



The Pacific Region Infrastructure Facility (PRIF)

Asian Development Bank-AusAID-NZAID-The World Bank Group
A partnership for better infrastructure in Pacific Island Countries

Kiribati: Infrastructure Sector Review

September 2009



Australian Government
AusAID



Acronyms and Abbreviations

| | |
|--------|---|
| ADB | Asian Development Bank |
| AKL | Air Kiribati Ltd |
| AusAID | Australian Agency for International Development |
| BoK | Bank of Kiribati |
| BOP | Business Operational Plan |
| BTC | Betio Town Council |
| CCUF | Christmas Clean-Up Foundation |
| CED | Civil Engineering Division |
| EU | European Union |
| FSPK | Foundations of the Peoples of the South Pacific Kiribati |
| GoK | Government of Kiribati |
| HF | high frequency two-way radio |
| ICAO | International Civil Aviation Organisation |
| ICT | Information and Communication Technology |
| ITU | International Telecommunications Union |
| JICA | Japan International Cooperation Agency |
| JV | Joint Venture |
| KAP | Kiribati Adaptation Project |
| KAP II | Kiribati Adaptation Project (Phase II) |
| KDP | Kiribati Development Plan |
| KDP | Kiribati Development Plan 2008-11 |
| KOIL | Kiribati Oil Company Ltd |
| KPA | Kiribati Ports Authority |
| KSEC | Kiribati Solar Energy Company Limited |
| KSSL | Kiribati Shipping Services Ltd |
| KSTP | Kiribati Sustainable Towns Program |
| KWASP | Kiritimati Water and Sanitation Project |
| LINNIX | Ministry of Line and Phoenix Islands |
| MCTTD | Ministry of Communications, Transport and Tourism Development |
| MDGs | Millennium Development Goals |
| MFED | Ministry of Finance and Economic Development |
| MISA | Ministry of Internal and Social Affairs |
| MOP | Ministry Operational Plan |
| MPWU | Ministry of Public Works and Utilities |
| NAP | National Adaptation Program |
| NWSCC | National Water and Sanitation Coordination Committee |
| NWSCC | National Water and Sanitation Coordination Committee |
| NZAID | New Zealand Agency for International Development |
| OICWSP | UNDP/UNCDF Outer Islands Community Water Supply Project |
| PE | Public Enterprise |
| PFL | Pacific Forum Line |
| PRIF | Pacific Region Infrastructure Facility |

| | |
|-------|---|
| PUB | Public Utilities Board |
| RERF | Revenue Equalisation Reserve Fund |
| SAPHE | Sanitation, Public Health and Environment Improvement Project |
| SOPAC | Pacific Islands Applied Geosciences Commission |
| TAK | Telecommunications Authority of Kiribati |
| TDF | Telecommunications Development Fund |
| TEU | Twenty-foot Equivalent Unit (standard shipping container) |
| TKL | Telecom Kiribati Limited or Television Kiribati Limited |
| TSKL | Telecom Services Kiribati Limited |
| TUC | Teinainano Urban Council |
| UC | Urban Council |
| UNCDF | United Nations Capital Development Fund |
| UNDP | United Nations Development Program |
| WSD | Water Supply Division |

Prepared on behalf of the PRIF partners – the Asian Development Bank, AusAID, NZAID, and the World Bank - by Castalia Strategic Advisors. Castalia is a part of the worldwide Castalia Advisory Group.

Table of Contents

| | | |
|----------|---|-----------|
| 1 | Introduction and Summary | 7 |
| 1.1 | Summary of Findings | 8 |
| 1.1.1 | Overall Sustainability | 8 |
| 1.1.2 | Electricity Sector | 9 |
| 1.1.3 | Water and Waste Sector | 9 |
| 1.1.4 | Airports, Ports & Telecommunications | 10 |
| 1.1.5 | Key sector issues | 11 |
| 2 | Methodology | 11 |
| 3 | The Social and Economic Context | 13 |
| 3.1 | Budget Position of Kiribati | 14 |
| 3.2 | Policy Drivers and Social Context | 15 |
| 3.3 | Sustainability | 16 |
| 4 | Electricity Sector | 17 |
| 4.1 | Service Standards | 18 |
| 4.1.1 | Access and Reliability | 18 |
| 4.1.2 | Consumption | 18 |
| 4.2 | Cost of Supplying Service Standards | 19 |
| 4.3 | Current Standard of Service | 20 |
| 4.4 | Reasons for Service Gap and Solutions | 21 |
| 4.4.1 | Incentives to Perform | 21 |
| 4.4.2 | Diesel Generation on Kiribati's Outer Islands | 22 |
| 4.5 | Solar Generation on the Outer Islands | 22 |
| 5 | Water, Sanitation and Waste Sector | 24 |
| 5.1 | Service Standards | 24 |
| 5.2 | Water | 24 |
| 5.2.1 | Current State of Water Sector | 25 |
| 5.2.2 | Modelling a Reasonably Efficient System | 25 |
| 5.2.3 | Reasons for Service Gap and Solutions | 28 |
| 5.3 | Sanitation Service Standards | 28 |
| 5.4 | Current State of the Sanitation Sector | 29 |
| 5.5 | Possible Solutions | 29 |
| 5.6 | Solid Waste Sector | 30 |
| 5.7 | Sanitation Services on the Outer Islands | 30 |
| 6 | Port and Maritime Transport Sector | 31 |

| | | |
|-----------|--|-----------|
| 6.1 | Port Sector | 31 |
| 6.2 | Shipping | 32 |
| 7 | Airport and Air Transport Sector | 32 |
| 7.1 | Service Standards | 32 |
| 7.2 | The Airport | 32 |
| 7.3 | Air Services | 33 |
| 8 | Telecommunications Sector | 34 |
| 8.1 | Service Standards | 34 |
| 8.2 | Current Service | 34 |
| | 8.2.1 Internet services | 35 |
| 8.3 | The Way Forward | 35 |
| 8.4 | Services in the Outer Islands | 35 |
| 9 | Cross-Sectoral Institutional Issues | 36 |
| 10 | Annex 1: Background Tables | 38 |
| 11 | Annex 2: Figures | 49 |
| 12 | Annex 3: Sectoral Analysis | 59 |
| 13 | Annex 4: References | 89 |

Preface

This report was prepared by Castalia Strategic Advisors under a contract with the World Bank, for the Pacific Region Infrastructure Facility (PRIF) – a partnership of the Asian Development Bank (ADB), AusAID, NZAID, and the World Bank.

The PRIF is a multi-donor facility designed to improve infrastructure services in Pacific Island Countries (PICs). At the current time PRIF processes to improve infrastructure outcomes in these countries are being designed and implemented.

The aim of the report is to provide a diagnostic review of infrastructure in Kiribati, to identify the issues and options for improved infrastructure in this country to inform the design and implementation of PRIF processes.

The report provides a basis for discussion between PRIF partners and the Government of Kiribati to develop PRIF priorities in Kiribati. It also provides a template for infrastructure reviews in other PICs as part of the ongoing development of the PRIF.

1 Introduction and Summary

The purpose of this report is to assess the performance of the infrastructure sectors in Kiribati and to identify the steps which could be taken to ensure delivery of the appropriate level of infrastructure services at a reasonable level of efficiency and in a financially sustainable manner¹. The report covers five infrastructure sectors: electricity, water and waste, port and maritime, airport and air transport and telecommunications.

The approach used in this report is to compare the actual service performance with an assessment of what it would cost for a hypothetical reasonably efficient operator to deliver the required level of service. The assessment is based on a simple cost model, which uses generally accepted engineering practice and typical costs for a small Pacific Island economy. In essence, the model asks what it would cost to build the required infrastructure from scratch, operate it, and renew capital as it ages. Correspondingly, the model tells what the charges would be to ensure full cost recovery, including the recovery of the cost of capital and of capital depreciation.

The cost model does not aim to be perfectly realistic. Kiribati has to deal with the reality of the historical infrastructure investment that it actually has. It does not have the luxury of starting from scratch. However, the cost model provides a useful benchmark to understand what is actually going on:

- How do actual costs compare to the reasonably efficient costs?
- How do consumer tariffs and subsidies compare to such costs?

We define financial sustainability as the ability of the provider to recover all costs associated with a reasonably efficient operation of an infrastructure service. Costs could be recovered either from user tariffs or from government subsidies and donor grants. If the service is not financially sustainable, it could be because:

- The actual costs of service delivery exceed reasonably efficient costs. While it may not be practical to eliminate all inefficiencies at once, over time it is unlikely that users, the government or the donors would be willing to pay for waste. We emphasise the term “reasonably efficient”: we do not try to compare actual practice with theoretically possible levels of efficiency, but rather with the kind of efficiency which could reasonably be achieved under Kiribati conditions
- The user tariffs and subsidies together do not cover the reasonably efficient level of costs. In this case, the service will always be in financial crisis. In fact, being in a continuous financial crisis could itself cause inefficiency, as resources are not available to invest efficiently or to maintain capital appropriately
- The level of service being delivered is not appropriate for the Kiribati circumstances, including the users’ willingness and ability to pay, and the government’s fiscal constraints.

One of the main difficulties in assessing the sustainability of various infrastructure sectors in Kiribati is the fact that capital is, in effect, treated as a free good. All infrastructure sectors receive periodic injections of capital, which is then allowed to run down over time. Periodic injections of capital are typically quite substantial relative to Kiribati’s GDP, such as the AUD25 million required to upgrade the port. Almost inevitably, such large one-off capital requirements cannot be financed by Kiribati.

¹ Data used throughout this report comes from “Kiribati Country Infrastructure Diagnostic Review”, a 2008 report to the PRIF, unless otherwise noted.

Requests for capital contributions of this magnitude create the impression that the infrastructure services in Kiribati are not sustainable without on-going donor support.

The simple modelling approach used in this report allows us to annualize the full cost of providing various infrastructure services. We then compare possible revenues with the annualized full costs, to estimate an annual subsidy requirement for each sector. This provides a clearer picture of the overall sustainability. We also argue that providing support to the infrastructure sectors in the form of on-going revenue subsidy, rather than one-off capital injections, may have significant efficiency benefits. It gives service providers the incentive to use capital efficiently, and to ensure appropriate maintenance.

The remainder of Section 1 summarises our findings for each infrastructure sector. Section 2 explains our methodology in more detail. Section 3 examines the general economic, policy and social context in Kiribati, which define the boundaries of reasonable and affordable standards. Sections 4 to 8 analyse the five infrastructure sectors. Section 9 examines institutional issues that span multiple sectors.

Throughout our report we focus on the development of infrastructure in South Tarawa because almost half the population live in this area and it has the most pressing infrastructure issues. Infrastructure development on other islands is also important, and lessons learned on Tarawa are extended to these islands.

1.1 Summary of Findings

1.1.1 Overall Sustainability

The table below summarises for each sector our assessment of:

- Annual revenue which would fully cover reasonably efficient costs of providing the relevant service, including the cost of capital
- Current annual revenue
- The implied annualised subsidy for each sector.

The calculations are obviously approximate. It is also important to recognise that they do not represent all aspects of providing services on the outer islands. However, these numbers provide a good indication of the implied annual subsidy being delivered to the main infrastructure services in Kiribati.

Table 1.1: Implied Annual Subsidy

| | Required revenue | Actual revenue | Gap |
|--------------------|------------------|----------------|---------------------|
| Tarawa Electricity | \$6,256,000 | \$4,048,000 | \$2,208,000 |
| Solar | \$2,520,000 | \$1,470,000 | \$1,050,000 |
| Tarawa Water | \$3,380,000 | \$288,000 | \$3,092,000 |
| Tarawa sanitation | | | \$720,000 |
| Solid waste | \$300,000 | \$260,000 | \$40,000 |
| Port | \$2,620,200 | \$330,000 | \$2,290,200 |
| Airport | \$2,090,000 | \$250,000 | \$1,840,000 |
| TOTAL | | | \$11,240,200 |

Source: Castalia estimates

To put this into context, the Government's total annual revenue is AUD80 million. In other words, if fully annualised, sustainable infrastructure subsidies would account for approximately 15 percent of the resources available to the Government.

In fact, we believe that the annual subsidy requirement could be substantially reduced. The port and airport should be able to recover their costs through user charges. It is difficult to see why these users should be subsidised. Electricity and water charges could be increased somewhat to bring them closer to full cost recovery. Overall, it appears that the annual infrastructure subsidy could be sustainably maintained at an annual level of AUD4 to 5 million. This would represent 5 percent of current Government revenue.

We now discuss each sector in more detail.

1.1.2 Electricity Sector

We develop a simple economic engineering model of South Tarawa's electricity network. We find that the reasonably efficient costs of operating such a network, including return on capital and depreciation, would be in the region of AUD0.8 to \$0.9 per kWh, depending on the cost of diesel for generation. This is comparable to what is known about the actual cost of operating such networks on other Pacific islands.

From the limited information available, it appears that the current costs of operating the South Tarawa network significantly exceed the reasonably efficient levels. It appears that operating costs alone are in the region of AUD0.8 per kWh. The high operating costs appear to be caused by a high level of system loss (around 30 percent), and by very high levels of fuel consumption.

While the current average tariff falls very short of the current costs, it is only marginally below the level required to recover the reasonably efficient level of costs. Since a significant proportion of capital appears to have been gifted by donors, and hence does not require a return, it is even possible that the electricity sector could be financially self-sustaining at current tariffs, particularly as diesel prices fall.

Hence, we conclude that the key issue facing the electricity sector on South Tarawa is inefficiency.

Little information was available for diesel generation on the Outer Islands. Solar generation currently supplies a valuable service to the Outer Islands. However, the current arrangements for solar generation are unlikely to be financially sustainable. The current tariff of AUD9.00 per month is not sufficient to maintain the current stock of solar panels. We estimate that the monthly tariff would need to be at least AUD24.00 to cover the full cost of the existing service. If additional capital for extending the service were obtained from commercial sources, the tariff would need to be around AUD33.00 per month to cover reasonable costs.

1.1.3 Water and Waste Sector

We define reasonable service standards for water, waste and sanitation by considering basic health needs, especially access to safe drinking water. These basic needs are currently not being met on the islands of Tarawa and Kiritimati. Sanitary standards should be established by regulation and enforced by authorities to prevent the contamination of land and drinking water on Tarawa and Kiritimati. We could not find any information on sanitation on the Outer Islands.

In rehabilitating South Tarawa's water supply, water needs to be supplied from both rainwater collection and the water lenses which feed the reticulated water system. Presently, too much water is being taken from water lenses, a large quantity of which is lost.

Our cost modelling shows that rain-water collection and storage provide the most cost effective means of increasing the supply of potable water. While overall there appears to be sufficient rainfall to meet household needs, the pattern of rainfall would make it difficult for households to rely solely on rainwater collection unless they made very significant investments in storage. However, it is important that households face sensible financial incentives when they decide between consuming more water from the central supply, and using roof-collection systems.

We estimate that the full cost of delivering water through the central system would be approximately AUD27 per month. In the short term, greater cost recovery from consumers would enable the Public Utilities Board (PUB) to deliver a more consistent service. A long-term move to water metering would encourage efficient switching between rainwater collection and mains supply furthering the conservation of water lenses.

Poor sanitation is a continued threat to health and the delivery of potable water supplies in Kiribati. Within South Tarawa sanitation is supplied as a centralised sewerage system to some, others use onsite solutions. Both of these approaches to sanitation are ineffective because of poor maintenance and inappropriate design, and therefore pose a threat to public health. Improving the health outcomes of onsite solutions requires changing the behaviour of users. The Government should consider implementing education, regulation and enforcement programs aimed at improving consumer understanding of how sanitation services should be used. In addition, improving central sanitation will require the improvement of central management practices and a review of funding. We find that there is scope to introduce a tariff for sanitation services for households currently connected to the central sewerage system.

1.1.4 Airports, Ports & Telecommunications

Ports and maritime, airports and air transport, and telecommunications all form part of Kiribati's economic infrastructure. Service standards in these areas are largely driven by consumer demand rather than basic infrastructure service needs.

The financial statements for the port at Betio indicate that it is currently profitable. However, this information is at odds with our analysis of cargo handling costs. It would appear that the current port charges are not sufficient to cover reasonably efficient costs. It is unclear whether the level of service is currently consistent with what is demanded. The apparent profitability may be a short-term feature, reflecting the low level of service provided. A Japanese company has announced plans to invest in deepening the port. We expect that services will improve considerably following this investment, but that port charges would also need to go up to cover the additional capital costs.

The state owned shipping company, Kiribati Shipping Services Ltd (KSSL) currently operates at a loss. The services provided by KSSL are also provided by commercial boats and local non-governmental organisations. Privatization of KSSL will encourage the expansion of private shipping services to meet demand without incurring a cost on the government.

From our analysis of available financial information, the cost of planned upgrades at Bonriki International Airport appears to exceed the capital cost of similar airport facilities. In addition, it appears that the Government could save approximately AUD1 million through contracting out emergency air services currently supplied by Air Kiribati Ltd (AKL)

Access to telecommunications services is expected to grow rapidly. Mobile phone services in particular have grown quickly and are likely to continue to do so as capacity is expanded. The level of telecommunications service across Kiribati does not currently meet reasonable standards. However, service is improving through commercially driven investments. We do not recommend any change in current policy.

1.1.5 Key sector issues

There are two major institutional issues common across several sectors. These issues are:

- **Independence and accountability of public entities.** It appears that public entities struggle between the conflicting demands of needing to fund service provision and the political concern about increasing tariffs. As long as tariffs do not cover costs, it is also difficult to hold them accountable for performance, as there is always an excuse for either not being financially sustainable or for not meeting the required level of service. Specific steps to deal with this problem could include:
 - Separation of commercial and policy functions. Public utilities should be run as commercial entities, with a requirement to generate return on investment. The Government could provide regulatory oversight to make sure that the utilities do not simply pass their inefficiencies to consumers
 - The PUB could be made more accountable if the electricity utility was separated from other PUB functions. The current structure includes electricity, water and sanitation utilities in one organisation. This allows the cost of electricity to remain hidden in the other parts of the business.
- **Intra-government debt.** There is a lack of inter-department transfers of revenue for services rendered between government departments, resulting in significant intra-government debt. Intra-government debt reduces the funds intended to be available to utilities for providing service, making it difficult to meet a reasonable levels of service. Government departments currently incur debt because they do not believe they will be denied service. In order to secure efficient delivery of services, utilities will need to make credible the threat of suspension of services to government departments if they do not pay their bills.

2 Methodology

Policy makers often face competing claims that infrastructure should cost less and be provided at a higher level of service. Such claims can only be verified by comparing them to reasonable and implementable levels of service and cost. A reasonable outcome, in this context, means that services are provided to a reasonable standard, for reasonable cost and that funding is available to pay these costs.

The service would be financially sustainable if funding from all sources covers total costs, including the return on capital and depreciation. If the funding does not cover all costs, capital renewal will always depend on donor gifts. In addition, it is likely that the service providers would make inappropriate decisions between maintenance and new capital

investment, or would invest relatively inefficiently. If the service is not financially sustainable, it can get into a vicious cycle: lack of funds leads to inefficiencies, which in turn lead to higher costs and an even greater lack of funds and so on.

Our methodology involves four steps:

- Define reasonable service standards
- Establish an efficient cost for delivering the service standard
- Assess the actual level of service and cost, and
- Identify gaps between the actual level of service and cost, and the proposed service standard and efficient cost, and propose changes.

We explain each of these steps in turn.

Reasonable service standards

Reasonable service standards can be defined through establishing the willingness of consumers to pay for infrastructure services. Where this is not possible, standards are guided by examining different modes for delivering service and deciding which one meets reasonable economic and social objectives. In some cases the most appropriate standard is defined by government objectives and fiscal priorities. In our experience, service standards can also be defined in terms of access to the service, the level of consumption and the reliability of service.

Establish an efficient cost for delivering the service standard

Efficient costs can be estimated through an engineering economic cost model. The cost model establishes what assets are needed, applies a weighted cost of capital and estimates the operational costs needed to provide the service standard. The importance of including the cost of capital in calculations is explained in Box 1.1. This process can involve a lot of detailed information which is difficult to obtain. If information cannot be obtained, the gaps are filled by benchmarking to other PICs.

In essence, the cost modelling resembles the work undertaken by the economic regulators in many jurisdictions. Economic regulators develop cost models to assess the reasonableness of the utilities' applications for tariff increases. The final outcome of the cost model is a per unit cost for delivering the service.

With respect to basic utilities, such as electricity, water and sanitation, the analysis in this paper focuses on the services provided on Tarawa. In part, this is because there is more information about infrastructure in South Tarawa than elsewhere. Partly, this is because that is where the greatest service need is, and where most government resources are spent. The costs of infrastructure service on Outer Islands can be a lot higher than on Tarawa. Where possible, we examine the implications of our cost analysis for the Outer Islands.

Box 2.1: The Weighted Average Cost of Capital

The majority of infrastructure services in Kiribati have been financed from donor aid. Donors do not require a return on capital. However, if Kiribati is to develop financially sustainable infrastructure services, over time they will need to be able to access commercial capital. Hence, over time tariffs will need to cover the cost of capital. Moreover, if the cost of capital is excluded from the analysis, it may be difficult to make appropriate choices between maintenance expenditures and new capital investments. In the extreme, if there is no cost of capital, it may be rational to run down the existing capital and to ask donors for more.

We have therefore included the weighted average cost of capital (WACC) in calculating costs for the infrastructure sectors reviewed in this paper. The WACC is the annual compensation required by an investor for supplying equipment, for the lifetime of that equipment.

The WACC is one of the costs a new entrant providing infrastructure would face. In fact this cost is not only faced by new entrants but also by existing service providers who want to expand their service. If tariffs are set lower than that justified by the full costs including the WACC, then there is no incentive to use capital to provide new infrastructure or expand existing infrastructure. This is true for both the public sector and the private sector.

Assess the actual level of service and cost

The third step examines what service is actually provided. We consider the level of service provided, the costs of delivering service and the financial sustainability of the current level of service.

Identify gaps between the actual level of service and cost, and the proposed service standard and efficient cost

Finally, we examine the gaps between the service standard and the level of service actually provided, as well as the gaps between tariffs, actual costs and reasonably efficient costs. The analysis of the gaps enables us to identify the institutional reasons for any under-performance of the infrastructure sectors:

- If tariffs are well below the level of efficient costs, and if the gap between tariff revenues and the reasonably efficient costs is not covered by explicit and reliable government subsidies, the institutional problems typically relate to pressures to keep tariffs down for political reasons, and to lack of fiscal discipline
- If actual costs are well above the reasonably efficient level of costs, the institutional problems typically arise from lack of commercial focus and lack of financial accountability by the service providers. Insufficient funding to the sector typically contributes to inefficiencies and lack of accountability, as it provides service providers with convenient excuses for any inefficiency.

At the conclusion of our report, we examine the likely mix of institutional problems in Kiribati, and develop initial recommendations.

3 The Social and Economic Context

In this section we examine the general economic and social conditions in Kiribati which define what service standards are reasonable. We also discuss whether the infrastructure sectors are sustainable.

3.1 Budget Position of Kiribati

The revenue of the Government of Kiribati is drawn from five main sources:

- Sale of fishing licences
- Official development assistance from overseas
- Revenue Equalisation Reserve Fund (RERF)
- General taxation
- Tariffs paid by households for services.

Sale of fishing licences currently generates around AUD36 million (US\$25 million) per year. This money is paid by commercial fishing operators to gain access to fish within the Kiribati Exclusive Economic Zone.

The experience of official development assistance in Kiribati is that it is often tied to specific development objectives, determined by donor countries. Kiribati receives around AUD36 million (US\$25 million), annually.

The RERF is a fund created with revenue from phosphate mining. At last record it was worth \$400 million USD in 2008. We are unable to ascertain the structure of the fund or its current value in Australian dollars.

The Kiribati Gross National Income (GNI) per capita is around 80% higher than Gross Domestic Product (GDP) per capita. This is a result of the large proportion of income received from foreign sources, including donor contributions. This means that people in Kiribati are able to consume more services than would be consumed in countries with a comparable level of per capita GDP, including more infrastructure services. As a consequence of Kiribati's relatively high level of external income, we use GNI as a more appropriate basis for considering the level of service Kiribati should expect from infrastructure.

Total government revenue is around AUD80 million per year. This allows the Government a per household per year budget of around AUD5,700. Money is distributed through Ministries to public entities which run and establish infrastructure. Public entities relevant to infrastructure are shown in table 3.1.

Table 3.1: Agencies Responsible for Infrastructure

| Agency | Infrastructure |
|--|---|
| Public Utility Board | Electricity, Water and Sanitation in South Tarawa |
| Kiribati Solar Energy Corporation | Solar Energy on Kiritimati Island and the Outer Islands |
| Kiribati Port Authority | Betio Port |
| Ministry of Communication, Transport and Tourism Development | Bonriki International Airport |
| Air Kiribati Ltd | Aviation in the Gilbert Group of Islands |
| Kiribati Shipping Services Ltd | Shipping within the Gilbert Group of Islands |
| Television Kiribati Ltd | Television, satellite television and internet services |
| Telecom Services Kiribati Ltd | Fixed line, mobile phone and internet services |

Infrastructure can also be funded either directly by the Government or through tariffs paid from household income (much of that income, is in turn, received from the government). According to The National Statistics office of Kiribati's household income survey, the average income of households in Kiribati is around AUD8,745². This ranged from a low of AUD4,930 in the Southern Gilbert Islands to a high of \$12,345 in the Line and Phoenix group of islands. Of particular interest to this analysis is the relatively high household income of South Tarawa, which is AUD11,464. This defines the budget for spending on all services, including infrastructure, of households in South Tarawa.

Overall, this relatively high level of household income suggests that:

- The population can expect reasonably high levels of infrastructure services
- Most of the cost of such services should be covered by user tariffs, rather than by government subsidies.

3.2 Policy Drivers and Social Context

There are two main drivers for prioritising infrastructure spending: human needs and market demand. Human needs are a priority in sectors like water supply and sanitation. Demand is a priority in areas such as telecommunications and economic infrastructure like ports and airports.

Further guidance on priorities is also provided by the Millennium Development Goals (MDG), which set a number of aspirational targets for developing countries, and the Kiribati Development Plan 2008-2011 (KDP), which sets specific goals for Kiribati. These policies guide the choice of service standards.

The table below shows the expenditure on infrastructure by source of funding. The bulk of investment in infrastructure continues to come from external development partners. The Government and development partners jointly subsidise about a third of operating expenditures. In the medium term, reliance on development partners is unsustainable. Future investments will need to be funded through user fees (public enterprises own sources) or through explicit Government subsidies. Hence, the Government needs to ensure that its financial commitments to the infrastructure sectors are carefully prioritised, and that wherever possible, consumers face the full cost of the service.

² The source is the Analytical Report on the 2006 Kiribati Household Income and Expenditure Survey from the National Statistics Office Kiribati.

Table 3.2: Expenditure on Infrastructure by Source of Funding, 2007 AUD000s

| | Total (AUD'000) | Central Govt. ³ (own source) | External dev. assistance | PEs ⁴ (own source) | Island and Urban Councils | NGO and Hhold |
|---|---------------------------|--|--------------------------------|-------------------------------------|------------------------------------|---------------------|
| Total (capital) | 10,335 (42.5%) | 0 | 9,025 | 1,310 | 0 | n/a |
| Total (O&M) | 13,966 (57.5%) | 3,643 | 1,098⁵ | >8,230 | 975 | n/a |
| <i>of which:</i> | | | | | | |
| Water, sanitation & solid waste mgt.(capital) | | | 461 | 0 | | |
| Water, sanitation & solid waste mgt. O&M) | | | 23 | >480 | 220 | |
| Telecoms (capital) | | | 0 | n/a | | |
| Telecoms (O&M) | | | 0 | n/a | | |
| Power (capital) | | | 4,205 | | | |
| Power (O&M) | | | 100 | >3,000 | | |
| Roads & land transport (capital) | | | 2,272 | | | |
| Roads & land transport (O&M) | | | 6 | | 755 | |
| Port & marine transport (capital) | | | 1,851 | 775 | | |
| Port & marine transport (O&M) | | | 26 | 850 | | |
| Airports & air transport (capital) | | | 236 | 530 | | |
| Airports & air transport (O&M) | | | 943 | 3,900 | | |

Source: Castalia

3.3 Sustainability

Table 3.2 is difficult to interpret because it provides a snapshot of support provided to Kiribati. Because Kiribati receives periodic capital injections, it is difficult to know whether the year for which the data were available was typical in some sense.

We believe a better way to assess the on-going need for support is to compare the annual revenue which would be required to cover the full reasonably efficient costs of providing the required services with the actual current revenue. The gap represents an annual subsidy requirement, and provides an indication of the on-going support which would be needed to make infrastructure services sustainable in Kiribati. As we discuss in section 1.1.1, on current tariffs and the expected service levels, we estimate the annual implied subsidy to be around AUD11 million. At present, the implied annual subsidy may differ from this for two reasons:

³ Includes subsidies with direct links to Ministries.

⁴ Includes subsidies from central government with no direct links to Ministries.

⁵ Excludes an amount of AUD3 million annual subsidy to Kiritimati Island route, announced in September 2008.

- The actual costs may be higher than the estimated reasonably efficient costs. As we discuss below, this appears to be the case across a number of sectors
- The current level of service is less than the desired level of service. For example, the above estimate includes the upgrade to the port, which is yet to take place.

Our estimate of about \$11 million per annum compares to the approximately AUD14 million spent by the Government and the development partners during 2006. However, as we also discuss in section 1.1.1, we believe the total subsidy requirement can be reduced to AUD4-\$5 million per annum, by ensuring full cost recovery in sectors where customers are able to pay (such as port and airport), and moving tariffs part way towards recovering full efficient costs in the sectors which mainly supply the households.

The medium term subsidy requirement of around \$4 million per annum would be comparable to the Government's commitment of about \$3.7 million in 2006. While these numbers are inevitably approximations based on limited available information, they suggest that on the on-going basis it should be possible to make the infrastructure sectors sustainable through a combination of tariff revenues and budget subsidies. In particular, it should be possible to avoid periodic large-scale injections of capital from the development partners.

As we discuss later in the report, a recurrent theme through all of the infrastructure sectors is that repeated injections of capital have created an environment where capital tends to be treated as a free good. This creates perverse incentives for the operators of the infrastructure sectors. For example, it is rational not to spend money on maintenance, since the sooner the capital equipment is run down, the sooner it is possible to request additional equipment from the development partners.

Moving towards an annualised subsidy not only clarifies the real subsidy needs of the infrastructure sectors. It also creates incentives for more efficient operation, which takes full account of the need to maintain capital equipment, and allows the operator to make informed decisions about the trade-off between maintenance spending and capital investment.

In effect, under such an arrangement, as far as the operator of the infrastructure service is concerned, it simply receives the tariff which reflects the full reasonably efficient cost of supplying the service. The Government and the development partners cover the gap between the full cost recovery tariff and the actual tariff.

4 Electricity Sector

This section analyses the provision of electricity in Kiribati. We find that access to electricity is limited in the Outer Islands and the quality of supply is poor in South Tarawa. We also find that the cost of providing electricity in South Tarawa appears to be significantly higher than the reasonably efficient level of cost. This seems to be due to high levels of system loss in the distribution network, and inefficient use of fuel in generation. The current tariffs are markedly below the level of current costs, which explains the poor financial performance of the PUB. However, the current tariffs appear to be only marginally below the reasonably efficient level of costs. Hence, the key issue on South Tarawa appears to be poor efficiency, rather than under-funding.

By contrast, the main issue with the Kiribati Solar Electricity Company (KSEC), which supplies electricity to the Outer Islands, appears to be under-funding. It is not be able to increase access to its service without further donor assistance, and will be unable to fund replacement solar panels when the current stock expires.

4.1 Service Standards

South Tarawa has a population of approximately 45,000 people living on the southern end of the 32 km² island of Tarawa. 90% of households are connected to the electricity grid. In total the network has 6,400 consumers this is comprised of 5,299 residential users, 814 commercial users and 287 industrial users.

4.1.1 Access and Reliability

A reasonable service standard in South Tarawa is 24 hour access, without voltage spikes for most residents. Twenty four hour service allows the use of lighting, is justified by the size and density of the South Tarawa population and allows more efficient use of capital.

Electricity supply that contains voltage spikes causes damage to electrical appliances. This limits the type of equipment that can be used with the supply. For example, voltage spikes have a negative effect on communications equipment and infrastructure. Improving the quality of electricity would likely lead to an increase in demand as a result of more appliances being able to connect to the network.

The cost of distribution networks per user decreases as users increase in dense populations like South Tarawa. Therefore, 100% connection is an appropriate standard of service. A higher user density is possible in South Tarawa because population density is very high.

4.1.2 Consumption

Consumption of electricity within Kiribati is very low relative to other PICs, averaging 108 kWh per person per year⁶. While we were not able to establish the level of consumption in urban centres, we think it may be almost double the national average. Anecdotally, many households use electricity only for lighting. Increases in tariffs to a cost recovery level may reduce consumption further.

While consumption is low it is not necessarily low for a PIC with the GDP per capita of Kiribati. Table 4.1 illustrates the comparative energy consumption of various PICs alongside their GDP per capita.

Table 4.1: Electricity Generation in Selected Pacific Countries

| | Nauru | Kiribati | Niue | Samoa | Tonga | Vanuatu |
|---|--------|----------|-------|---------|---------|---------|
| Electricity generation (kWh million per year) | 11.2 | 11.16 | 2.79 | 107.9 | 31.62 | 38.13 |
| Population | 11,716 | 103,092 | 2,166 | 177,297 | 112,422 | 215,446 |
| Electricity per person (kWh per year) | 956 | 108 | 1288 | 609 | 281 | 177 |
| GDP per person (USD PPP) | 2,400 | 3,600 | 5,800 | 5,400 | 5,100 | 3,900 |
| Year of GDP estimate | 2005 | 2007 | 2003 | 2007 | 2007 | 2007 |

Source: Castalia Database, National Reports

⁶ “Desk Review of Infrastructure in Nauru”, November, 2008, Castalia

There are two caveats on this data. First, the data is for generation rather than actual consumption. Since system losses differ from island to island, but generally tend to be lower than in Kiribati, this comparison over-states per capita consumption in Kiribati. The use of GDP for comparison, on the other hand, under-states the relative position of Kiribati.

The striking fact is that per capita electricity consumption in Kiribati is particularly low given its level of income per capita. However, consumption levels on Tarawa (at around 160 kWh per person per year) are more in line with other PICs, indicating that the problem is more with access to electricity on the Outer Islands.

4.2 Cost of Supplying Service Standards

We estimate the total cost of generating electricity in South Tarawa at around \$0.85 per kWh. Our estimate is based on:

- The level of generation and distribution assets that is required to service a demand of 160 kWh per person in South Tarawa.
- The annual cost of capital relating to those assets and an estimate of operating costs
- Finally, we divide these costs by the units consumed to get a *per unit* cost.

The assets needed to supply electricity to South Tarawa are estimated based on South Tarawa having a population of approximately 46,000 people, having 6,400 electricity consumers, living in a 12.6 km² area and consuming 160 kWh each. 160 kWh per person is a best estimate of consumption per person in South Tarawa.

The table below sets out the inputs into the cost model, which include the types of assets needed for the distribution of electricity on the scale of South Tarawa, and their 2008 replacement cost.

Table 4.2: South Tarawa System Asset Requirement

| Required Assets | Number | Replacement Cost (2008) AUD |
|--|--------|-----------------------------|
| 11kV Overhead Line (Heavy) (kms) | 30 | 930,000 |
| 11kV Underground Cable (Heavy) (kms) | 10 | 1,250,000 |
| Pole Mounted Transformers (11kV/400V, 100kVA) | 21 | 147,000 |
| 11kV Air Break Switch | 28 | 182,000 |
| Ground Type Transformer (11kV/400V, 200kVA) | 6 | 84,000 |
| Pad Mount Transformer (11kV/400V, 300kVA) | 4 | 64,000 |
| 3 Way Ring Main Switching Unit (11kV, >100kVA) | 2 | 8,000 |
| 4 Way Ring Main Switching Unit (11kV, >100kVA) | 3 | 33,000 |
| 400V Overhead Connection Lines (Heavy) (kms) | 60.0 | 2,700,000 |
| 400V Underground Connection Cables (Heavy) (kms) | 20.0 | 1,440,000 |
| 1ph Connections (Overhead) | 1,260 | 88,200 |
| 1ph Connections (Underground) | 180 | 45,000 |
| 3ph Connections (Overhead) | 180 | 32,400 |
| 3ph Connections (Underground) | 180 | 72,000 |
| Meters | 2,520 | 252,000 |
| Total Replacement Capital Cost | | 7,327,600 |

Our estimate of the reasonably efficient cost of providing the electricity service in South Tarawa includes annual depreciation of this replacement cost, as well as a return on capital which reflects the risk of doing business in Kiribati. In other words, our estimate of the costs approximates what a commercially minded new entrant into the market would have to charge.

A major and unstable component of the electricity price is the price of diesel. As we were unable to identify current prices for diesel in Kiribati, we based our estimate on current prices for diesel in Tonga of \$0.85, where we have undertaken a similar analysis. Tonga—like Kiribati—faces high diesel transport costs due to its remote location and low population.

On this basis, we estimate the total cost of supplying electricity at the desired service standard to be AUD0.855 per kWh. The table below details the core elements of this cost calculation.

Table 4.3: Electricity Costs (AUD per kWh)

| Total Retail Tariff | South Tarawa |
|---|---------------------|
| Generation Capital | 0.096 |
| Generation O&M | 0.320 |
| Energy Total | 0.416 |
| Distribution and Retail Capital | 0.217 |
| Distribution and Retail O&M | 0.222 |
| Distribution Total | 0.439 |
| Total Cost per kWh | 0.855 |
| Fixed and Variable Costs | |
| Total Annual Fixed Costs per Connection | 615.12 |
| Total Variable Costs per kWh | 0.542 |

Source: Castalia estimates based on industry practice

If we add the O&M costs for distribution and generation, we estimate that total variable costs should be in the order of AUD0.54 per kWh.

As noted earlier the consumption of electricity in South Tarawa may be more than twice the national average. This is because most of the electrified houses are in South Tarawa but only around half the population. If South Tarawa electricity consumption is 216 kWh per person, twice the national average, the price per kWh falls to AUD0.716. This is because the fixed costs are spread over more units.

4.3 Current Standard of Service

Although blackouts are rare and more than 90% of households are connected, voltage spikes on South Tarawa's electricity network are common.

The PUB, which manages the electricity network, is currently AUD3 million in debt. AUD2.7 million of this debt is owed to Kiribati Oil Ltd (KOIL) which supplies the PUB with diesel used to generate electricity. There appears to be a high rate of unaccounted for electricity loss—approximately 30 per cent—from the electricity network. This is a key factor behind the level of debt carried by the utility.

4.4 Reasons for Service Gap and Solutions

Our modelling of the reasonable costs of supplying electricity in South Tarawa indicates that the current service costs are relatively inefficient, and that this inefficiency appears to be the main problem in the electricity sector. In particular:

- The current administrative arrangements for the PUB do not suggest that managers are incentivised to work towards delivering to the service standard.
- **Persistently high levels of system loss from the electricity network.** This results from a combination of distribution losses and theft.

We also note that the current tariffs do not allow the PUB to fund the full reasonably efficient cost of service, let alone the current high cost of service. The shortage of funds may itself be preventing the PUB from implementing efficiency improvements.

Our analysis suggests that an electricity tariff of around \$0.85 per kWh would be required to achieve the desired service standard. Under the Government's policy, residential tariffs set in February 2008 are AUD0.40 per kWh, commercial tariffs are AUD0.55 per kWh and industrial tariffs are AUD0.70 per kWh. We understand that these tariffs were set at the time with a view to ensuring that households paid 50 percent of the total operating costs. In other words, this implies that with diesel prices at the level they were in February 2008, the actual operating costs alone were around AUD0.80 per kWh. By contrast, we estimate that at February 2008 diesel prices (AUD1.76 per litre), the total reasonably efficient cost of generating and distributing electricity in South Tarawa should have been AUD0.95 per kWh.

The PUB has proposed new tariffs which would set residential tariffs at AUD0.60, commercial tariffs at AUD0.65 and industrial tariffs at AUD0.80. While raising the level of tariffs is clearly desirable, the key problem appears to be the excessive level of costs.

4.4.1 Incentives to Perform

Quality of service and financial sustainability can only be achieved if service providers have incentives to perform. There are three key ways this can be achieved;

- **The PUB should have specific performance targets.** This includes:
 - Recovering all operating costs and making a profit
 - Reducing system loss
 - Reaching accepted industry heat rates
 - Reducing voltage spikes to an acceptable level, and
 - Reducing the hours of unplanned supply disruptions to an acceptable level

The PUB management should be paid in accordance with their performance.

- **At an institutional level, tariff setting needs to be separated from the political process.** Currently, the PUB clears tariff increases with the Government. This arrangement politicises the tariff setting process, and appears to suppress tariffs to

unsustainably low levels. However, allowing the tariff to be set unilaterally by the PUB could lead to tariffs being too high, or being seen as not legitimate by the population. We suggest that the Government investigate setting up a simple regulatory process based on the review of operating and capital costs. A fuel price adjustment mechanism would also need to be developed.

Commercialising the operation of electricity supply would create incentives to reduce costs. A profit motive naturally creates an incentive to decrease system losses and electricity theft since these activities decrease profits. Commercialisation also creates incentives to improve electricity quality and access since this increases demand for electricity and therefore profits. While privatization is generally regarded as the best way to entrench the commercial incentive, there may be practical difficulties in privatizing small utilities. We believe that significant improvements in commercial operation can be achieved without privatization.

4.4.2 Diesel Generation on Kiribati's Outer Islands

The general lessons learned for South Tarawa also apply to Kiribati's Outer Islands.

Electricity networks on the Outer Islands are significantly smaller and generally privately purchased and operated by individuals and local communities on these islands. Therefore, they do not fall under the same level of control by the Government as in South Tarawa.

Given current circumstances, it is appropriate for the Government to look to improve the provision of electricity supplies on the Outer Islands through encouraging greater private generation. This could be achieved in five ways, without necessarily resorting to direct subsidies:

- **Coordinating diesel generator procurement:** The Government could achieve economies of scale by periodically purchasing and transporting bulk quantities of generators on behalf of residents.
- **Setting technical standards and guidelines:** Standardising operating parameters for generators and equipment the interoperability of equipment and applicability of expertise
- **Creating standard agreements for sharing diesel generators:** Simple standard agreements for sharing the costs of operating generators would reduce uncertainty and disagreements in generator sharing arrangements.
- **Creating standard property arrangements for distribution networks:** Local investors are more likely to install distribution networks if they have property rights in the resulting network and those rights are simple and understood by all parties.

4.5 Solar Generation on the Outer Islands

In our experience, the costs of Diesel and of maintaining diesel generation sets is more expensive where islands are remote, and electricity distribution is more expensive when populations are less dense. This is the case for Kiribati's Outer Islands.

The reasonable service we identified for South Tarawa is unlikely to be suitable for the Outer Islands. This is because a 24 hour diesel generation is simply too expensive a solution for areas with low population density. We suggest that a more affordable standard for the Outer Islands is that residents should be provided with access to a

minimum level of electricity that would allow the operation of lights and communication equipment.

Solar generation is one potential option for meeting the electricity needs of the Outer Islands. The cost of solar onsite generation is not affected by remoteness or low density populations. Our analysis suggests that the full cost of onsite solar generation in Kiribati can be met by a monthly tariff of AUD32.83 per household.

Box 4.1 below shows how we calculated this figure.

Box 4.1: Cost of Solar Generation for Kiribati

We calculated the effective tariff required to cover the full cost of solar generation for Kiribati using the following equation:

$$M = Tc/hm$$

Where:

M = Monthly cost of electricity per household

Tc = Total annual cost of delivering electricity to Kiribati (consisting of a cost of capital of AUD31 and a AUD1.83 cost for operations).

hm = households * months

We estimate that the capital installed cost of solar generation units is AUD4000. On this basis, we estimate that it would cost AUD35 million to provide one solar panel unit to each of the 8,750 households in Kiribati which are not connected to a main electricity network. Assuming solar generation units have a lifetime of 20 years the cost of capital per unit per year is AUD372.

We estimate that the cost of operating, maintaining and administering solar units would be around AUD1.83 per month. This assumes that the operating cost is essentially the cost of 22 technicians, one for each island. If technicians are paid the average household income of AUD8,745 per year then total salaries would be AUD192, 390⁷. If only a quarter of households are serviced (as is currently the case) this cost rises to AUD7.32 per month.

If we accept that the solar panels are gifted by donors, and that only a quarter of households off the main grid are covered, the price required to maintain and replace those panels can be met by a tariff of only AUD23.99. This figure is not enough to justify a commercial solar generation venture, but will protect the value of donated capital.

Solar generation units currently supply a small amount of electricity to around 25% of the approximately 8750 households outside of South Tarawa. Units are supplied by the Kiribati Solar Energy Company Ltd (KSEC), a state owned entity, for a price of AUD9 per month. There is currently a proposal to increase the tariff to AUD14 per month. While it is desirable to increase the tariff to cover the costs of generation, the tariff levels proposed are not sufficient to either maintain the current stock of solar panels or justify expanding the provision of solar panels on a commercial basis. At current tariff levels, demand for solar units is high and there is still a waiting list for new solar units.

The supply of new units is currently limited to the rate at which they are donated by the European Union. However, we understand that there are plans to supply 1000 more units to Kiribati.

⁷ The source is the Household Income and Expenditure Survey (2006).

KSEC services will only be sustainable in the long term if donor contributions are maintained or tariffs are increased to a level where costs can be met. If this does not occur, solar electricity generation is unlikely to be extended to the remainder of households not connected to the main electricity network.

To maintain the current level of solar generation, we estimate that the tariff should increase to at least AUD23.99. We estimate that extending KSEC services to all households not connected to the main electricity network would require tariffs to rise to approximately AUD32.83. If the Government's objective is to increase the provision of solar generation, it may consider adopting a subsidy arrangement similar to that currently provided for residents of South Tarawa.

As there is currently a waiting list for KSEC services, the Government is in a position to increase the tariff for solar generation without impacting on consumption. In any case the tariff for solar generation should be increased to at least AUD23.99, if the Government wishes to maintain the current stock of panels in households not connected to the main electricity network.

5 Water, Sanitation and Waste Sector

This section analyses the provision of water, sanitation and solid waste disposal in Kiribati. We find that water is currently being extracted from natural reservoirs for the reticulated water supply at an unsustainable rate. This could cause salt water intrusion into the reservoirs. We propose increasing the water tariff which would both decrease demand for reticulated water directly and provide an incentive for homeowners to install tanks for collecting rain-water. Increased rain-water collection will also decrease the demand for centrally supplied water.

Sanitation is currently provided through a combination of central and onsite solutions. However, we find that both central and onsite solutions fail to meet a safe and hygienic standard. We propose the introduction of incentives for the managers of the sewerage utility and education programs combined with enforceable minimum hygiene standards for onsite solutions.

5.1 Service Standards

The Millennium Development Goals for water and sanitation aim to:

Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation

Essentially, water supply, sanitation and solid waste disposal should meet basic health needs. A reasonable service standard should give 100 per cent of people in Kiribati access to clean potable water. The World Health Organisation states that individuals require 30 litres of potable water and 70 litres of non-potable water per person per day. Meeting this standard will also require removing the risk of faecal contamination from the water supply, beaches and other human environments. Some facility should exist for the clean, safe disposal of general solid waste. A general convention applied to most urban environments is weekly collection and disposal to a land fill.

5.2 Water

We find that the service standard for water supply could be met effectively though promoting rainwater collection and improving central water supplies. In theory rain water could be used to supply all of Tarawa's water needs. In practice however, a prohibitively large quantity of water storage capacity is required. As a result it is inefficient to use water

stored from wet months to cover dry months and centrally supplied water will need to be used to supplement household water supplies.

5.2.1 Current State of Water Sector

Water in South Tarawa comes from 3 sources, water lenses, rain water collection and open wells. Water lenses, a geological formation that stores rain water, supply the reticulated network. Other sources are used for onsite supply.

The central water supply in South Tarawa is operated by the PUB and comes from one of two water lenses. Supply is through a constant flow arrangement that limits consumption. A flat tariff of AUD10 per month is charged for households connected to this service.

Since 2003 both the level of service and the number of consumers has decreased. There is a shortage of water. As a result water is rationed by cutting supplies every second day for 4-6 hours. Water pressure at the ends of the system is low. Because of this, some consumers have chosen to stop paying bills and have been disconnected by the utility. In fact, the proportion of the population connected to the main water distribution network has decreased by 30 percent since 2005.

The PUB states that no more than 1,700 m³ can be safely removed from the lenses daily. We understand that extracting water at high rates could lead to salination of the water lenses. However, a recent Asian Development Bank evaluation found that the PUB's is currently extracting water from the lenses at 2,040 m³, exceeding "safe limits" by almost 20 per cent. This contradicts the PUB estimate that daily household consumption is only 300 litres per household. As there are approximately 2,400 households connected to the system, this would imply that daily consumption should be approximately 720 m³—well within the PUB's safe extraction rate.

The high level of extraction from the water lenses and the relatively low levels of consumption indicate that Kiribati's water sector is experiencing high levels of loss. The PUB currently estimates unaccounted for water at 40 per cent. Further analysis of the water sector is needed to establish actual losses and to develop a practical strategy for rehabilitating the system.

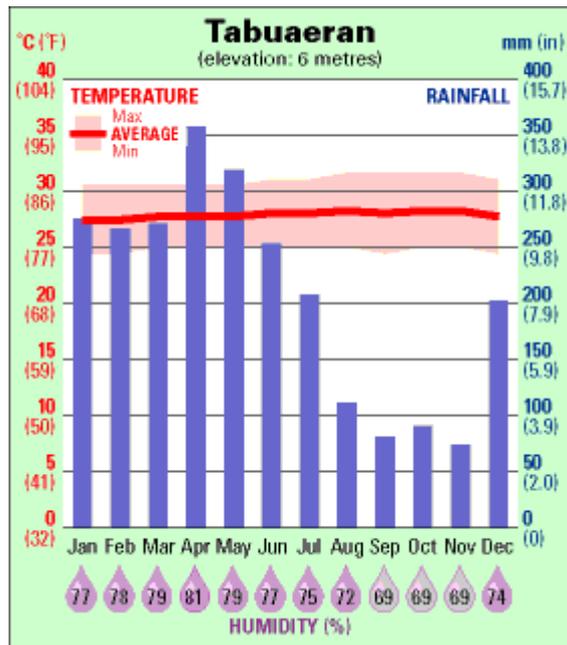
In addition, the percentage of the population using rainwater almost doubled from 23 per cent in 2003 to 43 per cent in 2005. This is probably a direct result of the low service standard caused by the high levels of system loss from the central water system.

5.2.2 Modelling a Reasonably Efficient System

Rainfall in the Northern Gilbert Islands which includes Tarawa is around 3000 mm per year⁸. Monthly rainfall data for Tarawa was not available, instead we have modelled monthly rainfall using data from Tabuaeran another Northern Hemisphere Island in Kiribati. The monthly data from Tabuaeran was scaled up so that the annual rainfall summed to the expected 3000 mm. From this we estimated monthly rain-water collection from a house with a roof surface area of 100 m². This monthly rain-water collection was used to determine how much rain would need to be collected during wet months, when rain collection exceeds consumption, to supply residents during dry months.

⁸ Retrieved from the BBC weather centre, www.bbc.co.uk/weather/world/country_guides/results.shtml?tt=TT005110

Figure 5.1: Rainfall Pattern



Source: Castalia

To achieve the service standard of 100 litres per person daily, an average South Tarawa household of 7.47 people would consume 22.7 m³ monthly. If the household is able to collect more than this from rainfall, they can store water to use in dry months. The table below shows that 48.9m³ of rain-water would need to be stored to make up for the shortfall in dry months. By comparison, large residential rain-water tanks in Australia are 5 m³—10 of these would be required to supply Tarawa households during dry months. This is clearly not feasible.

Figure 5.2: The potential for rain-water on Tarawa

| Month | Estimated Rain-Water Collected | Excess rain water collection |
|--------------|--------------------------------|------------------------------|
| December | 24.1 | 1.4 |
| January | 33.2 | 10.4 |
| February | 33.2 | 10.4 |
| March | 33.2 | 10.4 |
| April | 42.3 | 19.5 |
| May | 37.4 | 14.6 |
| June | 30.2 | 7.4 |
| July | 24.1 | 1.4 |
| Total | 257.7 | 75.5 |
| August | 12.1 | -10.7 |
| September | 9.7 | -13.1 |
| October | 10.9 | -11.9 |
| November | 9.7 | -13.1 |
| Total | 42.3 | -48.9 |

Source: Castalia

Our analysis suggests that rainwater can be collected as runoff from the roofs of homes and stored in medium-sized water tanks at a cost of approximately AUD2.9 per m³. A rain-water tank and guttering system costs approximately AUD4,550, and lasts about 10 years. This results in an annual average capital charge of AUD649.

We assume that the tank is too small to provide month-to-month storage, and is used to manage rainfall day-to-day. Hence, the amount of rain-water available for consumption is simply the amount collected during dry months, 42.3 m³, plus the amount consumed during the 8 months when rain-water collection exceeds consumption, 181.7 m³, which adds to a total of 225.4 m³. Dividing the AUD649 annual cost of a tank by the 224 m³ of useful collected rain-water gives a cost of AUD2.9 per m³.

The Sanitation, Public Health and Environment (SAPHE) project estimated that the operating cost of running Kiribati's current water supply arrangements efficiently is approximately AUD780,000 per annum. The South Tarawa system currently supplies 2,400 homes an average of 300 litres per day. Hence, the total annual water consumption on the system is around 262,800 m³ per year.

In other words, the operating cost of supplying water from the current system—ignoring all capital costs—is around AUD3 per m³. We have been unable to determine the capital value and therefore the annual capital cost of the water network. However, it is clear that the overall cost of water supply would be reduced—and the environmental and health outcomes improved—if households could be encouraged to substitute to roof-top water collection.

Water cannot be extracted from the water lenses at a rate greater than the safe limit, estimated at between 1,700 m³ and 2,050 m³ per day, without risking salination. However, supplying the total population of 46,000 people 100 litres per day would require extracting 4,600 m³ per day. Safely increasing the capacity of the central water system would therefore require more expensive options, like expanding the water lenses or using reverse osmosis.

Consequently, an efficient water supply system would combine incentives for rain-water collection with improved operations of the existing centrally supplied water system.

5.2.3 Reasons for Service Gap and Solutions

Overall, the shift away from the central water system towards a greater reliance on roof-top rainwater collection—while unintentional—represents a sensible trend. However, since the shift has occurred in response to poor service standards, rather than to sensible incentives, the overall outcome remains poor:

- The residual supply from the central system remains inefficient
- Households which rely solely on rain-water collection are either investing in inefficiently large storage tanks, or suffer water shortages during the dry period
- Households appear to be opting completely out of the centrally supplied water system, rather than optimising between rainwater collection and water reticulation.

In our view, it is important to establish appropriate incentives for the households. This suggests that the water tariff from the centrally supplied water system needs to increase to reflect true costs. In practice, water supplies are currently not metered. We suggest the Government consider increasing the monthly tariff to about AUD20, while investigating the introduction of metering. A metered volumetric tariff would provide appropriate incentives for households to choose when to draw on the centrally supplied water system.

The use of rain-water could easily be increased by either ending subsidies on reticulated water or by introducing subsidies for rain water collection. Currently, households who use rainwater incur the full cost of tanks, while households using mains supplies enjoy subsidised service, providing a perverse incentive for consumers to use reticulated services. Raising the tariff for reticulated mains services would eliminate this distortion and encourage efficient use of mains water by households.

Once the tariffs cover reasonable cost of providing the expected level of service, the management of the PUB could be held accountable for the commercial performance of the water utility.

5.3 Sanitation Service Standards

Similar to water supply, sanitation can be provided centrally or through on-site solutions, which vary in cost. The most expensive on-site solution is an installed septic tank.

Cheaper solutions, often applied in the PIC contexts, include pit latrines and composting toilets.

For a country like Kiribati, an acceptable service standard should be that all of the population have access to sanitation services that prevent contamination of potable water supplies and prevent disease. The current sanitation arrangements in Kiribati do not appear to meet this service standard.

5.4 Current State of the Sanitation Sector

In South Tarawa, approximately 40 per cent of the population (2,000 households) have access to flush toilets provided by the PUB. The remaining 60 per cent of the population use on site solutions. Pit latrines, septic tanks and atolette⁹ are common. We were unable to determine the prevalence of each method.

The central sanitation system, primarily in operation in operated in South Tarawa, is in a poor condition, suffering clogs and overflow on a regular basis—presenting a clear public health risk from faecal contamination of water supplies and the risk of disease . This situation is compounded through the use of poor and often inappropriate on-site sanitation solutions in both South Tarawa and the Outer Islands, which not meet hygienic standards.

Centrally supplied sanitation services in Kiribati appear to be delivered at a significant cost. The Sanitation, Public Health and Environment Improvement (SAPHE) project estimated the annual cost of operating the current system was AUD720,000. Therefore, effective recovery of operating and maintenance costs for the system would require each of the 2000 serviced households to pay \$360 per year. However, households currently pay no tariffs for sanitation services.

We estimate extending the central sanitation system to additional households will cost approximately AUD1,200 per additional household connected. Given this very high cost, the high operating costs of Kiribati's central sanitation system and the low ability of households to pay for such services, pursuing a strategy of extending on-site sanitation services is likely to be a preferable solution for achieving the desired service standard.

5.5 Possible Solutions

The failure of the service provider to deliver reliable services, and its inability to extend service due to lack of revenue, is leading to consumers choosing to make their own arrangements for sanitation. In the absence of enforceable regulation, consumers are able to choose sanitation solutions which may suit their lifestyle, but pose public health risk to the general community. The use of atolettes is one such practice which poses a public health risk.

Incentives need to be provided for the PUB which is the sanitation service provider, to improve services, and for consumers to use appropriate sanitation services. Achieving the desired service standard will involve:

- **Setting the right level of funding to secure effective operation and maintenance of central sanitation services.** The Government should seek to supplement the funding base by introducing a tariff for central sanitation service connections. Given the high cost and increased health risk to the community from poor sanitation, Government subsidies for sanitation services are justified. However, subsidies need to

⁹ An atolette is a simple toilet which empties into the lagoon.

be delivered in a way which incentivises the service provider to deliver an effective service, as well incentivising the population to adopt effective sanitation services. This may involve subsidising service connections (access) to the main sanitation network or subsidising on-site sanitation which the Government believes enable the desired service standard to be achieved

- **Incentives for Tarawa’s residents to change their sanitation behaviour** The Government should promote “safe sanitation” through community education programs, implementing regulation and minimum sanitation standards, and ensuring these standards are enforced.

Specific policies could include:

- Providing and promoting free composting toilets
- Banning toilets in South Tarawa
- Licensing and inspecting septic tanks and pit latrines, and
- Subsidising septic tank servicing.

5.6 Solid Waste Sector

Solid household waste in South Tarawa is collected on a weekly basis and disposed at a central landfill site. The service is supplied by two local governments—Betio Town Council (BTC) and Teinainano Urban Council (TUC). Both councils collect revenue for providing the service. Solid waste collection services appear to be operating at acceptable levels, although the Government is concerned about potential health and environmental risks at the landfill site. The available information we reviewed suggests that landfill equipment supplied by donors has not been maintained.

The SAPHE project estimated that the solid waste disposal services in Kiribati costs approximately AUD300,000 per year to deliver. BTC and TUC collected approximately AUD264,000 in fees from service operations, which is just below costs of providing the services. There also appears to be some evidence that both BTC and TUC are able to earn profit from providing the rubbish collection service. This suggests that some revenues which should have been used for the maintenance of the landfill equipment may be used for other purposes.

It would appear that the Government can address this problem through effective regulation and enforcement of landfill standards, including requiring the two councils operating the landfill to carry landfill insurance. This would create incentives for appropriate maintenance, and if necessary, for higher fees to recover full costs.

5.7 Sanitation Services on the Outer Islands

In the less densely populated Outer Islands, central water and sanitation solutions are more costly and less attractive. Policies encouraging the adoption of appropriate on-site sanitation solutions are more important. The remoteness of the Outer Islands makes maintenance of appropriate on-site sanitation solutions difficult. Therefore, the Government should consider arrangements which support communities on the Outer Islands in maintaining sanitation standards. This could include:

- Coordinating the purchase of water tanks
- Arranging travelling plumbers for remote communities

- Providing some basic plumbing education for Outer Island communities.

Health issues relating to sanitation and waste disposal are less of a risk in island areas with low population densities. However, we believe that education programs on safe sanitation in the Outer Islands are just as important as providing education in South Tarawa, particularly in rapidly growing settlement areas such as Kiritimati Island.

6 Port and Maritime Transport Sector

Unlike basic infrastructure services such as electricity, water and sanitation, service standards for port and shipping services are defined by commercial demand. That is, we would expect that a commercially justifiable service standard for port and shipping should be one which maximises total benefits from economic activity to the port authority and Kiribati as a whole.

Hence, the critical issue in the port and maritime transport sector is whether investment decisions are made on the basis of commercial considerations, or on the basis of other priorities. Since the Government is involved in such decisions, it is important to be clear about the drivers of investment.

As we explain below, the main issue in the maritime transport sector appears to be uneconomic investment—both in ports and in shipping—which delivers or is planned to deliver a level of service not necessarily required by the community. As a result, there is a risk that investment in these sectors, as well as on-going subsidies, would crowd out more productive investment in other infrastructure sectors.

6.1 Port Sector

It is difficult to determine the full capital (replacement) cost of the port. However, from the information we have reviewed, it would appear that additional investment of approximately AUD25 million would be required if the Government wants to upgrade the port to desired service standard of being able to handle 400 - 500 TEU per day per ship call. Currently larger vessels have to dock offshore and use a transfer boat to load and unload because the port is too shallow. This causes delays in unloading vessels of between two and three days. The port currently receives about two international vessels per month.

We estimate the annualised un-adjusted cost of capital for the upgraded port at around AUD2.12 million per year.

Container throughput averages around 6,600 TEU per annum, with a slight growth trend. Hence, container charges would need to be around AUD320 per TEU just to cover the cost of the upgrade. This excludes the current operating costs, or any recovery of the existing capital. We estimate that a tariff of AUD397 per container would be required to cover total operations and maintenance costs, as well as the capital costs of the upgrade. We understand that the current container charges are in the region of AUD50 per TEU.

At present, the inability of most ships to approach the international berth results in a slow container transfer rate, requiring 2 – 3 days to unload 400 – 500 TEUs. An upgraded berth would cut vessel call time to 1 day, saving vessel operators 2 days of port time.

At present, a vessel transferring 500 TEUs would pay AUD25,000 in terminal fees. The full cost of servicing such a vessel after an upgrade would be around AUD180,000. We

understand that an extra day of voyage time can cost a vessel operator approximately AUD10,000 in forgone revenue. Hence, the saving to the vessel owner from cutting the stay in Kiribati from 3 days to 1 day would be in the region of AUD20,000.

On this basis, the additional investment in the port does not appear to be justified. It may be more appropriate to allocate resources from development partners to other areas of infrastructure.

6.2 Shipping

The Government provides two maritime services from Tarawa, a port operation run from Betio by the Kiribati Port Authority (KPA) and a local shipping service operated by Kiribati Shipping Services Ltd (KSSL), which is wholly owned by the Government of Kiribati

KSSL owns four vessels which provide freight services to the Gilbert group of islands. It is not evident that the Government has a specific policy objective in maintaining KSSL in public ownership. The company is currently operating at a loss. Further analysis would be required to determine the viability of KSSL and opportunities for expanding KSSL's services to ensure its operating and maintenance costs can be met. However, given that KSSL already operates its services in competition with private companies in the region, we suggest that the conditions for potential privatization of KSSL exist.

7 Airport and Air Transport Sector

As we explain in this section, we find strong evidence that the upgrades planned for Bonriki airport will lead to an excessive level of service. We recommend the Government review what airport services are required. We also find that the provision of emergency air service capabilities is inefficient, costing more than necessary. We recommend that the provision of emergency services is tendered out

7.1 Service Standards

The primary function of an airport is to provide facilities to enable the take-off and landing of commercial freight and passenger flights. Given the traffic volumes, it is likely that the largest jet operating in Kiribati would be Boeing 737 or similar. This suggests that the reasonable standard of service for the airport facilities is the ability to service multiple Boeing 737 flights.

There is also a need for Kiribati to have access to aircraft emergency services, search and rescue facilities and medical evacuations. We understand that maintaining a capacity for these services at all times would require at least two aircraft capable of seating approximately 12 people. This type of aircraft would allow for the transport of medical personnel and equipment. Maintaining two aircraft ensures that at least one can remain operational while the other is being repaired.

7.2 The Airport

We do not have adequate information to determine what assets the Bonriki airport has, and what the economic cost of those assets would be. The Bonriki Airport in South Tarawa can accommodate a Boeing 737 and routinely handles international traffic.

One approach in these circumstances is to benchmark the Bonriki airport to similar airports where information exists about their replacement cost. In New Zealand, airports are required to report their Optimised Deprival Value (ODV) valuations. ODV is a

measure of depreciated replacement cost. A large domestic airport in Nelson and a small international airport in Christchurch have capital values of AUD7.3 million and AUD33 million, respectively¹⁰. Bonriki airport is a very small international airport with low numbers of departing international passengers, and an unknown number of domestic passengers. This would suggest that the replacement cost of a reasonable airport facility at Bonriki could be in the order of AUD15 million.

Using an estimated 20 year life of an airport, the annual cost of capital over the airport's lifetime is AUD1.4 million. We understand that the annual operating and maintenance expenditures of the airport have recently increased to about AUD0.7 million, giving a total annual cost of about AUD2.1 million. There are currently around 11,000 international departures each year. If we consider departures alone as a measure of consumption of airport services in Kiribati, an estimated cost (including return on capital) per departing passenger would be about AUD190.

To put it another way, if the airport was able to generate revenue of around AUD190 per outbound passenger, its income would cover all operating expenses, as well as the cost of replenishing its capital. Such revenue would be in line with revenues achieved by other airports (including landing fees, space rentals and direct passenger charges).

We understand that at present The Ministry of Communication, Transport and Tourism Development (MCTTD), which operates the Bonriki Airport, collects revenue of approximately AUD250,000. Clearly, there is a significant revenue shortfall, making the airport reliant on periodic donor injections, and ensuring that assets, once installed, are under-maintained. We understand that a AUD15 million upgrade is currently being discussed with external donors.

To make the airport financially sustainable, and to avoid the periodic need for massive upgrades, it would be necessary to raise airport revenue to the level which is consistent with the full cost of operating the airport. Air travellers, almost by definition, are either relatively well off, or are foreign nationals, and it is difficult to see why they should be subsidised by the Government. We have not been able to identify any evidence which would suggest that at full cost recovery travellers would not demand the airport's services.

The Government should consider institutional reforms which would drive the airport towards cost recovery, and a focus on providing the level of service required by the travellers and the airlines at the price they are willing to pay. One option is to create an independent airport authority, which would focus on achieving commercial performance objectives. Creating an independent public entity for managing the airport would encourage accountability and the potential for developing new revenue streams.

7.3 Air Services

Aircraft for emergency services and air transport are currently supplied by the Government owned Air Kiribati Ltd (AKL) AKL currently operates at a loss of approximately AUD1 million. However, as AKL relies on external partners for the provision of aircraft, it is likely that its estimated costs do not include the cost of capital, and hence the real economic loss from operating AKL is likely to be higher. AKL losses are, in effect, covered by the Government and the development partners.

¹⁰ Capital values are in AUD, calculated using an exchange rate of one NZD buying 0.788 AUD.

In principle, the Government should only be concerned with the availability of aircraft for emergency services. It is not clear why the Government should subsidise other air services.

The cost of providing access to aircraft for emergency services is essentially the annualised cost of capital for such aircraft. Two aircraft similar to those currently owned by Air Kiribati Limited can be purchased for approximately AUD5.25 million. Hence, the annual cost of owning these aircraft, including depreciation, would be around AUD500,000.

In other words, the Government could purchase access to available emergency aircraft for approximately half the annual subsidy it currently provides to AKL (not including any support from the donors).

It would appear that substantial savings could be achieved by separating the commercial operations of AKL from the provision of emergency services. The Government could tender out the provision of the emergency service availability.

Once this separation is achieved, the Government would be better able to focus on the commercial aspects of AKL's operations.

8 Telecommunications Sector

8.1 Service Standards

Telecommunications infrastructure is an important part of the economic infrastructure. A telecommunications service standard could be defined by consumer demand. However, information about willingness to pay for different levels of service is not available. From the Government's point of view, a reasonable minimum service standard might simply give all Kiribati residents access to either a mobile or landline as an economic and social objective. In South Tarawa, at least, there is strong demand for a variety and quantity of telecommunications services which surpass this basic standard.

8.2 Current Service

Two organisations currently supply telecommunications services in Kiribati, Television Kiribati Ltd (TKL) and Telecom Services Kiribati Ltd (TKSL). Both operate as semi-autonomous public entities.

TKL operates public access television, satellite television and internet services. TKL has not released detailed financial information on its operations, making it difficult to provide a detailed analysis of the viability of its operations. We understand that TKL is concerned about being exposed to competition. There is already limited competition from Sky satellite services.

Fixed line and mobile services operated by TKSL on Tarawa and Kiritimati Island are currently oversubscribed. In addition, fixed line services are at capacity with 5,000 landlines installed. Mobile service infrastructure on Tarawa can accommodate 10,000 connections. There are currently 9,900 allocated numbers, and the remaining 100 numbers are used for visitors. Plans are in progress to expand the system to accommodate 100,000 numbers, with a corresponding increase in capacity.

As the number of phone users in Kiribati increases, the benefit of owning a phone increases, since more people and businesses become contactable. This should lead to greater willingness to pay as the value of being on the network increases.

8.2.1 Internet services

From the information available, Kiribati appears to have around 540 internet subscriptions. As internet speeds are slow, the use of internet is limited to very basic applications such as email. Poor quality of electricity supply is a contributing factor to poor internet service quality.

The Telecommunications Authority of Kiribati (TAK) regulates telecommunications, collects revenues from licensing and sells .ki domain names. TAK is currently in discussions with Digicel to provide a mobile phone service in Tarawa.

8.3 The Way Forward

Within South Tarawa, the service level does not currently meet the required service standards, but is improving rapidly. TKL and TKSL operate relatively independently of the Government when compared to the PUB. Both organisations also face current or imminent competition from each other, Digicel and Sky. Independence and competition have to date delivered rapid expansion. Given current high demand and the increasingly competitive environment, services are likely to continue expanding and improving.

As the current approach is promoting competition and achieving acceptable service standards in Tarawa, we would not recommend any changes to policy.

8.4 Services in the Outer Islands

The service standard for Outer Islands should establish at least one reliable connection per settlement. This level of service will enable emergency services and basic commerce.

Outer island residents may not currently have a high demand for phones, but this will likely change as phone ownership on Tarawa increases. Poor service reliability in the Outer Islands also limits the usefulness of phone ownership in these areas. As the number of phone users in Tarawa increases, their demand for communications with all parts of Kiribati will also rise. Hence, willingness to pay for phone services in the Outer Islands may also increase, which we may lead to telecommunications providers improving services to match the increased demand.

In general, providing telecommunications services to remote areas with low population density comes at a greater cost per user. This is because the physical infrastructure required for long distances and in reaching disparate communities is more expensive, but number of users able to pay for services is smaller. This means that users must pay more in order to justify the higher cost of deploying telecommunications infrastructure.

Currently communications to the Outer Islands is poor. Islands close to Tarawa can be reached using high frequency radio. However, other islands have no telecommunications services. In the 1990s, the Government of Kiribati attempted to mandate that Telstra provide inter-island telecommunication services as a condition of its licence to operate in Tarawa as part of a joint venture. This caused Telstra to leave the joint venture, claiming that the Government's mandate rendered its continued presence in Kiribati unprofitable.

The proposed expansion of the Tarawa mobile phone network could lead to commercial opportunities to expand mobile and wireless services to the Outer Islands. As technology is rapidly developing, and demand for communications services on the Outer Islands is rising, the commercial viability of providing telecommunications services across all of the Outer Islands is likely to become more feasible. For example, we understand that Digicel is currently investigating opportunities to develop an inter-island communications network.

The Government may consider providing targeted assistance to ensure areas of Kiribati that are not considered commercially viable also receive upgraded communications services. Since making inter-island service a licence condition risks the departure of the potential operators, it may be more appropriate to invite tenders for the provision of inter-island telecommunications services.

9 Cross-Sectoral Institutional Issues

Our review of the infrastructure services in the preceding section suggests that there are a number of cross-cutting institutional issues which affect most of these services. Most sectors, with the exception of telecommunications, appear to be in a vicious cycle, where setting prices at below cost-recovery basis leads to poor maintenance, high costs, and reliance on periodic injections of capital from the donors.

In addition, not taking the cost of capital into account when setting prices, and treating capital as an essentially free good may lead to a significant misallocation of resources, including over-investment in some areas where the free provision of capital masks the lack of economic rationale for such investment. It appears that investment in the container berth is at risk of falling into that category.

The table below sets out the main organisations involved in the provision of the infrastructure services covered in this report. It would appear that the over-riding priority across all sectors is to separate policy setting and commercial operations.

Table 9.1: Institutions Involved in the Provision of Infrastructure Services

| Water, Sanitation and Waste Management | Electricity and Energy | Telecommunications | Airports and Aviation | Ports and shipping |
|--|---|---|--|--|
| Public Utilities Board (Water and sanitation for South Tarawa) - Public enterprise | Public Utilities Board (South Tarawa) - Public corporation Ministry of Works and | Telecom Services Kiribati Ltd (monopoly land and mobile. ISP) - Public enterprise | Ministry of Communications, Transport and Tourism Development (Airports) | Kiribati Port Authority (runs and maintains port assets) - Public enterprise. |
| Urban Councils (solid waste) – Elected local governments | Energy (rest of country) - Government department | Television Kiribati Ltd (TV and ISP) – Public Enterprise | Air Kiribati (domestic air service and seats on quasi-charter service Nadi-Kiritimati Island - no service on Line & Phoenix Islands) - Public enterprise | Chief Container Services (international freight between Australia & Tarawa) - Private company. |
| Island Councils (Outer Islands) Elected local governments | Kiribati Solar Power Company (rest of country) – Public enterprise | | Island Councils (maintenance of Outer Island Airstrips) – elected local governments | Kiribati Shipping Services Limited (domestic shipping) - Public enterprise. Private services provided to inner islands and Kiribati. Small private sector shipping operators |

Delivering a reasonable level of service in any infrastructure sector requires that utilities are given both reasonable funding and reasonable goals. When revenues from all sources do not cover reasonable costs, it is not possible to achieve a good level of service or to address inefficiencies adequately. Without the right goals, and incentives to meet those goals, managers will simply be unmotivated to perform. This two pronged approach of pursuit of reasonable funding and clear goals is naturally found in private businesses, but must be consciously put in place when infrastructure is owned by the government.

Tariff setting should become more independent from day-to-day political considerations. In essence, tariffs need to be set at a level which covers reasonable costs, and Government bodies responsible for setting tariffs need to have some capability to assess costs and to make their decisions transparent.

The setting of commercial objectives for the service providers would complement a regulatory policy which ensures that tariffs cover reasonable costs. At present, where tariffs are clearly below cost, and where managers are simply not able to meet any reasonable objectives, it is not possible to hold them to account for performance. As soon as tariffs reflect full costs, it becomes possible to make managers accountable for performance. Where customer tariffs are supplemented by subsidy for social reasons, it may be possible to tender out the provision of the subsidised service. This would ensure that public enterprises cannot use the universal excuse that their poor commercial performance is due to the provision of non-commercial services.

Finally, government departments and public entities consume a large portion of infrastructure in Kiribati and are notorious non-payers. Failing to refuse service to government departments who do not pay creates an expectation that service will not be disconnected in the future, which encourages non-payment. In addition, non-payment of intra-government obligations again provides public enterprises with a universal excuse for their non-performance.

10 Annex 1: Background Tables

Table 1: Gross Annual Aid Disbursements, Average 1992-2002 and 2006

| Country | Human Development Index ¹¹ (2005) | Annual Average 1992-2002 | | 2006 | |
|---|--|--------------------------|-----------------------|-------------------------------------|-------------------------------------|
| | | Aid as Percent of GNI | Aid Per Capita (US\$) | Aid as Percent of GNI ¹² | Aid Per Capita (US\$) ¹³ |
| Fiji | 0.762 | 3 | 68 | 2.04 | 3,300 |
| Kiribati | 0.515 (1998)¹⁴ | 21 | 194 | 16.1¹⁵ | 269¹⁶ |
| Marshall Islands | 0.563 (1998) | 51 | 1,124 | 28.5 | 3,000 |
| F.S. of Micronesia | 0.569 (1998) | 43 | 883 | 41.35 | 2,380 |
| Palau | 0.861 (2000) | 74 | 1,727 | 23.52 | 7,990 |
| Samoa | 0.785 | 19 | 238 | 11.28 | 2,270 |
| Solomon Islands | 0.602 | 18 | 138 | 60.55 | 680 |
| Tonga | 0.819 | 19 | 297 | 9.62 | 2,170 |
| Vanuatu | 0.674 | 18 | 211 | 13.64 | 1,710 |
| Average EAP (excl. Fiji) | | 33 | 602 | 18.86 | 2,679 |
| Average Africa | | 20 | 165 | n/a | 22 |
| Average ALL Low Population Countries | | 14 | 190 | -1.09 | 10 |

¹¹ Based on average life expectancy at birth, adult literacy, gross school enrollments and adjusted GDP per capita.

¹² CIA The World Factbook. (2008) United States Government. Viewed July 13, 2008. <https://www.cia.gov/library/publications/the-world-factbook/>

¹³ World Bank (2007).

¹⁴ Latest available data.

¹⁵ Based on communication with AusAID Kiribati to correct the anomaly in OECD figure for Australian ODA to Kiribati in 2006.

¹⁶ Consultant estimate based on adjusted ODA figure (see footnote 5) and 2005 national census population figure.

Table 2: Progress Toward Achieving Millennium Development Goals, Kiribati 2007

| Goal and Indicator | Progress |
|--|-------------------------|
| <i>Goal 1: Eradicate extreme poverty and hunger</i> | |
| Proportion of Households below \$1 (PPP) per day. | n/a |
| Prevalence of under-weight children under 5 years of age | n/a |
| <i>Goal 2: Achieve universal primary education:</i> | |
| Primary school enrolment | Early achievement |
| Reaching Grade 5 | No progress, regressing |
| Primary school completion rate | Early achievement |
| <i>Goal 3:</i> | |
| Gender primary | Early achievement |
| Gender secondary | Early achievement |
| Gender tertiary | n/a |
| <i>Goal 4: Reduce child mortality</i> | |
| Under-five mortality rate (CMR) | Slow |
| Infant mortality rate (IMR) | Slow |
| <i>Goal 6:</i> | |
| HIV prevalence | n/a |
| TB prevalence rate | Early achievement |
| TB death rate | Early achievement |
| <i>Goal 7: Ensure environmental sustainability</i> | |
| Forest cover | On track |
| Protected area | Early achievement |
| CO2 emissions | No progress, regressing |
| ODP CFC consumption | On track |
| Water urban | Slow |
| Water rural | On track |
| Sanitation urban | On track |
| Sanitation rural | Slow |

Source: MDG Indicators Website (2008) United Nations. <http://mdgs.un.org/unsd/mdg/Data.aspx>.

Table 3: Comparative Health Care Indicators

| Indicator | Kiribati (1997-2003) | East Asia Pacific | Lower-Middle Income Countries |
|---|---------------------------------|------------------------------|--|
| Health expenditure as % of GDP | 7.9 (13.1% in 2003) | 1.9 | 2.7 |
| Children (12-23 months) immunized against measles (%) | 88 | 82 | 86 |
| Children (12-23 months) immunized against DPT (%) | 99 | 86 | 88 |
| Births attended by skilled health staff (%) | 85 | 87 | 86 |
| Child malnutrition (% of under-5s) | 13 (1985-1990) | 15 | 11 |

Source: World Bank (2006)

Table 4: Comparative Health Indicators

| Indicator | Kiribati (1997-2003) | East Asia Pacific | Lower-Middle Income Countries |
|---|---------------------------------|------------------------------|--|
| Life expectancy at birth | 63 | 70 | 69 |
| Infant mortality (per 1,000 live births) | 49 | 32 | 31 |
| Under-5 mortality (per 1,000 live births) | 66 | 41 | 39 |
| Adult (Male) mortality (per 1,000 population) | 269 | 179 | 213 |
| Adult (Female) mortality (per 1,000 population) | 208 | 122 | 131 |

Source: World Bank (2006)

Table 5: Infrastructure and services providers

| Water, Sanitation and Waste Management | Electricity and Energy | Telecommunications | Roads and Land Transport | Airports and Aviation | Ports and shipping |
|--|--|---|---|--|--|
| Public Utilities Board (Water and sanitation for South Tarawa) - Public enterprise | Public Utilities Board (South Tarawa) - Public corporation Ministry of Works and Energy (rest of country) - Government department | Telecom Services Kiribati Ltd (monopoly land and mobile. ISP) - Public enterprise | Ministry of Public Works (routine maintenance of primary roads, runways) | Ministry of Communications, Transport and Tourism Development (Airports) | Kiribati Port Authority (runs and maintains port assets) - Public enterprise. |
| Urban Councils (solid waste) – Elected local governments | | Television Kiribati Ltd (TV and ISP) – Public Enterprise | Ministry of Internal & Social Affairs (through Urban and Island Councils) (secondary roads – routine maintenance). ODA (capital investments for new primary roads and restoration [large scale] maintenance) | Air Kiribati (domestic air service and seats on quasi-charter service Nadi-Kiritimati Island - no service on Line & Phoenix Islands) - Public enterprise | Chief Container Services (international freight between Australia & Tarawa) - Private company. |
| Island Councils (Outer Islands) Elected local governments | Kiribati Solar Power Company (rest of country) – Public enterprise | | | Island Councils (maintenance of Outer Island Airstrips) – elected local governments | Kiribati Shipping Services Limited (domestic shipping) - Public enterprise. Private services provided to inner islands and Kiribati. Small private sector shipping operators |

Table 6: Priorities in Public Expenditure (National Level)

(% Total Budget¹⁷ Expenditure-Actual)

| Sector | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 (Budget - planned) |
|-------------------------------|------|------|------|------|------|------|----------------------------------|
| Education | 18% | 25% | 21% | 25% | 27% | 24% | 25% |
| Health | 11% | 16% | 14% | 16% | 16% | 15% | 16% |
| Infrastructure | 7% | 9% | 8% | 9% | 10% | 9% | 10% |
| Envir. Lands & Agriculture | 2% | 3% | 3% | 3% | 3% | 3% | 3% |
| Fisheries | 3% | 2% | 2% | 2% | 2% | 2% | 2% |
| Debt servicing | 1% | 0% | 0% | 0% | 0% | 3% | 1% |
| Subsidies, grants & other | 21% | 13% | 27% | 18% | 14% | 15% | 13% |
| Contribution to Dev. Fund | 15% | 4% | 3% | 1% | 0% | 0% | 0% |

Source: Government of Kiribati 2003, 2004, 2005, 2006, 2007, 2008 Budgets

¹⁷ Recurrent Budget and Development Fund.

Table 7: Expenditure (Actual) on Infrastructure (National Level)

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| TOTAL Expenditures on Infrastructure (current (AUD)) | 11,180,263 | 19,093,808 | 18,424,411 | 19,922,144 | 11,188,213 | 12,712,790 | 18,379,648 | 17,984,494 |
| Recurrent | 6,324,647 | 6,699,430 | 7,412,824 | 7,896,273 | 7,098,603 | 7,923,017 | 8,045,906 | 8,095,279 |
| Capital (Development) Expenditure | 4,855,616 | 0 | 8,158,359 | 9,127,458 | 1,834,437 | 1,131,254 | 9,194,501 | 9,227,215 |
| Subsidies (no direct link with Ministry operations) | 0 | 12,394,378 | 2,853,228 | 2,898,414 | 2,255,173 | 3,658,519 | 1,139,241 | 662,000 |
| TOTAL Expenditures on Infrastructure (constant 2000 AUD) | 11,180,263 | 18,425,525 | 18,148,045 | 19,623,312 | 11,020,390 | 12,522,098 | 18,103,953 | 17,714,726 |
| Recurrent | 6,324,647 | 6,464,950 | 7,301,632 | 7,777,828 | 6,992,124 | 7,804,171 | 7,925,217 | 7,973,849 |
| Capital (Development) Expenditure | 4,855,616 | 0 | 8,035,984 | 8,990,546 | 1,806,920 | 1,114,285 | 9,056,583 | 9,088,807 |
| Subsidies (no direct link with Ministry operations) | 0 | 11,960,575 | 2,810,430 | 2,854,937 | 2,221,345 | 3,603,642 | 1,122,152 | 652,070 |
| Total Budget Expenditure (Actual, current prices AUD) | 66,163,000 | 90,995,222 | 96,014,000 | 85,538,000 | 94,025,000 | 85,920,000 | 82,071,000 | 85,320,000 |
| As % of national budget (incl. relevant subsidies) | 17% | 21% | 19% | 23% | 12% | 15% | 22% | 21% |
| As % of Total GDP (incl. relevant subsidies) | 7% | 11% | 11% | 14% | n/a | n/a | 19% | 22% |
| Per capita expenditures on infrastructure (constant prices) | \$130 | \$210 | \$203 | \$216 | \$119 | \$133 | \$189 | \$181 |
| As % of Total GNI (incl. relevant subsidies) | 4% | 6% | 6% | 8% | n/a | n/a | 11% | 13% |

Source: Government of Kiribati 2003, 2004, 2005, 2006, 2007, 2008 Budgets.

Table 8: Activities of Public Enterprises

| Public Enterprise | Main Activities | Responsible Ministry |
|---------------------------------|---|-----------------------------|
| Air Kiribati | Domestic air travel | MCTTD |
| Betio Shipyard Ltd | Ship repair and ship building services, upholstery and retailing of hardware goods. | MCTTD |
| Kiribati Ports Authority | Operation of the main international port in Betio, Kiritimati and Tabuaeran | MCTTD |
| Kiribati Shipping Services Ltd. | Provision of domestic shipping services | MCTTD |
| Public Utilities Board | Supply of electricity and water and wastewater collection on South Tarawa | MPWU |
| Solar Energy Company Ltd. | Provision of solar power systems outside South Tarawa. | MPWU |
| Telecom Kiribati Ltd. | Cable Television in South Tarawa and Internet Service Provider. | MCTTD |
| Telecom Services Kiribati Ltd. | Provision of domestic and international ICT services. | MCTTD |

Source: Castalia

Table 9: Estimate of Public Enterprises Capital Expenditures (Own Source Revenue), 2007¹⁸

| Expenditures from Entity Own-Source Revenues ¹⁹ | 2007 |
|--|--|
| Capital Expenditures (in current AUD) | > AUD1.31 million |
| PUB (Water, sanitn, sw) | 0 |
| PUB (Power) | 0 |
| KSEC | |
| TSKL | n/a |
| TKL | n/a |
| Air Kiribati | 0 ²⁰ |
| KPA | AUD530,000 |
| KSSL | AUD775,000 ²¹ |
| Recurrent Expenditures (in current AUD) | >AUD18.2 million (of which an estimated AUD8.5 million on O&M) |
| PUB (Water, sanitn, sw) | AUD480,000 |
| PUB (Power) | AUD3 million in debt |
| KSEC | AUD20,000 |
| TSKL | AUD5,000,000 (2005) (AUD4m arrears on sales) |
| TKL | AUD400,000 |
| Air Kiribati | AUD 8.3 million ²² (of which AUD0.6 million for maintenance) |
| KPA | AUD250,000 |
| KSSL | AUD650,000 (O&M of fleet) |
| Total PE Infrastructure Expenditure(in 2002 constant AUD) | |
| Capital Expenditures | AUD1.3m |
| Recurrent Expenditures | > AUD17.9m (of which an estimated >AUD8.5 million on O&M) |

¹⁸ Verifiable data is extremely limited.

¹⁹ i.e. Excludes expenditure from national budget.

²⁰ New capital expenditure is not reported on in the annual accounts.

²¹ Purchase of new ship \$5.2 million amortized over ten years at concessional interest rate.

²² Figures for 2007: Repairs & maintenance = \$0.6m; Total Operating cost = \$8.3m; Total Revenue = \$2.6m; Operating Profit (Loss) = (\$5.7m)

Table 10: Council Revenues and Expenditures

| All Councils | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|-------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Revenues (current AUD) | 2,967,476 | 3,435,163 | 3,813,781 | 3,531,287 | 3,576,210 | 3,801,325 |
| Expenditures (current AUD) | 2,946,160 | 3,337,468 | 3,696,131 | 3,577,996 | 3,576,799 | 3,785,480 |

Source: Urban Council Budgets and, for Island Councils, MISA records

Table 11: Total Net Disbursements Official Development Aid to Kiribati, 1997-2006

(Current Prices, US\$ millions)

| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|--------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|
| TOTAL | 14.2 | 16.97 | 19.55 | 14.79 | 10.37 | 18.68 | 12.83 | 10.06 | 21.32 | 24.9 |
| Japan | 6.7 | 8.54 | 12.08 | 7.7 | 2.57 | 8.84 | 3.7 | 1.18 | 11.69 | 9.8 |
| Australia | 4.93 | 4.99 | 4.5 | 4.86 | 5.39 | 7.17 | 6.03 | 5.43 | 7.01 | 6.34 |
| N.Z. | 2.44 | 2.03 | 2.27 | 1.7 | 1.54 | 1.56 | 2.13 | 2.05 | 1.68 | 2.0 |
| EU | 0.64 | 0.55 | 0.75 | 1.01 | 0.35 | 0.85 | 2.73 | 3.76 | 4.2 | 4.1 |
| | | | | | | | | | | |

Source: OECD Database.

Note: 2006 figures in OECD are erroneous due to a reporting error from Australia. The 2006 figure has been adjusted in consultation with the AusAID office, Tarawa.

Table 12: Donor Reported Funding for Infrastructure

| | Investment 1998 – 2002 | | | Investment 2003-2007 | | |
|---------------------------|------------------------|-----------|----------------------|----------------------|---------------------|----------------------|
| | (Actual) | | | (Actual) | | |
| | Capital | Recurrent | Total | Capital | Recurrent | Total |
| Water supply | AUD46,000 | 0 | AUD46,000 | AUD995,000 | AUD100,000 | AUD1,095,000 |
| Sanitation | 0 | 0 | 0 | AUD135,000 | AUD14,000 | AUD149,000 |
| Water/San/ Solid Waste | AUD20,800,00 | 0 | AUD20,800,00 | AUD1,172,000 | 0 | AUD1,173,000 |
| Electricity | AUD19,000,00 | 0 | AUD19,000,00 | AUD21,026,00 | AUD500,000 | AUD21,526,000 |
| Land Transport | 0 | 0 | 0 | AUD11,362,00 | AUD30,000 | AUD11,392,000 |
| Sea Transport | AUD35,790,00 | 0 | AUD35,790,00 | AUD9,255,000 | AUD132,000 | AUD9,387,000 |
| Air Transport | 0 | 0 | 0 | AUD1,182,000 | AUD4,717,000 | AUD5,899,000 |
| TOTALS | AUD75,636,000 | 0 | AUD75,636,000 | AUD45,127,000 | AUD5,493,000 | AUD50,621,000 |

Source: Castalia: Personal interviews with external donors, including bilateral and multilateral donors and concessional lenders.

Notes: No data provided by China

Table 13: Source of Funds for Infrastructure by Subsector Grouping (2003-2007)

| | Internal (%) | External (Development Partners) (%) |
|--|--------------|---|
| Total | 50% | 50% |
| <i>of which:</i> | | |
| Basic Services - Water, sanitation, solid waste, roads, electricity | 46% | 54% |
| Air and Sea Transport & Communication | 57% | 43% |

Source: Government of Kiribati 2003, 2004, 2005, 2006, 2007, 2008 Budgets (Internal) and data provided directly by development partners (External).

Table 14: Summary of Consolidated Expenditure on Infrastructure by Source of Funding, 2007 (AUD'000 current prices)

| | Total (AUD'000) | Central Govt. ²³ (own source) | External dev. assistance | PEs ²⁴ (own source) | Island and Urban Councils | NGO and Hhold |
|--|---------------------------|---|--------------------------------|--------------------------------------|------------------------------------|---------------------|
| | | | | | | |
| Total (capital) | 10,335 (42.5%) | 0 | 9,025 | 1,310 | 0 | n/a |
| Total (O&M) | 13,966 (57.5%) | 3,643 | 1,098²⁵ | >8,230 | 975 | n/a |
| <i>of which:</i> | | | | | | |
| Water , sanitation & solid waste mgt.(capital) | | | 461 | 0 | | |
| Water, sanitation & solid waste mgt.(operations and maintenance) | | | 23 | >480 | 220 | |
| Telecoms (capital) | | | 0 | n/a | | |
| Telecoms (O&M) | | | 0 | n/a | | |
| Power (capital) | | | 4,205 | | | |
| Power (O&M) | | | 100 | >3,000 | | |
| Roads & Land transport (capital) | | | 2,272 | | | |
| Roads & Land transport (O&M) | | | 6 | | 755 | |
| Port & marine transport (capital) | | | 1,851 | 775 | | |
| Port & marine transport (O&M) | | | 26 | 850 | | |
| Airports & air transport (capital) | | | 236 | 530 | | |
| Airports & air transport (O&M) | | | 943 | 3,900 | | |

²³ Includes subsidies with direct link to Ministries.

²⁴ Includes subsidies from central government with no direct link through Ministries.

²⁵ Excludes an amount of AUD3 million annual subsidy to Kiritimati Island route, announced September 2008.

11 Annex 2: Figures

Figure 1: Map showing location of Kiribati

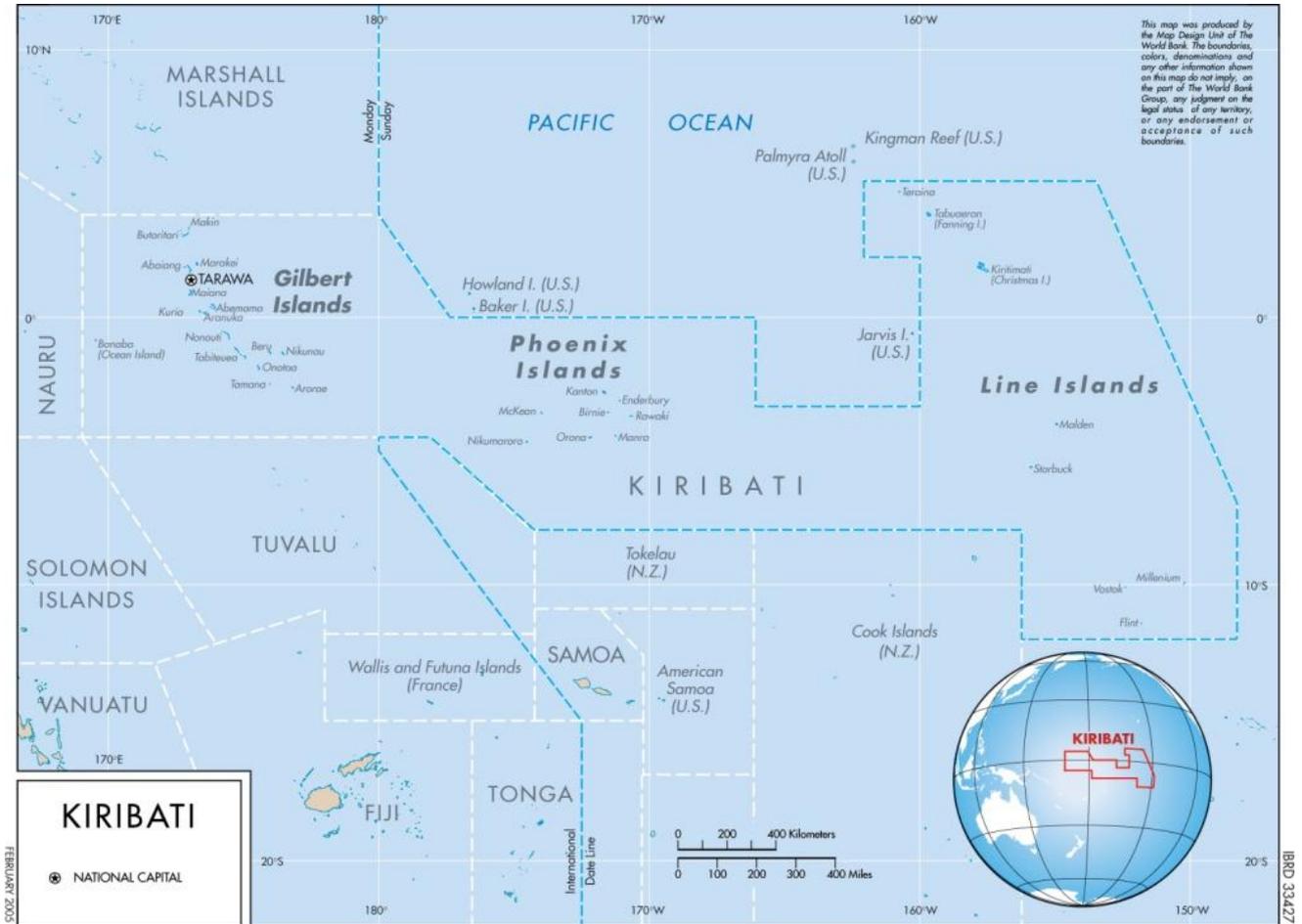
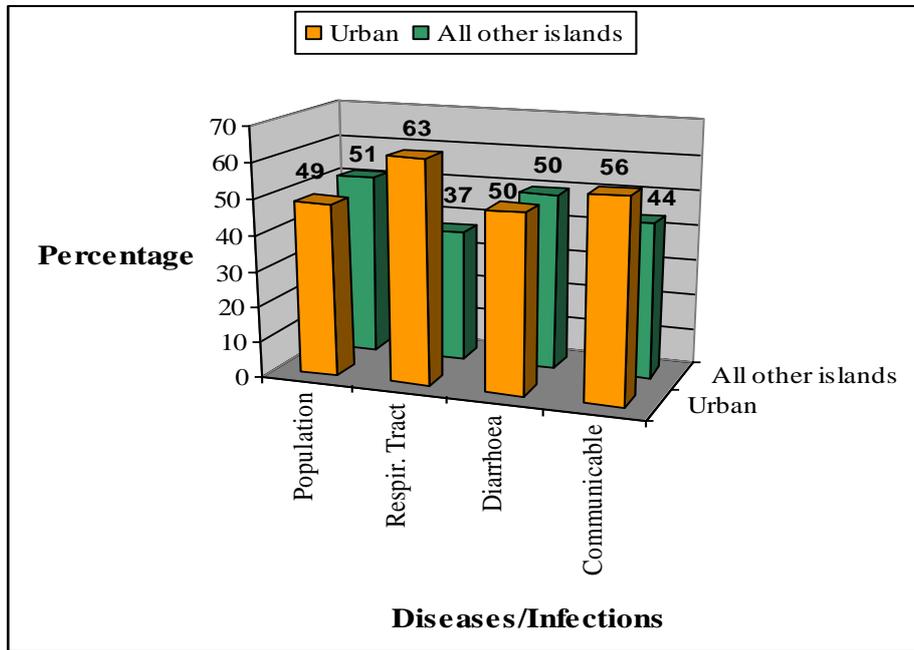


Figure 2: Numbers of Respiratory Infections, Diarrheal & Communicable Diseases



Source: Ministry of Health Data 2006

Figure 3: Gross Domestic Prices at Constant Prices – Annual Percentage Change

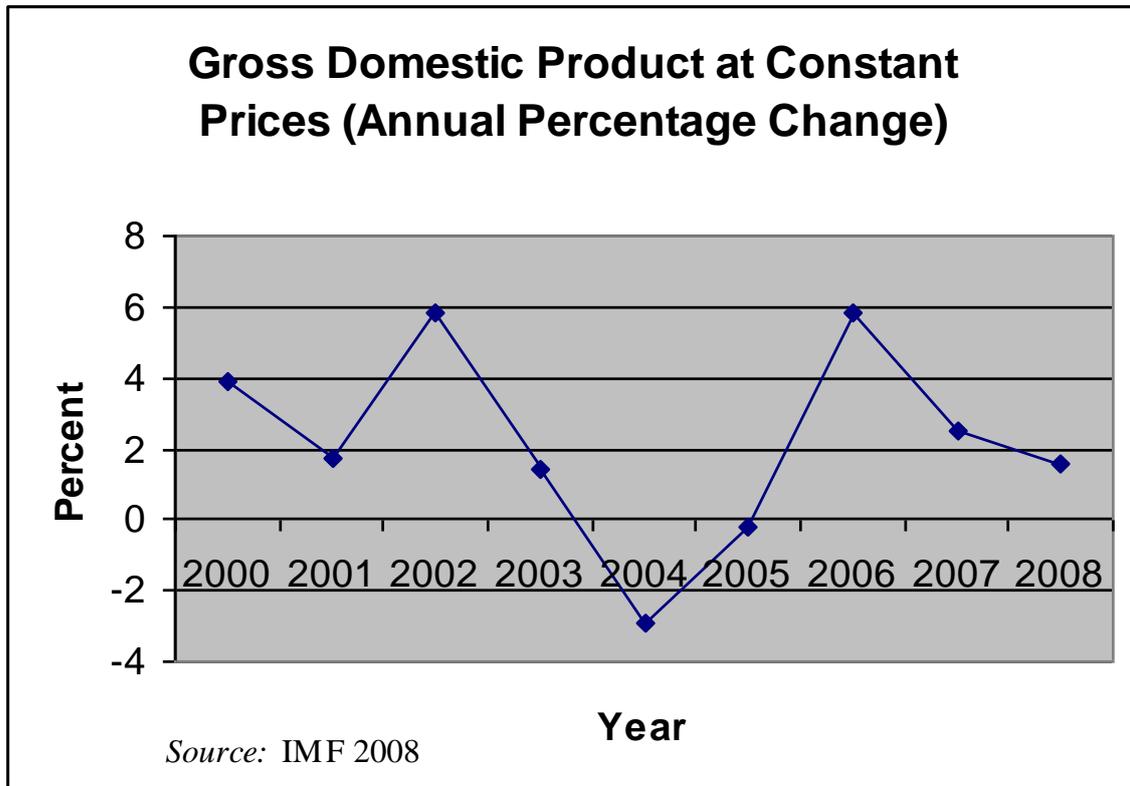


Figure 4: External Factor Income as % of GDP

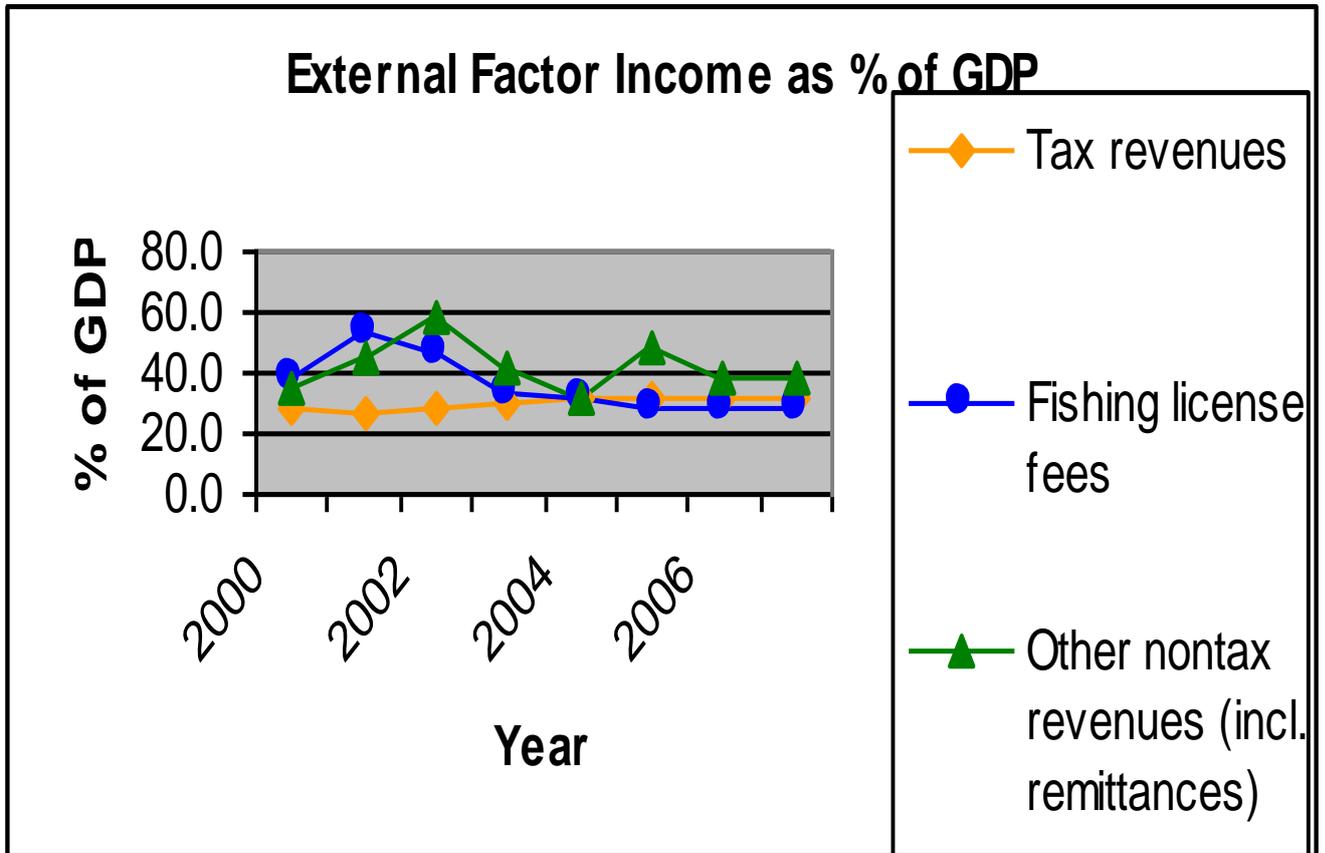


Figure 5: Gross National Income at Current Prices – Ann. % Change

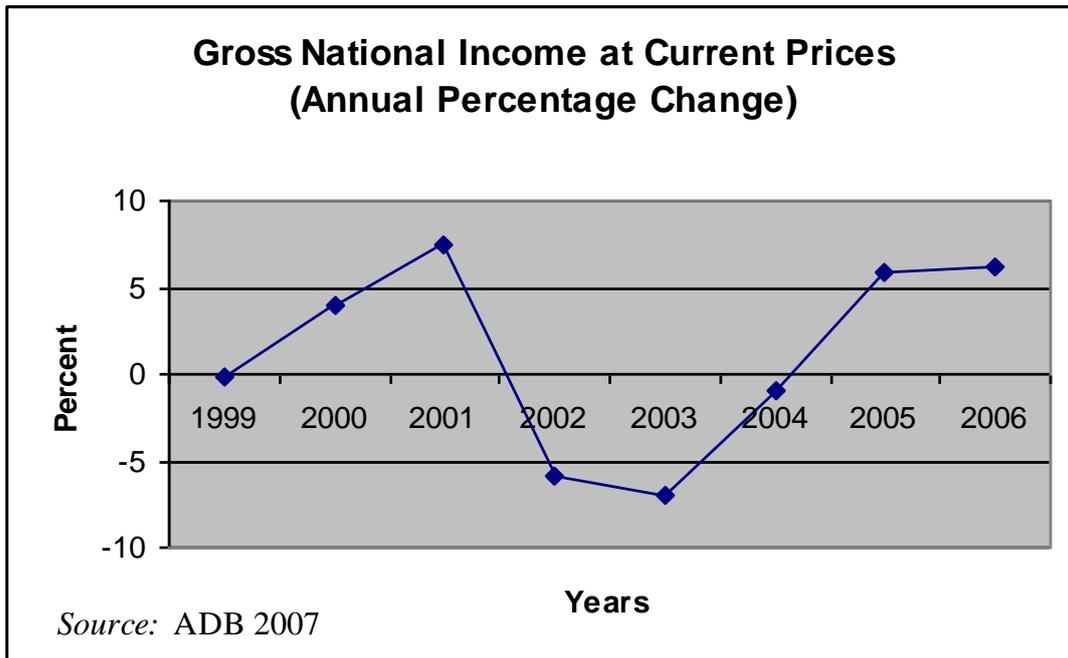


Figure 6: Current Account Balance - % of GDP

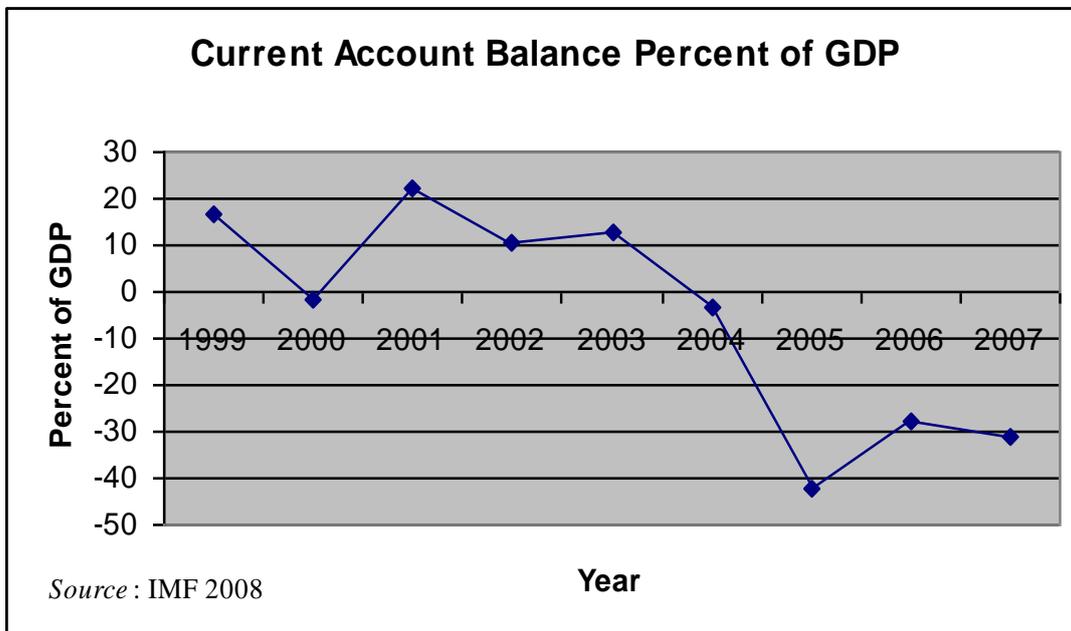


Figure 7: Central Government Revenue and Recurrent Expenditure

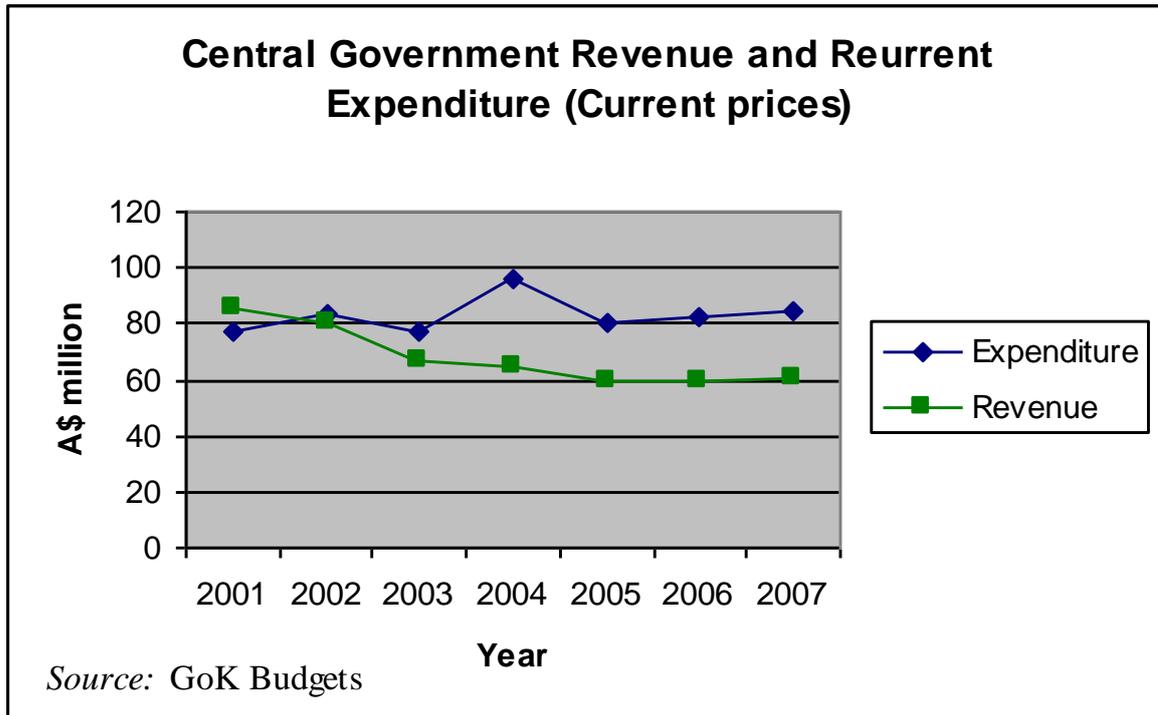


Figure 8: Revenue Equalisation Reserve Fund

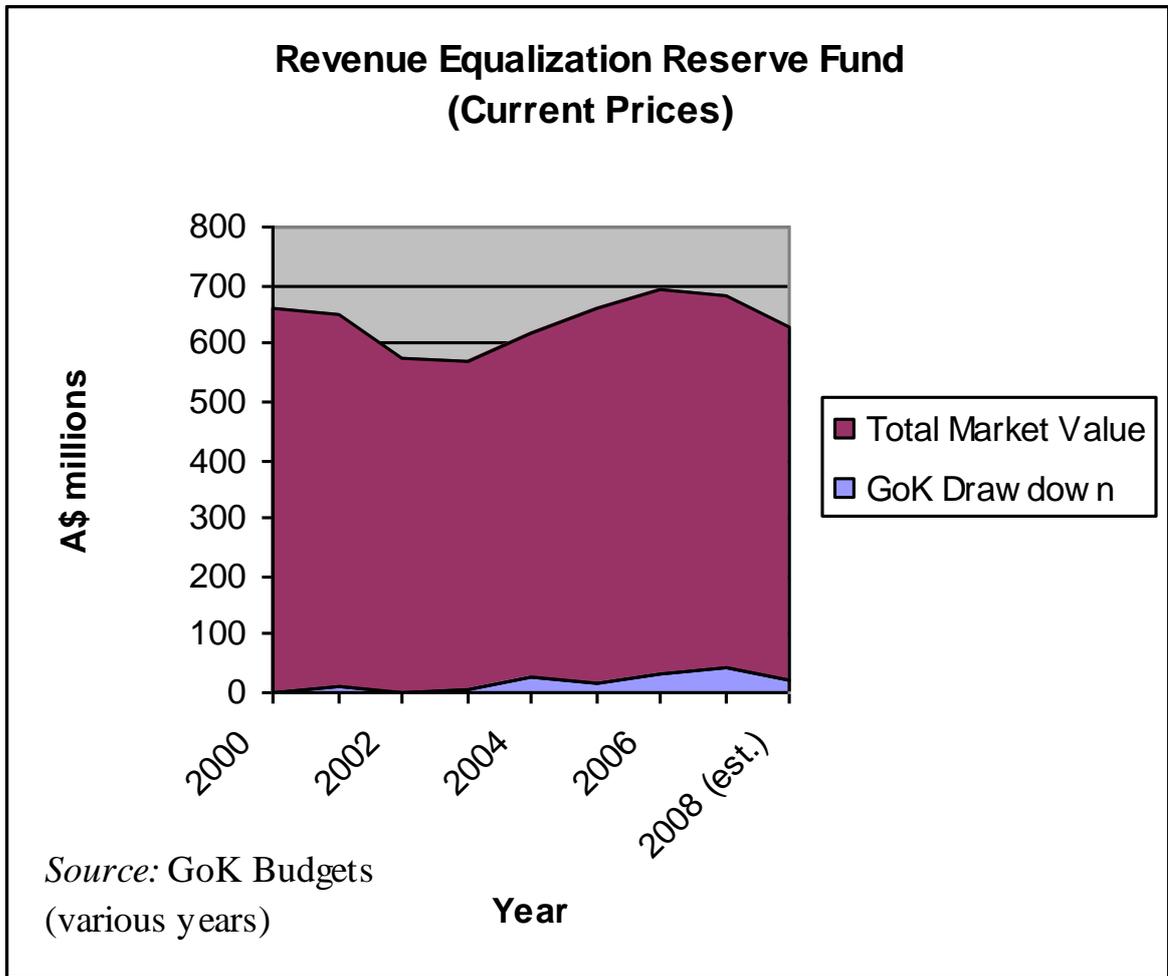


Figure 9: Development Fund – Capital Budget (Planned and Actual)

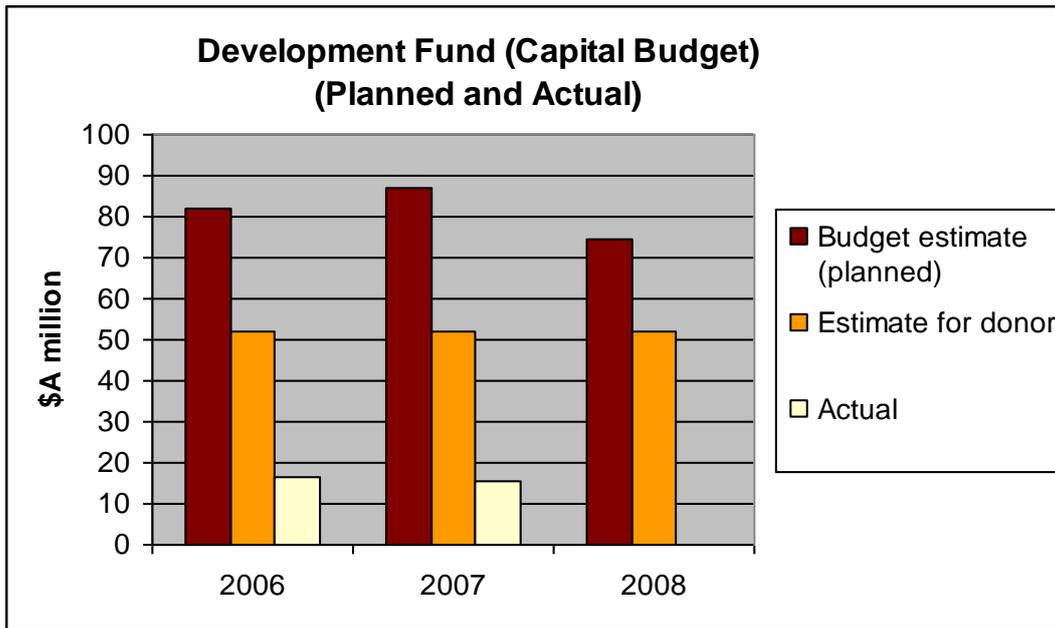
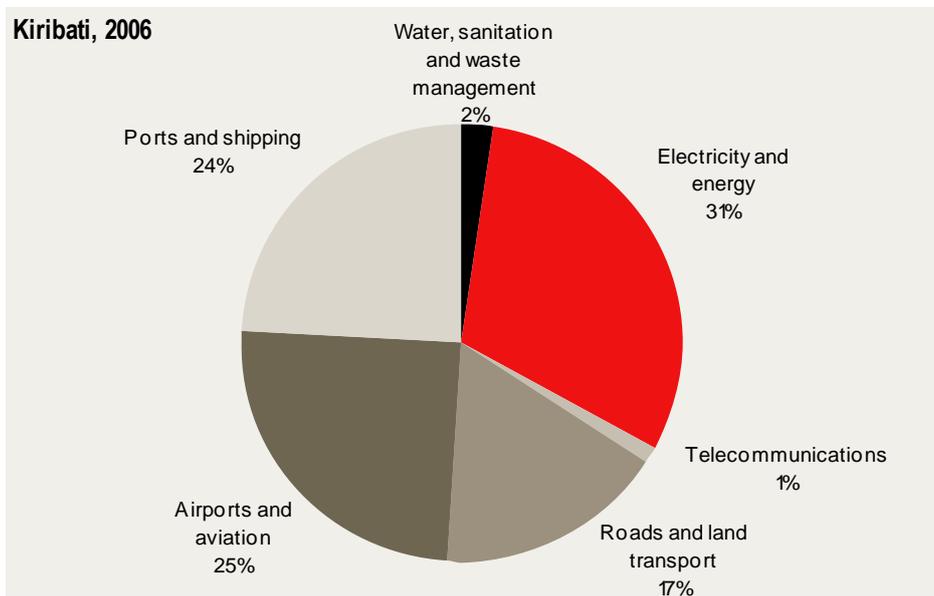


Figure 10: Planned Total Expenditures by Government (with Donor Support) by Infrastructure Sub-sector (2006)



Source: AusAID (2007).

Figure 11: MWPU and MCTTD 2006 Budget

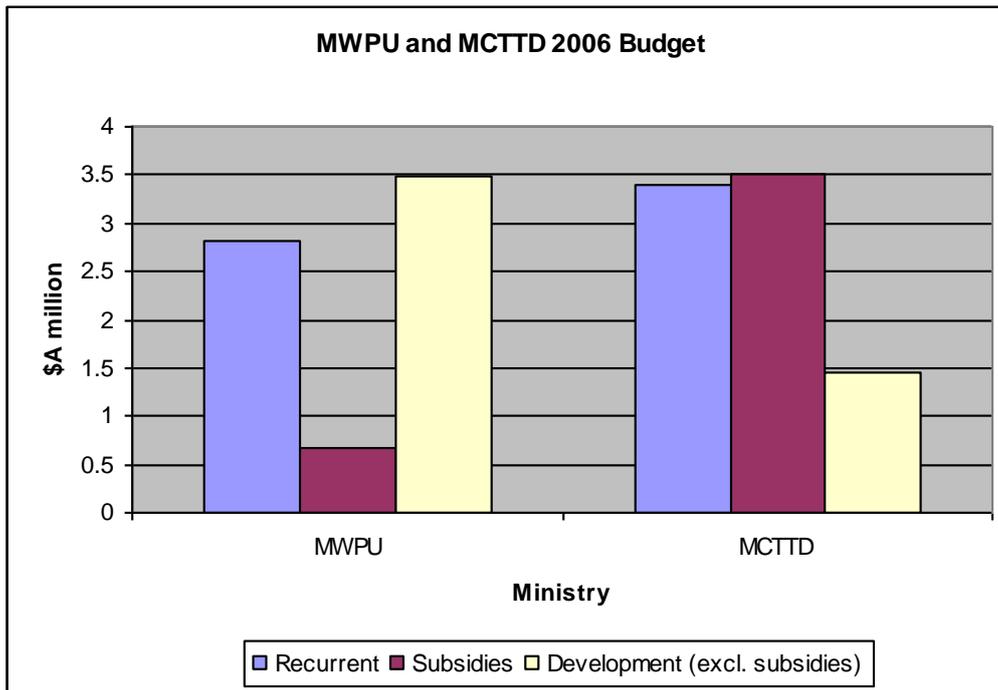


Figure 12: Local Government – Revenue and Expenditure

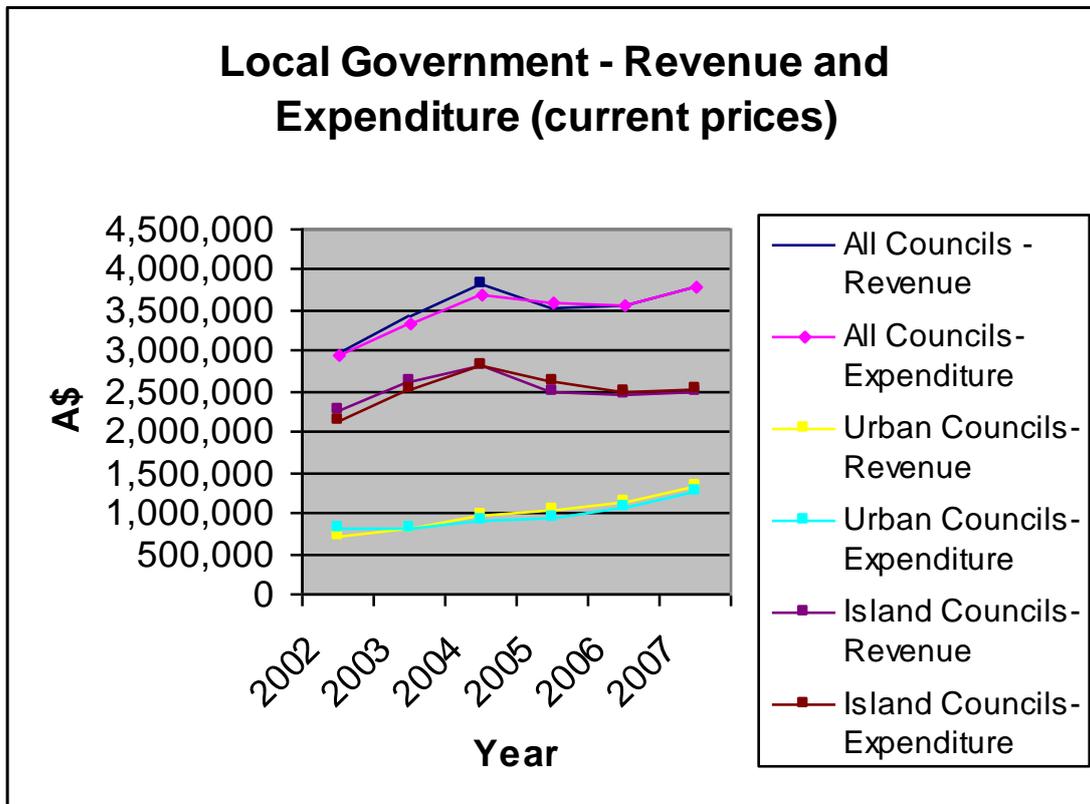
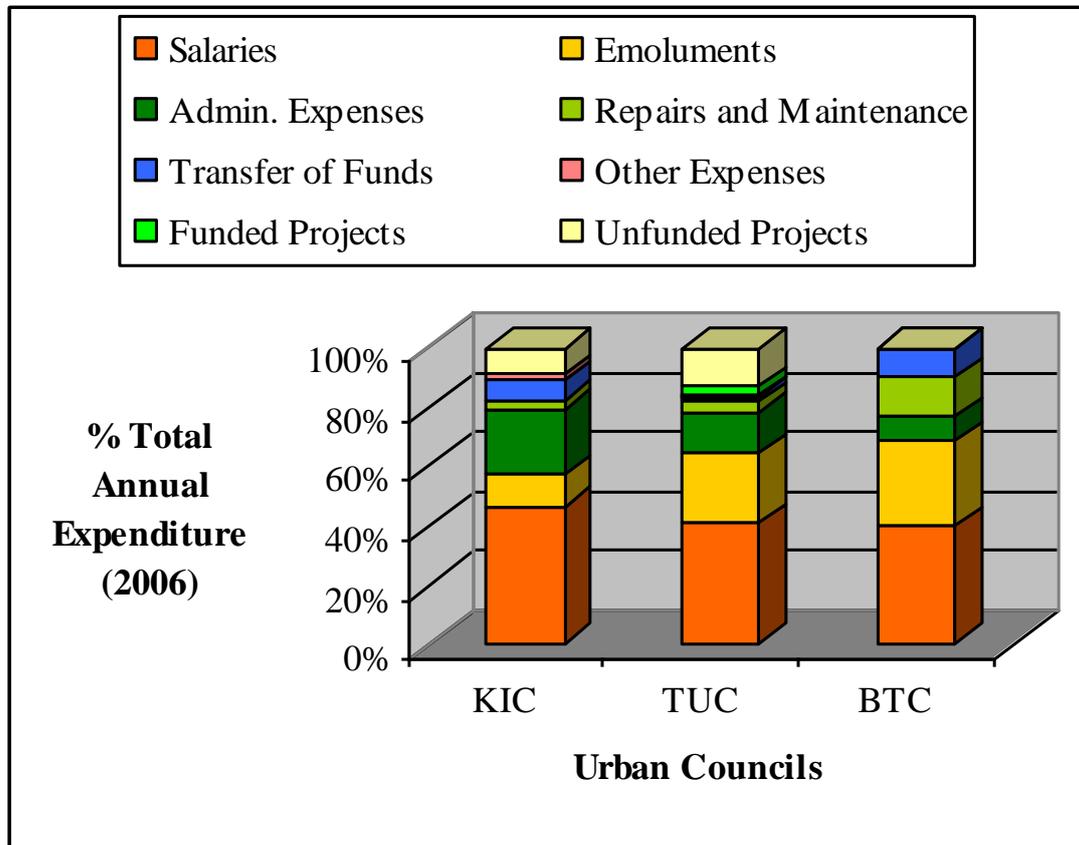


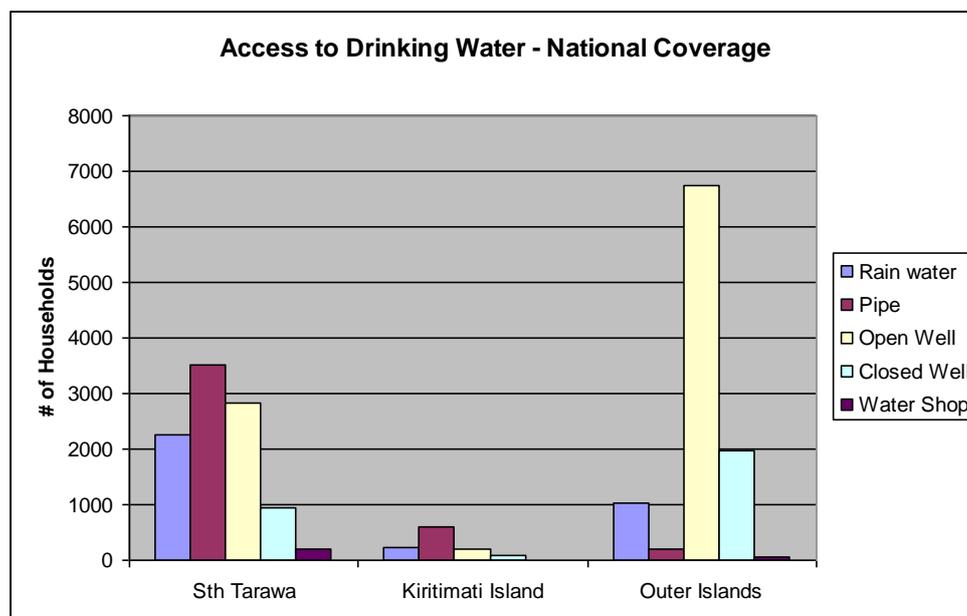
Figure 13: Local Government Expenditure by Purpose



12 Annex 3: Sectoral Analysis

1 Water Sector

Figure 14: Access to Drinking Water – National Coverage



Source: National Population Census, Government of Kiribati (2005a).

1.1 South Tarawa

- South Tarawa's domestic water supply comes from:
 - rainfall
 - shallow wells, and
 - treated water through the piped distribution system of the Public Utilities Board (PUB).
- In 2003 (after SAPHE project) 3,500 (67% of total 5,250 establishments) consumers were connected.
- the number of connections is now approximately 2,400 and thus current coverage is only about 46 percent of establishments in South Tarawa
- Decrease is due to disconnection of non-payers or vandalism.

1.1.1 System Losses

- Losses in the systems have been estimated by the PUB at about 40 percent
- ADB PCR suggests that leakage reduced from 70 percent to 20 percent as a result of replacement works under the project.

1.1.2 Water Consumption

- The PUB estimates the average consumption is currently about 300 litres/household/day.
 - This equates to 40-50 litres/capita/day.
- Constant Flow Arrangements:
 - Provide between 200 and 500 litres per day per household or an average of 50 litres per person per day
 - Supplies 2000 households.

1.1.3 Service Quality

- Water quality meets minimum requirements in about 99 percent of tests.
- System supplies water for 4-6 hours every second day.
- Pressure in the system is poor.

1.1.4 Freshwater lenses

- The PUB get freshwater from the Buota and Bonriki **freshwater lenses**.
 - SAPHE project claimed to have increased limit from 1,300 m³/day to just under 2,000m³/day
 - PUB consider the safe yield of the lenses is in the order of 1,700 m³/day.

1.1.5 The SAPHE Project

- The most recent ADB supported Sanitation, Public Health and Environment Improvement Project (**SAPHE**) aimed to provide improvements to South Tarawa's water supply (as well as sewerage, saltwater flushing system and power supply system).
- Under the SAPHE Project the water treatment plant (chlorination) at Bonriki was upgraded from 1,400 m³/day to 2,050 m³/day of potable water
- Additional galleries were installed at Bonriki and with other system modifications were said to increase the safe yield from 1,300 m³/day to just under 2,000m³/day
- However the PUB consider the safe yield of the lenses is in the order of 1,700 m³/day.
- A total of 3,200 of the connections were upgraded to Constant Flow Household connection arrangements.
- The SAPHE Project Completion Report that followed the project states:
 - The number of households with rainwater tanks has increased from 23 percent of households in 1995 to 43 percent in 2005.
 - Over 50 percent of households use open wells for all or part of their supply.
 - The PUB's current extraction rate from the water lenses exceeds safe yield by more than 20 percent.
 - In 2005 the average quantity of water supplied was approximately 54 litres/capita/day.

1.2 Kiritimati Island

- Kiritimati Island has approximately 470 consumers.
- Charges are AUD0.0015 per litre up to 15,000 liters per month and AUD0.002 per additional litre.
- AUD40 is levied for connection to the system.
- Consumers also pay for pipe, meter and tank installation
- Total connection and installation costs are often around AUD450 according to the Water Supply Division (WSD).
- The WSD reports that payment of monthly bills is poor.
- Arrears around the beginning of 2007 stood at approximately AUD70,000
- According to WSD some 100 consumers were disconnected in the year 2006-07.
- Some consumers receive potable water by tanker at a cost of AUD2.5 per 1000 litres.
- The water systems in the four camps are poorly maintained.
- The following repairs need to be made testing, maintenance and repairs to infiltration galleries, pumping systems, pipelines, chlorinators, tanks and tank stands.
- Losses in the systems have been estimated by the Water Supply Division at about 30 percent.
- New flow meters are required at gallery pumps to determine the extraction rates from the water lenses and to ensure that sustainable yields are not being exceeded.
- Further metering devices are required throughout the water supply system to better monitor supply and demand for the future

1.2.1 Freshwater lenses

- There are 4 main freshwater lenses located at Decca, Four Wells, Banana and New Zealand Airfield.
- The Kiritimati Water and Sanitation Project (KWASP) tapped the lenses and provided chlorinated supply to populations at London, Tabwakea, Banana, Main Camp and Poland.
- The majority of the population on Kiritimati are served with improved pipe water supplies.
- Minor lenses in at most settlements but are often contaminated with faecal matter or brackish water.
- Contamination from on-plot sanitation is a problem in Banana. The government intends to move the residents from Banana to 'New Banana'.

1.2.2 Rainwater

- There is a cultural preference for ground water over rainwater.
- Rainwater for drinking, and local well groundwater for toilet flushing, is used to augment supply as necessary.

- Approximately 20 percent of households use rainwater and a similar number use open wells.

1.3 Outer Islands

- Sources of water in the Outer Islands are:
 - Freshwater lenses through the construction of open wells
 - Rainwater collection.
- The very approximate distribution of freshwater access is:
 - Two-thirds through open wells
 - 20% accessing closed wells.
 - 10% percent accessing rainwater from tanks
 - 2% percent through piped water supplies.
- There are a lot of water tanks available but residents have a preference for ground water over collected rainwater.
- Banaba:
 - Has no freshwater resources available on the island
 - Is completely reliant on rainwater
 - Has large water storage infrastructure remains on the island
 - Has a small desalination plant able to support 300+ people which is currently not working.
- In response to the challenges in supplying water in the Outer Islands the Government has been expanding access to solar powered pump and reticulation systems on a cost recovery basis.

1.4 Institutional Summary

1.4.1 South Tarawa

- The PUB has four departments Water Engineering, Administration, Finance and Power Engineering
- Water Engineering is responsible for water supply and sewerage operations.
- The PUB has a Board of Directors answerable to the Minister of Public Works and Utilities and an Appointment Panel.

1.4.2 Kiritimati Island

- The Water Supply Division under the Ministry of Line and Phoenix Islands (LINNIX) is responsible for water supply on the island.

1.4.3 Outer Islands

- Water technicians have been recruited to all Island Councils and have the role of a technical resource for the ongoing operation and maintenance of all existing water supply systems.

1.5 Recent Projects and Proposals

1.5.1 South Tarawa

- The PUB has suggested a follow up project to SAPHE “Water Supply Extension and Sewerage Improvement to Designated Areas in South Tarawa” the project would:
 - extend water connections to more households in South Tarawa including Betio that were omitted from the SAPHE project; Increasing coverage to around 80% of South Tarawa households
 - construct two new elevated tanks (22,000 litres each) to improve pressure, and;
 - purchase water meters to install on all connected premises to enable volumetric charging.

Leak Detection and Repair Program

The Kiribati Adaptation Project II (KAPII) is primarily focused on policy outputs but included funding a consultant to assess the leak detection component and an interim report was prepared following the consultant’s visit in late November 2007. The report observed that:

- No information of the test zone established under the SAPHE project was available and whether losses were reduced;
- Equipment provided under the SAPHE project for leak detection was not used nor were PUB staff familiar with its use;
- A pilot zone was identified in the eastern end of Betio for detailed leak detection;
- If leakage is found in this zone then the issue of where valves are and excavation of the “new” main road will arise;
- Ideally the system needs modelling if leak detection is to be totally successful;
- Because of the nature of the reticulation system and its intermittent supply, water pressures may be too low and this, and a lack of fittings, means alternative leak detection methodologies may need to be employed such as Ground Penetrating Radar and Gas Detection;
- The Gas Detection method is considered the most appropriate and is recommended as it may be cheaper (equipment estimated at only AUD12,000) than conventional leak detection and requires less skill than the Ground Penetrating Radar method.

1.5.2 Outer Islands

- The 1990’s, Outer Islands Community Water Supply Project (OICWSP) built new wells and galleries on Outer Islands in the Gilbert Group but at a distance from villages, pit latrines and animals.
 - Water was delivered by either solar pumps or hand pumps, residents prefer solar pumps.
 - Most of these systems were not maintained and are no longer working.
- The EU, under EDF10 financing will support improved water and sanitation in the Outer Islands.
 - A 6.7 million Euro project will start in late 2008
- The project:

- will provide support for technical assistance, awareness materials, and workshops, improve water resource management, and revise building codes to enhance opportunities for water and sanitation on the Outer Islands.
- will support water resource assessments and physical improvements in water supply at selected locations,
- establish an Outer Island community development scheme for roof catchments, water storage, and sanitation.

1.6 Costs, Funding and Sustainability

1.6.1 South Tarawa

- The PUB currently applies a standard charge for domestic consumers for water consumed of AUD10 per month.
- Metered commercial consumers pay AUD5 per m³ and tanker/communal tap users pay AUD5 per household per month.
- Current arrears in payment for water are approximately AUD500,000.
- According to the PUB water sales are exceeding water supply operational costs so far in 2008 (AUD129,000 vs. AUD116,000). Although these operational costs do not include depreciation of assets nor actual electricity supply costs.
- The fee for connection to the system is AUD20
- Connecting a household, using constant flow arrangements, costs the PUB an average of approximately AUD550
- The SAPHE project financial analysis suggested required operating costs of approximately AUD780,000 per annum (AUD 325 per connection) assuming hidden power supply costs are included.

1.6.2 Outer Islands

- The Government “Policy on Outer Island Water Supply Systems: Revolving Fund”, sets out a regime for financing operational and maintenance costs associated with community solar powered pumps for the extraction and distribution of potable water to households.
- The regime involves the payment of user fees set at AUD2 per month to the Island Council. This fee is expected to cover all ongoing costs for the pump.

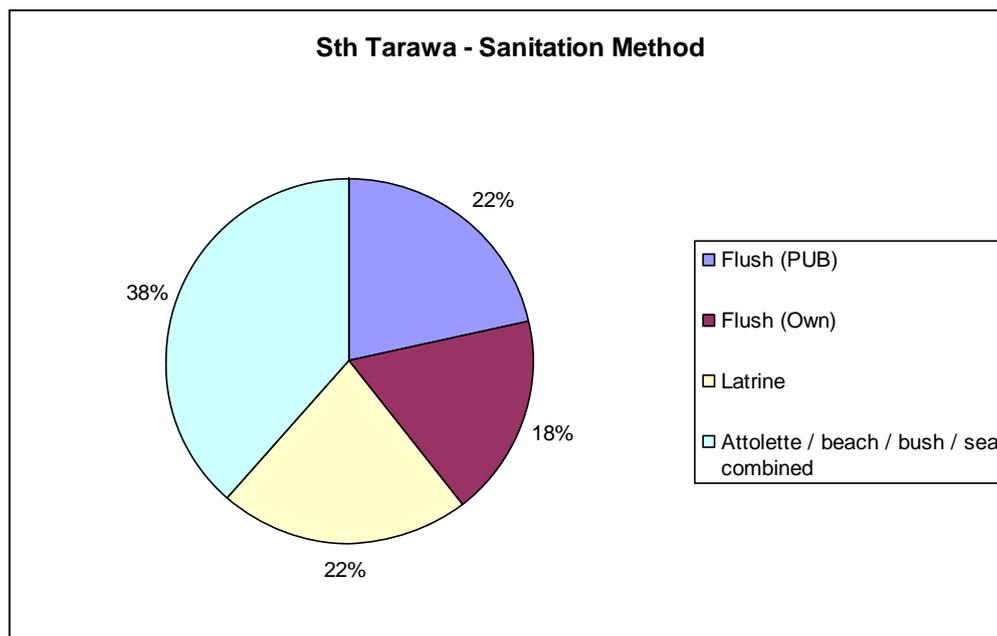
2. Sanitation

2.1 Existing Situation

2.1.1 South Tarawa

- Sanitation is by flush toilets to the central sewerage system, flush toilets to septic tanks, pit latrines, compost toilets or the beach.
 - The PUB also supplies a salt-water flushing system.

Figure 15: South Tarawa – Sanitation Model



The Sewerage System

The sewerage system has about 2,000 premises connected to it (approximately 40 percent of the total).

- The sewage collected is discharged to the sea at three locations.
- Pumps are poorly maintained
- There is no primary treatment (e.g. screening) and there are currently no plans to expand the system.
- Reticulated saltwater is used to flush toilets connected to the sewerage system
- There is no tariff for service

The SAPHE project:

- Improved and maintained the sewerage system adding:
- Additional sewers to connect more houses including

- Improving 400 existing house connections,
- Rehabilitating 19 existing pumping stations and
- Providing of one new pumping station,
- Repairing manholes
- Extending and repairing three existing sea outfalls
- Connecting all Government houses to the system.
- Improving saltwater pumping stations, by:
 - Adding a new 23 cubic meter elevated storage tank and
 - Improving the seawater intake chambers and galleries.
- The Environment Department is concerned that the outfalls pollute the beaches and observation would support this.
- The SAPHE project also supplied high pressure pipe cleaning equipment which is no longer operational.

2.1.2 Kiritimati Island

- There is no reticulated sewerage system on Kiritimati Island:
- Most wastewater disposal from residential and commercial premises is to septic tanks.
- Approximately half of the households use pour / flush toilet and a further
- 16 percent using pit latrines.
- 36 percent use open defecation by atolette, or in the beach, bush or sea.
- Septic tanks overloading is a problem, exacerbated by increasing household size
- The responsible authority (WSD of LINNIX) has no vacuum tanker to empty septic tanks.
- Most of the household sanitation systems on Kiritimati Island were established under KWASP completed in 2003,
- Many of these are now suffering from operational problems
- The KWASP project piloted the use of approximately 150 compost toilets. They were unpopular.

2.1.3 Outer Islands

- More than three-quarters of households use outdoor defecation by attolette (toilet raised above a lagoon), beach, bush and sea.
- 18 percent of households using pit latrines.
- 4 percent of households with some form of improved pour flush toilet.

2.2 Institutional Summary

At a national level, a National Water and Sanitation Coordination Committee (NWSCC) has been formed to provide a single point of contact for donors on water and sanitation projects and to act as a forum to develop a strategic approach to the development of water and sanitation proposals. At an island level, institutional arrangements vary:

- **South Tarawa:** The Sewerage Section of PUB is responsible for the sewerage and saltwater flushing system.
- **Kiritimati:** The Water Supply Division of LINNIX is responsible for sanitation.
- **Outer Islands:** Given the limited sanitation infrastructure in the Outer Islands there are no formal institutional arrangements for the installation and maintenance of assets. It is likely that the water technician employed by the island council on each island would assume responsibility for sanitation issues.

2.3 Costs, Funding and Sustainability

2.3.1 South Tarawa

- Connection to the reticulated sewerage system costs users AUD200.
- The Government currently budgets to fully subsidize the PUB sewerage operations.
- For 2008, approximately AUD450,000 is budgeted to pay for system operation and maintenance for the sewerage and saltwater flushing system or about AUD300 per household.
- The PUB operates a vacuum tanker for desludging its own facilities and septic tanks.
- The PUB charge AUD50 for desludging residential households and AUD100 for commercial premises.

3. Solid Waste Management

3.1 Existing Situation

3.1.1 South Tarawa

Teinainano Urban Council

- Solid waste is collected by the two South Tarawa Local Councils – Betio Town Council (BTC) and the Teinainano Urban Council (TUC).
- Teinainano Urban Council (TUC), until recently, had two garbage collection vehicles
- A tractor and trailer are also used for garbage collection.
- The council collects rubbish about once a week
- Waste is deposited in a new landfill site located to reclaim “land” in the longer term. The site is:
 - Protected from the sea by a protection wall.
 - Not operated as a sanitary landfill
 - apparently not lined and thus leachate is a potential problem to the environment.
 - an environmental problem and potential health hazard.

Betio Town Council (BTC)

- BTC has three vehicles although two are said not to be operational.
- The working vehicle is a “roll on–roll off” vehicle which serves two containers as in TUC (SAPHE).

- Waste is deposited in a new landfill site located to reclaim “land” in the longer term. The site is:
 - located to reclaim “land”
 - protected from the sea by a protection wall which has failed in places.
 - not operated as a sanitary landfill
 - not lined and thus leachate is a potential problem to the environment
 - fenced but the gates are always open and scavenging is carried out by humans and animals
 - an environmental problem and potential health hazard
- A recycling system was contracted out to a private operator about 18 months ago, the contract term is 3 years and is working successfully. The features of the scheme are:
 - Government charges importers of drink cans and plastic bottles an additional AUD0.05 per can or bottle and vehicle batteries AUD5.
 - This money goes into a dedicated fund at Ministry of Finance called the Package Deposit Fund.
 - Five collection points are strategically located throughout South Tarawa. People with cans/bottles take them to the collection points and are paid AUD0.04 per can/bottle by contractor’s staff at each of the collection points. They are deposited in 100 can or 500 can baskets. Plastic bottles are individually counted.
 - Baskets are taken to crushing machine and crushed into 500 can “biscuits”. Plastic bottles are crushed in a seaweed crushing machine.
 - These biscuits are then loaded into a ship’s container on pallets for ease of loading and off-loading and each container can hold 860,000 cans.
 - On a weekly basis the contractor submits a claim to Ministry of Finance for the number of cans/bottles crushed and is paid AUD0.05.
 - The AUD0.01 retained by the contractor covers his operating costs.
 - Containers of crushed cans are shipped to Australia and bottles to India. Most of contractor’s profit comes from the cans shipped to Australia.
 - Six containers per year are currently being shipped to Australia.
 - Twelve persons are employed on the scheme.
- The scheme benefits the poor as income from cans is often the only income for some families.

3.1.2 Kiritimati

- Solid waste is collected by the Kiritimati Island Council
- The Council uses a two tonne flat bed truck and employees three staff for collecting waste from London to the airport.
- There is no formal collection in Poland.
- Collection of solid waste is haphazard.
- Householders and businesses use old oil drums and open ground to deposit waste.
- Waste, in residential areas, is collected approximately once every 2 weeks.
- There are two dump sites:
- One in Tabwakea, where waste is dumped, often burned and occasionally covered. Proper sanitary land filling practice is not applied.

- The other, in Banana, is a properly engineered hazardous waste disposal site. This site is lined and is used for disposal of medical and hospital waste.
- Households have a variety of methods for disposing of waste:
- Around 10 percent of solid waste is deposited at organized collection points,
- Approximately one third of households use a pit to dispose of solid waste and
- A further third dispose of waste in 'other places' such as in the open and through incineration.

3.1.3 Outer Islands

- There is no formal system of collection and disposal of solid waste in the Outer Islands. Most waste is disposed of in a pit, the open, at the beach (around 25%) or incinerated.

3.2 Institutional Summary

3.2.1 South Tarawa

- Teinainano Urban Council (TUC) employs 80 staff of which about 26 work on the SWM service.
- Betio Town Council (BTC) employs around 63 staff of which about 15 work on the SWM service.

3.2.2 Kiritimati

- Collection and disposal operation of solid waste on Kiritimati is now run by the Island Council.

3.3 Recent Projects and Proposals

- An aluminium can recycling facility has been established adjacent to the Tabwakea disposal site on Kiritimati Island.
 - This facility is privately operated by the Japanese supported Kiritimati Clean-Up Foundation (CCUF).

3.4 Costs, Funding and Sustainability

3.4.1 South Tarawa

- The TUC (population 25,000) charges for waste collection as at early 2007 were:
 - Residential (Government houses) AUD72 per annum
 - Residential (non-Government houses) AUD20 per annum
 - Commercial AUD50 per annum
- The BTC (population 15,300) charges for waste collection as at early 2007 were:
 - Permanent House AUD29 per annum
 - Traditional House AUD17 per annum
 - Small Shops AUD50 per annum
 - Large Shops AUD300 per annum
 - Large establishments (e.g. Government companies) AUD600 per annum

- Fee collection performance by the Councils is strong and accounts for 30 percent of total revenues.
 - In 2007, TUC collected approximately AUD100,735 and BTC collected approximately AUD163,200.
 - Waste collection fees are deducted directly from government employees salaries
- It is estimated that, apart from appropriate management practices, in the order of AUD 150,000 per year is required by each Council if the SWM services are to be properly operated and maintained.

3.4.2 Kiritimati

- For solid waste collection fees are AUD1.50 per 2 weeks (i.e. per collection) for residential properties and AUD5 per month for offices and hotels.
 - Many residents do not pay
 - There is no collection at Tabwakea due to non-payment.
 - Arrears currently stand at about AUD5,000.

3.4.3 Outer Islands

- As there is no formal system of solid waste collection and disposal in the Outer Islands no costs or fee structures currently exist.

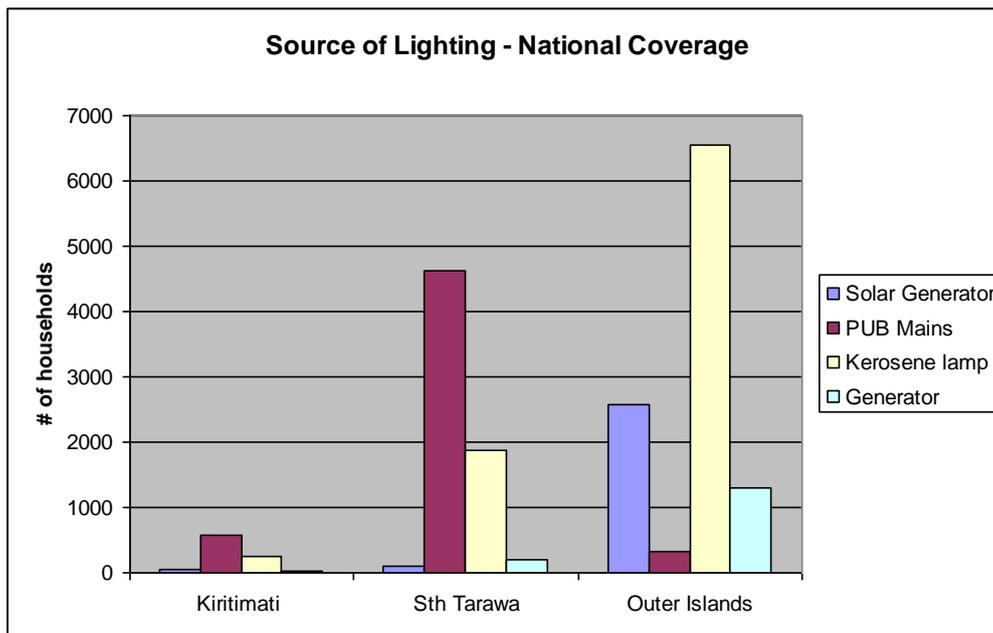
4 Energy

4.1 Existing Situation

4.1.1 South Tarawa

- Two separate generating stations serve South Tarawa including Betio:
 - The old station at Betio has one diesel generator of 1.25 MW capacity.
 - The newer station at Bikenibeu, has 3 diesel generators which deliver 4.20 MW giving a total system capacity of 5.45MW.
- Electricity is generated at 11 kv and is stepped down to a 415 volt system and then to 240 volts for household supply.
- Average demand is approximately 5.1 MW.
- The average monthly consumption in 2006 was about 2 million units [assume unit is kWhr].
- Losses/unaccounted for electricity is high at approximately 30 percent.
- Outages occasionally occur and voltage fluctuation is a common problem
- There are a total of about 6,400 consumers of which about 5,260 are domestic (Betio 2,020, Bairiki 1,835, Bikenibeu 2,552).
- There are 287 industrial consumers and 814 commercial consumers.

Figure 16: Source of Lighting – National Coverage



Source: National Population Census, Government of Kiribati (2005a).

4.1.2 Kiritimati

- Five separate generating stations serve the island's villages.

Table 2: Electricity Supplies on Kiritimati Island

| Station | Generators | Peak Demand | Supply Hours | Comments |
|-----------|-------------------------------------|-------------|--------------|--|
| London | 2x 250kva – 240v | 180 kw | 24 hours | Age 1995 and 2000 |
| Tabwakea | 2x 100kva – 240v | 70 kw | 24 hours | Old second hand generators and North Tabwakea not served |
| Main Camp | 2x ... kva - 110v | | 24 hours | The generating station is at the Captain Cook hotel which also serves the few houses in Main Camp. The JMB filling station / garage and store has its own generator. |
| Banana | 1x100kva – 240v 1x 65 kva – 240v | Very low | 24 hours | Banana village to be relocated- |
| Poland | 1x60kva - 240v | Very low | 12 hours | No standby generator |

- The KPC and Catholic schools each have their own generators as does the Fishing Lodge hotel.
- Distribution in Tabwakea and Banana is via underground cabling.
 - The cabling is old and subject to breakage and damage.
- In London distribution is:

- By overhead cable and
- Subject to significant power fluctuations due to the industrial/commercial establishments.
- North Tabwakea is not connected.
 - About 30 plots require connection at a cost of about AUD90,000.
- Other plans for the development of electricity on Kiritimati are:
 - The construction of a new generation station to serve the whole London to Cassidy airport corridor. (estimated to cost AUD8 million)
 - A 500kva generator at London which is estimated at AUD185,000.
- About two-thirds of households use mains power for lighting and more than a quarter of households use kerosene lamps.

4.1.3 Outer Islands

- The Kiribati Solar Energy Company Limited (KSEC) supplies solar panels which generate energy for lighting and radio.
- Peak power is 100 Watts.
- More than 60% of households use kerosene for lighting.
- Around a quarter of households use Solar generation
- Around 10% of households use privately owned generators

4.2 Institutional Summary

4.2.1 South Tarawa

- The PUB was given the exclusive right to provide electricity and water supply and services incidental thereto.
- Electricity Supply is the responsibility of two separate sections of PUB, the Power Generation Section and the Power Distribution Section:
 - Staff number 70
 - There is a lack of qualified engineers.

4.2.2 Kiritimati

- Electricity Supply is the responsibility of a separate Public Utilities Department under LINNIX.
- It has 2 divisions a Generation Division and a Distribution Division.
- There are 22 staff in the Generation Division and 13 in the Distribution Division.

4.2.3 Outer Islands

- KSEC is a wholly Government-owned company that sits institutionally with MPWU and has been very active in promoting the use of solar energy on Outer Islands
- KSEC has 20 staff based in South Tarawa and 22 staff in the Outer Islands, placing 1 technician/revenue collector on every island.

4.3 Recent Projects and Proposals

4.3.1 South Tarawa

- In 2005/6 the Bikenibeu power station was further extended to reinforce supply to the central and northern part of South Tarawa. The power station and associated works were constructed with Japanese finance. No further major projects are currently planned but PUB is looking to replace old faulty meters and is looking at the feasibility of introducing pre-paid meters to address non –payment of revenues.

4.3.2 Kiritimati

- KSEC is being supported by an EU project focused on the expansion of off-grid household access to solar energy in Kiritimati Island.
- This project will provide approximately 1000 panels in the Line and Phoenix islands at a cost of around AUD4 million.

4.4 Costs, Funding and Sustainability

4.4.1 South Tarawa

- Electricity tariffs on South Tarawa were increased from 1st February 2008. The electricity tariff was increased:
 - From AUD0.34 per unit to AUD0.40 per unit for residential properties;
 - From AUD0.47 per unit to AUD0.55 per unit for commercial properties and
 - From AUD0.60 to AUD0.70 per unit for industrial.
- The PUB has proposed a further tariff increase of AUD0.60 per unit; AUD 0.65 per unit; and, AUD0.80 per unit for domestic, commercial and industrial consumers respectively.
- Currently the tariff rates are designed to recover about 50 percent of operating costs on domestic consumers; 75 percent on commercial consumers and 100 percent on industrial consumers.
- Currently, arrears on electricity sales stand at about AUD1million although this is decreasing.
- The PUB has current liabilities of about AUD3 million of which about AUD2.7 million (90 percent) is owed to the state oil.

4.4.2 Kiritimati

- There are about 200 metered mains electricity consumers in London.
- Connection costs AUD30 and consumers pay for cabling from the mains to the house and the installation of a meter.
- The electricity tariff is:
 - AUD0.30 per unit for residential properties and
 - AUD33 per unit for commercial properties.
- Arrears at the beginning of 2007 stood at about A \$160,000.

- The biggest defaulters were Government businesses (e.g. CPP – AUD100,000; TSKL AUD60,000).

4.4.3 Outer Islands

- There is a waiting list for solar panels supplied by KSEC
- KSEC disconnects users who do not pay solar panel rental after 2 months of non-payment after 3 months non-payment panels are removed.
- Panels cost approximately AUD4,000 to install (materials AUD2,500) including all transportation and installation costs.
- Solar panels are rented by the KSEC on a monthly basis for AUD9 per month
- A KSECL technician make monthly visits to both maintain the panels and collect payments.
- KESC is currently working on a proposal to increase monthly rental to AUD14 and establish an installation fee of AUD195.

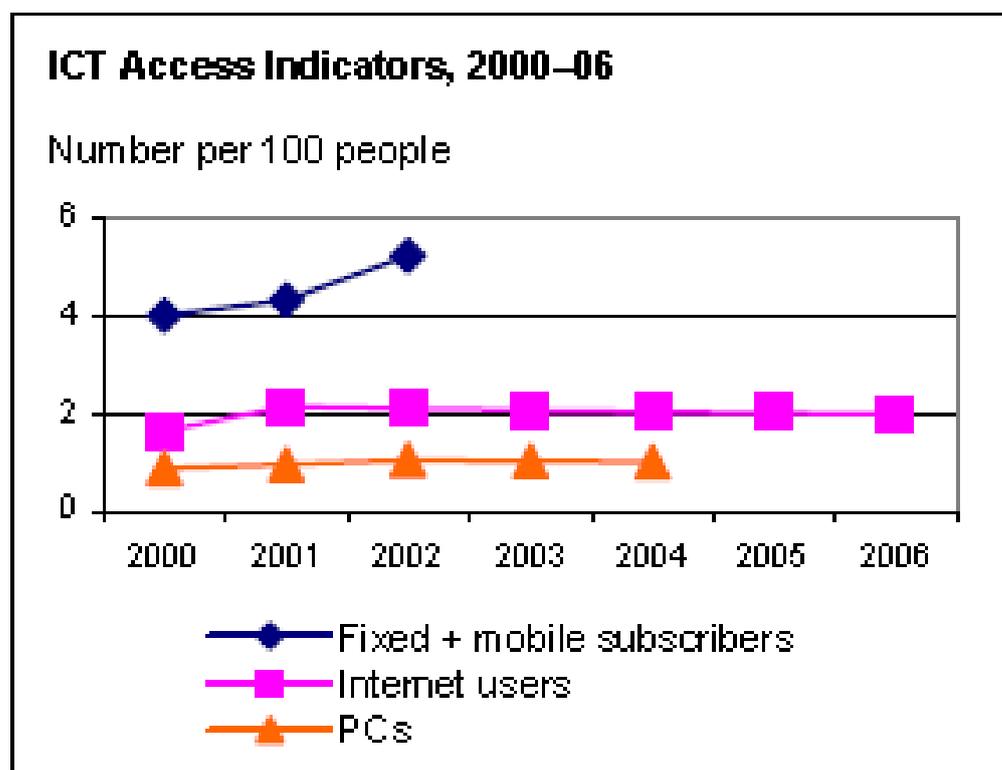
5 Telecommunications and Internet/ICT

5.1 Existing Situation

5.1.1 Operating Framework

- Telecom Services Kiribati Limited (TKSL) supplies internet and is the sole operator of fixed line and mobile phones in Kiribati.
- Television Kiribati Limited (TKL), also providers of internet services.
- Both companies operate semi-autonomously as Public Enterprises and are wholly owned by Government.
- Television Kiribati Limited is the sole provider of non-satellite television services in Kiribati.

Figure 17: ICT Access Indicators, 2000-06



Source: World Bank (2008).

5.1.2 Telephone Coverage and Access

- TSKL provides fixed and mobile telephone service in South Tarawa and Kiritimati Island.
- The system is over-subscribed and customers face a lengthy waiting period for new connections.

- Fixed line teledensity (subscribers per 100 inhabitants) has fallen from 5.1 percent in 2002 to 4.3 percent in 2007²⁶
- Overall coverage has increased since 2000.
- There are approximately 5,000 landlines installed,
- There are three exchanges on Tarawa.
- There is a high frequency two-way radio (HF) system connecting some of the nearby Islands but access is limited because the nearby islands are low lying.
- TSKL is currently running its mobile network near its 10,000 users capacity,
- And is in the process of upgrading its mobile network from 2G to 2.5G,
- And adding capacity up to 100,000 users and expanding its exchange to 6 digits from the current 5 digits.

5.1.3 Internet Coverage and Access

- TSKL has approximately 400 broadband subscribers in Tarawa and approximately 20 dial up subscribers on Kiritimati Island.
- TKL has approximately 120 internet subscribers to its service,
- Limited bandwidth means that upload and download speed on the systems are at times slow and the system is erratic, limiting its use to simple applications such as email.

5.2 Policy and Regulation

- The Telecommunications Authority of Kiribati (TAK) was established in 2004 to assume regulatory responsibility for the telecommunications, television, and internet sectors.
 - The TAK also collects revenues from Kiribati's internet domain, surplus telephone numbers, will collect any revenue from issuing licences to entrant telecommunication providers.
 - TAK is advising the Government on negotiations with Digicel, a potential mobile phone provider.

5.2.1 Institutional Summary

- TSKL and TKL are public enterprises under the respective legal framework of GoK, and are overseen by their respective management boards, which includes representation by relevant Government Ministries.
- TSKL, TAK, and TKL operate semi-autonomously.
- Each Public Enterprise has its own commercial account at the Bank of Kiribati and is able to keep its revenues separate from general Government budgets.

5.3 Costs, Funding and Sustainability

- Prices for mobile service range from around AUD0.30 per minute for peak usage, and AUD0.15 for off peak (see Box 4 1).

Box 4.1: Mobile Charges and Services in Kiribati

Mobile Phone Pricing: Varies depending on Model—imported from Australia

Normal Rate (outgoing): AUD0.30 minute

Off-peak: 50% of Normal Rate

Sim Card: AUD70 (includes AUD20 credit)

Reactivation of Service: AUD30 (Service Credit AUD20 and AUD10 reconnection fee)

Recharge Card Values: AUD10, AUD20 and AUD50

- Prices for landline services range from around AUD0.15 per call for local calls, and AUD2.80 per minute for international calls (see Box 4.2).

Box 4.2: Landline Phone Charges in Kiribati**Line and Phone Installation**

- Installation and handset: AUD70
- Reconnection Charge: AUD10
- Deposit AUD150

Calling Services

- Local call AUD0.15 per call, with a variety of operator assisted options at higher fees.
- International calls are AUD2.80 per minute, with additional charges for certain destinations and Immarsat (land to ship) satellite services
- HF calls, AUD0.9 per minute for private callers
- Call Waiting, Call Diversion, and Hotline calling AUD5 per month
- Wake Up, Conference Calling, and call blocking AUD3 per month
- Unlisted number AUD3 per month

- The lowest cost plan with TKSL is AUD15.00 per month for dial up services.
- Broadband services start at AUD30.00 per month for 128kbps burst speed and 500mb of usage.
- The highest level of service is AUD500 per month for 512KBps burst speed, 15GB of usage, and AUD20.00 per GB thereafter.

Box 4.3: TSKL Internet Usage Charges

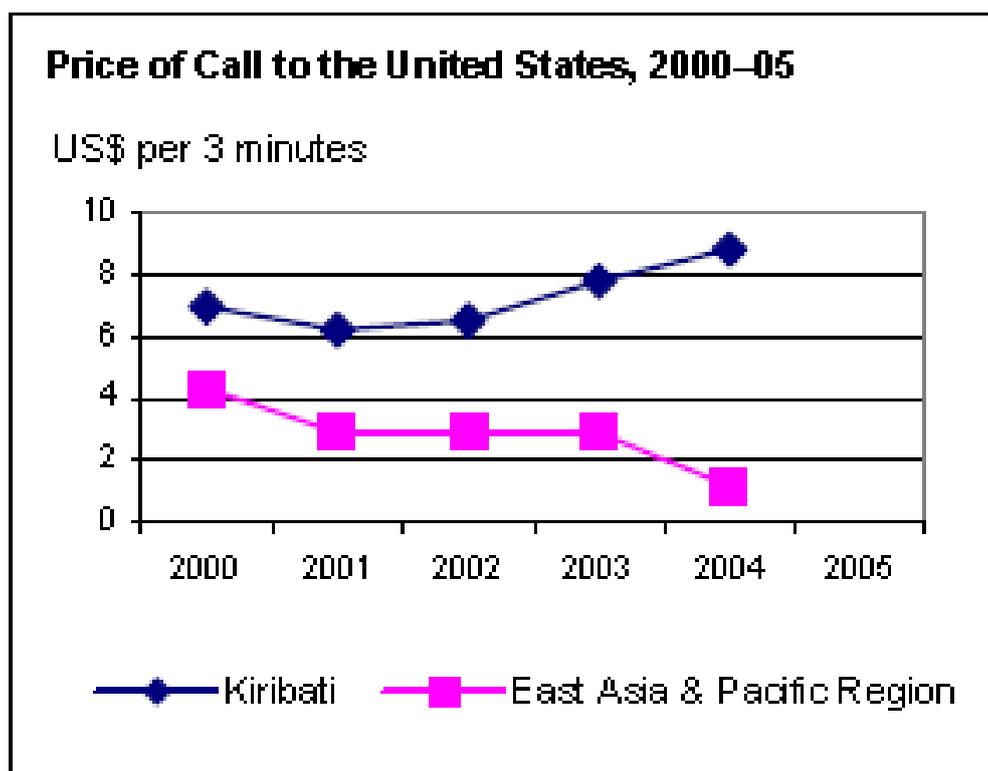
Installation

- Modem: AUD399 or AUD25 month
- Reconnection Charge: AUD10
- Deposit AUD150

Calling Services

- Local call AUD0.15 per call, with a variety of operator assisted options at higher fees.
- International calls are AUD2.80 per minute, with additional charges for certain destinations and Immarsat (land to ship) satellite services
- HF calls, AUD0.9 per minute for private callers
- Call Waiting, Call Diversion, and Hotline calling AUD5 per month
- Wake Up, Conference Calling, and call blocking AUD3 per month
- Unlisted number AUD3per month

Figure 18: Comparative Costs of Telephone Calls to USA



5.3.1 Finance

- TSKL is upgrading its system under a contract with a New Zealand company, and the costs are being paid by TSKL itself from revenue.
- Television Kiribati Limited. TKL is current running at a loss and maintains an approximately AUD400,000 overdraft at the BoK,

- It charges AUD10/month for access to its broadcast of the Australian Channel, ABC Network, and AUD20/month for broadcast of CNN, for which it pays a royalty of AUD0.35 per user.
- It has a fixed monthly cost for its own satellite usage of around AUD3,000 per month; and has a subscription level of approximately 100 users.
- It also broadcasts around 2 hours per day of free local content television signal.
- TSKL does not provide access to its financial data due to the pending the entry of competition.
 - In 2005 the company made a net profit of AUD117,000 on revenues of AUD5.28 million.
 - The majority of mobile phones are provided by Government to its employees.
 - At the end of 2006 arrears of telephone charges amounted to approximately AUD4 million.

6 Roads and Land Transport

Table 16: Length of Roads and Causeways

| Island | Roads (km) | | | | Causeways (m) |
|-----------------------|--------------|--------------|-------------|---------------------|-----------------|
| | Major | | Minor | | |
| | Sealed | Unsealed | Sealed | Unsealed | |
| South Tarawa | 31.1 | 4.8 | 10.5 | 9.1 + Council Roads | 7,380 |
| Kiritimati | 79.4 | - | 4.6 | 102.8 | - |
| Outer Islands | 4.7 | 425.2 | - | 126.2 | 11,481 |
| <i>Abaiang</i> | - | 39.7 | - | 5.8 | 375 |
| <i>Abemama</i> | - | 33.0 | - | 10.2 | - |
| <i>Aranuka</i> | - | 8.6 | - | 18.3 | - |
| <i>Arorae</i> | - | 9.0 | - | 9.4 | - |
| <i>Banaba</i> | 4.7* | 5.4 | - | 2.9 | - |
| <i>Beru</i> | - | 16.3 | - | 9.3 | 758 |
| <i>Butaritari</i> | - | 32.4 | - | 1.6 | 1330 |
| <i>Kuria</i> | - | 21.0 | - | 5.8 | - |
| <i>Maiana</i> | - | 23.4 | - | 1.5 | - |
| <i>Makin</i> | - | 12.6 | - | 4.8 | 100 |
| <i>Marakei</i> | - | 26.2 | - | 5.4 | - |
| <i>Nikunau</i> | - | 14.2 | - | 20.7 | - |
| <i>Nonouti</i> | - | 41.1 | - | 4.1 | 1263 |
| <i>Nth Tarawa</i> | - | 30.8 | - | 1.1 | 675 |
| <i>Onotoa</i> | - | 23.5 | - | 1.2 | 2900 |
| <i>Tabiteneva Nth</i> | - | 27.0 | - | 7.8 | 670 |
| <i>Tabiteneva Sth</i> | - | 14.0 | - | 3.0 | 2010 |
| <i>Tabueran</i> | - | 22.7 | - | 11.3 | 1400 |
| <i>Tamana</i> | - | 9.9 | - | 1.2 | - |
| <i>Teraina</i> | - | 14.4 | - | 0.8 | - |
| TOTAL | 119.4 | 427.1 | 13.8 | 238.1 | 18,861.0 |

Sources: MPWU and Public Works Department (1999) – Civil Infrastructure Assets Summary

6.1 Existing Situation

6.1.1 South Tarawa

- The road system in South Tarawa consists of :
 - 36 km of primary roads, of which 31km are paved.
 - About 20km of secondary roads, half are sealed and half unsealed
 - 40 km of unpaved roads
- Coverage does not support access to some areas in Betio and around Bairiki village.
- Routine and periodic maintenance of the main roads is carried out by MPWU labor force.
- The Bailey bridge (Tanaea/Buota bridge) linking South Tarawa with North Tarawa has recently, partially collapsed and the Civil Engineering Division (CED) of the MPWU is about to embark on rehabilitation.

- Road use on South Tarawa is growing rapidly.
- In central Bairiki, traffic volume has reached 5,000 vehicles per day and is growing at an average rate of 4 percent per year.

Public Transport

- More than one-third of vehicles in central Bairiki are privately owned mini-buses which provide a public transport service along the main trunk road with loops at Betio and the airport.
- The GOK provides transport to/from work for Government employees at a budgeted cost of AUD1.24m for 2008.
- Large trucks and heavy equipment for delivery and positioning of shipping containers is placing extra strain on unsuited road infrastructure.

6.1.2 Kiritimati Island

- 79.4km of sealed road link the main urban centers and villages, with the exception of Poland.
- The airport, port and jetty area at London are connected to the major road system but some of the roads are not paved.
- Road condition is generally good but requires work in some places.

6.1.3 Outer Islands

- Land transport on the Outer Islands is characterized by short sections of unsealed road and causeways used by a small number of vehicles.
 - Causeways, linking islets, are common in the Outer Islands.
 - Road bases are generally made of coral and compacted earth sand sourced locally on the atoll islands.
- The most common forms of transport in the Outer Islands are motorcycles and bicycles.

6.2 Institutional Summary

6.2.1 South Tarawa

- Responsibility for main and secondary roads on South Tarawa rests with the Civil Engineering Division (CED) of the MPWU.

Table 17: Responsibilities within MPWU regarding roads

The MPWU is structured as follows:

| Division/Unit | Responsibilities |
|----------------------------|--|
| Civil Engineering Division | Construction of maintenance of Roads; Road Drainage; Bridges: Causeways; Sea Defences; Airport |
| Construction Division | Construction of Government Buildings |
| Technical Design Division | Design of Government buildings and infrastructure |
| Energy Unit | Data collection and streetlighting |
| Water Unit | Service to Outer Islands |

- The total staff in the above units is approximately 80.
- Engineering capability within the relevant Divisions is limited and there is no fully qualified Civil Engineers.
- The CED has an establishment of 37 but about one-third of positions are vacant.
- The Highway Authority—administered by the Ministry of Communications, Transport and Tourism—is responsible for general road safety and approving road related requests for features such as speed bumps and bus stops.

Operation and Maintenance

- The CED is responsible for maintenance of the main roads. It is fairly well equipped with relatively new donor-provided plant and machinery including 2 backhoe excavators, 2 graders, 2 steel wheeled rollers, 2 rubber tyred rollers and 4 tipper trucks for road construction and maintenance work.

6.2.2 Kiritimati

- The CED under the Ministry of Lines and Phoenix Island (LINNIX) is responsible for the road system on Kiritimati Island, maintenance of the airport runway and apron, sea walls and keeping the lagoon channel into the London jetty operational for small shipping. Currently the division has a total of 9 staff.
- The division appears sparsely equipped for its duties. It has a tractor and trailer and a vibrating compactor but little other equipment.

6.2.3 Outer Islands

- Capital development and large rehabilitation works on the Outer Islands are initially undertaken by the Public Works Department.
- Then responsibility for ongoing maintenance of these assets lies with the individual Island Councils.
- Island Councils have struggled to maintain the assets and generally do not place a high priority on such works when considering the allocation of resources.

6.3 Recent Projects and Proposals

6.3.1 South Tarawa

- Approximately 11 km, mostly in Betio and Bairiki of this main road system, were recently improved at a cost of approximately AUD14 million.

6.4 Costs, Funding and Sustainability

- The remoteness of Kiribati and the fact that virtually all materials apart from sand and water have to be imported means construction costs are high—over AUD1 million per kilometre.

6.4.1 South Tarawa

- Tolls levied on the Nippon Causeway were about AUD300,000 in 2007. Tolls are deposited to the dedicated “Dai Nippon Causeway Fund”, which pays for causeway maintenance. In recent years the balance of the Fund has increased—toll revenue has generally exceeded Causeway maintenance costs—and now stands at about AUD2 million.
- To maintain the main road system on the island is estimated to cost annually about AUD 80,000 per year.
- The remainder of South Tarawa roads (20km) are gravel/sand roads and the annual periodic and routine maintenance requirement based on a unit cost of AUD 1,500 per km per year are estimated at AUD 30,000 per year.

6.4.2 Kiritimati Island

- To properly maintain the main paved road system a sum of AUD 2,000 per km per year is estimated and thus a total annual routine and periodic maintenance budget of AUD 158,000 is required.
- The remainder of Kiritimati roads are gravel/sand roads and the periodic and routine maintenance requirement is estimated at AUD1,000 per km per year.

7 Maritime Sector

7.1 Existing Situation

7.1.1 Sector Background

- There is an international container port at Betio on South Tarawa.
 - It has a single berth (170m)
 - Water depth is only 4-5 meters.
 - Larger vessels must moor off-shore and transfer containers to shore via barges
 - A typical 400-500 TEU transfer takes 3 days to complete.
- Betio also has facilities for fuel imports, inter-island shipping, fishing fleet, and other small scale maritime activities.
- International container trade volume at Betio is small, even by Pacific islands standards.
- Container throughput averages around 6,600 TEU p.a. (including empties) and fluctuates around a very slight upward trend.
- Trade is highly imbalanced with almost 90 percent of containers leaving Kiribati empty.
- International services are infrequent (around 1-2 ship visits per month)
- Most Outer Islands have no formal port infrastructure (wharves, jetties, channels, etc).
 - Inter-island ships moor offshore or in the lagoon entrance and transfer passengers and goods into smaller boats or directly into the water.
- Inter-island cargo trade is growing slowly but is highly imbalanced with more exported to the outer islands than imported to Tarawa.
- Consumer goods and vehicles moving to the Outer Islands and small quantities of copra shipped to Tarawa for processing and export.

7.1.2 Operating Framework

- In both the international and inter-island shipping markets there is a competitive mix of private sector and Government-owned services.
- The Government-owned shipping company Kiribati Shipping Services Ltd (KSSL) has four conventional vessels and a landing craft (as listed below).
 - The conventional vessels are old (two are more than 20 years old) and in poor condition.
 - The landing craft at Kiritimati Island is not operational.

Table 18: Kiribati Shipping Services LTD (KSSL) Vessels

| Vessel | Type | Size (GRT) |
|-------------|----------------|------------|
| MV Momi | Cargo/pax ship | 450GRT |
| MV Mataburo | Cargo/pax ship | 524GRT |

| Vessel | Type | Size (GRT) |
|-----------------|-----------------------|------------|
| MV Matangare | 40 TEU container ship | 1200GRT |
| MV Moanaraoi II | 60 TEU container ship | 1200 GRT |
| LC Betiraoi | Landing Craft | 80 GRT |

Source: ADB (2007c) *Oceanic Voyages: Shipping in the Pacific*. ADB Pacific Studies Series.

- The Government owned Kiribati Ports Authority (KPA) is responsible for port infrastructure and operations at ports with international shipping services (Betio, Kiritimati and Fanning Islands) and operates the international cargo terminal at Betio.
 - There is currently no private sector involvement in international port operation at any level.
 - Domestic port facilities are the responsibility of Island Councils.

7.1.3 Coverage and Access

- Frequent services are provided by KSSL and private operators to nearer islands in the Gilbert Group,
- KSSL provides monthly services to outer islands in the Gilbert Group, and services to the Line and Phoenix groups around every 1-2 months or on demand.
- Private inter-island shipping operators focus on islands that are near Tarawa
- There are three regular international shipping services:
 - Ocean Chief Line (Swire) – linking Kiribati with Australia and western Pacific ports with services every 33 days;
 - Greater Bali Hai Service – linking Kiribati with North Asia and Pacific ports with services every 2 months; and
 - KSSL – providing a shuttle service between Kiribati, Tuvalu and Fiji with services on average every 26 days.

7.2 Recent Projects and Proposals

- The JICA intends to improve facilities by:
 - Constructing of a new deep-water berth at Betio
 - Providing navigational aids and cargo handling equipment.
 - This will cost around AUD20-30 million.
- Based on current costs, annual repair and maintenance costs for upgraded maritime infrastructure is estimated at AUD500,000.
 - This includes around AUD100,000 for maintaining navigation aids and AUD400,000 for port infrastructure.
 - Repairs and maintenance costs for port infrastructure can be met from KPA's own resources.

7.3 Costs, Funding and Sustainability

- Prices for shipping international cargo to/from Kiribati are very high; around double the cost of shipping similar cargo to Fiji.

- Inter-island passenger and freight rates are regulated by Government and have not been adjusted for many years.
 - Inter-island shipping costs are offset by a rebate from the Import Levy Fund.
 - Under this scheme, a levy of around AUD30/tonne is imposed on imports and placed in a Special Purpose Fund administered by MFED.
 - Inter-island shipping users can claim a full rebate on freight rates from the fund.
 - The cost of shipping goods to Outer Islands is effectively fully subsidized by the Government and the cost to users is effectively zero.

7.3.1 Finance

- KPA has a strong financial position and receives no direct subsidy from GoK:
 - has positive cashflow,
 - net positive financial position,
 - is able to fund maintenance and upgrading of small/medium-scale infrastructure from its own resources.
 - its infrastructure is generally well-maintained and operational.
- KSSL financial performance is very poor.
 - It is has negative cashflow,
 - A current overdraft of around AUD1.2 million,
 - It has substantial loan liabilities underwritten by GOK.
 - Financial statements show an operating loss of almost AUD0.36 million in 2002, rising to AUD0.5 million in 2007.
 - Maintenance costs on its aging fleet were AUD650,000 in 2007
 - Outstanding debts could be as high as 40 percent of freight charges.

8 Aviation Sector

8.1 Existing Situation

8.1.1 Sector Background

- There are around 10-12,000 international passenger departures each year (including some 3,000 visitors and around 1,000 transit passengers).
- The inter-island aviation is operated by Government owned Air Kiribati Ltd (AKL)
- AKL aircraft are currently running at an average of around 60 percent capacity.
- There is a total of around 25-30 aircraft landings per week at Bonriki and 1-3 landings per week at most other airstrips.
- Bonriki International Airport on Tarawa is the main airport for international and inter-island air services.
- Cassidy Airport at Kiritimati Island is the other international airport.

- It has two landings per week by regular scheduled services as part of a Nadi-Kiritimati-Honolulu service operated by Air Pacific.
- The runway at Kiritimati is in poor condition due to water penetration.
- Repairs are required after most landings and the poor runway condition is threatening continuity of services.
- On Outer Islands, aviation infrastructure is basic. Airstrips are mostly unsealed coral mud construction
- Runway condition is also contributing to unreliability in inter-island air services.
- Services have recently been suspended for varying periods at several air strips (Nonouti, Kuria, Tabiteuea South, Aranuka) due to runway condition.

8.1.2 Operating Framework.

- Air Kiribati Ltd (AKL) has two aircraft (Harbin Y12; CASA 212) which operate in the Gilbert Group.

8.1.3 Coverage and Access

- Bonriki International Airport currently has two return flights per week by Air Pacific from Nadi; and Our Airline (formerly Air Nauru) provides weekly services on a Brisbane-Honiara-Nauru-Tarawa route.
- AKL operates scheduled services to Makin, Butaritari, Marakei, Abaiang, Maiana, Kuria, Aranuka, Abemama, Nonouti, Tabiteuea North, Tabiteuea South, Beru, Nikunau, Onotoa, Tamana, and Arorae.
 - Fares are low – all islands in the Gilbert Group can be reached from Tarawa for a fare under AUD100.
 - AKL does not operate to the Line or Phoenix Islands or Banaba.

Table 19: Inter-island Air Service Frequency from Tarawa

| Island | Population (2005) | Air Services per week |
|--------------|-------------------|-----------------------|
| Makin | 2,385 | 2 |
| Butaritari | 3,280 | 3 |
| Marakei | 2,741 | 3 |
| Abaian | 5,502 | 2 |
| Maiana | 1,908 | 3 |
| Abemama | 3,404 | 3 |
| Kuria | 1,082 | 2 |
| Aranuka | 1,158 | 2 |
| Nonouti | 3,179 | 2 |
| N. Tabiteuea | 3,600 | 7 |
| S. Tabiteuea | 1,298 | 1 |
| Beru | 2,169 | 1 |
| Nikunau | 1,912 | 1 |
| Onotoa | 1,644 | 1 |
| Tamana | 875 | 1 |
| Arorae | 1,256 | 1 |

Source: ADB (2007c) *Oceanic Voyages: Aviation in the Pacific*. ADB Pacific Studies Series.

-
- Air Pacific stops twice weekly on Kiritimati Island during its Nadi-Honolulu service, once a week in each direction.

8.2 Policy and Regulation

- Regulatory responsibility for the aviation sector rests with the Ministry of Communication, Transport and Tourism Development (MCTTD) in accordance with the Civil Aviation Act (2004).

8.3 Institutional Summary

- AKL is a fully Government-owned company established under the Company Act and overseen by a management Board. AKL operates semi-autonomously with a degree of independence in day-to-day operations. However fares are regulated by Government and requests for tariff increases must be referred to Cabinet for approval.

8.4 Costs, Funding and Sustainability

8.4.1 Finance

- Annual revenue from airport landing fees and passenger departure tax is around AUD200-250,000
- While the Airport Services budget of MCTTD has grown from around AUD500,000 to over AUD700,000 over the last three years.
- Overall, airport cost recovery is estimated at around 30 percent and the net cost to Government of airport operations is estimated at more than AUD0.5 million per year.
- AKL is in very poor financial condition:
 - has a current overdraft of around AUD0.8 million,
 - requires subsidies and regular cash injections from Government to keep it flying.
 - financial statements show that since reverting to domestic operation only, AKL had an annual operating loss (before depreciation and after subsidies) of around AUD1.0 million.
 - direct subsidies from Government and donors to AKL are around AUD500-600,000 per year

13 Annex 4: References

ADB (2002). *Kiribati Monetization in an Atoll Society – Managing Economic and Social Change*. ADB Pacific Studies Series.

ADB (2004) *Swimming Against the Tide? An Assessment of the Private Sector in the Pacific*. ADB Pacific Studies Series.

ADB (2007a) *Oceanic Voyages Aviation and Shipping in the Pacific: Executive Summary*. ADB Pacific Studies Series.

ADB (2007b) *Oceanic Voyages: Aviation in the Pacific*. ADB Pacific Studies Series.

ADB (2007c) *Oceanic Voyages: Shipping in the Pacific*. ADB Pacific Studies Series.

ADB (2007d) *Improving the Delivery of Infrastructure Services in the Pacific*. ADB Pacific Studies Series.

ADB (2007e): *Kiribati. Preparing the Outer Island Growth Centers Project – Phase 2 (Water Supply and Sanitation) – Working Paper No 3: Water Supply Summary*. ADB, Suva.

ADB (2008a) *SAPHE Project Completion Report*, May 2008, ADB.

ADB (2008b) *Kiribati: Managing Development Risk (Final Draft)*. April 2008. ADB Pacific Islands Economic Reports Series.

ADB-Pacific Power Association (2002) *Performance Benchmarking Pacific Power Utilities*. ADB TA No 5883-REG Performance Benchmarking for Pacific Power and Water Utilities.

AusAID (2004a) *Pacific Regional Transport Study*. AusAID, Canberra.

AusAID (2004b) *Pacific Regional Transport Study: Volume 2 Country Action Plan – Kiribati*. AusAID, Canberra.

AusAID (2007) *Public Expenditure on Infrastructure in Kiribati, Nauru, Samoa and Vanuatu*. AusAID, Canberra.

AusAID (2008) *Pacific Economic Survey: Connecting the Region*. AusAID, Canberra.

AusAID (2008b) “The diesel generation burden for Kiribati – a preliminary analysis”, AusAID, Canberra

Australian Government (2008). *Annual Program Performance Report For Republic of Kiribati*. ODE, Canberra.

Castalia (2006) *The Pacific Infrastructure Challenge*. World Bank.

CIA (2008) *The World Factbook*. US Government

Fallon (2008). *Pacific Performance and Outlook*. Background paper for *Pacific Economic Survey 2008*. AusAID.

Government of Kiribati (various) *Budget Papers 2002-2008*. GoK, Tarawa.

- Government of Kiribati (2003) *National Development Plan 2004-2007*. GoK, Tarawa.
- Government of Kiribati (2005a) *National Population Census*. GoK, Tarawa.
- Government of Kiribati (2005b) *Policy Statement on Climate Change*. Office Te Beretitenti, GoK, Tarawa.
- Government of Kiribati (2007a) *Draft National Water Resources and Sanitation Plan*. September 2007. GoK, Tarawa.
- Government of Kiribati (2007b) *Presidential Policy Statement*. 10 December 2007. GoK, Tarawa.
- Government of Kiribati (2007c) *Republic of Kiribati Millennium Development Goals Report*. Ministry of Finance and Economic Development, GoK, Tarawa.
- Government of Kiribati (2008) *Kiribati Development Plan: 2008- 2011 – Enhancing economic growth for sustainable development – A vibrant economy for the people of Kiribati*. Ministry of Finance and Economic Development, GoK, Tarawa.
- Government of Papua New Guinea and Finnroad (2007) *Social Impact Study of the Road Maintenance Rehabilitation Project*, World Bank.
- IMF (2008). “Statement at the Conclusion of an IMF Staff Mission to Kiribati”, April, 2008.
- McNamara, S. (2008) *Aviation in the Pacific: Building on Recent Gains*. Background Paper for *Pacific Economic Survey 2008*. AusAID, Canberra.
- Meyrick (2007) *Pacific Regional Transport Analysis*. Background paper for ADB (2007) *Oceanic Voyages: Shipping in the Pacific*.
- Government of Kiribati: MPWU and Public Works Department (1999) – Civil Infrastructure Assets Summary
- New Zealand Government (2008) “Kiribati: Country Information Paper” Ministry of Foreign Affairs and Trade, Wellington
- NZAID-Government of Kiribati (2007) *Kiribati Urban Renewal Scoping Study*. NZAID, Wellington.
- PFTAC (2007) *Review of Public Financial Management in Kiribati and Proposal for Technical Assistance*. Pacific Financial Technical Assistance Centre, Suva.
- Purfield (2005). “Managing Revenue Volatility in a Small Island Economy: The Case of Kiribati”. IMF Working Paper WP/05/154.
- SPC (2007) *Small Islands States Feeder Shipping Service Study*. Secretariat of the Pacific Community, Noumea
- UNDP (2007). *Human Development Report 2007/2008*. NYC: UNDP.
- United Nations (2008) MDG Indicators Website. United Nations. <http://mdgs.un.org/unsd/mdg/Data.aspx>.
- WHO (2000) *Water for Life – Making it Happen*. WHO, Geneva.
- World Bank (1992). *Pacific Regional Energy Assessment: Vol. 5 Kiribati*. IEOD: EAP Region.

World Bank (1994). *World Development Report 1994: Infrastructure for Development*. NYC: Oxford University Press.

World Bank (2000) *Regional Economic Report*. World Bank.

World Bank (2003) *World Development Report 2002*. NYC: Oxford University Press.

World Bank (2005) *Opportunities to Improve Social Services: Human Development in the Pacific Islands*. Human Development Sector Unit, East Asia and Pacific Region, World Bank.

World Bank (2006) *Pacific Regional Strategy 2006-2009*. World Bank.

World Bank (2007) *World Development Report 2007*. NYC: Oxford University Press.

World Bank (2008).

ADB Project Completion Report on the SAPHE project (ADB PCR)