

## TA No. 4456 : Kiritimati Island

### Preparing the Outer Islands Growth Center Project – Phase 2

#### The Proposed Water and Sanitation Project for Kiritimati Island, Kiribati

- INCEPTION REPORT
- October, 2007





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## Acronyms and Abbreviations

<b>AusAID</b>	Australian Agency for International Development
<b>ADB</b>	Asian Development Bank
<b>ENSO</b>	El Nino Southern Oscillation
<b>GIS</b>	Geographical Information System
<b>GLUP</b>	General Land Use Plan
<b>KI</b>	Kiritimati Island
<b>KLLPB</b>	Kiritimati Local Land Planning Board
<b>KUC</b>	Kiritimati Urban Council
<b>KIDP</b>	Kiritimati Island Development Plan
<b>KWASP</b>	Kiritimati Water and Sanitation Project
<b>LPID</b>	Line and Phoenix Island Development
<b>MFED</b>	Ministry of Finance and Economic Development
<b>MLPID</b>	Ministry of Line and Phoenix Island Development
<b>NDS</b>	National Development Strategy
<b>PSC</b>	Project Steering Committee
<b>RRP</b>	Report and Recommendations to the President ADB
<b>TSKL</b>	Telecom Services Kiribati Limited
<b>SKM</b>	Sinclair Knight Merz
<b>TA</b>	Technical Assistance
<b>TOR</b>	Terms of Reference

# 1. Introduction

## 1.1 Background

1. This Inception Report is submitted in accordance with the contract signed between the Asian Development Bank (ADB) and Sinclair Knight Merz (SKM) Pty. Ltd. (the Consultant) in September, 2007, for the **Preparing the Outer Islands Growth Center Project, Kiribati (Kiritimati Island)**. The aims of the project are:

- the design and feasibility of a proposed ADB investment project in water and sanitation, and
- development of an overarching draft Kiritimati Island Development Plan (KIDP).

2. The project team was mobilised in Kiritimai Island (KI) on the 10<sup>th</sup> October, 2007. At the time of the completion of this Inception Report, the project team was commencing week 3 of the 8 weeks mobilisation in KI.

3. This Inception report focuses on key activities undertaken in the Inception Phase (Phase 2 of the project) in weeks 1 and 2 including identification of initial findings, key project issues and directions emerging at this time. It also includes key outcomes as agreed by Government, the project team and other stakeholders at a roundtable meeting held on Wednesday 24<sup>th</sup> October, 2007, which discussed priority issues and project design directions.

4. Given the above, the structure of the Inception Report is as follows:

- Work Plan and Key Activities – Inception Phase
- Initial Findings - Project Directions
- Project Team and Local Arrangements

## **2. Work Plan and Key Activities – Inception Phase**

### **2.1 Work Plan**

The project comprises 4 phases, with 2 main phases in KI supported by 2 minor phases in South Tarawa, the latter prior to and at the completion of the KI inputs. The Work Plan is shown in Figure 1. The main project phases are:

- *Phase 1: Dialogue on the KI Project in South Tarawa*
- *Phase 2: Project Inception - Confirmation of Project Issues, Directions and Design Implications for KI*
- *Phase 3: Project Feasibility, Detailed Design and Assessment in KI*
- *Phase 4: Dialogue on the KI Project Results and Outcomes in South Tarawa*

In Phase 1, the Team Leader visited Tarawa from 4<sup>th</sup> October to the 9<sup>th</sup> October, 2007 and met key Government officials. Matters discussed included the aims and objectives of the project, project timeframe, why the project had been delayed 1.5 years, issues relating to water and sanitation in KI, initiation to relevant staff in Tarawa to join the planning team in KI and reporting mechanisms for the project between KI and Tarawa. Key officials met in Tarawa included the Director of Planning in the Ministry of Finance and Economic Development (MFED), Secretary of the Ministry of Environment Lands and Agricultural Development (MELAD), Director of Lands for Kiribati, Secretary of the Ministry of Communications, Chief Engineer in the Ministry of Public Works and Utilities, Secretary of the Ministry of Internal and Social Affairs and AusAID.

### **2.2 Phase 2: Inception**

Over the period 10<sup>th</sup> to 24<sup>th</sup> October, 2007, the project team has been undertaking tasks to achieve the following objectives:

- review of the existing technical, environmental, social and financial issues, that is, the existing situation and condition, associated with the development of KI generally and the water and sanitation system specifically;
- the implications of the above for developing the preferred design directions and parameters for an ADB investment project in water and sanitation in KI;
- clarification of the sustainable water resource yields and associated parameters such as per capita demand and recharge;
- identifying and meeting key stakeholders, including appropriate means of engagement via development of a community action planning and consultation process;

Task No	Task Description	Month 1				Month 2				Month 3			
		1	2	3	4	5	6	7	8	9	10	11	12
	<b>Key TA Milestones</b>												
	Establishment of TA Office - Mobilization in KI		■										
	Inception Report & Final Reports (RRP, technical, KIDP)			■	■				■	■	■	■	
	Tripartite Meetings x 2			■					■				
<b>Ph 1</b>	<b>Dialogue on the KI Project in South Tarawa</b>												
1	Dialogue with the Institutional Adviser on TA outcomes	■											
2	Dialogue with Government on TA outputs, timeframe, etc	■											
<b>Ph 2</b>	<b>KI Project Inception - Project Issues - Design Implications</b>												
3	Agree issues, project directions, design implications		■	■									
4	Confirm water resource issues - planning implications		■										
5	Agree community action planning process, stakeholders		■	■									
6	Identify baseline data needs, community surveys, etc		■	■									
<b>Ph 3</b>	<b>KI Project Feasibility, Design and Assessment</b>												
7	Project engineering designs, components, implications etc				■	■	■	■	■	■	■	■	
8	Economic and financial analysis of projects				■	■	■	■	■	■	■	■	
9	Social assessment, community engagement, planning				■	■	■	■	■	■	■	■	
10	Environmental assessment, project EIA, EMP, etc				■	■	■	■	■	■	■	■	
11	Institutional arrangements for MLPID - KI development				■	■	■	■	■	■	■	■	
12	Project Implementation Schedule - Logical							■	■	■			

	Framework													
13	Review draft KI Development Plan (KIDP) - draft RRP													
14	Prepare full draft of RRP and annexes													
<b>Ph 4</b>	<b>Dialogue on KI Project Outcomes in South Tarawa</b>													
15	Dialogue & briefings with Government on outcomes, etc													
	Submit work to SKM and ADB													

**Figure 1: Work Plan**

- agree key baseline data that needs to be collected and that action that needs to be put in place to collect the data. Amongst other data needs, this includes the need to undertake a Household Survey (on water supply, sanitation and household income and expenditure) and an Existing Household Water and Sanitation Survey (on the physical condition of household water and sanitation systems).
- completion of individual Work Plans by team members so that they contribute to the overall project Work Plan and outputs (Figure 1). This includes completion of a draft ADB Report and Recommendations to the President (RRP) by end week 8.

### **2.3 Inception Phase – Key Activities**

To achieve the above, the following activities were undertaken during the inception phase by the project team:

#### **2.3.1 Stakeholder Engagement**

- meeting key stakeholders at Government, community and business level including the Kiritimati Urban Council (KUC);
- appropriate means of community engagement including a community consultation program (see Annex 1);
- discussion on the project timeframe, activities and outputs with the project implementing agency (the Ministry of Line and Phoenix Island Development - MLPID) and KUC.

#### **2.3.2 Information Collection and Analysis**

- identification of spatial needs including upgrading of MapInfo base maps to show existing households on KI;
- infrastructure planning needs for water and sanitation including water consumption, number of houses, water meters, design of evaporation basins, pipe size, etc;
- preparation of community and household surveys on household needs (see water, sanitation and income and expenditure survey - see Annex 2) and existing status of the household water and sanitation supply system (see Annex 3);
- budget and finance information for water and sanitation.

#### **2.3.3 Environmental Management**

- assess institutional capacity within the Wildlife and Environmental Division of MELAD;
- assess existing policy and legislative framework including rationale;
- identify key natural resource and environmental management issues including impact on inshore fisheries;
- identify the ADB KI environmental project category, which is suggested at this stage as Category B.<sup>1</sup>

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<sup>1</sup> Category B: These are projects judged to have some adverse environmental impacts, but of lesser degree and/or significance than those classed as category A projects. An initial environmental  
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**2.3.4 Water Supply**

- review and assess available reports and plans including those of the previous AusAID Kiritimati Water and Sanitation Project (KWASP), 1998-2003;
- assess main water supply infrastructure including galleries, pumps, tanks, tank stands, house connections;
- assess status of household and community rainwater harvesting such as catchments, gutters and tanks;
- identify institutional arrangements for water and sanitation in KI (that is, the Water and Sanitation Unit in MLPID).

**2.3.5 Water Resources**

- review and assess available reports from KWASP on the sustainable yields of the water lens;
- monitor salinity and water level in selected boreholes and galleries;
- obtain accurate rainfall data to reassess long term recharge of water lens;
- estimate sustainable yields for major and minor lens;
- assess and recommend per capita consumption rates;

**2.3.6 Sanitation**

- assess existing sanitation systems including toilets (flush or pour) with septic tanks, pit latrines and compost toilets (the latter provided under the KWASP);
- assess greywater disposal systems such as soak pits.

**2.3.7 Economic and Financial Situation for Water and Sanitation**

- review and assess available reports, records and budgets from the Administration Unit and Water and Sanitation Unit in MLPID;
- review number of connections, water tariff rates and status of water bills and payments including arrears;
- construct income and expenditure profile for KI households.

**2.3.8 Community Participation**

- identify range of community groups that need to be consulted for a proposed ADB investment project in water and sanitation;
- ascertain community response to the existing water and sanitation systems in KI via household surveys (see Annex 2 and Annex 3 for surveys).
- ascertain community needs which would assist in designing an improved water and sanitation system for KI;
- develop an appropriate community consultation program to achieve the above with key stakeholders including KUC and MLPID.

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examination (IEE) is required to determine whether or not significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. Additionally, a detailed environment management plan (EMP) including a budget needs to be provided if the proposed project is deemed to be environmentally sensitive.

**2.3.9 Island Institutional Setting**

- confirm MLPID institutional setting including operational versus ‘planning’ functions, budget and division structure, and
- identify key island institutional coordination and integration issues including policy and legislative basis;

**2.3.10 Roundtable Meeting with Stakeholders<sup>2</sup>**

- clarify project aims, objectives and timeframe; define key island development issues such as population growth, environmental management, governance, island vision, growth management;
- assess existing condition of water and sanitation system and social, economic and environmental dimensions;
- define design directions and implications for the water and sanitation projects.

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<sup>2</sup> Held at the end of the first 2 weeks in Kiritimati Island in the Boardroom of the MLPID, London, on Wednesday 24<sup>th</sup> October, 2007. Time: 10 am to 12.30 pm.  
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### 3. Initial Findings and Project Directions

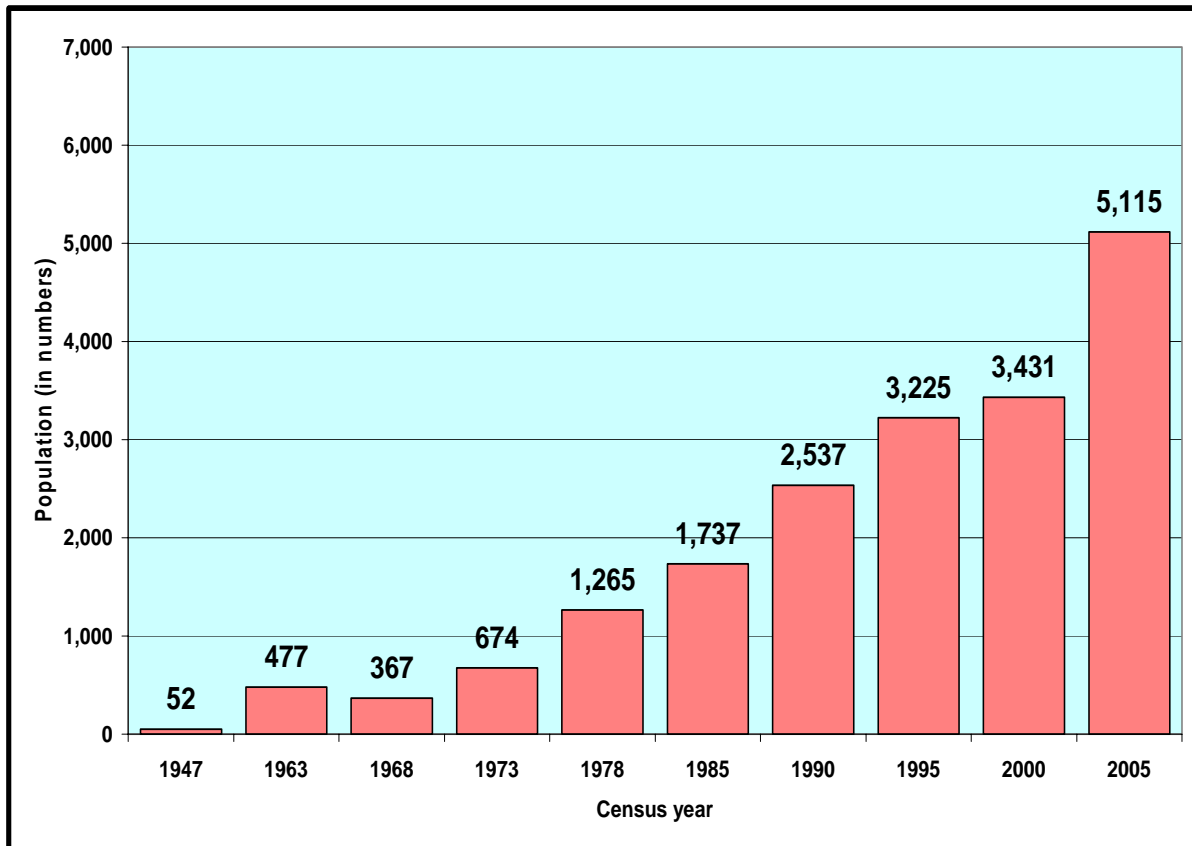
#### 3.1 Context

The work of the project team during the Inception Phase has identified a number of key themes relevant to the development of the proposed water and sanitation project and island development generally. Resolution of issues associated with these themes is critical to the success or otherwise of the proposed ADB investment project.

#### 3.2 Population Growth

The Government’s National Development Strategy (NDS), 2004-2007, provides the strategic framework for guiding development in Kiribati. The NDS includes a strong emphasis on equitable distribution of development throughout the islands and increasingly the promotion of development in the Line and Phoenix Islands. The impacts of this policy are now being seen in the latest Census (2005) where the capital South Tarawa (population 40,311 persons in 2005) experienced a reduced population growth rate of 1.9% for 2001-2005 compared to a high population growth rate of 3.5% per annum for the period 1995 through 2000. KI, on the other hand, has experienced a very high growth rate of 7.9% per annum since 2000, albeit off a low population base, but reflecting a shift in population in line with the NDS.

**Table 1: Kiritimati Island population trend: 1947- 2005**



The above population growth rates raise many development questions for the future of KI. Will the population of KI continue to develop on the higher 2000-2005 7.9% growth rate noting the Government is now starting a formal land release program for development in KI?. Or will population reduce to lower growth rates as reflected in the period 1990 to 2000? What values are important in the management of future growth of KI as tourism and growth center? The Table below indicates a number of population scenarios. At the 1995 -2000 growth rate, the population of KI will have doubled by around 2020. At the higher 2000-2005 7.9% growth rate, the population will have tripled to nearly 17,000 persons by 2020 and will have doubled by 2010. Is this population sustainable? How is this best managed? Given these trends, what is the planning horizon for the proposed ADB investment project in water and sanitation?

Population Projections	1995	2000	2005	2010	2015	2020
<b>Kiribati</b>	77,658	84,494	<b>92,533</b>			
(a) 1995-2005 growth rate: 1.75%				100,994	110,230	120,309
(b) 2000-2005 growth rate: 1.82%				101,349	111,004	121,579
<b>South Tarawa</b>	28,350	36,717	<b>40,311</b>			
(a) 1995-2005 growth rate: 3.52%				48,068	57,319	68,349
(b) 2000-2005 growth rate: 1.87%				44,262	48,600	53,363
<b>Kiritimati Island</b>	3,225	3,431	<b>5,115</b>			
(a) 1995-2005 growth rate: 4.61%				6,441	8,111	10,213
(b) 2000-2005 growth rate: 7.99%				7,627	11,372	16,957

Source: Secretariat of the Pacific Community (SPC), 2007

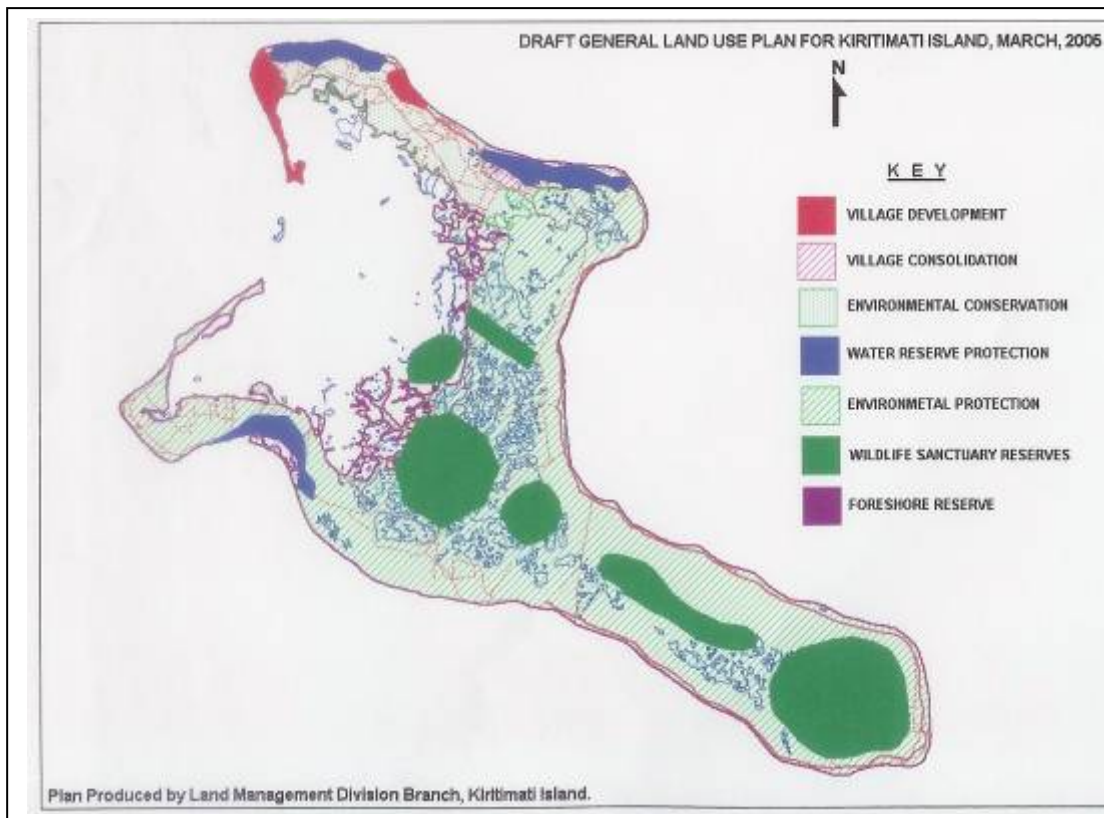
In the above setting, the future development of KI presents the GoK with the major challenge of planning for and managing a significant natural resource use in which the community can develop socially, economically and environmentally. Unchecked population growth without appropriate management structures, vision and leadership will give rise to growing unchecked social, environmental and economic problems. This includes demand for infrastructure and services, an orderly land supply, inclusive social structures and sound environmental and natural resource management.

**Government needs to consider the social, environmental and economic implications of the population trends if KI is to be a ‘planned’ growth center. Existing planning mechanisms to manage change seem to be having little impact on KI. A planning timeframe for the proposed water and sanitation project needs to be agreed such as a 10 year period from 2010. Such population needs to be commensurate to social, economic and environmental values appropriate to managing KI.**

**3.3 Managing Village and Island Growth - Where in KI?**

The draft General Land Use Plan (GLUP) prepared by the Land Management Division, MELAD, and the Kiritimati Island Local Land Planning Board (KLLPB) in 2005 sets the strategic framework for the future land use and environmental development of KI. The strategy embodied in the GLUP includes identification of what village lands should be expanded, contained or development restricted, the need for protection of key water lenses, and identification of areas considered to be of major environmental and conservation significance to the health of KI.

**Figure 1: Draft General Land Use Plan for Kiritimati Island, 2005**



The key features of the draft GLUP as agreed were:

- that development be consolidated in key village areas in the northern peninsula, that is, in the Cassidy Airport to London development corridor;
- that Tabwakea North and New Banana be the future main KI growth villages;
- that Banana village be contained, with no new development and no new plots released. Relocation would only be on a voluntary basis to Tabwakea North or New Banana villages.
- that Poland village be contained as far as possible, and
- the bulk of the island to the southwest of Banana and main lagoon be designated for environmental conservation and protection.

The draft GLUP has major implications for the proposed water and sanitation project as it sets the future development pattern for KI including what infrastructure needs to be provided by development front. By implication, it implies that Tabwakea North and New Banana will be the main new development villages (both developing as major extensions to existing village areas) and that Poland and Banana will be ‘minor’ villages with little or no growth respectively. Any changes to the 2005 draft GLUP need to be clarified and water and sanitation implications assessed.

**Government needs to confirm or otherwise that the strategy for the development of KI as contained in the draft GLUP is appropriate as it has major implications for the design of future water supply, infrastructure and services generally and importantly, management of the natural and environmental resources of KI. Government therefore needs to confirm its phasing strategy for Tabwakea North and New Banana under its new land release program, namely, that Tabwakea North will initially proceed over New Banana, or balanced land release in each front or more plots in New Banana, or mixture of the above.**

### 3.4 Environmental Management

Initial observations suggest that increasing in migration from Tarawa, population growth and development pressure is resulting in increasing pressure on the utilisation of the natural resource base for subsistence lifestyles and supplementing cash incomes. The bio physical environment is already suffering in and around the main villages including the London - Tabwakea and Banana - Main Camp corridor. It appears there is an absence of any explicit environmental stewardship and inadequate management tools to measure the existing state of the environment. This includes the impacts of population on groundwater quality, including near shore and lagoon water quality, and the necessary indicators to measure such change. It is also evident that the existing situation is possibly aggravated by an absence of village leadership and long term mechanisms to best manage and sustain natural resources within the community. Importantly, it is the conservation and protection of this natural resource base and the associated environment, which underpin the future economic potential of the tourism and fishing sectors, and the benefits they will bring to the KI community.

In this context, it is of concern that recent decisions have been made to release land in addition to the 300 approved plots to be released under the Government land program in 2007 in the Tabwakea North and New Banana growth areas. Some additional 150 plots are to be released for bush ‘subsistence’ living outside the approved village areas. These plots would be either near major water lens such as Decca or Four Wells or adjoining environmentally significant areas to the south east such as near Poland village. If such land release proceeds outside the approved planned village areas,

such ad hoc planning decisions will have major adverse environmental implications for development of KI as growth center.

Strong and effective institutional arrangements for island environmental management and coordination including clear roles and responsibility of the KUC and central government are paramount to improve and sustainable economic, social and environmental outcomes. This includes understanding existing attitudes to what appears to be an ‘unchecked’ use of the natural resource, agreeing the environmental values needed to sustain the future of KI and how community attitudes can be best addressed to cultivate managing environmental change.

**There is a need for a collective ‘whole of island’ vision concerning sustainable natural resource and protection of the unique environmental assets of KI. This includes defining what is required to sustainably manage future eco tourism development and how this can be best achieved at the community and KI level.**

### 3.5 Water and Sanitation

#### 3.5.1 Policy and Principles

The National Development Strategy, 2004-2007, includes policies and goals of direct relevance to the water sector in KI;

- raise the quality of life by improving the supply and quality of water;
- ensure sustainable use of water resources;
- promote community participation for better use of water resources;
- provide sound infrastructure and services at reasonable costs;
- rehabilitate and expand existing water supply systems;
- improve collection, storage, treatment and distribution of water;
- rehabilitate sewerage and sanitation systems and improve their operation and management;
- improve maintenance standards for government assets, and
- ensure that all future construction projects comply with the Environment Act.

In 2004, the GOK Cabinet agreed that outer island water supply systems should be more sustainable. The implication was that they should be sustainable from a financial, environmental and technical perspective. The Governments draft National Water Resources Policy (September, 2007) provides the framework for the conservation, sustainable use and management of Kiribati’s water resources and for the provision of safe, adequate and sustainable water and appropriate sanitation services to island communities. The policy goal of the draft policy is: *“To ensure that communities have affordable access to sustainable water supply systems*

*providing water of suitable quality and appropriate quantities and to appropriate sanitation to meet all reasonable health, environmental, and development needs”.*

There is clear policy intent that safe freshwater is to be made available in a sustainable manner so as to satisfy basic human needs, ensure improvements in health, meet the needs of the environment as well as those required for development.

The policy objectives outlined in the Draft National Water Resources Policy, September 2007, are to:

- improve understanding of water resources and their use;
- increase access to safe and reliable water supplies and appropriate sanitation;
- achieve sustainable water resource management, and
- increase community awareness of and participation in water management and conservation.

The above setting provides a framework for the development of the water and sanitation project in KI and future island development generally.

### **3.5.2 Water Resources**

The current water resources on KI come from 4 main sources:

- fresh groundwater in the form of freshwater lenses;
- rainwater;
- imported bottled water, and
- brackish groundwater, which can be used for non-potable purposes.

The main current problems can be summarised as:

- insufficient monitoring of groundwater resources which has led to incomplete knowledge of the long-term behaviour of the freshwater lenses.
- insufficient rainfall monitoring (one main site) and inadequate local storage and analysis of rainfall data. As rainfall is the only current source of freshwater to the island (both for recharge to groundwater resources and for direct capture of rainfall into tanks), and noting severe El Nino Southern Oscillation (ENSO) related droughts are common, this is a major issue.
- inadequate legislative basis for the management and protection of the fresh groundwater lenses
- lack of community participation in the planning, management and protection of water resources

Some key guiding principles for water resources management on KI are suggested as:

- identification and assessment of all groundwater resources and their sustainable yield (which has been done in previous studies in 1982 and 2000 but would require systematic updating if the project is to proceed);
- on-going monitoring and review of groundwater resources to ensure sustainability;
- protection of all groundwater resources from pollution and over-extraction;
- involvement of the community in planning and protection of water resources.

### 3.5.3 Water Supply

The main problems of the existing system can be summarised as:

- insufficient water from the piped systems to feed the current major population centres due to either insufficient pumping capacity (for example, for the London - Tabwakea population), major leakage from piped systems (such as Banana) and household - other use connection direct to the main trunk line.
- at present, bacteriological water quality within the pump wells and the water produced via the reticulated systems including the effectiveness of the chlorination system, are unknown. Irregular testing has been carried out and results are in the process of being reviewed.
- issues associated with the design, construction and maintenance of the pumping (gallery) systems. These include:
  - gallery pipe slots are too large and enable sand to enter the gallery pipes. This causes excessive wear of pumps. The width of a typical gallery pipe slot was measured as 6mm compared with the normal practice of no more than 1.5mm entry slot.
  - gallery pipes have not been laid low enough along the full length (400 m) of the galleries. The present galleries were designed and constructed to have a systematic variation of base level along their lengths (from 0.3m to 0.1m below mean sea level) rather than being horizontal (which is again normal practice).
  - suction pipes of some pumps are located at the base of the pump wells which means that sand and debris can easily be sucked into the pump system (and damage the pumps).
  - missing wind and solar pumps from gallery pump wells indicating vandalism (Banana galleries), inadequate spare parts or maintenance problems.
  - the absence in some gallery systems of backup pumps in the event of conditions adverse to the operation of wind or solar pumps.
  - diesel/petrol pumps at galleries may be pumping at too high a rate at some galleries, which may cause long-term high salinity problems.
- inadequate metering to assess water pumping from individual galleries (no meters at all to measure production) and to assess leakage from piped systems.

- insufficient collection of important water monitoring data including salinity data (at monitoring boreholes and pumping systems) and metered flows (at available bulk supply meters).<sup>3</sup>
- lack of water supply regulations related to groundwater piped systems and rainwater collection.
- lack of spare parts to repair pumps and other components of the main water supply systems. The budget for the Water and Sanitation Division for spare parts is very limited.
- lack of training of some current Water and Sanitation Division personnel in the operation and maintenance of the systems.
- inadequate collection of rainwater at houses and other buildings (including new buildings despite the many adequate roof catchments), and
- pollution of domestic wells from a variety of sources including sanitation systems and pigs.

Given the above, some key guiding principles for the management and development of a future water supply system in KI are recommended as:

- culturally appropriate, acceptable and affordable solutions;
- evaluation of current system condition and management and lessons learned;
- estimation of water usage and pipe system losses (including leakage from pipelines and illegal use);
- use of other water sources to supplement piped supplies from the groundwater including:
  - rainwater catchments for households and other buildings to provide good quality water to supplement water from the reticulated system.
  - household wells for non-potable purposes including washing clothes and flushing toilets.
- estimation of future demand for water based on reasonable water usage per population centre (including household consumption using population projections and per capita demands, institutional and commercial usage and pipe system losses);
- design of new water supply systems based on sustainable yield of each freshwater lens;
- minimisation of pipe transfer of groundwater to minimise infrastructure, operating and maintenance (including pumping) costs and system losses.
- minimise risks of failure;
- maximise use of renewable energy;
- use of appropriate designs for groundwater extraction, and.
- use of non-corroding materials.

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<sup>3</sup> Note – the water quality testing regime is currently being investigated with the Ministry of Health.  
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The current ADB investment project needs to consider the following:

- rehabilitation of existing water supply systems such as header tanks and trunk line;
- expansion of water supply systems to cater for the design demand;
- design and installation of appropriate rainwater collection and storage systems as a supplementary source, when available, for potable purposes;
- use of household wells as source of non-potable water only (for example, for toilet flushing and washing clothes) and abandonment of their use as a source of potable water and for personal washing (for example, showers). In the future, potable water would only be obtained from protected groundwater sources or from rainwater tanks;
- legislative basis for the MLPID to operate in water and sanitation;
- protection of groundwater sources;
- institutional arrangements for the Water and Sanitation Division including training of personal, and
- public participation, education and awareness programs for communities.

#### **3.5.4 Sanitation**

Sanitation is a crucial element in any future water supply and sanitation project. It is even more important in an atoll environment where traditional sanitation measures (such as beach and bush defecation) still feature strongly in the I-Kiribati way of life. Sanitation can be a significant consumer of water, a polluter of groundwater and the environment, and a potential major risk to personal health. Poorer households in KI rely almost exclusively on well water as their main source of water yet it is local groundwater that will be contaminated by sanitation and other activities (such as household pig pens). In KI, the benchmark for sanitation systems has already been set by the standards applied in government housing and the Captain Cook Hotel where government employees and tourists have access to flush pedestal toilets connected to septic tank systems.<sup>4</sup>

Current methods of sanitation as used on KI can be summarised as;

- flush (cistern or bucket) toilets draining to septic tanks with soak pits or evaporation basins.<sup>5</sup>
- pit toilets.
- compost toilets (very few are now being used from the 150 installed during the KWASP).
- use of beach or bush areas (including crab holes).

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<sup>4</sup> Note - these aspirations and needs are being assessed in the Household Survey now underway.

<sup>5</sup> There is one local entrepreneur who has developed a modified septic system based on 1 or 2 extra chambers to filter the effluent wastewater. So far, 3 have been constructed. This system can be added to existing septic systems.

The main problems with current sanitation methods can be summarised as;

- the most affordable method of sanitation, pit toilets, inject pollutants directly into the groundwater or the highly permeable soils immediately above the groundwater.
- septic tanks leak and discharge pollutants to the groundwater.
- many people prefer to use the beach or the bush – some 27% in the 2005 Census for KI indicated the bush or beach as their toilet (possibly used with flush, pit or other systems). While appropriate for low density populations, this practice presents significant health risks in higher density settlements in KI designated as a ‘growth center’.
- in most areas, greywater is generally directly discharged onto or into the soil.
- the compost toilet as provided under the previous KWASP is not acceptable to the vast majority of KI residents. This message has been made unequivocally clear to the project team based on feedback from many sources at all levels, during the inception phase. This sanitation technology has considerable advantages, including water saving, minimising impact on groundwater quality and the production of compost. However, the strong adverse reaction to this type of sanitation in KI including social, cultural, economic, technical and maintenance issues, means it is not acceptable, at this point in time, as a viable sanitation solution.

Given the above and noting the results of the Household Survey have yet to be analysed, some possible guiding principles for the development of sanitation and greywater systems on KI are suggested as:

- culturally appropriate, acceptable and affordable systems;
- protection of major groundwater sources (freshwater lenses) from faecal contamination and excessive nutrient loads, as far as possible;
- separation of household greywater from toilet water;
- use of simple, appropriate technology which is easy to maintain at all levels, including households, government and private sector.
- sanitation systems which do not have full dependence on using potable water for flushing.
- is within the financial capacity of the community (including government) to pay for recurrent costs.

A future project needs to consider the following elements;

- community leadership and ownership issues;
- minimisation of health risks;
- type of toilet;
- amount of water used in any flushing mechanism;
- where the water for flushing is sourced from, and

- method of disposal and treatment.

At this initial stage, possible options for toilet types, excluding use of bush or beach, are:

- pit toilet (which are the most affordable method but with adverse environmental impacts).
- pedestal toilet with cistern or bucket flush, and
- squat toilet with cistern or bucket flush.

As noted, government houses which represent approximately some 25% of housing stock and establish a benchmark for community expectations, are already fitted with flush toilets. In order to minimise water leakage and, maintenance requirements in houses, as general principle, bucket flush toilets are considered preferable to cistern flush toilets.

Possible options for improved disposal and treatment which are being evaluated at this stage of the project are:

- water sealed pit toilets which are affordable for most households. However, these cause major groundwater contamination, forcing the abandonment of local groundwater use, and the eventually the export of contaminated groundwater to the sea and lagoon.
- improved septic tanks using non-leaking components - for example, polythene septic tanks outflow filters and evaporation basins and on-site disposal of final effluent. This option attempts to improve the existing system at reasonable cost but recognises that some pollutants will inevitably enter groundwater near the disposal points. If accepted, this method would need to be accompanied by abandonment of the local groundwater (where it is used) as a source of potable water and water for personal ablutions. However, its use could be continued for non-potable uses such as toilet flushing and washing clothes may be possible. This would be a step by step incremental approach on the existing systems. Disposal of sludge would be via a pump out truck to an agreed sludge drying pits (concrete lined).
- septic tanks with piped systems to collect effluent from multiple septic tanks and discharge to communal treatment systems. This method could have a range of treatment options from reed beds to package treatment plants (located near ocean or lagoon margins). All of these would incur additional capital and recurrent costs as well as requiring additional operational and maintenance regimes. This approach would still not guarantee the safety of the local groundwater as such systems can leak and overflow. In addition, the local groundwater would be “exported” to the ocean or lagoon. However, maintaining public assets is not a positive feature of the I-Kiribati way of life.
- full piped sewerage systems using pump stations, similar to those at the main urban centres in Tarawa, except using local groundwater rather than seawater for flushing. Such systems are expensive to operate and maintain, require a

very reliable source of power to operate pumps and a well trained workforce to operate and maintain the systems. An additional disadvantage is the “exporting” of primary treated effluent to the ocean or lagoon and loss of fresh groundwater from the lens.

- evaporation basins for greywater discharge.

The future sanitation project now being developed needs to consider the following:

- social and cultural norms, values and preferences;
- step by step approach to current sanitation preferences;
- affordability;
- operational costs and support systems;
- impact on groundwater;
- ease of maintenance for private and government housing including collection and disposal of sludge;
- infrastructure improvements to be undertaken;
- the institutional setting such as the Water and Sanitation Division, MLPID;
- public participation, education and awareness programs for communities, including the use of different sources of water for different purposes. In particular, the abandonment of household wells as a source of potable water and even for personal washing (use more strongly in some village than others).

**Protection of major groundwater sources for reticulation systems is crucial to the health and wellbeing of the existing and future populations living in the urban villages in KI. Identifying rates of groundwater extraction that can be sustained over prolonged dry periods for the projected demands will need further systematic investigation as the project proceeds. The emerging water supply system will be based on a system of rehabilitation and improvements to the current system, including inclusion of rainwater tanks to supplement reticulated water and wells.**

**The preferred sanitation system for KI is likely to be a trade off between protecting the groundwater as far as possible and a `system which is comparatively easy to maintain, affordable and socio culturally acceptable. Poorer families currently rely on groundwater from wells as a main source of affordable potable water. The introduction of safer, affordable means of sanitation may force the abandonment of local groundwater for potable water use. There are important lessons learned for water resource management, water supply and sanitation from the AusAID KWASP.**

### **3.6 Water and Sanitation – Financial Setting**

Initial assessment of the financial operation of the Water and Sanitation Division of the MLPID shows that the monthly cash collection from the water supply operation in 2007 (to end September) is about \$2,600. This is about 20% of the monthly billings expected by this date. The policy for disconnections is 2 months after receipt of bill

by the customer, but implementation is not strict and disconnection varies upwards to 3 and 4 months plus.

Projected total operating costs in 2007 are approximately \$267,000 for the operation of the Water and Sanitation Division.<sup>6</sup> Salary accounts for 56% of expenditure while the balance is for maintenance work. Total customers as of September, 2007, are about 591 of which 511 are metered and 80 un-metered (primarily in Banana village).<sup>7</sup> The above includes 75 customers that were disconnected from the system due to non-payment of bills. With 21 staff for water supply operation alone, customer to staff ratio<sup>8</sup> is low at 25. Operating funds come from the national budget while water bills are paid directly to the MLPID and remitted to the Ministry of Finance and Economic Development (MFED) in Tarawa. The tariff, effective as of August, 2007, is \$1.2 per m<sup>3</sup> for the first 18 m<sup>3</sup> and \$5 per m<sup>3</sup> above 18 m<sup>3</sup>, for household and Government. For commercial use, the tariff is \$1.8 per m<sup>3</sup> for the first 15 m<sup>3</sup>, and \$5 per m<sup>3</sup> for above 15 m<sup>3</sup>. For households, the current rate represents a second reduction in tariff rate<sup>9</sup> due to complaints from customers that water tariffs in KI were higher than those applied in South Tarawa.

For sanitation, the charge is \$10 per emptying of a septic tank. A sludge pump out truck has been just been donated by Colorado Rotary in September, 2007, and has been used once. The current pump out system only applies to Government houses, the rest is done privately by households. Many septic systems have no removable lid for pump out.

**Payment for water supply is low and the project needs to understand why the this occurs including supply is limited, the water tariff is too high, maintenance is poor, inability to pay or combination of these and other factors. There is little enforcement of payment and many water bills are outstanding. These trends imply that future investment in water and sanitation will be heavily funded from national government including recurrent costs, while contribution from the community will be minimal. Cost recovery will be low.**

### 3.7 Understanding and Responding to Community Needs

Communities on KI are currently experiencing hardship. In some villages, communities are not receiving enough potable water. Many communities have

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<sup>6</sup> The water section has 21 staff while the sanitation section has 5 staff.

<sup>7</sup> These were not metered under the previous KWASP on the basis the village was to be relocated in the 2000-2003 period.

<sup>8</sup> A ratio of 100 and above is desirable.

<sup>9</sup> The tariff until November, 2002, was \$1.50 per m<sup>3</sup> (first 10m<sup>3</sup>) and from December, 2003, to July, 2007, was \$1.50 per m<sup>3</sup> (first 15 m<sup>3</sup>). In Tarawa it is \$10 per month per household.

sanitation facilities that are inadequate and in some instances, households have no sanitation facilities at all. Initial consultation with Government Ministries, KUC, Churches and the wider community have shown the following key themes:

- the needs and aspirations of each urban community are not uniform – for example, residents in London village (predominantly Government houses with piped water used for most purposes – wells are contaminated with oil, etc) are different from those in Tabwakea village (a mix of freehold land and private leasehold houses with a mix of well water and some piped water for most purposes).
- the compost toilet, trialed extensively during the KWASP project, is not acceptable to the people of KI and should not be considered for this project.
- the price of water in KI is perceived as being high in comparison to charges applied in Tarawa.
- there are growing social issues, particularly amongst the youth population, with a prevalence of drunkenness and disorderly behaviour. Apart from the Social Welfare Office (KUC), there are no formal support networks for assisting youth, the disabled or ‘poorer’ sections of the community.

A Household Survey of approximately 10% of KI households (70) has begun and will run for a period of 1 week. The Household Survey (see Annex 2) has been devised to assess the current water and sanitation systems, affordability and willingness to pay and will also gauge community aspirations for future infrastructure and services. One of the largest employees of people outside of Government is that of the fishing community. A survey of the fishing community is being conducted to understand the dimensions of the existing fishing and its sustainability. At the same time, a rapid assessment of bird colonies on KI is also to be completed. Concurrently, a Household Infrastructure Survey (see Annex 3) has been devised to record all current water and sanitation infrastructure and its condition, in all households in KI. This information will provide the project team with an indication of augmentation and/or replacement needs of the current population. The combined output of the surveys will feed into the design process for the investment projects.

A summary table of the Participation Strategy including a detailed list of project stakeholders, is shown in Annex 1.

**Households are currently experiencing hardship - many with not receiving enough potable water and other households with inadequate sanitation. Household surveys are currently underway in all the main villages to assess norms and values towards existing water and sanitation systems as well as income and expenditure. As part of the project design, consideration of social and cultural norms, values and preferences should drive the most appropriate water supply and sanitation designs.**

## 4. Project Team and Local Arrangements

### 4.1 Project Mobilization

The Project Team mobilized in KI on the 10<sup>th</sup> October, 2007. Ian White (Water Resources/Engineer) joined the team in KI on Wednesday 17 October, 2007.

The international consultants have been mobilized as per the schedule presented in the following Table.

Consultant	Team Position	Date of Mobilisation in KI
<b>International Consultants</b>		
Paul Jones	Team Leader / Development Planner	10 October, 2007
Tony McDonald	Environmental Adviser	10 October, 2007
Tony Falkland	Water Resources / Engineer	10 October, 2007
Jonathan Powell	Social Adviser	10 October, 2007
Marcus Napud	Economist	10 October, 2007
Ian white	Water Resources / Engineer	17 October, 2007

### 4.2 Local Counterpart and Stakeholders

The MLPID has allocated the project team a full time counterpart - Ms. Maketara Ioane who is the Resource Economist with the MLPID.

Meetings were held with key stakeholders during the first two weeks of the project to discuss the aims and objectives of the project, the project timeframe, expected outcomes and indicative activities. Stakeholders consulted during this period included:

- the Implementing Agency, MLPID, including the Minister for LPID as well as the Secretary for MLPID;
- the KUC (Friday 19th October, 2007);
- Fisheries, Ministry of Fisheries and Marine Resource Development;
- Land Management Division, MELAD;
- the Wildlife and Environment Division, MELAD;
- relevant Divisions within the MLPID including Water and Sanitation Unit and Administration (collection, billing, etc);
- Ministry of Health;
- Church leaders;
- businessmen and the private sector, and
- Poland local community (Thursday, 18th October, 2007).

The project was also reported in the general news on Radio Kiritimati FM, indicating to the public that the ADB planning team was now in KI undertaking a review of

water and sanitation systems, and that household surveys and stakeholder consultation would be carried out to identify needs and concerns, etc.

### **4.3 Project Office Arrangements**

The project team is based in the offices of the Land Management Division within MELAD. For a 2 month assignment, the offices are satisfactory. The project team has access to offices facilities including photocopier and phone. It also has access to the Map Info GIS, noting map bases are currently being updated for the TA. Major project meetings have been held within the offices of the MLPID. Internet facilities on KI are unreliable in all Government offices and when they do work, are slow. The result of the above is that members of the project team have to use the local internet café facilities in the offices of Telecom Services Kiribati Limited (TSKL). The project team has hired two cars (saloon and utility) as per the project budget.

## **Annex 1 Participation Strategy**

## ANNEX 1

### Participation Strategy Summary Chart

Stakeholder Group	Justification for Inclusion in Project Design	Type of Participation	Participation Methods		Time Line (By Project Week)	Cost Estimate
			Which Method	Responsibility		
<b>Central Government Ministries</b>						
Ministry of Line and Phoenix Island Development (MLPID) - Administration / Accounts - Water & Sanitation - Development Planning & Statistics - Civil & Technical	Implementing Agency and likely Loan Project Implementation Agency  Responsible for island development	Shared Decision Making	Meetings, Workshops, Counterpart TA Staffing	All Project Team Members	Ongoing, with Tripartite Meetings in Weeks 3, 6 and 8	Tripartite Meetings & Workshops – A\$1,000 (inc. refreshments and food)
Ministry of Environment, Lands and Agriculture Development (MELAD) - Lands Division - Wildlife Conservation	Key Ministry for Planning, Land Administration and Environment / Conservation	Shared Decision Making	Meetings, Workshops, Counterpart TA Staffing	Team Leader, Environmental Specialist	Ongoing	Nil
Ministry of Health and Medical Services (MHMS) - Preventative Unit - Health Inspectors	Key Ministry for Social Welfare  Responsible for water quality testing	Consultation	Meetings	Team Leader, Social Adviser, Infrastructure Engineer	Ongoing	Nil
Ministry of Finance and Economic Development (MFED) <sup>10</sup>	Executing Agency	Consultation	Meetings Progress	Project Economist	Ongoing	Nil

<sup>10</sup> Located in Tarawa 3,000kms to the west of Kiritimati.

Stakeholder Group	Justification for Inclusion in Project Design	Type of Participation	Participation Methods		Time Line (By Project Week)	Cost Estimate
			Which Method	Responsibility		
	Key Ministry for Financial and Economic Analysis		Reports			
<b>Other Government Stakeholders</b>						
Kiritimati Urban Council - Councilors (8) - Council Clerk - Social Welfare Officer	Community-elected representatives for each urban centre on the island	Consultation & Shared Decision Making	Meetings, Workshops	Project Team	Ongoing, with interaction at Council Meetings in Weeks 2 and 7 / Individual Meetings during HH Survey Period	Nil
Kiritimati Local Land Planning Board	Responsible for land use planning	Consultation	Meetings	Team Leader	Ongoing	Nil
<b>Community and Community Groups</b>						
Households - London / Tennessee - Tabwakea - Main Camp / Banana / New Banana - Poland	Direct project beneficiaries	Consultation	Surveys, Focus Groups	Social Adviser	Week 2 (Focus Group) / Weeks 3 to 5 (Surveys) / Weeks 6 and 7 (Validation Meetings)	Household Survey & Existing Infrastructure Survey - A\$4,000 / Validation Meetings
Churches - Roman Catholic Church - Kiribati Protestant Church(KPC) - Church of God - Church of Christ - Seven Day Adventist	Key community pillars and source of support for communities within I Kiribati society  Provide guidance on household and personal hygiene	Consultation	Focus Groups	Social Adviser	Weeks 3 and 4	Focus Group – A\$100

Stakeholder Group	Justification for Inclusion in Project Design	Type of Participation	Participation Methods		Time Line (By Project Week)	Cost Estimate
			Which Method	Responsibility		
- Church of Jesus Christ for Latter Day Saint - Bahai Church						
Schools - Itoini Mainiku High School - Saint Francis High School - TRW Junior Secondary School - Banana Primary School - Poland Primary School - Tennessee Primary School	Key access point for behavioural change in water & sanitation hygiene education and environmental education	Consultation	Meetings	Social Adviser, Environmental Specialist	Weeks 4 and 5	Nil
Nei Baneawa (Women's Association)	Recognized group within community with strong understanding of water and sanitation issues; contemporary voice for women and women's affairs	Consultation	Focus Group	Social Adviser	Week 4s & 5	Focus Group – A\$100
Youth Associations / Youth Groups	Growing percentage of the population; future managers of island resources	Consultation	Focus Group	Social Adviser	Weeks 4 & 5	Nil
Business Owners (Private & Government Owned)	Employment providers	Consultation	Individual Meetings	Social Adviser	Weeks 3 to 5	Nil

## **Annex 2 Household Survey**

## ANNEX 2

### Household Survey

**Introduction**

The following survey is being conducted as part of the ‘Outer Islands Growth Centers Project’, funded by the Asian Development Bank (ADB) and the Government of Kiribati. The information you provide will assist the project team in assessing options for improved water supply and sanitation for Kiritimati Island. All personal information will remain confidential, including the respondents identity. Thank you for your time to complete this important survey.

**Personal Information**

1. a) Village: London  Tabwakea  Banana   
 Poland

b) Would you prefer to live in another village? If yes, circle.  
 Yes  No

2. Sex: Male  Female

3. Age:

4. Number of People Living in the House/Dwelling: \_\_\_\_\_

5. What type of House/Dwelling do you have?  
 Government  Private

6. Interview Date:

**Component 1 – Water Supply**

7. Which of the following water supply systems do you have at you home and for what purpose do you use each?

Please also estimate the water usage, in litres per person/per day for the different systems.

Type	Drinking / Cooking	Bathing	Washing	Flushing Toilet	Other Uses
Piped water into house/dwelling					
Piped water from neighbour					
Rainwater tank					
Well in own yard					
Well in neighbours' yard					
Bottled water					

8. How many buckets (20L) do you think each person requires each day?  
\_\_\_\_\_

9. Do you have problems with your piped water supply? For instance:

- Do you run out of water?  How often: \_\_\_\_\_
- Does it have taste poor?  How often: \_\_\_\_\_
- Does it have poor colour?  How often: \_\_\_\_\_
- Any other issues?  Comment: \_\_\_\_\_

10. Do you think you need better:

- Piped system                       Rainwater tank                       Well

11. a) Do you think anyone in you family got sick from water during the last year?  
\_\_\_\_\_

b) If yes, did the sick person received treatment, and how much were the medical costs?  
\_\_\_\_\_

12. How do you treat your drinking water?

- Boil                       Filter                       Boil & Filter                       None

13. Do you think the Government should be charging for the provision of water?

- Yes                       No

14. How much would you be willing to pay per month for a 24 hour, 7 days a week and good quality piped water supply?

- Nothing                       \$2                       \$5                       \$10

Other: \_\_\_\_\_

15. Do you pay you water bill?

- Yes                       No

If no, then why? \_\_\_\_\_

**Component 2 – Sanitation**

16. Where do you go to the toilet? Please rank three options that you prefer (1 – Highest and 3 – Lowest).

Ranking

- |                          |                                    |                          |
|--------------------------|------------------------------------|--------------------------|
| <input type="checkbox"/> | Pedestal toilet with flush cistern | <input type="checkbox"/> |
| <input type="checkbox"/> | Pedestal toilet with bucket flush  | <input type="checkbox"/> |
| <input type="checkbox"/> | Squat toilet with bucket flush     | <input type="checkbox"/> |
| <input type="checkbox"/> | Pit Latrine                        | <input type="checkbox"/> |
| <input type="checkbox"/> | Compost toilet                     | <input type="checkbox"/> |
| <input type="checkbox"/> | Ocean beach                        | <input type="checkbox"/> |
| <input type="checkbox"/> | Lagoon beach                       | <input type="checkbox"/> |
| <input type="checkbox"/> | Bush                               | <input type="checkbox"/> |

17. a) Are you currently satisfied with your household sanitation system?

- Yes     No

b) If no, would you prefer a different system? Please comment:

\_\_\_\_\_

18. If you have a Septic Tank, how often do you have it cleaned out?

\_\_\_\_\_

19. Would you be willing to use well water to flush you toilet with a:

- Bucket                       Pump

**Component 3 – Environment**

20. With regards to Government efforts to manage fish and bird problems, what do you see as the major environmental issues on Kiritimati Island? And, what do you think Kiritimati Island will look like when your children grow up?

\_\_\_\_\_  
 \_\_\_\_\_

21. Who is responsible for management of these problems?

\_\_\_\_\_  
 \_\_\_\_\_

**Component 4 – Household Income and Expenses**

22. Monthly expenses on (A\$):

<b>Income</b>	
Formal Employment	
Informal / In-Kind Income	
<b>Expenses</b>	
Food	
Clothing	
Housing (rent, repair)	
Transport	
Water	
Power	
Telephone	
Education	
Health	
Others	

23. How many persons in the household contribute to income?

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24. How much does your household save per month, if any?

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***We thank you for your participation in this important survey.***

## **Annex 3 Existing Household Sanitation System Survey**

**ANNEX 3**

**Existing Household Water Supply and Sanitation System Survey**

1. Village: London/Tenn  Tabwakea  Banana/MC  Poland
2. House Number: \_\_\_\_\_
3. Date:
4. Name of Surveyor:
5. Description of Water Supply:
  - a) Piped water into house  Yes  No
    - (i) Condition
      - Any leaks in outside pipes?  Comment: \_\_\_\_\_
      - Any leaks in inside pipes?  Comment: \_\_\_\_\_
      - Any leaks from taps/shower?  Comment: \_\_\_\_\_
      - Any broken taps/fittings?  Comment: \_\_\_\_\_
      - Any cracks in low-flow tank?  Comment: \_\_\_\_\_
  - b) Rainwater tank  Yes  No
    - (i) What is the tank made of?  Fibreglass  Plastic  
 Steel  Concrete  
 Other
    - (ii) Tank Dimensions
      - What is the tank's height? \_\_\_\_\_ m
      - If round, what is the tank diameter? \_\_\_\_\_ m
      - If square/rectangular, what are the tank widths? \_\_\_\_ m x \_\_\_\_ m
    - (iii) Estimate current water level (as a %) \_\_\_\_\_ %
    - (iv) Condition
      - Any leaks?  Comment: \_\_\_\_\_
      - Any broken taps/fittings?  Comment: \_\_\_\_\_
  - c) Well  Yes  No
    - (i) Is the well:  Covered  Open
    - (ii) Does the well have a raised edge/wall?  Yes  No
    - (iii) Distance from house? \_\_\_\_\_ m
    - (iv) Distance from nearest septic tank or pit toilet? \_\_\_\_\_ m
  - d) Other Collection Methods Present (i.e. large drums):  Yes  No  
 If yes, comment: \_\_\_\_\_

6. Description of Sanitation System:

- a) Septic system  Yes  No
- (i) Location:  
 - Distance from house: \_\_\_\_\_ m
- (ii) Type of toilet  
 - Pedestal toilet with flush cistern   
 - Pedestal toilet with bucket flush   
 - Squat toilet with bucket flush   
 - Which type of water to flush?  Piped  Well
- (iii) Condition of toilet  
 - Any leaks in pipes?  Comment: \_\_\_\_\_  
 - Any leaks in cistern (if fitted)?  Comment: \_\_\_\_\_  
 - Any broken taps/fittings?  Comment: \_\_\_\_\_
- (iv) Disposal Method  
 - Soak pit (with coral rocks)  Condition: \_\_\_\_\_  
 - Evaporation basin (with coral rocks)   
 Condition: \_\_\_\_\_
- b) Compost toilet  Yes  No
- (i) Location:  
 - Distance from house: \_\_\_\_\_ m
- (ii) Condition of toilet  
 - Any damage/breakages?  Comment: \_\_\_\_\_  
 - Any problems?  Comment: \_\_\_\_\_
- c) Pit Toilet  Yes  No
- (i) Location:  
 - Distance from house: \_\_\_\_\_ m
- (ii) Condition of latrine  
 - Any damage/breakages?  Comment: \_\_\_\_\_  
 - Any other problems?  Comment: \_\_\_\_\_
- d) No sanitation system

7. Presence of vegetables / garden beds / fruit trees: Yes  No

Bananas

Paw Paw

Breadfruit

Other Fruit  \_\_\_\_\_

Vegetables