Reducing the Risk of Disasters and Climate Variability in the Pacific Islands

REPUBLIC OF KIRIBATI COUNTRY ASSESSMENT

GFDRR
GLOBAL FACILITY FOR DISASTER REDUCTION AND RECOVERY

THE WORLD BANK

SOPAC

Acronyms and Abbreviations

AusAID	Australian Agency for International Development
CCA	Climate change adaptation
CCST	Climate Change Study Team
DCC	Development Coordinating Committee
DRM	Disaster risk management
DRR	Disaster risk reduction
ECD	Environmental Conservation Division of MELAD
EEZ	Economic exclusive zone
EIA	Environmental impact assessment
ENSO	El Niño Southern Oscillation
EU	European Union
GFDRR	Global Facility for Disaster Reduction and Recovery
GIS	Geographic Information System
GoK	Government of Kiribati
HYCOS	Hydrological Cycle Observing System
KAP	Kiribati Adaptation Program (I and II)
KSDP	Kiribati Sustainable Development Plan
M&E	Monitoring and evaluation
MELAD	Ministry of Environment, Lands and Agricultural Development
MEYS	Ministry of Education, Youth and Sport
MFED	Ministry of Finance and Economic Development
MFMRD	Ministry of Fisheries and Marine Resource Development
MISA	Ministry of Internal and Social Affairs
MOP	Ministry Operational Plan
MPWU	Ministry of Public Works and Utilities
NAP	National Action Plan for DRM
NAPA	National Adaptation Plan of Action for CCA
NASC	National Adaptation Steering Committee
NGO	Nongovernmental organization
NIWA	National Institute for Water and Atmospheric Research of NZ
NWSCC	National Water and Sanitation Coordination Committee
NZAID	New Zealand Agency for International Development
OB	Office of *Te Beretitenti* (Office of the President)
PICCAP	Pacific Islands Climate Change Assistance Program
SAPHE	Sanitation, Public Health, and Environment Improvement Program
SNPRA	Strategic National Policy and Risk Assessment (Unit)
SOPAC	Secretariat of the Pacific Islands Applied Geoscience Commission
SPSLCMP	South Pacific Sea Level and Climate Monitoring Project
UNFCCC	United Nations Framework Convention on Climate Change

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Introduction

The World Bank policy note "Not If, But When" shows the Pacific island countries to be among the world's most vulnerable to natural disasters. Since 1950, natural disasters have directly affected more than 3.4 million people and led to more than 1,700 reported deaths in the Pacific Islands Region (excluding Papua New Guinea). In the 1990s alone, reported natural disasters cost the Region US$2.8 billion (in real 2004 value). The traditional approach of "wait and mitigate" is a far worse strategy than proactively managing risks. The Hyogo Framework for Action (HFA) 2005-2015 lists the following five key priority areas for action:

(1) Ensure risk reduction is a national and a local priority with a strong institutional basis for implementation;
(2) Identify, assess, and monitor disaster risks and enhance early warning;
(3) Use knowledge, innovation, and education to build a culture of safety and resilience at all levels;
(4) Reduce underlying risk factors;
(5) Strengthen disaster preparedness for effective response at all levels.

This assessment report represents a stocktaking exercise to review the extent to which disaster risk reduction (DRR) and climate change adaptation (CCA) activities have progressed in Kiribati. It identifies gaps or impediments that hinder achieving the HFA principles and identifies opportunities for future DRR/CCA investment that would be timely, cost-effective, and implementable within a three-year timeframe. The focus is on risk reduction, rather than post-disaster recovery and response. While some specific sector activities are addressed in the assessment of Kiribati national and local government policies and institutional arrangements, the Kiribati report does not provide a comprehensive summary of sector-by-sector activities. Instead, it refers to other reports that have covered this and complements these with suggestions for taking the necessary steps.

The goal of the report is to deepen the understanding in the gaps, opportunities, and needs at the national level toward stronger operational disaster and climate risk management in the Pacific islands and to link closely to other ongoing and future efforts by other donors and stakeholders (such as SOPAC regional initiatives following the Madang Framework and the National Action Plans) to ensure synergy and avoid duplication. The assessment focuses on practical, proactive measures that Kiribati can take to inform its national development policies and plans and to strengthen its capacity to reduce the adverse consequence of natural hazards and climate change, as it relates to risk reduction. The linkage of these two areas mainly includes managing the impacts of extreme weather events, variability in precipitation such as storm surges and sea-level rise.

This assessment highlights aspects such as the current country status, gaps, opportunities, and barriers related to (a) national policies, strategies, plans, and activities to manage natural hazards; (b) the enabling environment for a comprehensive risk management approach to natural hazards; and (c) the capacity to undertake such a comprehensive approach, including institutional arrangements, human resources, public awareness, information, and national budget allocations. It also reviews and identifies the need for informed policy choices, improved decisionmaking processes, strengthened regulations, and legislative and policy changes required to support proposed country-level activities.

With respect to achievement of the first HFA principle, there is clear evidence of systemic difficulties among many Pacific island countries in establishing an enabling environment and promoting a cross-sector focus for DRR and CCA activities. Since the available evidence shows that ad hoc and externally driven approaches have not provided satisfactory results so far,

the HFA emphasis upon a strong government commitment and action is one of the primary and early challenges to be surmounted in achieving goals of the International Strategy for Disaster Reduction.
World Bank experience in countries with similar challenges shows that, while it is important to have a clear long-term vision, given the institutional, financial, and resource constraints, more modest "bottom up" approaches tend to have better results. Also, taking existing investment programs and incorporating simple key DRR/CCA elements demand relatively fewer efforts and resources and yield results that can lay the foundation for more complex, follow-up stages. Getting stakeholders to coordinate their activities in line with the 2005 Paris Declaration on Aid Effectiveness also appears to be relatively easier with such a modest starting point than with formal efforts aimed at overall "top down" coordination.

This Kiribati assessment begins by explaining the context of the country in relation to disaster risk reduction and climate change adaption. It follows with sections on the Key Country Findings and Detailed Country Assessment that focus on some key components relevant to HFA achievement: adopting and mainstreaming policies, data and knowledge, risk and vulnerability assessments, monitoring and evaluation, awareness raising and capacity building, planning and budgetary processes, and coordination. From this assessment, possible opportunities for addressing the identified gaps and needs within the HFA are presented in the final section. Some potential opportunities for future support are proposed in Annex A.

Funding for this assessment was provided by the Global Facility for Disaster Reduction and Recovery (GFDRR), which is a partnership with the UN International Strategy for Disaster Reduction (ISDR) system supporting the Hyogo Framework for Action. Other partners that support GFDRR work to protect livelihoods and improve lives include Australia, Canada, Denmark, European Commission, Finland, France, Germany, Italy, Japan, Luxembourg, Norway, Spain, Sweden, Switzerland, United Kingdom, USAID Office of Foreign Disaster Assistance, and the World Bank. ❖

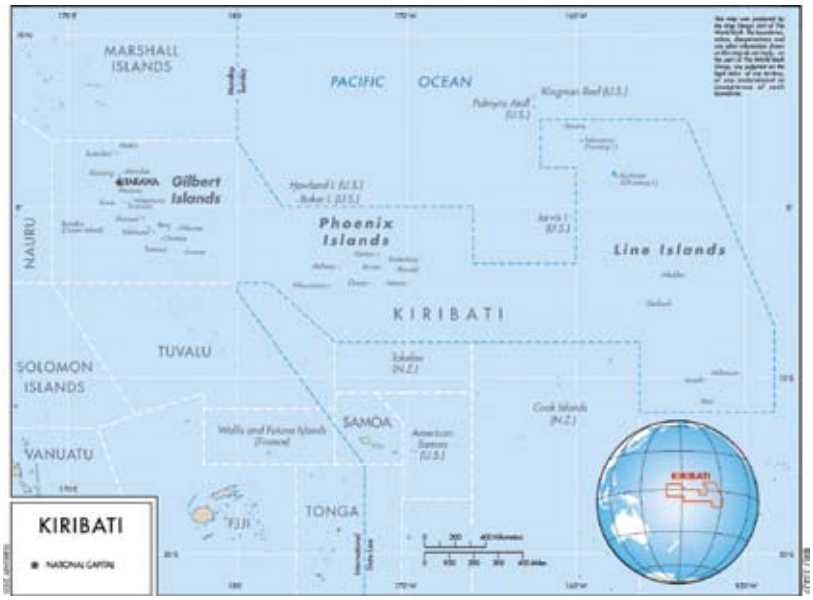
Country Context

The Republic of Kiribati comprises 32 low-lying coral atolls, which are divided into 3 main island groups—the Gilbert Group to the west, the central Phoenix Group, and the Line Islands to the east—and the oceanic island, Banaba (Figure 1). Kiribati is broadly situated in the dry belt of the equatorial oceanic climatic zone with an average mean temperature of 29°C. Rainfall varies from 1,000 millimeters per year in the south to 3,000 millimeters per year in the northern group. Due to its specific geographic location spanning the equatorial belt, Kiribati generally escapes the major climate-related threat of cyclones. However, the relatively small size of its islands means it is highly vulnerable to most climate-related hazards. The limited information base does not allow a definitive assessment of any geologic hazards to which Kiribati may be prone.

Its total land area is about 811 square kilometers within an equatorial economic exclusive zone (EEZ) of some 3.6 million square kilometers spanning the Central Pacific.[1] Of the estimated Kiribati population of 95,000 in 2005, over 90 percent lived in the Gilbert Group, mainly on Tarawa atoll, the capital and commercial center of Kiribati. The combination of unsustainable population growth, environmental degradation and the exploitation of scarce and fragile natural resources has exacerbated the already high physical vulnerability of low-lying atolls. This is particularly noticeable in South Tarawa.

There are several resource and environmental issues, common to island nations, affecting sustainable development in the Republic of Kiribati. These include climate variability and sea-level rise, environmental degradation and pollution, and resource management. More specific challenges to sustainable development include coastal erosion, water quality, water availability, and sanitation. Sustainable management of resources such as aggregate, terrestrial, and offshore minerals and renewable energy are other issues that impact on Kiribati's quest for development.[2] ❖

Figure 1. Map of Kiribati.



[1] EEZ as defined by UNCLOS (United Nations Convention on Laws of the Sea) Pt 5, Article 55.
[2] Summarized from SOPAC Kiribati Country Profile.

Key Country Findings

Among the Pacific island countries, Kiribati is unique in terms of the effort and process being followed to address the impacts of natural disasters and climate change. While many countries have started to develop a National Action Plan (NAP) for Disaster Risk Management (DRM) and/or a National Adaptation Plan of Action (NAPA) for CCA, Kiribati is now at the stage where it is implementing the second stage of the Kiribati Adaption Program (KAP II), its national adaptation strategy.

The DRR/CCA process through the KAP and the NAPA in Kiribati has a built-in mechanism for review and possible readjustment. Following are some of the findings from this assessment and the KAP process:

- ***Process is lagging.*** The KAP process commenced with much to commend the governance structure, coordination mechanisms and, most of all, the leadership. The focus, plans, and strategy appeared to be of sound design. However, progress is not as fluent, delivery is a bit more difficult, and implementation is falling behind. As issues become more technical, the management, direction and timing of the process presents a not unexpected challenge for the generalist leadership. Coordinating the existing expertise and capacity in the various ministries worked well in the early planning stages and still does in the case of normal bureaucratic oversight. However, DRR/CCA mainstreaming requires more than just accepting a defined process; it demands some capacity to deliver on the technical and scientific substance in several key areas.
- ***Capacity is inadequate.*** One key over-riding weakness is an absence of critical human resources and experience. How skills, expertise, and absorptive capacity will be addressed is critical at several levels of the KAP process such as mainstreaming, coordination, and taking an integrated and holistic approach to CCA and DRR. Looking to the future of sustainability, the KAP approach could be more of a challenge when upscaling is required. There is a feeling there might be too much activity for the limited in-country capacity to manage. All the usual concerns about coordination, sequencing, value-adding, and sustainability post-project life seem to apply.
- ***Information systems are weak.*** There are basic technical and scientific weaknesses that affect data, knowledge and information systems in terms of quality, depth, and geographical coverage. Physically, Kiribati is one of the most vulnerable countries where small threats or small incremental changes are likely to have a disproportionate impact. There is no room for error in using trends based on limited data or good guesses about climate change, and neither is ballpark figure modeling acceptable for future planning.
- ***Donors are supportive.*** The Kiribati effort does not lack for external support from donors. The Government does not appear to apply oversight and control of all the external assistance. There is no question of the need for the donor support. It is the effectiveness and the question of sustainability that is the issue.

A summary of the country situation and the gaps or impediments that lead to effective risk reduction, which justify the selection of these opportunities, is presented in Table 1. The opportunities for Kiribati are further discussed in the final chapter.

Table 1. Summary of Key Gaps and Opportunities for DRR and CCA for Kiribati

Situation	Gap	Opportunities
Current involvement in DRR by the various ministries appears to be project based rather than issues related.	Risk mapping not integrated into planning process.	Develop whole-of-government, simple DRR arrangements, coordinated with CCA activities.
Potential importance of data and information system management already recognized within Government. Risk data seen as of paramount importance to most institutions but are fragmented and often too difficult to coordinate.	Lack of knowledge concerning hazard/risk zones. Lack of a robust, fully operational, and a whole-of-government information management system (currently only one map server based in a single ministry and a sprinkling of IT persons with some short-term training).	Develop a comprehensive GIS spatial mapping base for recording geographic hazard and oceanographic data.
Access to technology and specifically airborne or space platforms is not readily available to carry out long-term monitoring or the short-term post-disaster mapping and assessment. Current successes in access have been largely due to SOPAC support. Several global ocean observing systems are operating across the Pacific but products are not being transferred to Kiribati.	Lack of a common geographic information database across departments. Mechanisms to collect, collate and interpret data and information is ineffective or absent. Lack of basic climate and hazard data collection capabilities.	Promote mechanism to collect key data, and map onto a GIS-based system.
Critical deficiency in scientific human resource capacity and whole-of-government information management systems is common to all areas of Government assessed. Mistaken notion that IT expertise is equivalent to GIS or other information system expertise.	Required experience or minimum human resources in the various ministries to manage the numerous projects is lacking. Lack of capacity to assess risks from natural hazards.	Develop a facility for developing risk maps and assessments for all relevant hazards.
Central authority needed for updating data and informing users.	No single entity is in charge of knowledge products relevant to DRR and CCA.	Build a qualified and experienced cohort in a central authority capable of sustaining and promoting the spatial database. Ensure a national capability to replicate data to different IT-based systems in line ministries and other interested NGOs.
Low sustainability of projects after the (externally supported) life of the project ends is a major risk.	Major challenge presented by the low absorptive capacity of the GoK to coordinate and implement the large suite of externally supported projects.	Develop key and sufficient skills and experience.
Donor coordination and leadership is required to ensure better-focused, better-designed, and better-sequenced assistance	Lack of coordination of external forces promotes environment of information hoarding.	Develop information system and meta-database for not only storing information and data but for sharing lessons between all stakeholders, including donors & CROP.

Detailed Country Assessment

At the outset it should be stated that, among the Pacific island countries, Kiribati has a higher-than-average level of awareness with regard to potential climate change and associated issues. This is as a result of the significant number of studies, communications, and CCA projects generated over the past 15 years that have provided opportunities to consult with the general population and provide directions for the way forward.[3] This heightened awareness however does not necessarily equate with knowledge, leading to understanding, and most of all, to implementation of adaptation or risk reduction measures.

Identification, assessment, and monitoring risks

The main risks for low-lying atoll nations such as Kiribati are assessed to be those arising from sea-level rise, coastal erosion and inundation, droughts, saline intrusion, and ecosystem degradation.

Earthquakes. Kiribati is located within the more stable center of the Pacific tectonic plate, which in theory reduces the likelihood of damaging geological hazards such as earthquakes. There is little public information however on the seismological history of the relatively geologically young Kiribati atoll chains. Data from the SEAFRAME tide gauge installed at Betio provides information on recent (vertical) movements of Tarawa atoll. Currently, it appears from the Continuous Geographical Positioning System results that the island of South Tarawa at Betio is showing a slight emergence (+0.1 millimeters per year) but is essentially vertically stable with respect to the International Terrestrial Reference Frame, within the present uncertainties of measurement given the relatively short-time frame since installation in 2002.

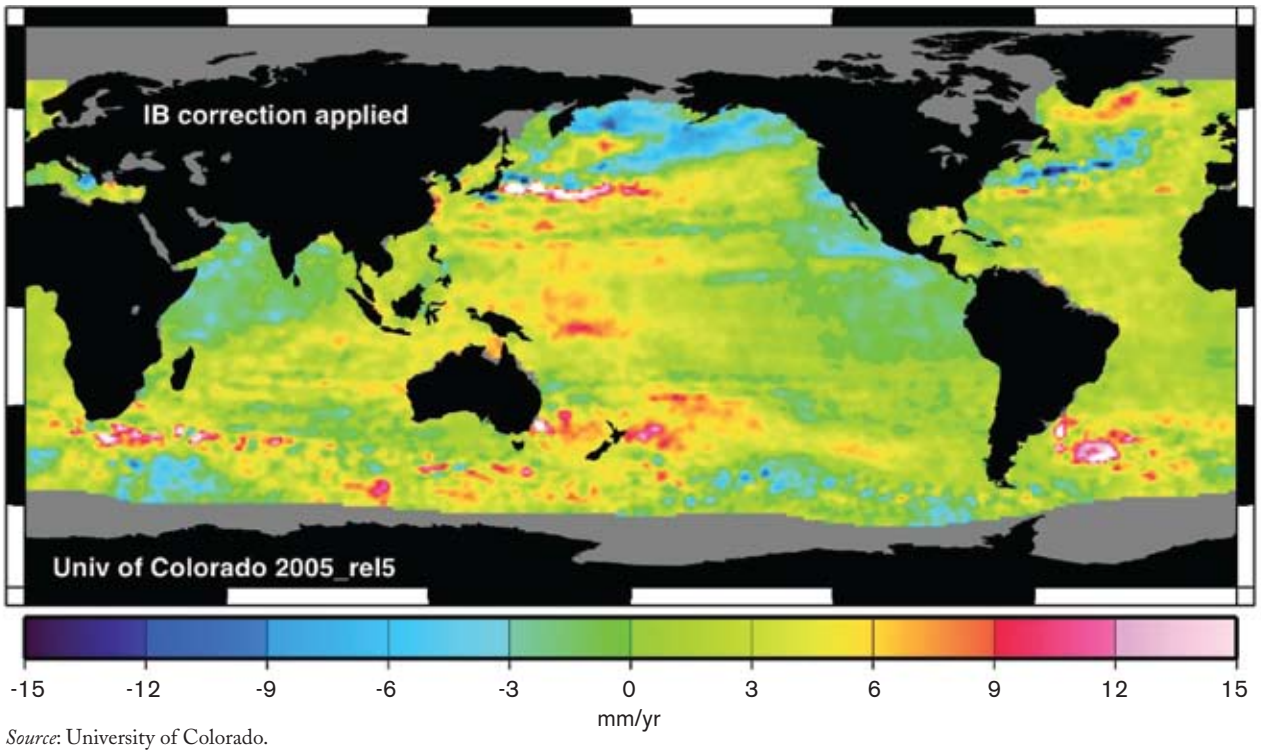
Unpublished information[4] from geologic mapping indicates relative emergence of the eastern end of South Tarawa relative to the western end where the Betio tide gauge is located, suggesting recent tilting of the atoll and possibly active tectonism as has been put forward by Dr. Loren Kroenke of the University of Hawaii.[5] There is untapped geological knowledge available in the form of storm or tsunami deposits on Tarawa (and probably other islands) that could give indications as to the long-term frequency and severity of potentially disastrous events. This indicates the need for better understanding of the geology and geomorphology of the atolls of Kiribati before the threat posed by critical geologic hazards can be properly assessed.

Sea-level rise. The fact that the country is largely made up of atolls just a few meters above mean sea level increases the possible threat from ocean- or climate-generated hazards. The figure often used for sea-level rise on Tarawa is +4 millimeters per year or just less than 34 centimeters rise over the last 100 years.[6] A number of longer-term records are available in the Joint Archive for Sea Level Data from gauges at Tarawa, Kiritimati, Fanning, and Kanton islands. Most have less-than-adequate survey control and precision and, in fact, give inconclusive results as widely varied as -3.78, +0.80, +3.15, and -0.43 millimeters per year.

The net relative sea-level trend estimated as of June 2006 by the South Pacific Sea Level & Climate Monitoring Project (SPSLCMP) from the SEAFRAME gauge at Betio, taking into account inverted barometric pressure effect and vertical movements in the observing platform, is currently +5.3 millimeters per year. However, the authors who reported this trend are careful to warn that, even though the survey quality is well controlled and of high precision, this sea-level

[3] 1993 National Environmental Management Strategy, PICCAP, UNFCC 1st National Communication (1999), Kiribati Adaptation Projects (KAP I & II), ADB 2006 Country Environmental Analysis, and the 2007 National Adaptation Plan for Action.
[4] Dr. G.G. Shorten, personal communication.
[5] Dr. Loren Kroenke, personal communication.
[6] Kiribati NAPA (1999).

Figure 2. Regional Rates of Sea-Level Change as Measured by Satellite Altimeters, December 1992 to August 2005



Source: University of Colorado.

record is relatively short, and it is still too early to deduce a long-term trend.

The sea-level trends from SEAFRAME stations are mostly higher than the global average rate derived from satellite altimetry (+2.9 millimeters per year) but are consistent with the map of regional satellite altimetry sea-level trends (Figure 2) adopted from the SPSLCMP report. Global mean sea-level change during this time has not been geographically uniform, and continued monitoring is necessary. For example, sea level has risen at higher rates in the Southwest Pacific region and has fallen in the Northwest Pacific due to a basinwide decadal 'slosh' in the Pacific Ocean.

Droughts. Droughts are one of the main climate-related risks. In addition to rainwater harvesting the primary source for water supplies is from the narrow, shallow, and often fragile groundwater lenses. The recharge of these lenses and therefore their viability as community water sources are directly related to rainfall recharge. Rainfall variability is linked to ENSO events, which have a major impact on water availability on the atolls. Specifically, El Niño events are associated with high rainfall and more secure water supply in Kiribati. The reverse situation is linked to periods under La Niña.

Severe, prolonged droughts are common in the drier islands in the central and southern equatorial region (e.g., the Gilberts, Banaba, the Phoenix Islands, and Kiritimati). As a result, the tools required for better climate modeling and rainfall prediction become extremely critical. The ability to use the regional climate models to provide predictions specifically for drought becomes very important. However, their utility to date in the outer islands is untested. There are plans as part of KAP II to upgrade the meteorological equipment and network to assist improve climate and rainfall data.

Groundwater aquifers and particularly the water lenses on small atolls are very complex, three-dimensional bodies. Understanding the critical hydrogeological parameters is essential for sustainable water resources management. Apart from the water lenses at Bonriki and close by at Buariki on North Tarawa, there is little knowledge of the sustainable yield and development potential of groundwater elsewhere in the country. It is uncertain whether this assertion also applies to the other major population center, Kiritimati Island.

Coastal erosion and inundation. On small atolls the loss of land due to erosion or inundation from the sea is a major threat. Quantitative coastal change modeling on South Tarawa might have been possible from a relatively long (20-year plus) beach-profiling program conducted by the Lands Department. However, it was reported that this exercise has recently stopped, and there are now questions raised about the reliability and accuracy of the surveying data.

The 33 islands of Kiribati, spread as they are over one of the largest exclusive economic zones in the world, make the use of airborne or satellite remote sensing extremely practical both as a mapping and a monitoring tool. The oldest air photos used, particularly for coastal change assessments, are no earlier than 1969. Air photos from World War II are also a possibility but have been difficult to obtain. Satellite imagery used in recent work carried out by SOPAC has been shown to be very useful particularly in mapping the impact of coastal erosion and stability. However, it comes with the usual constraints of imagery acquisition and the requisite specialist interpretative skills base. Recently some air photo analysis was carried out on Tarawa and the 4 outer islands of Abiang, Abemama, Butaritari, and Onotoa. Apart from geology, the other weak area is in regard to oceanographic information. There are several global ocean-observing systems operating across the Pacific, but the products are not as yet being transferred to Kiribati.

A Kiribati map server was established by SOPAC in its focal point government ministry, Ministry of Fisheries and Marine Resource Development (MFMRD), and apparently contains data for 7 atolls.[7] This country assessment was not able to ascertain how well used and maintained it is.

Disaster records. In recent times storm surges, coastal erosion, droughts, and pandemics have been perceived as having the greatest impact on the country. In the last 50 years of global records the only disasters listed for Kiribati have been the coastal impacts of Cyclone Bebe in 1972, the 1977 Cholera outbreak, and the drought from May 1998 to March 1999.[8] These 3 reported major disasters do not reflect the perception within Kiribati where frequent disasters having regular impact on individual islands and communities present a picture of a much more disaster-prone nation.

Climate modeling. Despite apparent awareness of the risks associated with climate-related hazards, it is questionable whether there is any in-depth knowledge and understanding underpinning projections of future risk. In the absence of long and reliable data sets and better scientific understanding, realistic future scenarios become difficult to formulate. There are however, a few site specific studies mainly on Tarawa that are often used as the basis for predictions.[9]

Locally, a great deal of emphasis is placed on traditional knowledge and often referred to in the absence of long-term monitoring and data. The prediction of strong "westerlies" in December and January is an example of one such prediction based on traditional knowledge.

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[7] Kiribati MapServer website, http://map.gov.ki.

[8] EMDAT data, World Bank (2006). Kiribati is not prone to cyclones so Cyclone Bebe probably refers to impacts on Tuvalu when both countries were part of the Gilbert & Ellice Islands.

[9] Summary results from KAP II PAD of 1999-2000 World Bank-funded study in Annex B.

Possibly the longest national monitoring program has been that carried out by the Meteorological Division with both upper air and surface observing systems in Tarawa. There is some limited surface observing capabilities on Banaba and on 6 other atolls. Whether these data sets are useful enough for water resources and coastal zone management on the outer islands remains to be seen. Kiribati is a participant in the regional Island Climate Update Network and is also a user of climate prediction models such as those linked to Bureau of Meteorology of Australia and National Institute for Water and Atmospheric Research of New Zealand (NIWA).

As part of KAP II, some significant progress has been made on the development of information for climate change management focusing on reports and use of a NIWA calculator for wave climate and rainfall over decadal periods.

Gaps

In general, development of the knowledge base required for natural and climate-related hazard assessment requires broader skills and stronger experience base than that which presently exists.

- ***"Gaps in data and in knowledge about the atolls contribute significantly to the difficulty faced in trying to identify options for adaptation,"*** as stated in the Kiribati first UNFCC Initial National Communications (1999). It further states, "Gaps in data and knowledge could misdirect policies towards different focus from areas which when given attention can ensure long term benefits to the economy and environment."
- ***Data and knowledge related to geologic hazards is weaker than those for the climate-related threats and, in some areas, absent altogether.*** All this leads to a weak scientific understanding and monitoring of hazards, even though there is potential to glean much more geological information about long-term risk for relatively little investment.
- ***Insufficient asset data and maps lead to a poor understanding of exposure to risks.*** Where data exists it is far too patchy and not enough to ensure sustainable management and planning. This will become particularly evident and more critical when dealing with the outer islands. Some island profiling is scheduled as part of the KAP II project, but it is unlikely to substitute for detailed hazard and vulnerability mapping. Where profiling has been undertaken (1999-2000 World Bank study), the internal assessment of the level of certainty is said to be *low to very low*.[10]
- ***In general there is a lack of long time-series data sets.*** Where they exist, which is mainly on Tarawa, they are not readily retrievable or user-friendly. A good long-term dataset of beach profiling on South Tarawa is thought to be of dubious value due to questions about the surveying methods.[11] The SEAFRAME sea-level gauge located at Betio is providing useful time-series data, but the conversion of the data into useful products for coastal engineers and other local users has not been developed.
- ***The availability of products to be used by the water supply, agriculture, fisheries, and other sectors appears limited.*** However, there does appear to be a long time-series meteorological dataset. This gap could possibly be reduced with the recent input from KAP II and SOPAC Pacific HYCOS program.
- ***Other data gaps exist with regards to unaccounted for water losses, water resource reserves, and water quality data.***

[10] See Annex B. In 1999-2000 the World Bank funded a study of vulnerability and adaptation in Tarawa, conducted by experts from the International Global Change Institute, the Government of Kiribati, the University of Otago, and Eco-wise Environment. This assessment taken from Table 2 of World Bank (2006) Project Appraisal Document.

[11] Personal communication, MFMRD (Biribo)/Simpson.

- ***Nationwide data on beach mining, aggregate use, and the status of other natural resources is limited*** or at least not readily available.
- ***The atolls are fairly low-lying.*** It is estimated that the highest point above sea level is about 8 meters. As a prerequisite to any detailed mapping, monitoring, and land-use planning, accurate maps together with digital elevation models are required.

Understanding of the gaps is nothing new as illustrated by the feedback from questions asked in Tarawa, which identified the following as specific data and information needs and limitations:

- Data from sea-level monitoring gauge is of limited use and provision of products would be more useful.
- Targeted modeling products from rainfall/climate data for storm surges, drought prediction, and migratory fisheries management are needed.
- Water resources data from borehole hydrometric monitoring for water quality and quantity management.
- Health of coral reef and marine ecosystem information, including mangrove and sea grass ecosystems stress data.
- Coastal change data, including erosion hot spots and mining sites.
- The economic assessment of marine and terrestrial species value in the Phoenix Island through the Phoenix Island Protected Area Project.
- Island topography or contours to isolate very low-lying high-risk areas from slightly higher grounds.
- Location of critical infrastructure.
- Location of groundwater galleries or potable groundwater aquifers.
- Location of settlements, including village institutions on the outer islands.

The critical shortage of scientific human resources is largely responsible for the unsatisfactory state of knowledge and absence of data. The ineffectiveness or absence of mechanisms to collect, collate, and interpret the data and information is a basic weakness. This issue of general scientific capacity and a need for a whole-of-government information management system (geographic information system or spatial database) recurs time after time with most issues assessed as part of this country assessment.

Vulnerability and risk assessment

The risks from natural hazards and climate change faced by Kiribati are exacerbated by its small size and the physical vulnerability of the atolls together with the high exposure of its coastal-dwelling communities to oceanic- and climate-related hazards.

The most substantial natural hazard risk assessment-related work carried out to date has been part of the KAP projects. Some site-specific technical studies, some as part of KAP II, have evaluated the possible impact of natural hazards: Coastal erosion, coral reef and ecosystem degradation, coastal engineering with potentially adverse effects, uncontrolled beach mining and over-exploitation and degradation of groundwater resources have been some of the issues assessed. Many of these were classified as environmental stress symptoms by the National Adaptation Program of Action (NAPA) process, completed in January 2007.

Risk profiling or hazard mapping, being a key requirement for risk assessment, has not been completed nationwide, and what has been carried out has been largely site and hazard specific. It is not the intention to repeat the detailed results from the extensive KAP and NAPA consultation and development processes that prioritized what were perceived vulnerabilities.[12] Immediate issues related to water resources, which impact on the daily lives of the communities, figured as

[12] KAP II Project Implementation Paper (December 2005), and PAD Report No 35969-KI (May 2006).

a high priority in the national consultations. Whereas externally, as often highlighted in various international fora, the perception would be that sea-level rise and the resultant loss of valuable coastal land might be a higher priority. For Kiribati, knowing the risks is not the problem but it is important to be able to understand, prioritize, and develop coping strategies.

From consultations with two key ministries (MELAD and MFMRD), backed up with questionnaires, the following specific issues are highlighted:

- The risk due to sea-level rise, sea inundation, saline intrusion, coastal erosion, ecosystem degradation, and droughts were seen as priorities.
- The risk of climate change escalating health-related issues and the exposure of most village infrastructure to potential storm surge hazards were key social issues.
- Islands are particularly vulnerable due to being low-lying (2-3 meters above mean sea level), narrow in width, close to reefs, and composed of relatively non-indurated permeable carbonate material (at least at the surface); and having fragile groundwater lenses, fragile coastal fisheries, negative impact of beach mining and inappropriate coastal engineering, and pressures of unsustainable population growth, particularly on South Tarawa (Betio).[13]
- The pressure or negative environmental impact from over exploitation of natural resources is apparent. Around 90 percent of the population is dependent on limited land resources and the fragile coastal marine ecosystem for their livelihoods.
- The risk from climate change and sea-level rise would put further pressure on the island economy.[14]

Sea-level rise. Until scientific studies prove otherwise, the greatest perceived threat is from inundation due to sea-level rise[15] and the increasing threat in the short term from more frequent extreme climatic events. The increased risk is related to the high exposure of both the population and critical infrastructure. The absence of detailed surveys and asset maps makes the exact exposure and potential economic losses difficult to quantify. Where such information exists, it is largely kept within individual ministries, organizations, or with individual researchers. Dr. A. Webb (SOPAC, 2005) and Dr. P. Kench (KAP II, 2005c) have produced detailed analysis on critical infrastructure on South Tarawa such as the Bonriki airfield, the main Tungaru Hospital, and the South Tarawa causeways. However, the in-country capacity to use such advice remains one of the key challenges.

Poorly planned coastal development. Analysis of historical changes on South Tarawa show that the vulnerability of the area has increased significantly over time, exacerbated by anthropogenic pressures from development and high population growth. Poorly planned development, many projects initially intended as short-term solutions, has resulted in increased vulnerability and escalated impact of hazards and climate change. The blocking of channels between the atoll islets through reclamations or by building causeways has now significantly changed nearshore oceanographic processes. As a result of poorly designed coastal engineering and protection structures, the natural lagoon circulation patterns, sand deposition, and erosion processes have been significantly modified in places. Some possible solutions have been proposed as part of KAP II. They will be tested through pilot activities implemented in 2009 and 2010.

[13] Half the population and growth rate of approx 3 percent per year.
[14] World Bank Regional Economic Report (2000) estimate: by 2050 economic impact around US$8-16 million per year.
[15] World Bank Regional Economic Report (2000) estimate: up to 54 percent of areas in Bikenibeu, South Tarawa, and up to 80 percent of Buariki, North Tarawa, could become inundated.

This situation could be of even greater concern on most of the other outer islands. During the 4-year period, 2004-2007, the Ministry of Internal and Social Affairs (MISA) has approved over Australian (A)$3.3 million of coastal infrastructure work in the outer islands, including a rainwater catchment project on Banaba. The project list includes the building and repair of 5 causeways, 3 seawalls, a bridge, a boat passage, and a wharf. It is not clear whether much of this work is proceeding with the necessary environmental impact assessment (EIA) or if the engineering design is based on any proper risk assessment.

Water resources. Other risks linked to anthropogenic activity include the degeneration of lagoon and fresh-water quality. Both human and, to a lesser degree, industrial pollution place the fragile freshwater resources and the surrounding marine ecosystem in a highly vulnerable state. A healthy coral reef is the main source of sand replenishment on the atolls and a major contributor to marine ecosystem survival. Apart from understanding the response of reefs to changing water depths and temperature, there is a critical need to monitor the adverse impacts from land-based pollution. It was estimated (J. Hay & K. Onorio) that about 60 percent of the households in South Tarawa still carry out beach toileting.[16] Broad-based baseline studies against which to measure changes, as well detailed surveys, are lacking.

Climate change risks. The ADB 2006 Country Environmental Analysis by Hay and Onorio demonstrated that vulnerability to climate and weather impacts were critical to economic planning in Kiribati as a whole. During La Niña, the resultant low rainfall meant lower copra production. Hay and Onorio asserted that lower ocean temperatures brought with it higher sea levels and increased coastal erosion. Lower ocean temperatures also mean lower fish (i.e., tuna) catches resulting in lower EEZ access fees. However, during an El Niño period, the high rainfall improved water supply security but at the same time increased the likelihood of vector-borne diseases. Hay and Onorio assert that higher ocean temperatures combined with lower sea levels increased the possibility of increased coral bleaching. The higher sea temperatures (i.e., the "warm pool") resulted in higher fish catch and EEZ access fees.

Since access fees contribute about 60 percent of government revenue, a better understanding of ENSO events and the effect on ocean temperatures can lead to better economic planning and possibly leave the Kiribati economy less vulnerable to the impact of La Niña events.

Coastal erosion and degradation. One of the main factors increasing coastal vulnerability has been the impact of uncontrolled aggregate mining, particularly but not exclusively on the beaches. A solution in the final stages of finalization was the location of an economically recoverable deposit of lagoon sand just off Betio. The EIA for this EU-funded mining venture is being carried out. The project is attractive in that it provides an alternative to mining the beaches and the areas around the groundwater lens reserves. However, it remains to be seen if it stops the many who mine sand locally because it is their only source of income.

Gaps

- In spite of the claim to have followed the CHARM process,[17] the general lack of vulnerability and risk assessments maps, surveys, and use of appropriate tools does not indicate much rigor has been applied in the process.
- There is a noticeable gap between data collection and investigative studies and the generation of in-

[16] ADB Kiribati Country Environmental Analysis, TA:6204-REG (December 2006).
[17] Comprehensive Hazards and Risk Management – Guidelines for Pacific island countries promoted by SOPAC.

formation and products for use by planners and resources managers.

- There is an apparent disconnect between plans for future development and CCA and DRR work. If some of the outer islands are being earmarked for resettlement or other such development (e.g., mariculture), then they need to be subjected to vulnerability and risk assessment procedures.
- Transferring lessons learned and extrapolating trends and data are commonly used techniques. How much this is possible between atolls in Kiribati requires further evaluation.

Mainstreaming into plans, policy, legislation, and regulations

Stand-alone DRR and CCA efforts have historically caused limited nationwide impact. Kiribati DRR and CCA will only be effective once reflected in the key policy and planning instruments. Kiribati, where the Constitution is the supreme law, is well endowed with plans, policies, and legislations.

- As part of KAP, a Legislative and Regulatory Review was carried out (KAP II, 2005a). The Review identified a number of specific CCA-relevant issues:
- The capacity for implementation and enforcement of policy and legislation was a problem.
- Overlap and poor coordination exists between some closely related regulatory regimes.
- Exemptions in some legislation reduce the effectiveness of the law.
- Striking a balance is needed between traditional values and the modern regulatory framework.
- Better public education and participation is required in policy and legislation development.

The main existing CCA-related legislative instrument is the Environment Act (1999) and its Regulations (2001), which have been amended (2007). The amended regulations contain explicit reference to climate change issues. The Mineral Development Licensing Ordinance (Cap 58) covers the brief for what should be the important inter-ministry Foreshore Management Committee. Among other issues, seawall construction is covered by the Foreshore and Land Reclamation Act (1977), which was amended in 2005 apparently "to assist landowners".

Customary law is considered part of the law in the country and may be applied to issues relating to land ownership, fishing rights, and sea and lagoon ownership.

In terms of government policy, the National Development Strategies, 2004-2007, provides the main development agenda. The high potential cost and effects of climate change on economic growth and its potentially dangerous social impact are recognized in the Strategies. The period 2008-2011 is now covered by the Kiribati Sustainable Development Plan (KSDP), which is the successor to the National Development Strategies.

There is a Climate Change Policy (2005) as well as a CCA Strategy. The Climate Change Policy Statement sets three main aims:

(a) Kiribati should be mentally, physically, and financially well prepared to deal with whatever climatic trends and events the future may hold.
(b) This should be achieved through a coordinated, consultation-based adaptation program carried out by official and private agencies.
(c) External financial assistance should be obtained to meet the costs of the national adaptation program.

The CCA Strategy describes detailed strategies to implement the Climate Change Policy Statement. These are addressed as action items under eight headings:

1. Integration of climate change adaptation into national planning;
2. External financial and technical assistance;

3. Population and resettlement;
4. Governance and services;
5. Freshwater resources and supply systems;
6. Coastal structures, land uses, and agricultural practices;
7. Marine resources; and
8. Survivability and self-reliance.

A Water Resources Policy was developed as part of the KAP II and adopted by Government in 2008.

The main instrument for implementation, under the responsibility of the National Planning Office of the policies and strategies, is the Ministry Operational Plans (MOP). The performance of each ministry (and possibly the CEO) is linked to delivery against their MOP.
In addition to the formal instruments there are other guidelines and tools. The CHARM approach or SOPAC-promoted DRR tool were used as part of the national consultation process under KAP. The MELAD has draft guidelines for applicants to the Foreshore Management Committee. Building codes are presently under development although this assessment could neither ascertain the status of this work nor whether the codes will be based on the results of local field testing.

The Environment Regulations (2001) require EIA processes but are silent in the screening process on the potential effects of climate change. However, under the new draft Environmental (General) Regulations (2007), two types of EIAs may be required as per Section 33(1) (d) of the Environment Act: basic EIA (para 7) and comprehensive (para 8). For some reason only under requirements for a basic EIA (Item 8) is any explicit reference made to climate change, which requires "*a description of how climate change and climate variability may impact on the activity.*"

The National Disaster Management Office, which previously was located within MISA, has been disbanded, and post-disaster management is now managed out of the Office of the President (OB) when the need arises.

In summary, Kiribati as demonstrated by the advanced stage of the KAP process is the most advanced of all Pacific island countries in attempting to mainstream CCA. However, mainstreaming CCA/DRR is a new concept and much remains to be done beyond acceptance of the concept.

Gaps

It may be too early to assess the effectiveness or impact of the attempts at mainstreaming CCA/DRR. However, initial indications from observing the implementation of inter-ministry policy and project coordination seems to indicate that mainstreaming is still not effectively carried out in the various sectors.

- ***This slow progress is influenced by the historic silo architecture of government ministries.*** The effect is heightened by limited human resource capacity; available staff see as their first priority to concentrate on what is perceived as core business. Involvement by various ministries appears to be project based rather than issue (i.e., DRR) related. The issue arises whether true ownership by the various parties has in fact been achieved.
- ***A major issue already identified in regard to the existing laws is the lack of enforcement.*** Dr. R. Kay (KAP II, 2008d) estimated that 50-70 percent of the seawalls built did not go through any approval process. The country's largest contractor, the Government, in particular the Civil Engineering Unit of the Ministry of Public Works and Utilities (MPWU) does not systematically adhere to the normal approval procedures, including EIAs.
- ***The limited human resources are further reflected in the lack of enforcement of laws and regulations.*** Hay and Onorio state that the Environment Act and its regulations have just not delivered against the re-

quired outcomes. The low number of prosecutions under the Act, such as for illegal sand mining, indicates ineffectiveness or the lack of political will to enforce the law.

- ***There may also be tension between the law and customary practice.*** Though apparently illegal, some 60 percent of the households in South Tarawa still practice beach toileting. Hays and Onorio explain that "often individuals have no viable alternative to non-compliance."
- ***It is felt that policies and guidelines (and possibly even the draft environment regulations) might not be specific enough to address the distinct culture and geography of a nation of small atolls.*** The difficulty of moving from rhetoric to action often still applies, and the development of building codes is a good example of the problem in practice.

Monitoring and evaluation

It is probably safe to say that it is too early in the cycle to objectively comment on monitoring and evaluation (M&E) as it relates to DRR in Kiribati. Also, in the early stages of the KAP and other CCA programs it is estimated that some 80 percent of the priorities that have been identified are associated with awareness raising, policy development, and similar activities. The M&E becomes challenging, particularly early in the process when investment opportunities are limited and not envisaged until KAP III and beyond. The other challenge is the need for measurable performance indicators.

The M&E that is being performed is therefore mainly in relation to the few pilot projects under the KAP. Specifically, technical assistance has been instigated to monitor coastal changes, coral reefs, environmental impacts of offshore sand dredging, and water leakage. Some baseline profiles are also planned for some outer islands against which changes might be assessed. Even though financial resourcing under the specific projects appears not to be an issue, the success to date of these activities is at best marginal. The lack of people, expertise, and tools again is a contributing factor. It raises early concerns not only with the plans to up-scale the pilot projects, post-KAP II, but also with the general sustainability of risk reduction through CCA in the country.

The issue of data and information system management weaknesses is already identified as an issue and recognized as such within the Government. The MELAD stated, in effect, that risk data is of paramount importance to most institutions, but these data are fragmented and often too difficult to gather. It would be good to collect these key data, map them onto a GIS-based system, set up a central authority and replicate to different IT-based systems in line ministries and other interested NGOs. The central authority is responsible to update versions of data and inform users of data.

Gaps

- ***There is a lack of technical or scientific expertise to observe, assess, and learn the lessons from each event.*** It is often found that expertise within ministries is based around a single person.
- ***M&E requires benchmarks against which to measure change, both with time and geographically across the different islands.*** In the absence of ground truth, much of the evaluation is subjective. It is a concern that generally applies to the broader environmental issues. Again, Hay and Onorio in their wider environmental assessment work found the same subjectivity because environmental indicators are very under-developed.
- ***Apart from benchmarks, quantifiable targets are needed to assess effectiveness and realistic progress.***
- ***Subjectivity is further enhanced by lack of a robust, fully operational, and a whole-of-government information management system.*** A map server based in one ministry and a sprinkling of IT persons with

some short-term training cannot substitute for acceptable GIS capacity and expertise.

- ***Access to technology, and specifically airborne or space platforms, is not readily available to assist with long-term monitoring or the short-term, post-disaster mapping and assessment needs.*** Whatever past success has been due in part to externally supported projects. If SOPAC or other external mechanisms are unable to satisfy the ongoing needs of Kiribati, then some in-country-based solution will need to be developed to provide the necessary tools.

Awareness raising and capacity building

Awareness raising has been a noticeable success of the KAP and NAPA processes. It has been at the core of the community consultation processes that have been the base on which both initiatives were developed. The awareness raising not only covers the whole country but also has extended to the highest level of government to include the Office of the President. Initially it began at the grassroots involving a number of consultations in the three island groups that make up Kiribati.

Other activities as part of KAP II have commenced, including a survey of public awareness and attitudes; in December 2007, a national consultation on CCA was carried out with another planned in 2009.[18] Other public awareness activities include the annual Environment Awareness Week and a Ministry of Marine Resources Week, supported by MELAD, which is responsible for weekly releases on CCA and other environmental issues.

In spite of general awareness, there is still lacking a specific understanding of consequences. Actions such as continuing beach mining, over-fishing and beach toileting reflect the fact that the message is still not getting through and affecting behavioral change. The absence of an alternative gives the defaulters little choice. Whatever strategies employed in the past, they are not as yet totally effective, although the recent KAP II efforts might prove otherwise.

Some long-term investment in greater awareness is planned through education, particularly by introducing CCA into the curricula taught in schools. This initiative is also part of the KAP II project in collaboration with the Ministry of Education Youth and Sport (MEYS).

Capacity building and human resource issues are key challenges facing Kiribati. There is strong evidence to support the argument that the difficulty in implementing DRR and CCA is largely due to the absence of experienced people. There is no obvious quick-fix solution; in the meantime, the absence of capacity affects ongoing adaptation programs and the sustainability of longer-term DRR and CCA programs.

In the present division of labor by the lead implementing ministries, MFMRD takes on a lead role for coastal and reef surveying and monitoring, leaving MELAD with responsibility for permitting and approving coastal structures, aggregate-removal, and compliance monitoring. The Civil Engineering Unit investigates coastal erosion problems and rehabilitates and rebuilds seawalls, causeways, and other coastal structures. These three ministries alone have responsibilities and functions that are not only critical to CCA but should have an impact on risk reduction. Good reports and advice are available; but in the absence of human resources, skills, and experience, very little change is effected.

The MFMRD has a qualified marine biologist, and its Minerals Unit has one person with post-graduate

[18] A better update of KAP II awareness-raising activities is found in the KAP II (2008c) Aide Memoire.

expertise in coastal zone management (but may be away on study leave for a year or two). The Civil Engineering Unit is grossly under-staffed and does not have a graduate engineer. The MELAD Environment Conservation Division (ECD) has several graduates, but it is unlikely to have adequate EIA experience for coastal or offshore projects.

At the upper governance end of the Government, there are very experienced administrators and managers. There is however a lack of depth and experience in natural resources management and more particularly in disaster reduction management.

To carryout and achieve sustainability in implementing DRR and CCA, appropriately qualified and experienced staff should be recruited. A complication exists in that in certain circles there is a feeling that expatriate expertise is not the preferred choice. So real difficulties arise where indigenous expertise is not available

Gaps

- ***Measuring the effectiveness of the public awareness efforts or gauging whether there has been any measureable behavioral change at the community level has not been a priority.*** For example, the continuation of beach mining is an indication that behavioral change has been minimal.
- ***Sensitizing and educating the next generation has not gained importance or value.*** Some careful thinking and consultation between curriculum developers, DRR experts, and the local people is required.
- ***Awareness information and material has not been tailored for local consumption and for different targets in society.*** Awareness should start with politicians with appropriate advocacy material and spread to the villager with advice on "no regrets" actions, such as building setback that can be carried out without outside intervention.
- ***The lack of involvement by the Public Service Commission or the ministry responsible for the public service and human resource is a major impediment to sustainable capacity building.*** An expertise and skills gap analysis is required across the board. There is a short-term gap to be addressed; if mainstreaming of DRR and CCA is to be carried out, some serious and immediate training and capacity building is required.

The Public Service Commission may also need to review the government organization structure in order to allow for the effective mainstreaming of DRR and CCA. There is a need to build synergies between line agencies and ensure more effective delivery of services and capacity building.

Implementation

In spite of an ongoing decade-long process, implementation of DRR and CCA, in particular, is at best considered still in its early or pilot project stage. The intended governance mechanisms are best reflected in the implementation plan for the KAP projects. An enabling environment has been established with leadership and overall management emanating from the Office of the President (OB). The actual processes and mechanisms for mainstreaming are presented in the next section when describing the coordination mechanisms within government.

If all is successful, then the main design instrument for implementation is through the Ministerial Operational Plans. A key development objective of KAP II is to change the way planning and implementation activities are handled so that better account is taken of climate risks (KAP II, 2008c). However, progress to date has been slow with regard to the technical work of risk assessment and identifying adaptation investments. Within the Office of the President, the delay in forming the proposed Strategic National Policy and Risk Assessment (SNPRA) unit has also been identified as a critical bottleneck.

Gaps

- Lack of a robust scientific and technical base will continue to undermine efforts and put at risk attempts to mainstream CCA. A model should be developed for acquiring the necessary expertise and staffing appointments to address the particular CCA/DRR requirements.

- For the longer term (i.e., beyond KAP II) and to ensure some degree of sustainability, plans should be put in place to address the required permanent skills base. The non-participation of the Public Service Commission does not bode well for any capacity-building program either for short or long term.

Coordination

As previously stated, Kiribati's efforts have benefited by establishing an "enabling environment" through the KAP process together with the leadership offered by the Office of the President. An enabling environment requires, among several things, performance-based budgeting, enforceable legislation, capable staff, participatory planning, and most importantly, intersectoral coordination.

Overall leadership is in the Office of the President, where the Permanent Secretary has overall responsibility for coordination of CCA/DRR initiatives. Implementation through the MOP is the responsibility of various ministries. The link between the ministries and the Office of the President is provided through 3 committees: the Development Coordinating Committee, the policy-focused National Adaptation Steering Committee (NASC), and the technical Climate Change Study Team (CCST). There are other key national committees with major responsibilities, probably none with a more challenging task than the National Water and Sanitation Coordination Committee (NWSCC).

It appears to be a workable structure but much depends on continuing leadership and the required expertise within the various committees. There are critical capacity gaps in some key implementing ministries. In terms of funding alone, two of the water sector projects, the ADB Kiritimati (US$10.7 million) and the EU outer islands program (6.7 million Euros), are larger than both KAP II and NAPA. Both will present coordinating, staffing, and implementation challenges that could possibly go beyond present capacity within the Government of Kiribati.

The NZAID-funded Sustainable Towns Program (STP) (urban renewal initiative) also has possible activities (e.g., infrastructure) that will need to be coordinated with all others.

Challenges and impediments

- The major challenge is one of absorptive capacity of the Government to coordinate and implement the many externally supported projects.

- Present indications are a lack of experience and minimum human resources in the various ministries to manage the numerous projects.

- Sustainability when the (externally supported) project ends is a major challenge. In this regard, the lessons learned from the completed Sanitation, Public Health, and Environment Improvement Project (SAPHE) might be useful. The completed SAPHE Project had a US$10.24 million ADB loan.

- There is also the risk of depending too much on managing by committees. A great deal of non-accountability and key skill gaps can be hidden within the committee mechanism.

- The usual challenge of non-donor coordination continues to be an issue. It is unlikely that Kiribati will refuse offers of continued external assistance so some donor leadership is required to ensure better focused, designed, and sequenced assistance.

- In spite of the early national consultations, the initial stakeholders appear to have their roles diluted or marginalized altogether. The NGOs rarely get a mention, and communities are referred to as recipients rather than partners. The areas outside of South Tarawa are reportedly much under the control of Island Councils and traditional leadership. For coordination, awareness raising, implementation, and ownership of sustainable DRR/CCA, a more effective way of engaging the grassroots stakeholders needs to be designed. It might be too much to expect MISA alone to provide the necessary links.

Planning and budgetary processes

Figures are not available but the key role played, in theory at least, by the Ministry of Finance and Economic Development (MFED) ensures that CCA is mainstreamed into the planning and budgetary process. The KSDP and the MOP development process are probably the two main mechanisms for ensuring Government budgetary support.

Funding, already mentioned, includes the A$8.7 million for KAP II over 4 years with 35 percent Government contribution and the USD$3.1 million for the NAPA. In addition to the ADB and EU water sector projects, there is in excess of several million dollars for other water sector activities. The EU is also committed to funding a substantial offshore sand-dredging project.

Challenges

- The quantum of external assistance does not presently appear to be an issue. The concern maybe in the Government of Kiribati being able to meet its counterpart obligations both in terms of budget and implementation capacity.
- The question of sustainability is a concern. The Pacific is littered with projects and infrastructure that collapse at the first problem or when governments are unable to meet the annual recurrent budget needs for maintenance (for example, the numerous non-operating desalination plants.)
- As a great deal of the support is through external funding, the key issues of donor coordination and sequencing and scheduling of support and programs become critical. The coordination and scheduling of the KAP and the NAPA is the first such challenge. The second major area requiring attention is how to sequence the many activities in water sector projects. ❖

Opportunities for Investment

From the Kiribati country assessment, it is evident from the gaps and impediments that a myriad of opportunities for investment leading to the improvement of risk reduction can be identified. Gaps range from the standard weaknesses with institutions, instruments and incentives. Hopefully, much will be addressed over time if the KAP and NAPA processes are closely coordinated, properly reviewed and allowed to run their course. However, there are some critical precondition issues like better data, systems and policy, which need to be addressed.

The major gap, and one which could undermine the whole goal of implementing DRR, is the human resource capacity issue, a far too ambitious challenge for investment by the pilot GFDRR project but nevertheless one on which the whole success of DRR/CCA depends. A dialogue on capacity building in Kiribati and the other small island states in the Pacific should be held immediately. Project technical assistance is unsustainable and regional organizations because of the sheer scale of the challenge are often limited to an advisory service and some limited backstopping. A comprehensive review, beyond the intention and scope of this country assessment is required to provide some real and sustainable solution.

This assessment highlights country status, gaps, opportunities, and barriers related to national policies, strategies, plans and activities with regard to the management of natural hazards in Kiribati. This focus extends to the enabling environment for a comprehensive risk management approach to natural hazards and the capacity to undertake such a comprehensive approach, including institutional arrangements, human resources, public awareness, information, and national budget allocations. In most discussions among key government officials and other stakeholders, investment programs are prioritized and selected based on expectations of several criteria (costs, available funding, efficiency, expected benefits, institutional, financial, legal and related capacity).

Kiribati and most of the Pacific island countries already have established policies, institutions, systems, and related structures to address DRR/CCA challenges. Several programs (NAPs, NAPAs, etc.) are ready to be implemented. Different from the other Pacific island countries, Kiribai has an ongoing DRR/CCA process through the KAP and the NAPA. As a process, it already has an inbuilt mechanism for review and possible readjustment. However, there are significant gaps in the 5 key HFA priority areas discussed; additionally, while some efforts have been made to address certain issues, others (funding, staffing and related operational support) persist. High-yielding, short-term priority issues have been identified by several participants; however, it appears that more effort is needed to fully analyze such needs and decide upon appropriate corresponding short-, medium- and long-term programs.

The Kiribati policymakers, sector officials (in consultation with local stakeholders), and various donors and financial institutions identified the list of priorities. The Government could choose to pursue any of these options with its own resources, with support from the international donor community, and/or international financial institutions such as the Asian Development Bank and the World Bank. Grant funding for Kiribati is being mobilized from the Global Facility for Disaster Reduction and Recovery to support pilot programs, which could be leveraged to undertake some of the proposed investments, based on demand. Funding would be expected to support programs from 2009-11.

There are two particular opportunities proposed in the country assessment. One opportunity is in the area of information systems and management. It is proposed because of its critical role in mainstreaming disaster risk reduction, and development in general, beyond the bounds of KAP & NAPA. It is an issue, which is seen as a key impediment throughout the Pacific Region, and so presents an opportunity to be addressed regionally without losing the specific focus of the country-driven needs. The second proposal focuses on establishing a simple DRR/CCA institutional framework. These proposals are presented in Annex A.

It is expected that the 2008 KAP II mid-term review will identify many of the key gaps flagged in this country assessment, and that strategies will be devised to address them. ❖

Annex A. Proposals for Support to Kiribati

Proposal:	**K1 Establish Integrated Hazards Information System and Tools (with GIS capability)**				
Country/sector:	**Kiribati: Hazards advisors and sector users, KAP**				
Goal and purpose:	**To inform and promote risk reduction decisions through information sharing and sound data management, analysis and presentation**				
Lead agency:	**MELAD with MPWU, MFMRD, Met Services, MISA**				
Total cost:	**US$220,000 over 12months**				
Hazards targeted	***Risk reduction measures***	***Key gaps/barriers***	***Tasks***	***Cost US$k***	***Time-frame***
Wind, storm surges sea-level rise Climate change extreme events Coastal inundation and erosion Fire Droughts Fresh and marine water pollution Pandemics	Evaluate and map hazards Assess risks and map vulnerability Map assets and assess critical infrastructure Monitor environmental changes and increased exposure to risks	Generally weak information management systems in most agencies and no information system management policies. Most hazard information is still hard-copy based and of questionable standard. Limited capacity for information system management Weak hardware and software computing capacity Limited tools and models for resource managers	Provide technical assistance support (8 person months) for the development of an integrated hazards information system Develop and adopt a Hazards Information Policy addressing: • Data sharing and availability • Single GPS datum/projection system for Kiribati • Catalogue of data to be held • Datasets to be made available digitally Assess data needs and products for DRR/CCA Identify long-term storage requirements, analysis tools, and mapping needs Acquire appropriate computer hardware, software, and high-speed Internet connection Support capacity building through populating the information system with available historical data and undertaking vulnerability mapping and risk modeling and for climate change and risk prediction Kiribati Government to ensure sustainability through annual recurrent budget for data and image acquisition, hard/software maintenance, and communication access costs	160 30 30	3rd Qtr 2009 to 3rd Qtr 2010

Continues

Annex A. Proposals for Support to Kiribati

Proposal:	**K2 Establish a simple DRR/CCA institutional framework**				
Country/sector:	**Kiribati: All**				
Goal and purpose:	**To increase the effectiveness and efficiency of CCA and DRR initiatives**				
Lead agency:	**Office of the President**				
Total cost:	**US$200,000 over 12months**				
Hazards targeted	***Risk reduction measures***	***Key gaps/barriers***	***Tasks***	***Cost US$k***	***Time-frame***
Wind, storm surges Sea-level rise Climate change extreme events Coastal inundation and erosion Fire Droughts, Fresh and marine waters pollution Pandemics	Improve institutional arrangements for DRR	Currently no clear DRR institutional arrangements, but recent appointment in the Office of the President Lack of coordination between CCA and DRR	Provide technical assistance support (8 person months) and training for the development of simple institutional arrangements to strengthen DRR	200	4th Qtr 2009 to 3rd Qtr 2010

Annex B. Potential Impacts of Climate Change, Variability, and Sea-Level Rise in Kiribati, 2050

[This Annex is based on KAP II PAD.]

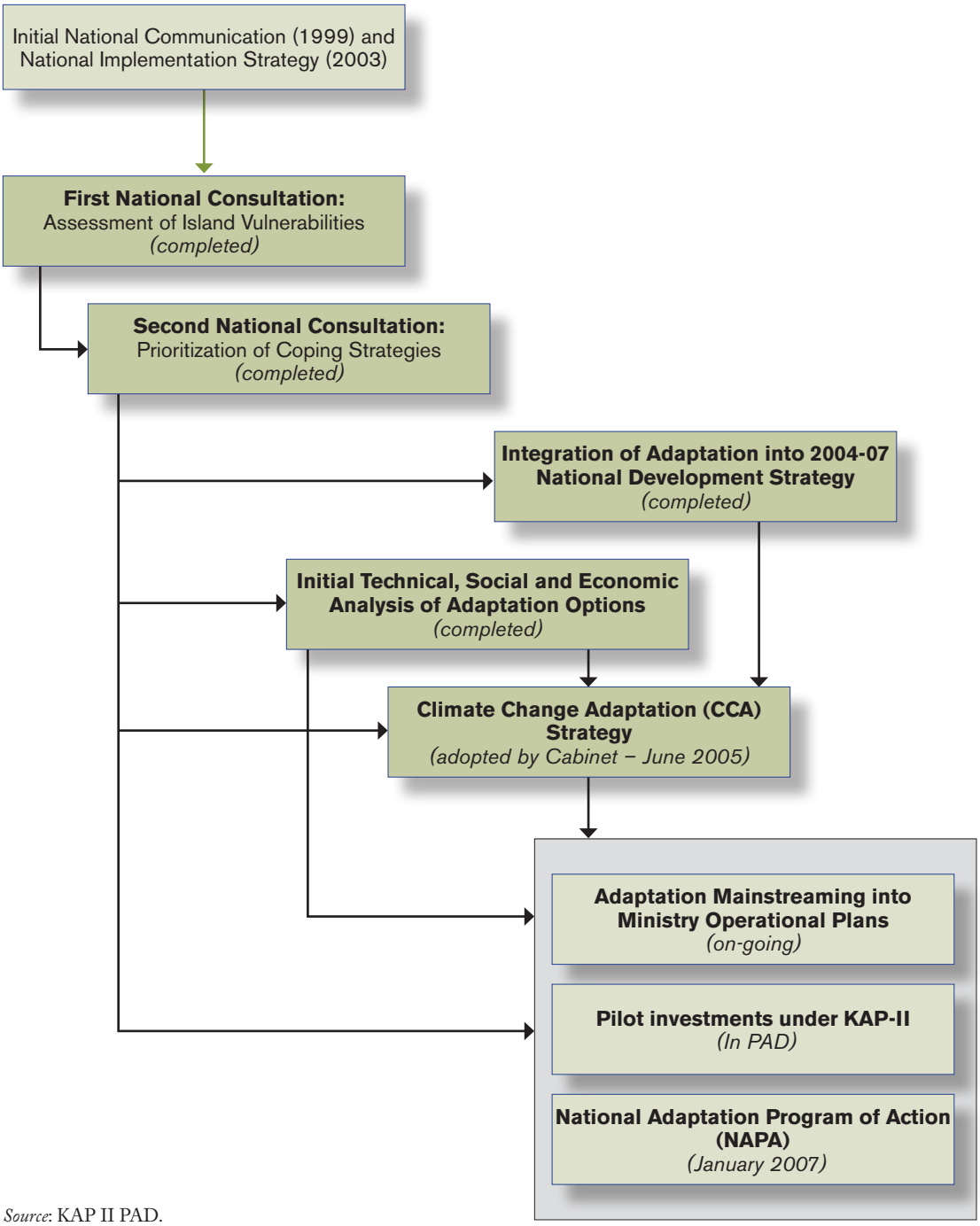
A 1999-2000 World Bank-funded study of vulnerability and adaptation in Tarawa, conducted by experts from the International Global Change Institute, the Government of Kiribati, the University of Otago, and Eco-wise Environment, found that climate change and sea-level rise are likely to lead to severe incremental impacts, disrupting major economic and social sectors (Table A1). By 2050, in the absence of adaptation, Kiribati could experience potential economic damages of US$8-16 million a year, equivalent to 17-34 percent of the 1998 GDP.

Table A1. Potential Impacts of Climate Change, Variability and Sea Level Rise in Kiribati, 2050

Type of impact	Physical impact	Annual damages (US$ millions1998)	Level of certainty
Impact on coastal areas:			
Loss of land to erosion Buariki (North Tarawa) Bikenibeu (South Tarawa)	 0.3 to 0.7% 0.6 to 1.3%	0.1-0.3	Low
Loss of land and infrastructure to inundation Buariki (North Tarawa) Bikenibeu (South Tarawa)	 18 to 80% 0 to 54 %	7-12	Low
Loss of coral reefs	10 to 40%	0.2-0.5	Very low
Impact on water resources:			
Change in groundwater thickness (Bonriki lens)	19 to 38%	1-3	Low
Impact on agriculture:			
Agriculture Output Loss	Depends on rainfall scenarios; sea-level rise would have negative impact	+	Low
Impact on public health:			
Increased incidence of diarrheal disease	Expected to increase	++	Low
Increased epidemic potential of dengue fever	22 to 33%	+	Low
Increased incidence of ciguatera poisoning	4.6 to 6.1 fold	+	Low
Impact on public safety and the poor	Substantial: impact on subsistence crops/fisheries, increased crowding	+	Very Low
Potential increase in fatalities due to inundation and water-borne or vector-borne diseases	Expected to increase	+	Low
Total Estimated Damages		***>8-16+***	

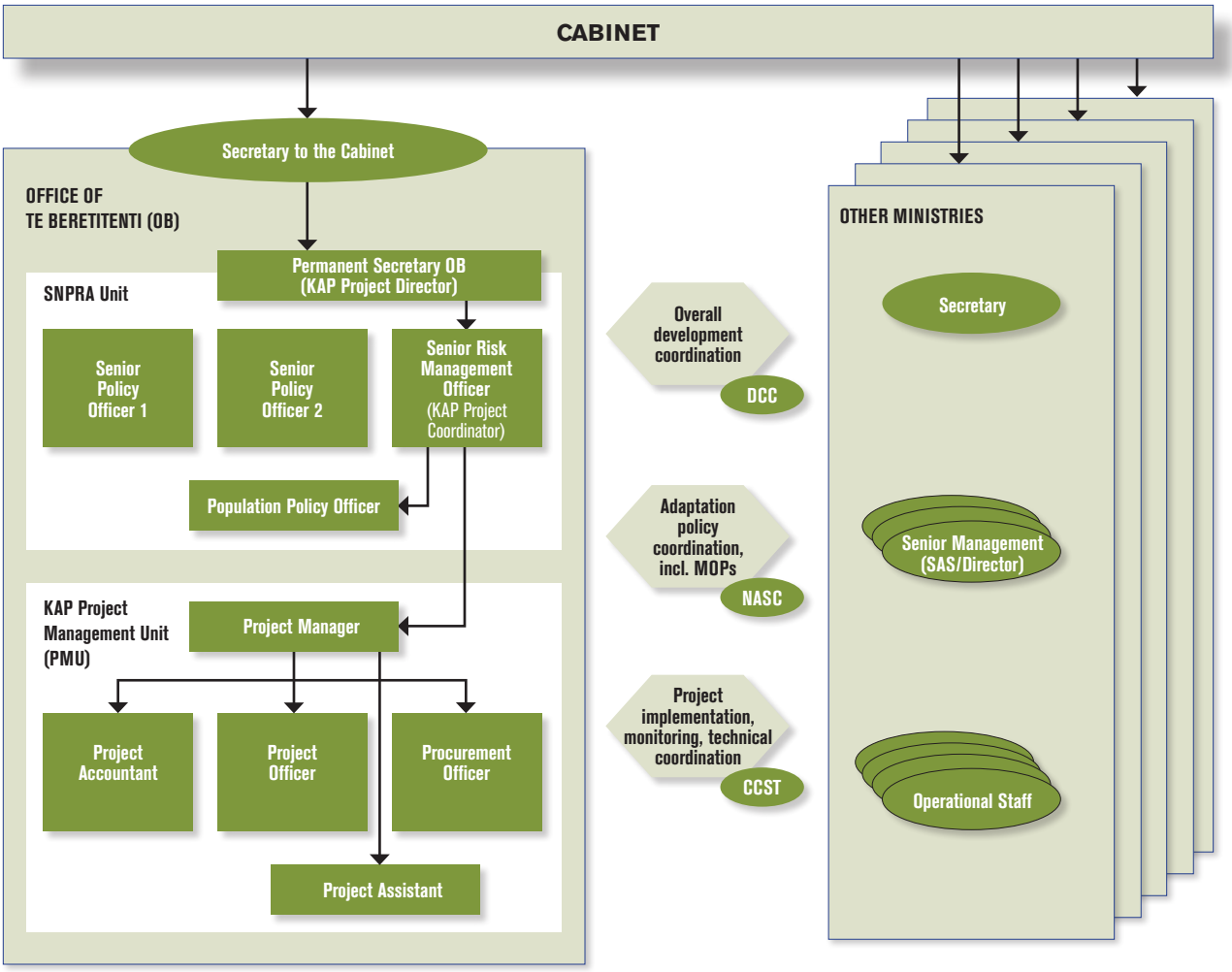
Furthermore, the study suggested that 18 to 80 percent of the land in Buariki, North Tarawa, and up to 54 percent of land in Bikenibeu, South Tarawa, could become inundated by 2050, although the effects of erosion are expected to be relatively small. The combined effect of sea-level rise, changes in rainfall, and changes in evapotranspiration due to higher temperatures could result in a 19-38 percent decline in the thickness of the main groundwater lens in Tarawa. Agriculture productivity—particularly for taro and pandanus—could decline due to storm-induced saltwater intrusion into groundwater. Higher temperatures could also increase the epidemic potential for dengue fever by 22-33 percent, increase the incidence of ciguatera poisoning and degradation of coral reefs, and divert critical tuna resources away from Kiribati waters.

Annex C. Mainstreaming Adaptation In National Economic Planning



Source: KAP II PAD.

Annex D. Proposed Institutional Relationships



Source: KAP II PAD.

SNPRA: Strategic National Policy & Risk Assessment Unit

MOP: Ministry Operational Plans, specifically to ensure that there is mainstreaming of adaptation at the operational level. The MOP is a key planning tool for all Government ministries and public enterprises.

NASC: National Adaptation Steering Committee was established for promoting and monitoring coordination among project activities across the implementing agencies. The NASC is chaired by the Secretary of the Office of the President (OB), and includes higher-level officials from all key ministries.

CCST: Climate change study team comprises technical officers from all key departments affected by climate risks to provide expert analysis and technical advice on climate-related matters, as well as coordinate scientific activities

Annex E. Project Team and Country Visits

Country team

Alf Simpson	Consultant, Australia
with	
Marianne Grosclaude	World Bank

Persons consulted (April 1-8, 2008)

Kautuna Kaitara	KAP Coordinator, PM Office
Kaiarake Taburuea	KAP Manager, PM Office
Maurongo Kalatia	Water Unit Services, MPWU
Moanataake Beiabure	Director of Engineering, MPWU
Taboia Metutera	Public Utilities Board, MPWU
Kianteata Teabo	Deputy Secretary, MPWU
Tierata Metio	Civil Engineering, MPWU
Taareti	Meteorological Services
Tarsu Murdoch	Deputy Secretary, MICTT
Miire Raieta	Deputy Secretary, MFMRD
Reenate Willie	Mineral Development Officer, MFMRD
Manikaoti Timeon	Deputy Secretary, MISA
Amina Uriam	Director of Local Government, MISA
Teboranga Tioti	Deputy Secretary, MELAD
Tererei Abete Reema	Director of Environment & Conservation Unit, MEALD
Teiti Teariki-Ruatu	Deputy Director Environment, Min EALD
Riibeta Iabeta	Environment Inspector, MEALD
Marii Irata	Environment Inspector, MEALD
Kinaai Kairo	Director of Agriculture Division, MEALD
Taneti Ioane	Deputy Director, Agriculture Division, MEALD
Harry Redfern	Chief Lands Officer, MEALD
Roberta Thorburn	AusAID
Richard Croad	Consultant, World Bank KAP Review Team
Naomi Biribo	SOPAC

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