategies could also provide solutions to some of the problems that Kiribati and other low-lying atoll islands are facing. Recommendations in this thesis are not intended to provide quick fix solutions to the merging climate related problems. They are simply proposing possible activities that could be considered beside what the Kiribati government and other low-lying atoll countries have in place in terms of strategies to address anticipated impacts of climate change. The future survival of low-lying atoll countries like Kiribati depends on the decisions their leaders, people, and government make today regarding strategies to address climate change related impacts.

This chapter has discussed proposed recommendations put forward by participants during the MGD and IDI on South Tarawa and Kiritimati. They are only proposals and it is up to the government together with its people and interested stakeholders to work together to identify and implement recommendations in their strategies that they think will enable long term human existence in Kiribati. The next chapter will discuss these proposed recommendations in line with what literature said and draw conclusions on the possible future that Kiribati is likely to encounter.

CHAPTER SEVEN

THE WAY FORWARD

...Our future depends on the policies we pursue, the programmes we undertake, the commitments we can muster and all the many other factors that have one in common. It depends totally and squarely on us. There is no other way....

(Tabai 1993: 320)

7.1 INTRODUCTION

It has been three decades since Kiribati attained political independence from Great Britain. The progress of the new nation has not come without difficulties especially when the islands are naturally endowed with limited resources. The coincidence of political independence with the exhaustion of phosphate mining, which initially accounted for 85 percent of export earnings, was a major economic hurdle Kiribati encountered on becoming an independent nation (Neemia 1993).

Research on climate change in the Pacific, especially the low-lying atolls, has revealed that most of the on-going environmental issues such as coastal erosion, frequency of bad weather patterns, and changes in sea level that continue to affect Pacific Island Countries (PICs) have been exacerbated by climate change (Barnett and Campbell 2010; Carr, Rubenstein, Graff, and Villarred 2013; IPCC WG1 AR5 2014; Mimura et al 2007). The “Pacific Plan 2012 Annual Progress Report” by the Pacific Island Forum expressed concern about how climate change will affect all aspects of life in the Pacific (Pacific Island Forum 2012). The recent IPCC WG11 AR5 (2014) report reiterated what others have indicated about climate change impacts on small island countries when it specifically stated that “Sea-level rise poses one of the most widely recognized climate change threats to low-lying coastal areas on islands and atolls” (IPCC 2014: 2).

In the past, Kiribati has experienced development challenges that were mostly influenced by the lack of its own resources; today the challenge it faces is climate related which is beyond its capability to resolve on its own. Global support in planning to combat climate change-related problems is vital to ensure the islands are protected from further destruction. Such support is necessary in the form of

programmes geared at enhancing the capacity of atoll islands to sustainably respond to population and development challenges. The way forward for Kiribati requires the collective efforts and support of the government, the local population and the international community.

7.2 REVIEW OF RESEARCH QUESTIONS

This thesis considers important and relevant questions relating to impacts of climate change in the urban areas of South Tarawa and Kiritimati and has explored five major research questions:

- 1) What have been the major changes in the coastal environments and groundwater supplies on South Tarawa and Kiritimati Island since Kiribati attained political independence in 1979?
- 2) How much of the degradation in the environments of South Tarawa and Kiritimati Island is due to increasing pressure of population and changing patterns of human use of the environment?
- 3) What strategies have the Government of Kiribati adopted to combat on-going degradation of atoll environments in the urban areas and how effective will these strategies be in the light of projected changes in sea level and other climate change-related developments?
- 4) How are the local populations coping with both the increasing pressure of people on the limited resources of the urban atoll environments as well as the degradation of water supplies, lagoon and ocean beaches and reefs, and the availability of fresh water and locally grown foods that supported the livelihoods of the urban population?
- 5) What are the main effects of climate change on the population and settlement patterns in South Tarawa and Kiritimati and what adaptation strategies are likely to be effective for adapting to climate change and its related impacts in the long term?

The focus on the urban population is deliberate as statistics reveal that approximately 60 percent of the total population of Kiribati is now residing in the two main urban areas of South Tarawa and Kiritimati. The population of South Tarawa has trebled since independence while Kiritimati's population has increased fivefold. It is expected that the share of Kiribati's population in South Tarawa and Kiritimati will continue to increase for some years to come.

The concentrations of population and economic activity in the South Tarawa urban area in particular have already proved unsustainable. There is growing empirical evidence that the pressure of population on the urban environment is being further exacerbated by climate change, especially the rise in sea level. As a result, adaptation strategies are essential to ensure the population can continue to survive in the area and on atolls more generally.

7.2.1 Changes in coastal environments and groundwater

South Tarawa's geographical characteristics, particularly its low elevation and narrow strip of land, make it vulnerable to sea water intrusion during high tides, flooding and storm surges. Temaiku is one area where erosion is quite prevalent. Other land areas along the lagoon side have experienced severe erosion as well. On Kiritimati, coastal erosion is not a major concern both to the residents and the government. The larger landmass of Kiritimati enables people to live away from the shore resulting in them paying less attention to what happens in coastal areas. On South Tarawa, coastal erosion is easily detected by the people as almost every piece of land is utilised right to edge of the ocean and lagoon due to limited land area. The government, through the Kiribati Adaptation Programme (KAP), has provided physical defence structures in areas along the coast of the national capital where erosion is more severe.

Erosion along the lagoon side in some areas has forced some families to relocate further inland or move to another part of the atoll. The limitation of available lands on South Tarawa, has forced some families to seek accommodation with relatives whose lands are not affected by erosion. While seeking residence with families is

traditionally acceptable, the disadvantage of this is that it will cause overcrowding in homes where the family size is already large.

The need to protect the islands from the forces of the sea is vital to ensure erosion is controlled and important resources like food and medicinal trees are made available for use by the people. The use of coastal defences is not new in Kiribati as our people have been using them in the past to protect the islands from erosion. Interestingly, the methods and materials used were simple involving dry coconut leaves and coconut logs besides stones and sand. The purpose of coastal defences is to protect erosion of the land and not to extend the land boundary of anyone's land.

More specifically, according to the old people of Tarawa who participated in the *maneaba* group discussion on Betio, sea walls were traditionally constructed on the edge of the land where the beach and land meets and should not extend onto the beach. Building sea walls over the beach usually disrupts the movement of the sea during high tides resulting in the erosion of adjacent lands. Sadly, construction of sea walls on South Tarawa today was mainly for the purpose of extending the land area of those people living near the beach. Unfortunately, the use of this method proves inappropriate as it usually causes more damage rather than preventing it.

Recent research by Duvat, Magnan and Pouget (2013) on South Tarawa also identified the importance of coastal defences to protect the land from erosion and sea flooding. Their findings on South Tarawa concluded that:

...buildings “with” coastal defences were considered as less exposed to coastal hazards than other buildings that were defined as “without” coastal defences... (Duvat, Magnan, and Pouget 2013: 427)

A similar study also concluded that shorelines on the ocean side that face the windward side display erosion while lagoon beaches that face away from the ocean swell experienced accretion instead (Duvat, Magnan, and Pouget 2013). The fact is that shorelines are dynamic physical features that rely heavily on the availability of sediments and oceanographic processes for their maintenance. Human

interventions, including reclamation and coastal defences, have the potential to alter or interrupt shoreline modification on atolls (Biribo and Woodroffe 2013: 346).

Flooding of the land during high tides affects the water lenses under the atoll by increasing the salinity of groundwater. This problem is obvious on South Tarawa where erosion of the land has reduced the size of the water lenses resulting in worsening the salinity of well water. Government, through the Kiribati Adaptation Programme, has built a concrete sea wall on already affected areas in the Nanikai area for example to protect it from further erosion. Since then the area has never experienced further erosion.

The major difference in the type of coastal defences today from those in the past relates mainly to the construction materials and the methods used in the construction. Previously, local materials like leaves and logs were used while today oil drums, used tyres, collected rocks from the land and reef, and concrete blocks are widely used. Some of these materials are now difficult to find in the urban area, especially natural materials like logs and leaves. Sea walls in South Tarawa often serve multiple purposes; firstly to protect the land from erosion and secondly to create areas that can be used for the disposal of urban waste (Duvat, Magnan, and Pouget 2013: 427).

Despite using coastal defences to protect vulnerable areas from erosion, most of the people occupying coastal lands on South Tarawa find it hard to fund construction of proper sea walls for their land. Families with a stable income use imported materials such as cement to construct their sea walls. Those who cannot afford to construct a seawall have had to use available local materials like coconut logs and dry leaves. However, these materials are in very short supply due to the fact that they are also used for cooking fires. The rest who could not construct sea walls to protect the erosion of their land have continued to reside on their land at the mercy of nature.

Coastal erosion and flooding caused by high tides, king tides, and wave surges are now becoming a major problem confronting urban dwellers on South Tarawa. Collaborative efforts between the government and all land owners on South Tarawa

are required to ensure every vulnerable coastal area is protected from future erosion. This call for the development of a coastal defence design that is affordable and easy to adopt by all land owners (see Chapter 6, section 6.4.2.1 for an example).

To ensure this works, the government should consider legalising the construction of sea walls by all families occupying land close to the beach on both the ocean side and lagoon side of the island. Government should also consider providing assistance either with construction materials or finance. This would ensure that everyone complies with the construction plan.

Land on South Tarawa is practically fully occupied by the government and the urban population. Overcrowding is common and important urban services and the capacity of amenities such as housing, water provision and waste disposal services to provide for the needs of the resident population has been declining. The combined impacts of coastal erosion and human activities on the land have contaminated groundwater lenses that provide the main source of water for the people. This calls for combined efforts by the government and the local population to collaborate to ensure erosion is managed and ground water is protected from further contamination. Other related urban issues like overpopulation and congestion should also be addressed to ensure their impacts on the land that supports the urban population and development are managed more effectively.

7.2.2 Environmental degradation in Kiribati

The increasing urban population has inevitably contributed to the production of more urban waste. Waste from imported commodities such as tins, plastics, bottles and cardboard has increased with population growth and become a major concern on South Tarawa given the absence of proper waste disposal facilities. The problem with the systems used on South Tarawa to dispose both human excreta and domestic garbage relate mainly to the inadequate operation of the current sewerage system and the way in which it is utilised by the people. Consequently there has been degradation of the land as well as the lagoon of South Tarawa. Shell foods that were collected along the mudflat in the lagoon during low tide are not only hard to obtain but also contaminated.

Besides the urban waste problem, there is unsustainable harvesting of trees for use as building materials and medicinal purposes. The shortage of certain parts of medicinal trees, due to unsustainable harvesting methods, like harvesting of *te kaina* (pandanus tree) on Betio has resulted in traditional local healers travelling to other areas of the atoll as they search for the appropriate part of *te kaina*. Also, the unsustainable harvesting of sand and gravel from the coast is responsible for erosion of coastal areas where harvesting is intense. The cutting of mangrove trees for use in constructing *te buia* (local raised floor house) has become a problem on South Tarawa because mangroves have been used for such purposes unsustainably. While the availability of land for disposing of waste is not a concern on Kiritimati, it is important that the problem is managed to ensure the experiences of South Tarawa are not repeated on Kiritimati in later years.

7.2.3 Government strategies to combat environmental degradation

Through various local, regional, and international consultative processes, the government has identified a number of development priorities and put in place some planning instruments to combat environmental problems. These include the National Medium-Term Development Strategy (MTDS) 2001 – 2003; National Development Strategy (NDS) 2004 to 2007; Kiribati Development Plan (KDP) 2008 – 2011; and KDP 2012 – 2015. The objectives of these development instruments have been to identify important long term actions and investments appropriate for the sustainable development of the country (Manikai and Tooki 2013).

Urban population growth, in particular, on South Tarawa, has put enormous pressure on the urban environment especially in terms of land space for settlement and development. Currently, overcrowding is a major problem especially on Betio islet, where the population density is about 10,000 persons per square kilometre (sq. km) on a land area of just 1.7 square kilometres. The demand for land not only to accommodate the growing urban population but also the development of urban infrastructure is currently a critical issue confronting the government. The issue of land shortage on South Tarawa is also affecting *kain Tarawa* because most of their lands are either leased by government or settled by outer island immigrants. There

is not much the government can do to solve the land shortage issue as most of the available lands have been used by the government, the immigrants and the different churches.

In addressing climate change impacts, the Kiribati government has launched adaptation programmes such as the KAP I, II, and III. Generally, KAP has implemented strategies aimed at improving coastal defences for vulnerable coastal areas on South Tarawa as well as improving urban water supply. The government is also working with overseas developing partners such as Australia and New Zealand on programmes to improve the skills of young I-Kiribati men and women so that they meet the requirements for entry for work overseas. Included here are the Kiribati Australia Nursing Initiative and the seasonal work programmes that New Zealand and Australia established from 2007.

Kiribati is now faced with two main problems. The first concerns finance and the other technology to combat impacts of climate change. While some of the proposals outlined in this study may appear expensive, working with overseas developing partners is important to ensure government policies to combat climate change impacts are addressed and implemented successfully.

7.2.4 Local population coping capacity

In the past, I-Kiribati used their traditional knowledge in the way they interacted and harvested resources from the land and the sea. When they fished, they would only harvest what the family required for the day. People fished every day to supply protein needs of the family and when excess fish was harvested, it was shared with neighbours to ensure the fish was not wasted. The modern Kiribati concepts dictate the importance of monetary economy which has in many ways affected the Kiribati concepts of harvesting of resources.

I-Kiribati now consider money important and as a result increase the volume of resources harvesting for the purpose of monetary economic benefit. Particularly in urban South Tarawa, unemployed people have used their skills in fishing to harvest excess fish to sell in the fish market.

7.2.5 Climate change and adaptation strategies

The impacts of climate change on the population and the settlement patterns on South Tarawa and Kiritimati have caused considerable concern not only for the government but also for the people who have called the urban areas their home. The development of adaptation strategies is still not able to provide a quick fix solution to climate related problems in the urban areas let alone problems on outer islands which are also experiencing similar problems to the ones in the urban areas.

It is highly likely that climate change impacts will affect the lands that provide sustenance to the people. Already people have experienced higher “king tides” as well as high tides which greatly affect coastal settlements both on the lagoon and ocean sides of the islands (Mackenzie 2004). Additionally, seepage of sea water to the water lenses during severe high tides has contributed to the salinisation of the ground fresh water lenses. Flooding of the land during high tides associated with rough weather also destroys important traditional trees used for medicinal, and construction purposes.

Another critical aspect of climate change relates to the warming of the sea and increasing ocean acidity that could result in the increasing mortality of coral. Kanton atoll has experienced coral bleaching as a result of increased water temperatures. Warming may also decrease the ability of corals to keep pace with sea level rise (Connell 2013; Yamamoto and Esteban 2014: 32). This process could also affect the potential of coral reefs on atoll islands to support marine ecosystems.

It was estimated for South Tarawa, that a 10 percent reduction in average rainfall could result in a 20 percent decrease in the size of the freshwater lenses. Prolonged periods of droughts are likely to worsen the availability of freshwater (IPCC 2013; Yamamoto and Esteban 2014). Climate change has also caused inundation of coastal areas including the beach as well as erosion of shorelines (Terry et al 2012). This will likely further affect coastal settlements, vegetation, and land tenure of affected lands.

In addressing climate change impacts, the Kiribati government has launched adaptation programmes such as the KAP I, II, and III. Generally, KAP implement strategies aimed at improving coastal defences for vulnerable coastal areas on South Tarawa as well as improving urban water supply. The government is also working with overseas development partners such as Australia and New Zealand on programmes including the training of nurses in Australia, and employment scheme in New Zealand. These programmes are geared at improving young I-Kiribati skills that are recognised in other countries.

7.3 OVERALL FINDINGS OF THE STUDY

This study reveals two important issues. While the focus of the study is on climate change, it has also found that urban development contributes to major environmental problems now experienced in the urban centres in Kiribati. Based on the information obtained from research participants during the MGD, IDI and UHSQ, this study has concluded that climate change and issues resulting from urban development are the main problems that confront the government and the urban population in Kiribati. However, the effects of these issues were more critical on South Tarawa, the national capital and main urban centre of Kiribati as compared to Kiritimati, the other smaller urban area of Kiribati.

The following are major issues that were repeatedly mentioned and widely discussed by research participants during the IDI, MGD and UHSQ; 1) provision of urban water resources sources, 2) diminishing traditional natural resources, 3) coastal erosion, 4) urban accommodation, and 5) urban land shortages. According to research participants, these problems were linked to climate change and urban development.

As already mentioned in earlier chapters, the Kiribati Government is aware that “South Tarawa has a large and growing population and is placing an additional burden on the already fragile atoll environment” (Ministry of Internal and Social Affairs 2012:7). The transition from subsistence to monetary economy has inevitably put pressure on the limited resources the atoll environment can provide for the people. This has created specific challenges to development on South

Tarawa. As a result, the government, together with the island councils is facing the challenges "... on how best to ensure that their services reach the public...in order to enhance the quality of life for the people living in the urban areas" (Office of Te Beretitenti & T'Makei Services 2012:7). Population pressure and the shortage of land on South Tarawa are critical problems unlike on Kiritimati where similar urban problems are slowly emerging but not yet critical. In fact most participants highly recommended that urban development on Kiritimati needs to be carefully discussed by the government and interested development partners as well as the general population to ensure that the current urban problems confronting South Tarawa are not repeated.

Urban development includes physical changes to the natural environment to give way for the development of an urban centre. It involves the cutting down of trees, the filling of traditional babai pits, and the relocation of traditional villages to other areas to provide space for the development of urban amenities such as residential areas, government offices, roads and other urban infrastructures. According to IDITR4, "...when England came, they cut down trees, filled babai pits and destroyed other important resources and structure for us in order to provide space to build their houses, offices, roads...they destroyed everything important to us on our land..." MGDDBE participants' also explained their concern, "...they said they were going to develop our land for the benefits of our people...but instead they destroy our land...our livelihoods..."

As development intensified on South Tarawa, it resulted in the flow of outer island people there to seek a much better perceived lifestyle than they have on outer islands. Hence, the concentration of population together with urban development on South Tarawa has resulted in the creation of other urban related problems like urban congestion, squatter settlements, urban crime, and the like that have become major issues today. Literature has also mentioned that the social disparities that exist between the urban areas and outer islands have influenced the movement of people to urban areas (Connell and Lea 2002, Crocombe 2001, Bryant 1993). Research participants also pointed out that "...population on Betio has reached a point where the land is no longer able to support the people...no more land to occupy...not

enough resources to use like young coconuts, ripe pandanus fruits that we used to have in abundance before...” (IDITR8).

Consequently, as people continue to seek residence on South Tarawa in search of urban services that are not readily available on outer islands, coupled with the effects of the rise in level they have inevitably caused adverse effects on the urban environment. This has hindered the ability of the people to provide for the livelihoods. As mentioned by IDITR22, “...getting food from the land and also the lagoon on South Tarawa is no longer easy...now we are depending more on imported food from the store...but for those unemployed it will be hard for them to survive here...”

7.3.1 Proposed strategies

Based on what research participants have discussed (see Chapters Five and Six), the social and technical approaches are proposed strategies to address issues resulting from climate change and urban development. Additionally, this study has identified that while research participants are aware that climate change and in particular the rise in sea level together with urban issues associated with urban development, are becoming obvious problems confronting South Tarawa in particular and to a lesser extent Kiritimati, the responses of participants are not always the same. Basically, there are people who want to migrate to another country and those who want to remain in Kiribati.

As already indicated by the research participants in the UHSQ for South Tarawa, 70% want to migrate and 30% don't want to migrate while for Kiritimati 40% want to migrate and 60% do not wish to. It is quite clear that quite a good number of people are not prepared to migrate from the two main urban areas in Kiribati. In fact more people on Kiritimati don't want to migrate compared to those who want to migrate. This shows that there is still a need for the government to consider strategies to help protect the islands to make them liveable for those who do not want to move.

This same concern was strongly pointed out by participants in both the IDI and MGD. IDITR30 suggested “...our government should seriously look into protecting some of our islands to ensure that those of us who want to stay will still have a land to live on...” It is also clear from the responses of those participants’ who do not want to move to another country that they have a very strong attachment to their land. This is because to the Kiribati people land is life, it is part of them.

As discussed in chapter 3 the traditional concept of “*abau*” my land is *maeu* (life), *mwengau* (home), and *kinakiu* (identity) clearly explaining the importance of land ownership to the Kiribati people. Their ancestors have shed blood in order to claim their rights to their land. Traditional land ownership is inherited and not acquired. Land rights amongst family members have been passed down from fathers to their children and to their grandchildren. Every person, both male and female, in Kiribati own a land. This process has been going on from generation to generation. Therefore, for some people, the concept of migrating to another country is hard to accept because they do not want to leave the land that they have such a strong cultural connection with. As pointed out clearly by IDITR24, “...I belong to this island, my island is my root and my home...as long as I live I will never leave my island...even when it is going to be destroyed by the rising sea...”

7.4 IMPLICATIONS FOR POLICY AND PRACTICE

Kiribati is most vulnerable to adverse impacts of climate and sea level rise. The critical aspect of atoll islands in relation to climate change is their physical characteristics; low elevation and natural resource limitations. Therefore, the long term survivability of the population depends entirely on how the environment is utilised to enhance economic development and livelihoods of the people. Inundation and erosion of the islands is likely to intensify in the near future as climate change continues (FEMA 2013). When this happens, it could affect important natural resources that have always supported the livelihoods of the population while storm surges could contaminate the groundwater lenses that provide the main water source. The economic evaluation of inundation, erosion, and storm surges on Kiribati economy is estimated to cost about 35 percent of GDP (World Bank 2011).

Kiribati is now faced with two main problems. The first concerns finance and the other technology to combat impacts climate change impacts. Hence, it is imperative that the Kiribati government consider policies that the country could afford in the long term. While some of the proposals in this study may appear expensive, working with overseas development partners is important to ensure government policies to combat climate change impacts are addressed and implemented successfully.

As already mentioned earlier, the traditional knowledge is important as it enables people to utilise their natural resources sustainably. Traditional knowledge and skills have, in the past, enabled the people to live within what the limited atoll environment could provide for the people. Harvesting of resources both from the land and the sea were done in a way that they were not wasted. If trees were cut down for use as construction materials, new trees were planted in their place. When pandanus trees are in season, their ripe fruits were all collected, cooked, sun dried and preserved for future use in times of pro-longed droughts and bad weather.

The traditional knowledge in weather forecasting has also helped I-Kiribati in the past to know when to start storing food in preparation to approaching long term natural disasters such as droughts and strong winds. Travelling on local canoes between islands for trade and visiting families on other islands was also common in the past where people used their traditional skills to navigate their way in the open ocean. People used the direction of the current, different clouds formation and colours, and the stars, to navigate their way in the open ocean. As explained by IDITR21, "...we have certain families who have the knowledge in navigation, they can forecast the weather for the day by looking at the clouds, stars in the night and sometimes the direction of the wind...and when they travel in the open ocean they can see the direction of the land by the stars in the night and the clouds during the day..."

Hence, this study strongly recommends reviving traditional skills and knowledge supported by government as this can provide the people with skills to survive on the limited atoll environment. These same skills and knowledge were also used by their ancestors in the past to survive on their atoll islands. It is vital that the

government consider the collection of these important skills and knowledge from people who still have them before these skilled people pass on. This same recommendation was also emphasised during the MGD and IDI where participants strongly suggested the reviving of important traditional skills and knowledge. As stated by IDITR22,

...we need to revive our traditional skills from people who are experts in them...as this can help our young people understand how our ancestors have survived on these islands that are very limited in natural resources...

It is also important for the government of the day to consider in its development plans strategies that will help protect, if not every island, some islands beside Banaba that they see necessary from becoming completely affected by the impacts of climate change and in the long run able to support human existence. As previously mentioned in chapter 6, the protection of some islands using sea walls is one alternative strategy to consider besides the rehabilitation of Banaba. As clearly emphasised by participants in the MGD and IDI the protection of some islands is necessary to ensure the protection of the Kiribati people to survive in the long term. IDITR30 pointed out, "...it is very important to protect our Kiribati race...the only way to do this is by looking at ways to protect our islands from the rising sea level...when we protect our land we are actually protecting our people..." It is vitally important that our government looks at strategies to ensure our islands survive the impacts of climate change in the future.

7.5 MOVING FORWARD

This study has endeavoured to explore the views of the Kiribati people on environmental issues relating to climate change. As indicated in the responses of the participants in the urban household questionnaire survey (UHSQ) and in-depth interviews (IDI) as well as maneaba group discussions (MGD) climate change is intensifying urban problems experienced on South Tarawa such as overcrowding, dwindling of natural resources and the shortages of urban land.

The Kiribati government and its population have very limited options to consider as climate change slowly takes its toll on the land. The major threat of climate

change to Kiribati is the rising sea level. With the exception of Banaba, the atoll populations have little choice in terms of where to move to within Kiribati in the event of the rising sea level. As noted in Chapter Six, the rehabilitation and leasing of lands on Banaba for the purpose of establishing another urban area, is one possible solution that the government could consider as a strategy to combat impacts from the rising sea level. Such a strategy requires the support of the landowners of Banaba who now live in Fiji as well as funding which the Kiribati government would need to obtain from overseas development partners and sources.

For an I-Kiribati, land means everything and losing this land in the future because of climate change is something the people struggle to accept. Campbell (2012: 60) explains this feeling well when he observes that “land in Pacific Island countries tends to have meanings to those who “belong” to or are “part” of it”. This exactly is what land means to the people in Kiribati who enjoy whatever resources are available from the land. Even though Kiribati people do not have much in terms of wealth and resources, the land they have is all that matters to them.

The land represents the blood of their forefathers who fought for ownership of the lands which have been passed down from generation to generation within the family. Similar understanding of the importance of the land has been emphasised by the Kiribati President His Excellency Anote Tong in numerous addresses to the United Nation General Assembly as well as during international meetings and conferences. The Kiribati government will consider every possible strategy they can possibly think of to ensure the people continue to have an option of living on their atolls.

It has been encouraging to note the increasing concern of international and regional organisations such as the Intergovernmental Panel on Climate Change (IPCC), United Nation (UN), World Bank (WB), United Nations Framework Convention on Climate change (UNFCCC), Global Environment Facility (GEF), Pacific Forum Secretariat (PFS), South Pacific Regional Environmental Programme (SPREP) in supporting the Kiribati Government in their efforts to find viable strategies to address climate change impacts. It was also encouraging that the Conference of Parties to the UNECCC have agreed to pledge climate change funds to assist

countries that are not financially capable to address increasing problems caused by climate change on their islands.

The Kiribati government should continue pressing for funds to be made available by countries who are responsible for causing climate change. When climate funds are available then strategies they consider appropriate to address climate change impacts in Kiribati should be implemented. There is no time to waste as climate change is affecting the islands. Nobody knows exactly what will happen in twenty years' time from now in Kiribati. However, based on current studies on climate change, we can only assume that maybe the worst is yet to come. When it comes to climate change, the most threatening aspect to the Kiribati people is the loss of their land and resources to support their livelihoods. Most critical in the minds of an I-Kiribati is the losing of his/her land. Land is the most important part of their lives and losing it is something they will never accept. The sea, itself, is not perceived to be a major threat by I-Kiribati. Their closeness to, and familiarity with the ocean has ensured they have the skills to navigate between islands using the stars, sea currents and wind directions to take them to their destinations. The impact of the sea on their land is what most is threatening to the people.

As already mentioned, two main groups of people were identified in this research. The first are those who are happy to migrate to another country should the need arise. The second are those who do not want to leave Kiribati for any reason. The government is fully aware of these two important sets of views of the people and is working hard to ensure those who stay will still have a home to live in. Based on the views of the people, taking into account those who wanted to leave the islands in the future and those who wanted to stay, two appropriate strategies have been identified.

These are a technological strategy which involves protecting the islands from the rising sea level and cultural strategy which involves preparing people for migration to another country. The views of some commentators who stress the likelihood of complete relocation of the Kiribati people to another country in the near future is not emphasised here. This study has focused on exploring strategies that will help protect the islands from the rising sea level. Saving islands from complete

submergence under water will require technological approaches to address the rising sea level problem.

It is important that the Kiribati government does not lose sight of the fact that the people need their land. While the forces of nature are something humans cannot predict or control, reviving our traditional skill in weather reading is vital to ensure people know whether calm or rough weather is approaching. Including Kiribati skills in the construction of coastal defences like sea walls is important as well when considering the technological approach. Documenting the different traditional skills in constructing sea walls and combining these with western technology will produce appropriate methods to use. Another important dimension of traditional culture that needs to be revived is the skills our forefathers utilised to ensure their survival on the limited resources of atoll environments when these environments were under stress from extreme natural events like persistent droughts, damage caused by severe storms, and the shifting patterns of sand accumulation that is a persistent feature of atolls.

Combining traditional skills with modern technology for the purpose of finding the best appropriate strategies to protect the islands from future impacts of climate change merits serious consideration as a way forward to ensuring the survival of the islands and the Kiribati people. In doing this Kiribati as an independent sovereign nation in the Pacific will continue to survive as a country. More importantly, the Kiribati people will continue to survive without fear that one day they will become strangers in other peoples' lands because the sea has taken over the islands. Even if all the coastal protection strategies do not work, and the rise in sea level does eventually submerge the atolls, Kiribati will continue to survive as a country because Banaba will remain above sea level.

Strategies to rehabilitate Banaba, together with strategies to protect some if not all the atolls from the rising sea level need to be priorities for the Kiribati government and the international community that seems to favour adaptation to climate change rather than bearing the costs of seriously attempting to mitigate the causes of the rising temperatures of the atmosphere and the oceans. The government, the people and the global community together with international financial institutions need to

work together to invest in strategies that will address the impacts of climate change on vulnerable islands inhabited by people who have contributed virtually nothing to the emissions that are at the heart of the climate change dilemma. Where there is a will there is a way.

7.6 THE FUTURE

The future of Kiribati's lands and people depends on decisions the local people, the national government and the international community take today to combat climate change issues. While climate change problems are eminent, there are other on-going issues, especially those associated with population growth and urbanisation that also need to be addressed simultaneously. It is inevitable that the path ahead for Kiribati will be difficult especially as the impacts of climate change will slowly take their toll on the environment. However, while rising sea level is a threat to the low-lying islands, recent studies show that "... cases of coastal inundation and erosion often cite additional circumstances such as vertical subsidence, engineering works, development activities of beach mining as the causal process" (IPCC WG11 AR5 2014: 6).

Examples of such causal processes were confirmed in the Torres Islands in Vanuatu where displacement of people was the result of a combination of tectonic subsidence and sea level rise (Ballu et al 2011), Anjouan Island in the Indian Ocean, where beach aggregate mining was a contributing factor to rapid beach erosion and in the exposure to flooding of expanding settlements and agricultural development in the low-lying flood prone Rewa river delta in Fiji is an example where extreme events superimposed on a rising sea-level baseline can become the main drivers that can affect the habitability of low-lying islands (IPCC WG11 AR5:2014 6; Yamamoto and Esteban 2014).

In the case of Kiribati, the most threatening aspects of climate change relate to the inundation of low-lying islands as a result of rising sea level. However, extreme events such as storm surges, king tide, coupled with human activities such as inappropriate engineering works and beach harvesting have already impacted the islands in many ways. On the main strip of land in South Tarawa along the lagoon

from Bairiki to Bikenibeu coastal erosion was obvious, especially beside lands with sea walls that were constructed right onto the mud flat. Initially the reason for constructing sea walls onto the mudflat was for the purpose of extending landholdings rather than protection of settlement from the sea. Not much consideration was given to the impact of such seawalls on adjacent lands.

This study emphasises the importance of coastal defences only for the purpose of protecting coastal lands from erosion in the events of storm surges, king tides, high tides, and future rise in sea level. Coastal defences are not meant to extend the boundary of one's land onto the reef for settlement purposes on the ocean side of the island or the mudflat in the lagoon. They should primarily be used for the purpose of protecting coastal areas from the action of the sea.

Protecting our islands from becoming totally affected by the rising seas is paramount not only for the survival of the people but also for the preservation of I-Kiribati identity. I-Kiribati are only recognised as a people and a nation simply because they have traditional lands that call home. When this land is no longer visible on the face of the map, then it is likely that the legal status of Kiribati as a country will become questionable in the eyes of the law (Smith 2013). The people will lose their identity; this is something the government and the people are not prepared to experience in the near future. There is much that the government and the people have to do now to ensure their continued survival as a country and a people. Consequently, protecting the islands from completely submerging under water in the events of rising sea level is paramount for the survival of Kiribati as a nation.

Depending on the financial and technological capability of the country, the possibility of saving every island may not be possible. However, having a raised limestone island of Banaba is something the country has to consider developing now to ensure it is capable of supporting urban services and facilities in the long term. While the island has its own economic, cultural, and environmental difficulties, the advantages it will provide to Kiribati in the long term will outweigh the disadvantages. It is encouraging to see considerable interest by the global community in committing to develop the "Green Climate Funds" to help in

mitigation and adaptation programmes by developing countries (Schalatek and Nakhooda 2013). Such support, including that from traditional aid donor countries in the region, should enable Kiribati and other low-lying atoll countries in the region, to secure funding for their adaptation programmes.

7.7 CONCLUSION

I-Kiribati people have survived many challenges over the centuries of their occupation of atolls in the central Pacific. The land and the sea have always been integral components of the Kiribati culture – these have long been the sources of all aspects of livelihoods of the people. In the past, their traditional knowledge and skills in fishing, cultivation, cooking, preserving food for use in times of extreme hardship, sustainably harvesting the limited land and marine resources, healing the sick, and protecting their islands from the forces of nature, have ensured the survival of the Kiribati people on their islands for millennia. It is expected that reviving traditional skills and knowledge and combining these with modern technology will help them to address problems associated with contemporary climate change impacts.

This study has endeavoured to collect the views of I-Kiribati people on how they view climate change. It has used different approaches it considers relevant including the UHSQ, MGD and IDI to collect the different perspectives of the people. It has included people from different backgrounds such as young people, the middle aged, *unimane*, the employed and unemployed, and *kain Tarawa* and outer island immigrants. Each of the research participants involved in this study have provided important information relevant to this study. A significant conclusion based on the responses of research participants reveals the importance of protecting the islands from anticipated impacts of climate change. This is because there will be I-Kiribati in the long term who will not want to leave Kiribati even when the rise in sea level affects all the islands.

It has also explained the physical make-up of the atoll islands which are simply low islands with very limited natural resources. The limited resources from the atoll environment have always provided the livelihoods of the atoll people for

generations. Development of the land to support urban development together with the concentration of population in urban areas has inevitably placed strain on the atoll environment to sustainably support development in the long term. As already experienced on South Tarawa, future urban development is becoming a major problem for the government and the people. The pressure from the urban population for necessary services and amenities such as water provision, urban housing, land space, and the like are slowly threatening the sustainable survival of both the people and the urban area. Coupled with the threats from climate change and in particular the rise in sea level, this has become the major issue that the government needs to consider and address in urgency before it is too late.

Literature reveals the possibility that some of the low-lying atolls may not be able to support human existence in the future when sea water covers the entire islands. The IPCC has also indicated in its report that atoll islands are the most vulnerable to climate change impacts and that strategies to address this are important for the future of these islands. However, while the local people are aware of the report, there those people who are still determined not to move or leave their island in the future no matter what happens to their island. Interestingly, they are determined to look for strategies that will help protect their islands in the events of climate change impacts. This study has collected the views of the people as to how they want to protect their islands.

Most of the research participant responses as to what they suggest as strategies to protect the islands from becoming un-inhabitable in the future are explained in chapters 5 and 6. These detailed chapters have carefully explained the views of the people and the possible strategies that could be considered by decision makers and the people to ensure that life on Kiribati, especially the main urban area of South Tarawa continues in the long term. Together with the belief that Nareau, their traditional god, will provide ways for them to survive on their islands is something that makes some of these people determined to stay despite what has been stated about the impacts of climate change on low-lying atoll islands.

The future survival of Kiribati as a nation depends on the decisions the government and the people make today. The future for Kiribati lies in the hands of the younger

generation and the way they respond to the different challenges they will encounter in the process. The different approaches they adopt to utilise the resources from the land and the sea to support their daily lives and on-going economic development in their island homes is crucial to the long term survival of Kiribati.

This study has endeavoured to explore adaptation strategies with a view to ensuring I-Kiribati can remain in their islands rather than having to be resettled elsewhere. Many may chose to leave to find alternative places to live but there will always be those who choose to stay and practice their Kiribati culture at home. The prime objective of adaptation is to ensure the people can continue to live and enjoy whatever resources are available from the land and sea in their traditional homes in a sustainable manner. The proposals discussed and mentioned in this study are not to be read as recommendations per se but rather as possible ways forward to addressing the impacts of climate change in Kiribati as well as other low-lying atoll islands.

Further research is needed to elaborate on them to create improved strategies that could be used to assist I-Kiribati and atoll dwellers adapt to the changes in their environment that are accompanying climate change. As technology improves so too do the chances to design cheaper and improved strategies that will help alleviate the problems that small island countries like Kiribati are encountering as a result of climate change. Even though, the way forward for Kiribati as a nation may not be easy, through the collaborative efforts of the government, the people and the international community, proposed programmes for the purpose of ensuring the islands in Kiribati will continue to survive into the future will be a way forward for Kiribati to adopt. In the words of Hon. Ieremia Tabai, Kiribati's first President,

...There is no way one can predict what the future may hold. We must not, however, allow this to frighten us...instead; we must regard it as a challenge to do better and to achieve a higher level of development... (Tabai 1993: 319 – 320).

Kiribati has gone through many changes, from being a colony to becoming an independent state. Despite the changes and the challenges it has encountered in its

economic, social, and political developments, it has always survived. Now with the anticipated impacts of climate change and in particular the rise in sea level, another challenge to its very existence as an independent country has emerged. The question this study would like to challenge both the leaders and the people of Kiribati is “should our leaders give in to the problems they see and experience now as caused by climate change” and consider relocating the entire population to another country that is alien to an I-Kiribati? Is moving to another country the only solution to the problems Kiribati is facing now as a result of climate change. What will happen to the identity of the Kiribati people when they move to a new country? Will they still continue to call themselves I-Kiribati? According to the views of participants during the MGD and IDI, protecting the islands is a must to ensure the Kiribati people and culture are preserved in the long term. This is evident from the fact that quite a number of participants are not considering leaving their island despite what will happen in the future. This study is also of the view that protecting, if not all islands, some islands is vital for the future survival of I-Kiribati as a people and Kiribati as a nation in the future.

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APPENDICES

APPENDIX A



INFORMATION SHEET

University of Waikato

Faculty of Arts & Social Science

**Climate change and its impacts on the livelihood of urban dwellers of
Kiribati.**

Researcher: John Corcoran

This research is part of the requirement for my doctoral studies, which I am currently pursuing at the University of Waikato in Hamilton, New Zealand. The major aim of the research is to investigate and assess the contemporary impacts of climate change on the livelihoods of urban dwellers of Kiribati. My focus is to collect information from the urban people about major urban problems they have and are experiencing which they perceive as a result of climate change. I am also interested in ascertaining personal views, based on personal experiences, regarding strategies they adopt to enable them to cope with climate change impacts.

For the purpose of collecting data and information from willing participants, I am using the UHSQ (urban household survey questionnaire), IDI (in-depth interview), and the MGD (maneaba group discussion). The length of the UHSQ and IDI is

estimated to be no more than 40 minutes. The MGD will take longer and is estimated to be an hour or two longer. Your ideas, thoughts, and experiences are vitally important to this research hence, it is important to share everything you know that you think relates to climate change. All that is written, said, and discussed during the UHSQ, IDI, and MGD will be recorded and kept for use in this research. All collected data and information from participants will be used in the writing of my doctoral thesis. An electronic copy of the thesis will be placed online for easy access by anyone on internet. In the case of an IDI, each participant will be briefed with whatever information they gave to ensure that the information recorded is correct and reflects only what the participant has given during the UHSQ and IDI.

If you are happy to participate in the research, the following are your rights that you need to be aware of:

- 1) To withdraw from the interview anytime you wish during the course of the UHSQ and IDI, or refuse to answer any particular question at any time,
- 2) To ask any further question about the research that you have in mind either before or during the interview or any other time,
- 3) To remain anonymous in the thesis and any publications.

Any further queries relating to the ethical conduct of this research should be addressed to the Secretary of the Ethic Committee, postal address, Faculty of Arts and Social Science, Te Kura Kete Aronui, University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240, or email to fass-ethic@waikato.ac.nz. If you have any questions about the research, please do not hesitate to contact me or my chief supervisor whose contacts are listed below:

Researcher: John Corcoran



[REDACTED]
[REDACTED]
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Chief Supervisor: Associate Professor John Campbell
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APPENDIX B



Information Sheet

UNIVERSITY OF WAIKATO FACULTY OF ARTS & SOCIAL SCIENCE

Climate change and its impacts on the livelihood of urban dwellers of Kiribati.

Researcher: John Corcoran

This research is part of the requirement for my doctoral studies, which I am currently pursuing at the University of Waikato in Hamilton, New Zealand. The major aim of the research is to investigate and assess the contemporary impacts of climate change on the livelihoods of urban dwellers of Kiribati. My focus is to collect information from the urban people about major urban problems they have and are experiencing which they perceive as a result of climate change. I am also interested in ascertaining personal views, based on personal experiences, regarding strategies they adopt to enable them to cope with climate change impacts.

For the purpose of collecting data and information from willing participants, I am using the UHSQ (urban household survey questionnaire), IDI (in-depth interview), and the MGD (maneaba group discussion). The length of the UHSQ and IDI is estimated to be no more than 40 minutes. The MGD will take longer and is estimated to be an hour or two longer. Your ideas, thoughts, and experiences are vitally important to this research hence, it is important to share everything you know that you think relates to climate change. All that is written, said, and discussed

during the UHSQ, IDI, and MGD will be recorded and kept for use in this research. All collected data and information from participants will be used in the writing of my doctoral thesis. An electronic copy of the thesis will be placed online for easy access by anyone on internet. In the case of an IDI, each participant will be briefed with whatever information they gave to ensure that the information recorded is correct and reflects only what the participant has given during the UHSQ and IDI.

Any further queries relating to the ethical conduct of this research should be addressed to the Secretary of the Ethic Committee, postal address, Faculty of Arts and Social Science, Te Kura Kete Aronui, University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240, or email to fass-ethic@waikato.ac.nz. If you have any questions about the research, please do not hesitate to contact me or my chief supervisor or supervisor whose contacts are listed below:

Researcher: John Corcoran
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School of Social Sciences
University of Waikato
Hamilton, New Zealand
Email: mikegold@waikato.ac.nz

APPENDIX C



RESEARCH CONSENT FORM

I am happy to participate in this research project described in the Information Sheet and hereby agree as follows:

- 1) To participate voluntarily,
- 2) To withdraw if I wish not to continue with the research and that my withdrawal has to be done before the researcher leaves the country,
- 3) All information and data collected during the research will be treated with strict confidentiality and be kept securely for use in the completion of a doctoral thesis,
- 4) My name will not be mentioned on any academic papers and reports of the researcher,
- 5) Collected information and data will be destroyed after five years of the completion of the research,
- 6) Feel free to contact my supervisor for any further information about this research project,
- 7) In the case of unresolved issues, I can contact his chief supervisor,
- 8) I consent that all my responses in this research and which the researcher see relevant to the research will be recorded on paper.

I have read and agree to the condition stated above and hereby consent to take part in this research.

Participant: _____

Researcher: _____

Name: _____

Name: _____

Location: _____

Location: _____

Signed: _____

Signed: _____

Date: _____

Date: _____

APPENDIX D



Urban Household Survey Questionnaire (UHSQ)

Location: _____ Date: _____ No. _____

This survey is to obtain information relevant to this study. All information that you provide will be kept confidential and will only be used for the purpose of the study.

Name	Gender	Age	Marital Status	Occupation	Religion

A: General

1. Which island you come from? _____
2. How long have you been living on South Tarawa/Kiritimati? _____
3. Have you moved places since coming to South Tarawa/Kiritimati? _____
4. If yes, list the places you have moved to: _____
5. List four major reasons for coming to South Tarawa/Kiritimati
 - a) : _____
 - b) : _____
 - c) : _____
 - e) : _____

7. What do you think are the main urban problems in South Tarawa and Kiritimati now Mark (x) on any three you think is the main urban problems?

- | | | | |
|---------------------------|--------------------------|------------------------|--------------------------|
| a) Increasing Population: | <input type="checkbox"/> | b) Climate Change: | <input type="checkbox"/> |
| c) Shortage of food: | <input type="checkbox"/> | d) Poor Transportation | <input type="checkbox"/> |
| e) Increasing crime rate: | <input type="checkbox"/> | e) Water Problem | <input type="checkbox"/> |

B: Contacts with South Tarawa/Kiritimati

1. What type of transport did you take to South Tarawa/Kiritimati?
 - a. Boat
 - b. Plane
2. List some of the major reasons for leaving your home island? _____
3. How long have you lived in this area? _____
4. Do you plan to live permanently here or want to go back to your home island later?
 - a. Stay permanently
 - b. Go back later
 - c. Don't know

C: Housing

1. What type of house you occupy? Permanent Local Mixed material
2. Number of people living in your house,
 - a. Children _____
 - b. Relatives _____
 - c. Non-relatives _____
3. Who owns the house you occupy?
 - a. Kiribati Housing Corporation
 - b. Private rented house
 - c. Myself
4. Construction material used,
 - a. Local material only
 - b. Permanent material only
 - c. Partly local and permanent material

D: Water

1. Where did you get your drinking water from?

- a. PUB/Water Supply
- b. Own Tank
- c. Well Water
- d. Others

2. Do you have dug well beside your house? Yes No

3. Is your well water safe to drink? Yes No

4. Do you pay for the water? Yes No

5. Do you have problems with water? Yes No

6. If yes, explain: _____

7. Do you worry about water provision in the future? Yes No

9. If yes, explain why? _____

E: Energy

1. Is your house connected electricity? Yes No

2. How do you cook your food at home?

- a. Open fire
- b. Electric Stove
- c. Gas Stove
- d. Kerosene Stove
- e. Others

3. Do you use firewood for cooking? Yes No

4. If so, list at least 5 types of firewood you use.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

5. Is it easy or hard to get firewood? _____

6. List 5 types of trees that you use for firewood.

1. _____
2. _____
3. _____
4. _____
5. _____

F: Waste Management (Solid and Liquid)

1. What are the common types of waste/rubbish you know and how you dispose them?

Type	Method of disposal
a. _____	_____
b. _____	_____
c. _____	_____
d. _____	_____
e. _____	_____

2. How did you dispose your household rubbish from your food?

- a. Feed pigs
- b. Bury
- c. Throw in the sea/beach
- d. Backyard
- e. Burn
- f. Collected by Council
- g. Others (State)

3. How did you dispose other rubbish like empty tins/cans/plastics/bottles etc.?

4. What type of toilet you have?

- a. Septic
- b. Sewerage system
- c. Bush
- d. Beach
-

e. Others (specify)

5. Explain any problems associated with any of the above system.

G: Agriculture activities

1. Do your family still dependant on local trees and plants around your house for food? Yes No

2. List five main local trees that you collect food from around your house and explain whether it is easy or hard to get?

Local trees	Easy to get	Hard to get

3. Explain why it is hard to get food from local trees around your house.

- a) _____
- b) _____
- c) _____
- d) _____

4. Do you have a home garden? Yes No

5. What type(s) of home garden do you use?

Types of home garden	Types of trees and crops grown
Babai Plantation	
Mixed vegetable garden	
Local household trees	
Mixed of local and vegetable garden	

6. Identify five important traditional medicinal plants/trees that you know and their use?

Name	Usage	Extinction	Rare	Short Supply

H: Marine Resources and Activities

1. What are the main fishing methods you use to catch fish?

Fishing methods	Yes	No
Lagoon fishing (using net or line)		
Reef fishing (using net, line and spear)		
Ocean fishing (using canoe or boat)		

2. Is it easy or hard to catch fish now? Easy Hard Don't
know

3. If your answer is hard to catch fish, please explain the reasons? _____

4. Identify five important traditional fish that are now rare, extinct, or in short supply and the reasons that they are rare, extinct and in short supply?

Name	Rare	Extinct	Short Supply	Reasons

5. What do you think should be done to protect or re-establish these fishes? __

I: Health Issues

1. List four common diseases that frequently affects your health and what do you think are the possible cause and who are more at risk?

Common diseases	Possible cause	More at risk age group

2. When someone is sick in your family, do you seek hospital or local remedy, and why?

Type of remedy	Reason for taking this remedy
Hospital	
Local	

3. What do you think should be done to help minimise the spread of the above mentioned disease in the future? _____

4. Do you think diseases are more common now? Yes No

5. If yes, why? _____

J: Climate Change Related Problems

1. During your stay in this area, have you experienced any changes in the weather pattern? Yes No

2. If yes, can you explain the changes you have experienced so far? _____

3. What is the weather pattern like now when compared to ten or more years ago?

Cooler Hotter Don't know

4. During high tides, is the sea level higher or the same when compared to the first time you arrived in this area?

Higher Same Don't know

5. If your answer is higher, how has this affected the following?

a) Beach and coastal areas: _____

b) Coastal vegetation's: _____

c) Underground well water: _____

d) Coastal marine ecosystem: _____

e) Infrastructure: _____

6. Based on your personal knowledge and experience of this land, which part of the land has been affected the most? _____

8. What do you suggest should be done to assist the problem? _____

9. Based on your personal knowledge and experience of this area, do you think the rise in sea level affects the salinity of the water, and why? _____

K: Traditional knowledge on weather pattern and protecting the land

1. Do you have any traditional knowledge regarding the changes in the weather pattern? Yes No

2. What visible signs can you tell that good or bad weather is coming? _____

3. What traditional methods you normally use to protect your properties (house, canoe shed, your food trees, and land etc.) before bad weather strikes?

4. What traditional methods you use to protect your coastal areas from high tides and strong waves? _____

L: Personal Views on Climate Change

1. Do you believe that the rise in sea level will affect the potential of your atoll island to support human existence in the near future? Yes No

2. If Yes, what action you intend to take?

a) Migrate

b) Stay

c) Others (explain)

3. Can you suggest some traditional strategies that you know can assist urban dwellers to cope with impacts caused by the rise in sea level in the urban areas?

4. Have you heard or know the Kiribati traditional belief that our islands will be affected by something that will come from underneath the land: Yes No

5. Do you think the Kiribati Government and the urban dwellers should help in protecting our islands from the impacts of climate change? Yes No

6. What do you suggest the Government should do to protect our islands from climate change? _____

7. What do you suggest the people should do to help protect our land from the future impacts of climate change? _____

8. Should our Government seek assistance from outside, e.g. UN, Australia, and New Zealand etc.)? Yes No

10. If yes, explain how? _____

9. Any other suggestions/comments that you would like to share to help protect our atoll islands from future impacts of climate change? _____

10. Do you believe that one day Kiribati will become abandoned as a result of climate change? _____

Ko bati n raba for your time.

APPENDIX E



IN-DEPTH INTERVIEW (IDI)

Semi-structured interview questions

People's general perception on climate change:

1. How important is your land to your survival?
2. Have you seen any changes/destruction to the land you live on? (e.g. coastal erosion, trees washed/dying)
3. Can you explain what climate change is?
4. What do you think is the main cause of climate change and the rise in sea level?
5. Do you think you are responsible for climate change?
6. Can something be done to stop climate change?
7. Is climate change affecting your family? (e.g. your property, land ownership, food, health, water, etc.)

8. What you think should be done to minimise the impacts of climate change?
9. Should the government and the people do something to combat impacts of climate change? If yes, how?
10. Do you know any traditional skills that could be used to help protect our islands from climate change related problems?
11. What do you think should be done by the urban population to help minimise future climate change impacts, especially the rise in sea level?
12. What do you suggest the Government should do to prepare people from possible future threats of climate change?
13. Do you think Kiribati will eventually become abandoned in the future because of climate change related problems?