PACIFIC REGION INFRASTRUCTURE FACILITY

INFRASTRUCTURE MAINTENANCE IN THE PACIFIC

Challenging the Build-Neglect-Rebuild Paradigm

INFRASTRUCTURE MAINTENANCE IN THE PACIFIC

Challenging the Build-Neglect-Rebuild Paradigm

Pacific Infrastructure Advisory Centre.
Infrastructure Maintenance in the Pacific. Sydney, Australia: Pacific Infrastructure Advisory Centre, 2013.

Cover photo: Kerry McGovern ©2013

Pacific Infrastructure Advisory Centre
Suite 1802, Level 2
1 Margaret Street
Sydney NSW Australia 2000
www.theprif.org

This is a publication of the Pacific Infrastructure Advisory Center (PIAC).

The report was authored by Maria Corazon Alejandrino-Yap (Project Team Leader, PIAC), Matthew Dornan (Individual Consultant, Australian National University) and Kerry McGovern (Individual Consultant, K McGovern & Associates) with guidance and direction from John Austin (Manager, PIAC).

The team acknowledges the valuable reviews, generous time and insights provided by our peer reviewers and participants. A full list of peer reviewers, contributors and persons consulted is provided in Annex 4 of this report.

PIAC operates under the Pacific Region Infrastructure Facility (PRIF), a multi-partner infrastructure coordination and financing mechanism for the Pacific region. The partners are the Asian Development Bank (ADB), the Australian Agency for International Development (AusAID), the European Commission (EC), the European Investment Bank (EIB), the New Zealand Ministry for Foreign Affairs and Trade (NZMFAT), and the World Bank Group (WBG).

contents

list of figures

list of tables

list of boxes

abbreviations

ACP	African, Caribbean and Pacific States
ADB	Asian Development Bank
AMC	Australian Managing Contractor
APTC	Australia-Pacific Technical College
AUD	Australian Dollar
AusAID	Australian Agency for International Development
BAMS	Bridge Asset Management System
BNR	Build-Rebuild-Neglect
CEO	Chief Executive Officer
CIAA	Cook Islands Airport Authority
CIIC	Cook Islands Investment Corporation
CSO	Community Service Obligations
DoW	Department of Works
DMC	Developing Member Country
ESIOP	Environmental and Social Impact Operational Policy
EU	European Union
FEA	Fiji Electricity Authority
FF&E	Furniture, Fittings and Equipment
FJD	Fijian Dollar
FSM	Federated States of Micronesia
ft	Feet
GASB	Government Accounting Standards Board
GDP	Gross Domestic Product
GFSM	Government Finance Statistics Manual
GIS	Geographic Information System
GNI	Gross National Income
ICAO	International Civil Aviation Organisation
ICT	Information and Communications Technology
IFC	International Finance Corporation
IMF	International Monetary Fund
IPP	Independent Power Producer
IPSAS	International Public Sector Accounting Standards
ISO	International Standards Organisation
JAMS	Justice Asset Management System
JICA	Japan International Cooperation Agency
K	Kina (Papua New Guinea)
km	Kilometre
KPI	Key Performance Indicator
kWH	Kilo-Watt hours
LTA	Land Transport Authority
M&E	Monitoring and Evaluation
MDG	Millennium Development Goals
MFSM	Monetary and Finance Statistics Manual
MID	Ministry of Infrastructure Development
MJLA	Ministry of Justice and Legal Affairs
ML	Mega-litre (1,000,000 litres, or 1,000 m^3)
MoF	Ministry of Finance
MoFT	Ministry of Finance and Treasury
MoW	Ministry of Works
MS	Microsoft
MTDP	Medium Term Development Plan
MTEF	Medium Term Expenditure Framework
MWTI	Ministry of Works, Transport and Infrastructure
NEC	National Executive Council
New Zealand Aid	New Zealand Aid Programme
NGO	Non Government Organisation
NJ	National Judiciary
NRA	National Roads Authority
NRW	Non-Revenue Water

NTF	National Transport Fund
NTP	National Transport Plan
NZD	New Zealand Dollar
O&M	Operation and Maintenance
OECD	Organisation for Economic Co-operation and Development
OEI	Overall Efficiency Indicator
OPI	Overall Performance Indicator
PEFA	Public Expenditure and Financial Accountability
PFM	Public Financial Management
PFTAC	Pacific Financial and Technical Assistance Centre
PIAC	Pacific Infrastructure Advisory Centre
PIC	Pacific Island Country
PIFS	Pacific Islands Forum Secretariat
PMS	Pavement Management System
PNG	Papua New Guinea
PPA	Pacific Power Association
PRIF	Pacific Region Infrastructure Facility
PSDI	Private Sector Development Initiative
PUB	Public Utilities Board of Kiribati
PWD	Public Works Department
PWWA	Pacific Water and Wastes Association
RAMS	Road Asset Management System
RAMSI	Regional Assistance Mission to Solomon Islands
RMI	Republic of the Marshall Islands
SAMS	Samoa Asset Management System
SANRAL	The South African National Road Agency Ltd
SBD	Solomon Islands Dollar
SKM	Sinclair Knight Merz
SI	Solomon Islands
SIG	Solomon Islands Government
SOE	State Owned Enterprise
SOPAC	Applied Geosciences and Technology Division of the Secretariat of the Pacific Community
SPC	Secretariat of the Pacific Community
TA	Technical Assistance
toe/L	Tonne of Oil Equivalent per Litre
TOP	Tongan Pa'Anga
TOR	Terms of Reference
TWB	Tonga Water Board
UFW	Unaccounted for Water
UN	United Nations
UN-HABITAT	United Nations Human Settlements Programme
UNELCO	Electrique du Vanuatu Ltd
URA	Utilities Regulatory Authority
USA	United States of America
USD	US Dollar
WB	World Bank
WBG	World Bank Group
WST	Samoan Tālā

Executive Summary

Inadequate infrastructure maintenance has long been recognised as a challenge. The failure to manage and maintain existing infrastructure assets in Pacific island countries has resulted in a large infrastructure debt – representing the gap between what has and should have been spent on infrastructure. The premature deterioration of infrastructure affects lives. It translates into fewer people having access to health clinics; fewer children going to school; deaths from vehicles colliding when negotiating pot holed roads; and disease resulting from the contamination of water sources because of blocked drains, untreated sewage, and the exposure of hazardous waste. The lack of preventative maintenance is also costly in a financial sense. It is well known that preventative maintenance provides a better financial return than investment in new infrastructure. This is important given that Pacific Region Infrastructure Facility (PRIF) partners alone will be spending an estimated USD1.7 billion investing in core economic infrastructure between 2008-09 and 2016-17.

World Bank estimates of the resources required for infrastructure maintenance range from an average of 2.5 per cent in middle income countries to 3.73 per cent of Gross Domestic Product (GDP) in low income countries. For Pacific island countries, we estimate an average of 3.1 per cent of GDP is required for the maintenance of existing infrastructure, equating to USD634 million per annum.[1] Pacific island countries must also address the backlog of delayed maintenance and budget for the maintenance of planned infrastructure. Data on current maintenance spending are not available, but there is common agreement that maintenance is being avoided within the 'build-neglect-rebuild' paradigm.

[1] As set out in Annex 2, Table A – Information Profile on Public Financial Management Data on Pacific Island Countries. The amount is equivalent to USD242.31 million for PRIF developing members (without PNG and Fiji).

Image: © World Bank.

The maintenance of infrastructure depends on the availability of resources, the capability of organisations managing infrastructure and the incentives of staff. These factors determine whether Pacific island countries, in partnership with development partners, are able to deliver sustainable infrastructure services. There is no silver bullet to ensure all three factors are in place for good asset management. Rather, a range of initiatives and reforms are required for the effective delivery of services. Careful planning of service delivery to local areas, both urban and rural, and collaboration among service providers is also required if Pacific island countries are to meet the Millennium Development Goals (MDGs).

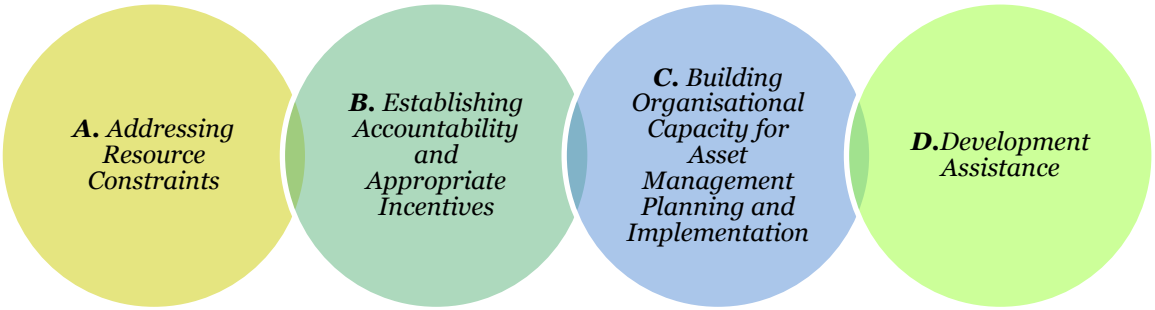
Financial resources are required for the ongoing management and maintenance of infrastructure assets. These are not always available. Resource constraints in Pacific island countries are especially evident in agencies dependent on allocation from government budgets. The Pacific is one of the most aid-dependent regions in the world, with many Pacific island governments reliant on development assistance for their operations. The resource constraint challenge is especially problematic where new infrastructure does not increase the productive capacity of the economy. There is often an implicit assumption in the design of infrastructure projects that core economic infrastructure will 'pay for itself' by generating economic growth. This assumption can be problematic in Pacific island countries, especially in microstates, which are remote and unable to take advantage of economies of scale.

Resource constraints on asset management can also result from institutional arrangements. A common problem around the world is that governments, despite having adequate resources, fail to allocate necessary funding towards maintenance. Another challenge prevalent around the world is that user fees set by government or regulatory agencies are not high enough to cover service provision costs. The end result is poor service provision, as lack of maintenance leads to the premature deterioration of infrastructure. This can create a vicious circle, as customers are unwilling to pay more for a service that is sub-standard. As a result, agencies find it difficult to increase user fees or to refuse to provide services to non-paying customers.

Organisational capability is also necessary for sound asset management and maintenance. Capacity constraints among infrastructure service providers that can result in inadequate maintenance include poor forward planning of maintenance; a limited long-term pool of trained maintenance staff with the technical capacity to maintain new and old infrastructure; and weak internal systems and processes that fail to ensure maintenance staff have the equipment and stores required to regularly maintain all infrastructure. Unclear roles and responsibilities, which lead to lack of accountability, are also an issue. A common issue in the Pacific relates to the division of responsibilities among national and sub-national governments, and community organisations. Sub-national governments in larger Pacific island countries are responsible for service delivery, but are provided with insufficient funding by the national government. Much community infrastructure is provided by community organisations that have limited access to a pool of maintenance personnel.

Incentives are interlinked with many of the reasons for poor asset management already discussed. Managers must be motivated and provided with support to undertake asset management activities. Clear roles and responsibilities for which managers are accountable are important for establishing such incentives. Communities must also value infrastructure services for their provision to be a success. A typical reason for the failure of service delivery in rural areas is that communities are not involved in the planning for and design of infrastructure services.

There are a number of steps that Pacific island governments, infrastructure service providers, and development partners can take to address the three barriers to sound infrastructure asset management. These are grouped into four categories:



a. addressing resource constraints

1 Improve budget preparation through better data on infrastructure assets, and scope and cost of work to be completed. Forward looking budget estimates can help improve planning for maintenance, but must be based on sound inputs from line departments.
2 Revenue sharing between national and sub-national governments could be improved. A first step is to improve the budget submissions of sub-national governments.
3 Consider earmarking government revenue for the management of assets in certain infrastructure sectors, subject to stringent conditions.
4 Ensure that user fees are adequate to cover routine maintenance as well as the operation of the infrastructure and its replacement, when combined with formal government subsidies.
5 Governments should assume financial responsibility for provision of basic services to some households where affordability is a problem.

b. establishing accountability and appropriate incentives

1 Asset managers should be required to set targets for performance of infrastructure, including the level of service required.
2 Moving service provision from government departments to an independent body has the potential to improve asset management, although economies of scale in smaller island states also need to be considered. Experience in the Pacific suggests that independence from political direction leads to better infrastructure services. Arms-length contractual arrangements underpinned by good corporate governance are necessary.
3 State-owned enterprises (SOEs) need to be provided with clear objectives to deliver infrastructure services to a pre-determined level of service. The performance of SOEs should be monitored against key performance indicators.
4 The roles and responsibilities for infrastructure service provision of different organisations, and of sub-national and national level governments, must be clearly specified in legislation.

c. building organisational capacity for asset management planning and implementation

1 Infrastructure service providers need to estimate the maintenance requirements of infrastructure assets in future years. These figures can be used for budget submissions and in determining tariffs.
2 An asset register is an essential first step in improving asset management, and can help to generate ‘capital-consciousness’.

3 Infrastructure service providers can benefit from the use of an asset management system, which includes detailed inventories of the condition and function of all infrastructure assets and their components.
4 The appropriateness of asset management systems is context specific. Smaller operations may benefit most from simple systems using commonly available software solutions (e.g. Open Office or Microsoft Excel).
5 Infrastructure service providers should adopt a risk-based approach to asset management, prioritising maintenance by assessing the impact of potential service failure.
6 An organisation should have appropriate technical and financial skills for good asset management in place, with clearly defined roles and responsibilities.
7 Outsourcing of asset management activities, including maintenance, should be considered where this can decrease costs, improve service, or address capacity constraints within an organisation.

d. development assistance

1 Development partners need to consider sustainability in the design of all infrastructure projects. This should include analysis of the asset management liabilities associated with new infrastructure.
2 Development partners should direct more resources towards the rehabilitation and maintenance of existing infrastructure rather than new projects, given that on average, this is a more efficient use of scarce resources.
3 The use of long-term maintenance contracts by development partners can ensure good asset management for a period of time, and can assist in the development of private sector contracting capabilities.
4 There needs to be a greater focus on construction arrangements and standards.
5 Development partners can provide useful technical assistance in a number of areas, including regulatory arrangements, public financial management, public-private partnerships, and asset management at the level of the organisation.
6 The use of earmarked funding can be appropriate in some circumstances.
7 Development partners should continue to reform their assistance in line with commitments made under the Paris Declaration, Cairns Compact, and similar agreements. This should lead to better donor coordination, as well as the alignment of assistance with government objectives and systems. Direct budget support arrangements can be extended to include funding for maintenance.

1 Introduction

1.1 the challenge

The problem of inadequate maintenance is essentially one of poor asset management.

Inadequate infrastructure maintenance has long been recognised as a challenge (World Bank 1994:5-15). Failure to maintain physical infrastructure has led to its premature deterioration around the world in what is sometimes termed the 'build-neglect-rebuild' (BNR) cycle (Mohanty 2005), given that deteriorated infrastructure assets are commonly rebuilt.

The problem of inadequate maintenance is essentially one of poor asset management (World Bank 1994:6). Limited attention is given to the management of infrastructure assets, resulting in insufficient resourcing and planning for ongoing maintenance requirements.

Pacific island countries in the 1960s and 1970s had a proud emphasis on infrastructure, including new water treatment plants, sewage systems, roads, airfields, and ports.

Asset management is also a challenge in the Pacific. Pacific island countries in the 1960s and 1970s had a proud emphasis on infrastructure, including new water treatment plants, sewage systems, roads, airfields, and ports. However, funding for the ongoing maintenance of infrastructure has suffered as a result of efforts to maintain a sound fiscal footing and due to competing expenditure priorities. Pacific island governments have generally prioritised new infrastructure projects over the ongoing management of existing infrastructure.

The failure to manage and maintain existing infrastructure assets has resulted in a large infrastructure debt – representing the gap between what has and should have been spent on infrastructure. The premature deterioration of infrastructure affects lives. It translates into fewer people having access to health clinics; fewer children going to school; deaths from vehicles colliding when negotiating pot holed roads; and disease resulting from the contamination of water sources because of blocked drains, untreated sewage, and the exposure of hazardous waste. In rapidly expanding urban centres of the Pacific, lack of maintenance prevents the expansion of infrastructure services and is leading large numbers of people to live without access to basic infrastructure services, often in informal settlements.

The lack of preventative maintenance is also costly in a financial sense. It is well known that preventative maintenance provides a better financial return than investment in new infrastructure. De Sitter's Law of Fives estimates that in the case of concrete structures, "every dollar of routine

maintenance that is deferred will end up costing $5 in repairs, or ultimately, $25 in rehabilitation or replacement as the asset declines overtime"(De Sitter 1984).

The accumulation of an infrastructure debt results in significant expense in the future, with rehabilitation being a costly exercise when compared to routine maintenance. Poor asset management in one sector also affects other infrastructure sectors. Poor road conditions hamper rural electrification and water and sanitation initiatives in many Pacific island countries. The value of preventative maintenance is demonstrated using a number of case studies in this report (see Annex 1).

One feature of the Pacific region that has sometimes augmented the problem of inadequate maintenance is the funding of core economic infrastructure by development partners. Provision of funding for new capital expenditure can distort decision-making, with infrastructure capital treated as if it were a 'free' good. This alters asset management practices and reduces incentives to consider the impact and management of infrastructure over its asset life-cycle. The future liabilities created by donor-funded infrastructure can also be a problem. The implicit assumption is often that economic infrastructure will lead to economic development, thereby generating income to pay for ongoing infrastructure maintenance. However, in many cases this is not true, with infrastructure often constructed for social objectives or for motivations of 'national prestige'.

The problem of poor infrastructure asset management is therefore important for many reasons. Infrastructure facilitates access to services that are essential for livelihoods and economic activity. The premature deterioration of infrastructure affects these services, placing lives at risk. The lack of maintenance also has a financial impact. The premature deterioration of infrastructure is costly to Pacific island governments and other infrastructure service providers over the long-term.

The infrastructure asset management challenge in the Pacific has never been more important than today. There is a considerable pipeline of infrastructure investment forecast for the region which will require ongoing management. It is estimated that assistance from PRIF development partners alone will lead to approximately $1.7 billion of investment in core economic infrastructure between 2008-09 and 2016-17.[2] Additional funding for new infrastructure is likely to come from other donors and from global initiatives to address climate change. Effective asset management is necessary in order to maximise the economic benefits of new infrastructure investments.

1.2 the scope of this study

This study is designed to enhance dialogue around infrastructure asset management in Pacific island countries. The study's objectives are to:

a	Investigate maintenance practices in core economic infrastructure sectors of PRIF developing countries, with consideration of the impact of policies and regulatory environments;
b	Identify best practice asset management in PRIF developing countries, highlighting the benefits generated by good asset management;
c	Explore the impact of development assistance from PRIF development partners on infrastructure maintenance in the region; and
d	Propose approaches for improving asset management in PRIF developing countries.

[2] PRIF development partners include the ADB, AusAID, EU, EIB, New Zealand Aid Programme and the World Bank. JICA is an observer.

The paper focuses on core economic infrastructure in the power, water and sanitation, waste management, information and communication technologies (ICT), and transport sectors, including the roads, marine and aviation sub-sectors. This list of sectors does not cover all core economic infrastructures. Local fresh food markets, for example, generate considerable economic activity within both the formal and informal sectors. The report has nevertheless limited the number of sectors examined in order to facilitate a more in-depth analysis. The infrastructure sectors considered here are those under the mandate of the PRIF.

Core economic infrastructure in this report is defined as all produced, physical capital assets with a fixed location. This is a narrower definition than that of fixed assets, which according to the International Monetary Fund's (IMF) *Government Finance Statistics Manual* (2001) includes non-produced assets such as land, and produced assets which can be moved such as ships and aeroplanes.[3] Again, this study intentionally adopts a narrower definition in order to facilitate a more in-depth analysis. This means that core economic infrastructure (normally referred to as 'infrastructure' in the report) includes port and airport facilities, but not ships, aeroplanes, or the land on which they are based.

The paper centres on infrastructure in PRIF developing countries,[4] Papua New Guinea (PNG) and Fiji. Cross-country data is used where possible, although the limited availability and reliability of relevant data in the Pacific prevents the use of this approach in the majority of infrastructure sectors. One contribution from this work is the development of a high-level information profile detailing country and sector policies and plans that influence asset management.

In the absence of good cross-country data, a case study approach is used in order to explore asset management practices in the region. General discussions of asset management are supported by references to different case studies wherever possible. Additionally, the paper presents a number of detailed case studies with the hope that these will help generate insights into how asset management in the region can be improved.

The paper is structured as follows:

Chapter Two presents the infrastructure maintenance challenge in the Pacific in more detail. It explains why maintenance is important and why it is so often suboptimal around the world. The chapter also provides an overview of issues and challenges in different infrastructure sectors. The case study of the Fiji Electricity Authority, at the end of the chapter, details how an organisation has implemented sound asset management practices in the Pacific.

Chapter Three provides an overview of asset management and maintenance. It details the importance of preventative maintenance using specific examples. The chapter also discusses how Pacific island countries can implement principles of asset management.

Chapter Four assesses infrastructure service provision in the Pacific, drawing on data from recent benchmarking reports. The chapter investigates how institutional arrangements for service provision hinder asset management through inadequate funding mechanisms, lack of incentives, and exacerbation of resource constraints.

[3] The World Bank's *World Development Report: Infrastructure for Development* (1994:2), focused on economic infrastructure and includes services from: public utilities (power, telecommunications, piped water supply, sanitation and sewerage, solid waste collection and disposal, and piped gas); public works (roads and major dam and canal works for irrigation and drainage); other transport sectors (urban and inter-urban railways, urban transport, ports and waterways, and airports.

[4] PRIF developing countries include Cook Islands, Federated States of Micronesia (FSM), Kiribati, Nauru, Niue, Palau, Republic of the Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

Chapter Five discusses the importance of development partners to infrastructure sectors in the Pacific. It details how development partners, and especially PRIF development partners, have increasingly considered asset management in their assistance to Pacific island countries.
Chapter Six brings the report together by outlining how different stakeholders can improve infrastructure asset management in the Pacific. It details the broad role of Pacific island governments in improving service provision, and argues for a greater emphasis on partnerships with the private sector and community entities. The chapter discusses options available to Pacific island governments, providers of infrastructure services, and development partners.
Chapter Seven lists the recommendations of this report.
Chapter Eight concludes with a series of steps major stakeholders can take to manage infrastructure.

Case studies of asset management in the Pacific are produced in full in Annex 1 of the report. Summaries are provided throughout the report.

A series of **information profiles** are also included in Annexes 2 and 3. The profiles present information on the fiscal position of Pacific island governments, budgeting characteristics, and analyses of institutional arrangements in the infrastructure sectors of Pacific island countries.

2

Infrastructure maintenance: the challenge in the Pacific

frastructure services in the pacific

The quality of infrastructure service provision is closely linked to infrastructure asset management and maintenance.

Infrastructure across all sectors serves a common purpose: to deliver services to people. Pipes, and water and sewage treatment facilitates are established so people can access clean water and safely dispose of waste. Generation and distribution infrastructure provide electricity to households and businesses. ICT infrastructure enables people to access and share information, and to communicate with one another. Roads, ports and airports are similarly established to provide a service; roads enable travel and the movement of goods by vehicle, airports facilitate travel by aeroplane, and ports allow for commercial shipping operations. All three transport sub-sectors are about facilitating the mobility of people and goods. The physical infrastructure in these sub-sectors aids access to markets and social services, including health and education facilities.

Infrastructure services are essential for economic development, providing necessary conditions for economic activity. Providing a community with road access has immediate impacts, such as facilitating market access and increasing household income. It also has long-term and indirect effects. Better ICT and transport infrastructure services can introduce new ideas and change institutional structures within communities. In the long run, better infrastructure services help communities to interact with society and the economy by stimulating access to education and employment opportunities.

The provision and maintenance of economic infrastructure has a mixed and often unsatisfactory record in the Pacific. The poor state of infrastructure services can be partly explained by levels of economic development (World Bank 2006). Low income levels impose constraints on the maintenance activities that can be funded out of government revenue and through direct fees and charges. The impact of income levels on the quality of infrastructure services is clearly visible when comparing countries in the region. The quality of physical infrastructure in the Cook Islands, a country with one of the highest per capita GDP levels in the region, is generally superior to that of Melanesian countries with lower per capita income levels.

It should be emphasised that Pacific island countries are not the same. PNG and Fiji are large relative to other Pacific island countries and face different issues from those present in Polynesia, Micronesia

and other parts of Melanesia. The special challenges faced by microstates are highlighted throughout the report.[5]

The majority of Pacific island countries are lower and upper middle income countries (where lower middle income countries have a GDP of USD1,026-4,035 per capita, and upper middle income countries have a GDP of USD4,036-12,475 per capita).[6] The provision of infrastructure services can be challenging as a result of low per capita income, given that members of the public may be unable to pay the full cost of infrastructure services (including ongoing operation and maintenance costs).

Table 2.1: Pacific Island Countries: Key Statistics

Country	Last Population Census	Population	GDP per capita (current USD, World Bank data)	Land size (km²)	Exclusive economic zone (km²)
Cook Islands	2006	15,324	11813[1]	240	1,800,000
Federated States of Micronesia	2010	102,624	2781	700	2,900,000
Fiji	2007	837,271	4397	18,272	1,260,000
Kiribati	2005	92,533	1648	726	3,600,000
Nauru	2006	9,233	7329[1]	21	320,000
Niue	2006	1,625	5800	259	390,000
Palau	2005	19,907	8031	487	600,900
Papua New Guinea	2011	7,059,653	1844	462,000	3,100,000
Republic of the Marshall Islands	1999	50,840	3168	181	2,100,000
Samoa	2006	180,741	3485	2,934	120,000
Solomon Islands	2009	515,870	1517	28,000	1,600,000
Tonga	2006	101,991	4151	688	700,000
Tuvalu	2002	9,561	3636	26	757,000
Vanuatu	2009	234,023	3094	12,190	680,000

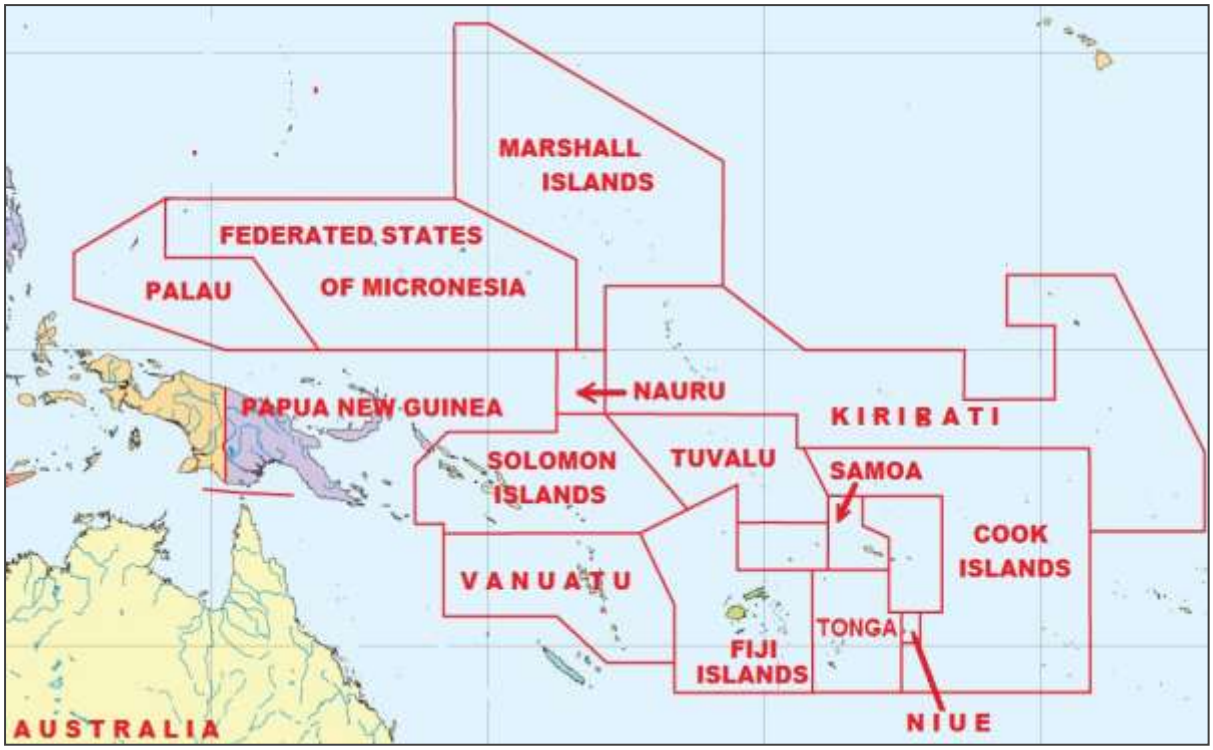
Notes: Preliminary census results. 1. Asian Development Bank (ADB) data, Secretariat of the Pacific Community (SPC) Pacific Island Populations – estimates and projections of demographic indicators for selected years. http://www.spc.int/sdp/ p provisional.

Another challenge for Pacific island countries in delivering infrastructure services is the region's geography and size. Pacific island countries (with the exception of PNG) are among the smallest in the world, distant from major markets, and vulnerable to natural disasters which frequent the region. Provision of infrastructure services is difficult in these circumstances. It is costly to link small and dispersed communities to major population centres, especially when the costs of doing so are often unrecoverable from these communities. The provision of power and water and sanitation services in rural areas of the Pacific is also difficult for this reason.

[5] The term 'microstates' refers to extremely small states. In the Pacific, it is commonly interpreted as including Nauru, Tuvalu, and Niue. Palau and the Cook Islands are sometimes also considered to be micro-states.
[6] World Bank Data: Country and Lending Groups, East Asia and Pacific.

The recent independence of Pacific island countries also explains why Pacific island governments with populations spread over remote archipelagos have not yet been able to provide the same level of services as smaller countries where the population is primarily urban. Prior to independence, infrastructure was largely aimed at supporting international commodity production and trading, and colonial rule. Upon gaining independence, much of the development was aimed at establishing a functional government and a diplomatic presence. Infrastructure was provided to central urban areas. Foreign businesses frequently provided their own infrastructure. Services were thus extended to residential areas inhabited by foreigners and national leaders, but not to rural populations. Widening access to infrastructure remains an important challenge for Pacific island governments.

Figure 2.1: Map of the Pacific Islands Region



Pacific island countries face a number of new challenges in infrastructure service provision. Rapid expansion of urban centres requires a rapid expansion of infrastructure services. However, the necessary level of investment is not occurring, with the result being a growing infrastructure deficit. High population densities also create challenges for infrastructure service provision. The population density in parts of the Pacific is extremely high. In Kwajalein, on Ebeye in the Republic of Marshall Islands (RMI), the population density was approximately 38,600/km^2 in 2007, six times that of Hong Kong. In South Tarawa the population density is 2,558/km^2. In Betio alone, it is 10,400/km^2, twice that of Hong Kong.

These factors create challenges for infrastructure service provision in the region (Haberkorn 2008). The ADB's *State of Pacific Towns and Cities* report notes that "under-provision and poor maintenance of physical infrastructure and services" is a significant problem (Asian Development Bank 2012). Addressing the problem is not simple. The report proceeds to argue that:

> "Managing urbanisation and urban growth in Pacific DMCs [developing member countries] is complex, and is much more than undertaking urban development projects that are often not anchored in city plans and overarching visions … [it] cannot be separated from timely provision of land, transport, services, and other

> economic infrastructure" (Asian Development Bank 2012).

These points emphasise the importance of coordinated planning and involving all relevant stakeholders for the effective development of infrastructure services. The discussion also highlights land ownership, distribution, and access as significant issues in the delivery of infrastructure services.

An emerging challenge to infrastructure service provision is climate change. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) predicts that climate change will lead to an increase in the occurrence and severity of natural disasters in the South Pacific (IPCC 2007). Natural disasters such as the tsunami in Samoa, and the cyclone that affected both Samoa and Fiji in late 2012, were costly and generally reduced the level of available resources, including for infrastructure service provision. Climate change also has implications for appropriate construction standards and asset management activities.

2.2 infrastructure sectors

Challenges to asset management differ among infrastructure sectors because of the physical and geographical differences they face and varying institutional arrangements. These differences affect funding levels, and the incentives of managers and staff working together in each sector. This section provides a brief overview of infrastructure sectors in the Pacific. It discusses the impact of asset management on service provision and identifies common challenges across sectors. Regional strategies to address the challenges in each sector are also considered.

A number of regional organisations under the leadership of the Council of Regional Organisations in the Pacific (CROP) are supporting Pacific island countries to achieve sustainable development. PRIF partners and regional organisations work together to harmonise external assistance. A 2007 review of infrastructure in the Pacific found that:

> "... there remains a great wastage in assets in some instances where budgeting processes continue to starve sectors of resources for maintenance. There remains apparent indifference at the top to the needs of sometimes critically important sectors (e.g. water supply, roads and domestic shipping in several countries) or at least extraordinary tolerance for chronic under-performance. Given the more recent and positive trends, however, it is expected that such cases will stand in increasing contrast, and become less tolerable" (Asian Development Bank 2007a).

The study provided the following overview (see Table 2.2) of maintenance issues in infrastructure sectors.

Table 2.2: Summary of Maintenance Issues in Infrastructure Sectors

	Telecoms	Water/ Sanitation	Power	Roads	Ports
MAINTENANCE ISSUES	- There are no significant maintenance issues in the telecoms sector.	- Assets are generally well maintained by commercially-oriented water supply entities (e.g. PNG, Port Vila-Vanuatu). - In contrast, unaccounted for water (UFW) is often 50 per cent or more in non-corporatised water supply entities such as Public Works departments (Fiji, Samoa, Palau). In these cases, leakages from the distribution networks are high, treatment facilities (if they exist) are often overloaded and thus do not function properly, and supply interruptions due to broken pumps and pipes etc., are frequent and often of long duration.	- Maintenance is largely not a significant issue in the urban power sector. Diesel-based rural supplies, in contrast, are essentially unsustainable due to acute difficulties with maintenance and logistics to remote locations, and a lack of necessary technical skills in rural areas. - There is a lack of outsourcing of operations and maintenance (O&M) services, and of direct private sector investment in generation in most countries. The outstanding exception is Fiji, where large diesel station O&M has been outsourced; there is also considerable investment by Independent Power Producers (IPPs). There is also an IPP operating in PNG, but that project has not worked well due to a faulty pricing mechanism in the supply contract.	- Poor road maintenance is a serious and chronic issue in many countries. - Preventative maintenance attracts almost no funding in all countries except Samoa, PNG, and (to a far lesser extent) Fiji. Road assets in general are poorly monitored, repaired on a continuing stop-gap basis, and are not improving in overall quality.	- Maintenance of the commercial ports is adequate to keep them operating, but several are under near-term pressure to upgrade and rehabilitate facilities to cater for larger ships. - The minor ports receive little maintenance support and are in poor shape. The minor ports require extensive refurbishment and upgrading if they are to play a greater role in outer islands and rural development.

Source: Asian Development Bank (2007a).

water

Infrastructure that provides clean water to urban and rural areas in the Pacific is managed by municipal councils, water authorities, water boards, and private sector corporations. Villagers manage their traditional water sources and many households provide their own water by harvesting rainwater and storing it in tanks or digging wells.

Potable water is a 'private good' which is normally provided for a fee. The provision of potable water is supported by a number of government services, which have 'public good' characteristics, such as the protection of water sources, management of access, and quality standards. Because potable water is seen as an essential service, governments commonly set very low fees in order to ensure that it remains affordable for low income households. A government's failure to reimburse

The distinction between public and private goods is fundamental to the way in which economists analyse infrastructure service provision.

***Public good infrastructure**, the consumption of which cannot be controlled, is generally funded by government, as private agents have no incentive to provide something that others can access for free.*

***Private good infrastructure** is excludable, meaning that consumption can be controlled and fees charged for consumption.*

The distinction between public and private good is discussed in more detail in Chapter Four.

these subsidies often has negative health ramifications for users of water in the region.
Many countries in the Pacific are in danger of not meeting the MDG of "halving, by 2015, the number of people without access to safe drinking water and safe sanitation." The funding arrangements for water utilities in the region appear to adversely affect their ability to manage assets and provide safe water. Partly as a result, water utilities have neither the resources nor incentives to extend water service provision into un-served areas. The quality of existing supplies is also a problem, with potential health impacts. A Water and Sanitation Sector Coordination meeting in 2012 identified "minimal to no maintenance" as a key challenge to improving water and sanitation service provision in the Pacific (Pacific Region Infrastructure Facility 2012). Improved financing arrangements are necessary to address this challenge. Trained staff members are also important.

"Lack of investment and trained staff inhibit water quality testing arrangements in a number of Pacific states."

This is just one of the findings in the report of a cooperative audit into access to safe drinking water in the Pacific region.

Pacific Regional Report of the Cooperative Performance Audit: Access to Safe Drinking Water

The *Pacific Partnership Initiative on Sustainable Water Management* (2003) prepared by the Applied Geoscience and Technology Division (SOPAC) of the Secretariat of the Pacific Community (SPC), identifies a number of strategies to build capacity in the sector. These include governments and utilities working together to protect water sources, improve human resource capacity, and place water utilities on sound financial footing.

A 2011 benchmarking report provides statistics on the availability of water resources across the Pacific. It identifies the availability of reliable information on water utility performance as a key challenge for the sector (Pacific Water and Wastes Association 2012).

power and energy

Electricity is a 'private good' that is normally sold to consumers. Electricity in Pacific island countries is provided by government agencies, SOEs, and private sector organisations. Non-government and community organisations are commonly involved in rural electrification, sometimes with financial support from government. Self-generation is also on the rise, with households and businesses in both urban and rural areas purchasing cheap petrol-operated generators or installing solar panels for power and hot water.

Given the monopoly characteristics of the distribution and transmission network, governments in the Pacific are generally involved in the sector through either the direct provision of electricity or by means of price regulation. Electricity provision by SOEs is the most common institutional arrangement. As in the water sector, it is common for prices set by government to be below the cost of service delivery, given political imperatives. This results in unreliable power supply which further exacerbates the financial challenges of power utilities.

Insufficient revenue is a major cause of difficulties in maintaining energy infrastructure and in supplying electricity in many Pacific island countries. It is also a reason for the slow rate of rural electrification in the region. Only 30 per cent of Pacific Islanders have access to electricity, ranging from very low rates in some countries, (PNG ~10 per cent, Solomon Islands ~20 per cent, and Vanuatu ~25 per cent) to over 95 per cent in others (Cook Islands, Guam, Nauru, Niue, Northern Mariana Islands, Samoa, Tonga, Tokelau and Tuvalu). Electricity utilities also face other challenges.

The *Framework for Action on Energy Security* in the Pacific notes that:

> "Investments in government-owned facilities often fail to deliver the expected services sustainably for various reasons, including poor planning, management, operation and maintenance, exacerbated by insufficient operating income from fees and subsidies. The total amount of cross-subsidies (e.g. from urban to rural electricity consumers on larger grids) and other subsidies (e.g. for rural electrification or shipping fuel to remote areas) is often unknown. Subsidy processes lack transparency and are not clearly designed and targeted to achieve specific purposes such as social equity. For individual projects, both urban and rural, there is often little or no routine M&E [monitoring and evaluation]" (Secretariat of the Pacific Community 2010).

The structures and challenges in other energy sub-sectors are different. Petroleum and other fuels are normally imported and distributed by the private sector. The management of assets and the supply of fuel are generally sound, although there have been concerns raised about the monopoly power of multinational corporations operating in some countries. This point emphasises the importance of sound, effective, and efficient regulation. The approach of Samoa and American Samoa, which tender the operation and maintenance (O&M) of state-owned fuel importation terminals to the private sector, is highly regarded in the region (and is outlined in Chapter Six).

The SPC has regional responsibility for the coordination of energy sector development. In 2010, the SPC issued a framework for action on energy security in the Pacific: *Towards an Energy Secure Pacific* (Secretariat of the Pacific Community 2010). The report encourages Pacific island governments to take a whole of sector approach to energy generation and distribution. A whole of sector approach is likewise important for balancing different priorities, including: the promotion of investment in energy efficiency and renewable technologies; improved access to secure, reliable, affordable, and high quality energy services; and the adoption of more efficient practices in petroleum supply chain management and procurement.

waste management

Waste management is often politically contentious, making management of the sector a challenge. Waste is created by the activities and decisions of many people, meaning that management involves many stakeholders.

Waste management is usually the responsibility of the municipal council or local government, and is rarely centralised within the national government. Waste management involves the collection and disposal of many types of waste, including solid waste, liquid waste, marine waste, and hazardous waste. In rural areas, households or villages normally organise waste disposal with minimal government assistance.

Pacific Regional Report on Cooperative Performance: Audit of Solid Waste Management

The country audits assessed implementation of waste management laws and policies against the following key aspects of the waste stream:

- *Prevention*
- *Generation*
- *Recycle, reuse, recover (3Rs)*
- *Collection*
- *Transport*
- *Treatment and disposal*

Sub-national government agencies responsible for waste management in the Pacific normally rely on the national government for funding. In some countries, local municipal rates and market fees are the source of funds for waste management – although the concept of local rates is yet to be introduced in many Pacific island countries (in urban areas of Fiji the concept of rates is established, although collection remains a problem). Waste management has both public and private good characteristics.

Funding models whereby households pay for waste disposal are possible. However, strong government oversight and subsidies are also required given the health impacts of waste. Any user-pays framework needs to be accompanied by requisite legislation.[7] Sources of funding for waste management can include a combination of fees, charges, levies, penalties, fines and taxes, as well as budget appropriation, and grants from government budgets and donors.

Appropriate infrastructure and technologies for the collection and disposal of waste is equally important for ensuring that waste is not simply disposed of in a way similar to organic waste, causing environmental problems. Many technologies for the treatment of liquid waste in particular are not appropriate for Pacific island countries, especially for small atolls. In Tuvalu for example, poor quality septic tanks installed by households result in liquid waste contaminating the shallow groundwater of Funafuti, adversely affecting the health of residents and local fish stocks. It is estimated that poor liquid waste management in Funafuti alone is costing Tuvalu about $500,000 a year (Lal *et al.*, 2006).

The *Pacific Regional Report on Cooperative Performance: Audit of Solid Waste Management* found that:

"Implementation of the legal framework was variable and monitoring and reporting systems that were in place not adequate to capture reliable data to provide assurance that key environmental and public health risks were addressed or to inform future planning and decision-making for solid waste management."

The *Pacific Regional Solid Waste Management Strategy 2010-2015* identifies waste avoidance, minimisation, and recycling as important for managing solid waste in the Pacific region (SPREP 2010). It also identifies a series of financing activities already being used in the sector, detailed below in Table 2.3.

Table 2.3: Financing Activities of Waste Management in Pacific Island Countries

Financing Activity	Description	Applicable PICTs
Landfill tipping fees (gate fees)	Fee for dumping waste at a landfill	Cook Islands, Fiji, Guam, Palau*, PNG, Samoa, Vanuatu,
Container deposit charge	Charged on new beverage containers. Partial refund issued when the container is returned for disposal	Cook Islands, FSM (Yap) Kiribati, Palau
Advanced disposal charge	Disposal fee charged when certain products are imported, no refunds issued	FSM (Kosrae, Yap)
Visitor levy	Charge payable by each visitor to the country	Cook Islands
Waste service fee	Fee charged for providing a service (e.g. waste collection)	Fiji, Kiribati, PNG, Solomon Islands, Tonga
Annual Vehicle registration fee	Waste management fee payable when renewing vehicle registration	Guam
Penalties and fines	Fine for breaking the environment or waste management laws	Fiji, Kiribati, Palau, PNG, RMI, Solomon Islands
Permitting Fees	Paid when applying for various waste-related permits and licenses	Fiji, Kiribati, Palau, RMI, Samoa, Solomon Islands
Council taxes	General taxes which include a component for waste management (usually waste collection)	RMI, Solomon Islands, Vanuatu
* Legislated but not enforced		

Source: *Pacific Regional Solid Waste Management Strategy 2010-2015* (SPREP 2010).

[7] Illegal dumping enforcement, abandoned vehicle removal, litter collection, bin emptying, hazardous waste collection and disposal, public education and policy development and identification and management of community service obligations.

information and communication technology (ict)

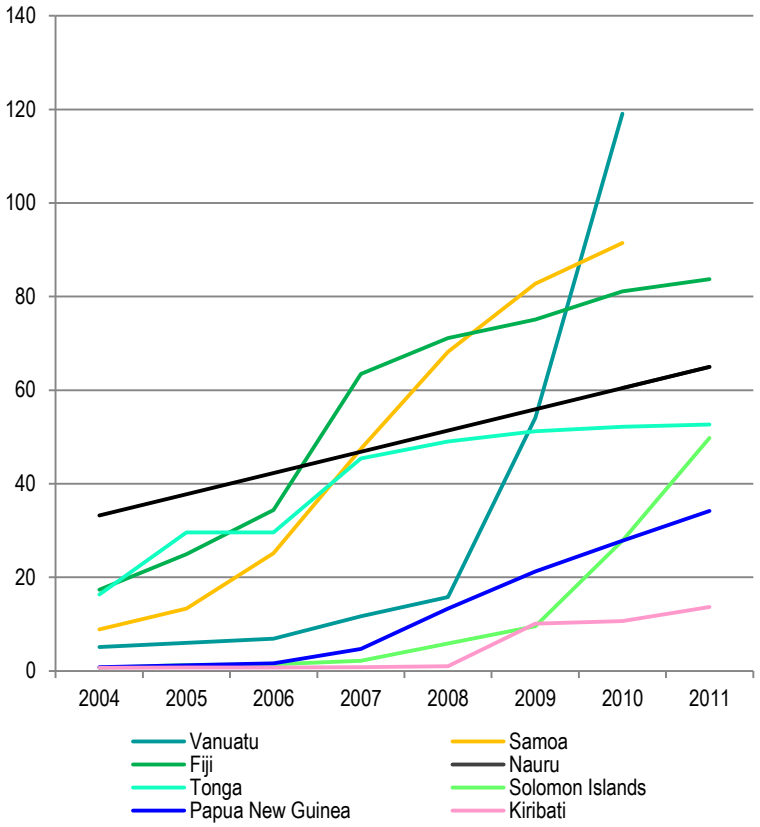
The ICT sector is one of the Pacific's biggest success stories. Regulatory reform along with technological change has facilitated an explosion in access to information and communications technologies. A 2012 report titled *Digital Islands: How the Pacific's ICT Revolution is Transforming the Region,* estimates that mobile usage rates in Tonga have increased from three per cent in 2002 to 53 per cent in 2011. Fiji, Samoa, Vanuatu and New Caledonia now enjoy mobile usage rates of over 80 per cent, and in PNG, mobile usage has increased from two per cent in 2006 to 34 per cent in 2011. There are now more Pacific Islanders with mobile phones than bank accounts (Cave 2012).

Access to information and communications technologies is changing the way that people operate in other areas. Mobile banking is increasingly common and is widening access among the rural population to financial markets.

Social networking is also affecting civic-government relations by increasing transparency and accountability. This has implications for the delivery of public services. Already, Facebook discussions have led to an inquiry into health services in one Pacific island country.

The provision of ICT services in the Pacific is increasingly conducted by the private sector, although SOEs remain important in many countries. Fees are charged for service provision, normally on a cost-recovery basis.

Figure 2.2: Mobile Subscriptions (per 100 inhabitants) for Selected Pacific Island Countries



Access arrangements, and in some cases pricing, are regulated by government. The entry of private sector operators into Pacific markets has been facilitated by regulatory reform, with governments dismantling monopolies that were previously allocated to SOEs.

The need to remain competitive and generate a profit ensures that asset management in the sector is normally sound. Poor asset management and lack of maintenance continue to be a problem in countries where reform has not taken place and government monopolies continue to operate.

transport

Wharves, roads, and airfields are crucial to social and economic activity in Pacific island countries. The following sub-sections discuss infrastructure for travel by land, sea and air.

Roads

Roads are the only infrastructure asset in this report that can be categorised as a true 'public good' according to economic theory.[8] It is very difficult (and costly) to limit access to roads among the public. The public good status of roads has implications for the way in which roads can be funded. It is generally not possible to charge a fee for road access, so revenue for road construction and ongoing asset management must be sought from other sources. In most Pacific island countries, governments have funded roads using consolidated revenue.

The experience with roads in the Pacific has been mixed. Governments have generally allocated insufficient funding towards maintenance through the budget process, with negative implications for the condition of roads. The result has been the deterioration of existing roads – often occurring at the same time as new roads are constructed. A technical report prepared for the ADB noted that in the Pacific:

> "The roads sector is, in general, poorly maintained and under the care of entities that are under-equipped and under-financed to do the job properly. Lack of awareness of the economic importance and priority of well-maintained roads is commonly observed at the top levels of government" (Asian Development Bank 2007a).

Poor maintenance of roads has led to interest in the use of earmarked revenue. This involves permanently appropriating a dedicated revenue stream to an earmarked fund, which is accountable to the legislature outside the normal tabling of the budget and financial statements. It is too early to tell whether this arrangement will succeed in the Pacific.

There is more detailed discussion and analysis of transport and road funds in PNG and the Solomon Islands in the chapters that follow.

Figure 2.3: Road Works in Chuuk, FSM.

Photo courtesy of Cori Alejandrino-Yap (PIAC)

Development Assistance for Transport Infrastructure

The majority of development assistance for infrastructure in the Pacific is directed towards the transport sector. Between 1969 and 2010, 68 per cent of all infrastructure-related assistance in the Pacific from the ADB was directed towards the transport sector. Similarly in 2011-12, 76 per cent of AusAID infrastructure-related assistance was channeled to transport. Roads are the most significant transport subs-sector.

Notable road projects in the Pacific include:

- *In the Solomon Islands, PRIF partners have directly assisted with the rehabilitation and maintenance of approximately 25 per cent of the road network (discussed later in this report).*
- *In Vanuatu, 140km of priority road on three outer islands is being rehabilitated and maintained.*

[8] Not all roads are strictly public goods. It is possible to charge for access through the establishment of tolls on major highways. There is very limited experience with this in the Pacific. Local roads are closer approximations of a public good; however in the Pacific customary land ownership can result in land owners charging vehicles an informal toll (giving the road private good characteristics).

Ports

Ports and wharves are often described as the 'lifeblood' of the Pacific, facilitating commercial shipping operations for the movement of both cargo and people. Primary ports are used for international trade, whereas secondary ports are used for domestic travel and trade. Governments generally own ports at either the national or sub-national level.

It is common for SOEs to operate port facilities, although increasingly, operation and maintenance activities are being outsourced to the private sector (Asian Development Bank 2007b). Some minor secondary ports are under the responsibility of communities which they serve.

Some ports do much better than others.

The Port Moresby port comes close to achieving the World Bank's 'Doing Business' indicators. It is the Pacific's most efficient port, with relatively short clearance times (three days for exports) and reasonable costs ($200 per 20-foot container).

The worst performing port is Port Vila, where it takes 17 days to clear exports and costs more than $1000 per 20-foot container (AusAID, 2008).

Primary ports are often operated efficiently in the Pacific, although there is some variance across the region. Ports receive revenue from cargo charges and berthing fees, sometimes complemented by budget allocations from government. The importance of ensuring the continuation of trade means that port authorities are rarely short of funding for ongoing everyday operations and maintenance, although limited funding can prevent expansion and rehabilitation works.

The case of secondary ports is a different matter. Secondary ports are rarely able to recover their costs due to both political constraints and the small scale of operations. These funding gaps are generally not filled by government subsidies. The lack of a viable funding model for secondary ports adversely affects their maintenance, leading to the premature deterioration of port infrastructure. A technical report on asset management in the Pacific argued that:

> "Maintenance of the commercial ports is adequate to keep them operating, but several are under near term pressure to upgrade and rehabilitate facilities to cater for larger ships. The minor ports receive little maintenance support and … are in poor shape. By and large the minor ports require extensive refurbishment and upgrading if they are to play more of a role in outer islands and rural development" (Asian Development Bank 2007a).

The poor state of secondary ports point to the importance of developing arrangements for funding the community service obligations of governments – an issue discussed in later chapters.

Airports

Airports facilitate quick and easy travel within Pacific island countries and with the rest of the world. Airports are as important as ports in many countries, enabling the development of a tourism industry.

Airports are a private good: access to an airport can be limited on the basis of whether someone has paid a fee. However they also have significant positive externalities, with Pacific island countries relying on them for tourist income, as well as for essential healthcare (such as medicines) and other services. Airports are generally owned by the state, with operation and maintenance the responsibility of SOEs, or in some cases, government departments.

There are primary and secondary airports servicing international and domestic routes, just as in the case of ports. Again, there are stark differences between the two. International airports in countries with significant tourism are maintained at an acceptable standard. International airports in the region are audited by the International Civil Aviation Organisation (ICAO), as noted later in the case study of the Cook Islands Airport Authority (CIAA). This process ensures that safety equipment, the runway, and other infrastructure essential for the safe landing of aircraft are maintained.

However, international airports still have problems in raising sufficient funds for capital works or replacement of infrastructure.

Externalities are costs or benefits that are not incorporated into the price of a good or service.

An airport is an example of a positive externality. The benefits of an airport for the economy include access to air travel and benefits from tourism. These are often not captured in the cost of an airport.

An example of a negative externality is pollution from a factory, the cost of which is not included in the price of the products produced by the factory.

AusAID's *Pacific Economic Survey* (2008) concluded that "under investing in airports is a significant barrier to growing more efficient air services, particularly in domestic markets, and … hampers tourism development". The situation for secondary airports facilitating domestic travel is considerably worse, with poor asset management leading to premature deterioration of airport infrastructure.

The primary challenge for airport operators is to set fees at a level that covers costs. This is challenging because of policy decisions designed to lower the cost of travel for tourists (thereby growing the industry) and an inability to take advantage of economies of scale. Governments are obliged to keep primary airports operating, given their economic importance, leading to a perverse outcome where governments use scarce budget resources to support the travel of high income households and foreign visitors. Secondary airports are often allowed to deteriorate.

Kundiawa airport in PNG was closed for several months in 2010 because inadequate maintenance of the runway had led to it being unsafe.

Kundiawa is the capital of Chimbu province which largely has a primary production economy.

Roads are frequently impassable and farmers rely on air transport. During the months the airport was closed, farmers were unable to get their goods to market and they were fed to the pigs.

The *Pacific Economic Survey* argued that:

"… the capital intensive nature of infrastructure development, upgrading and maintenance … is proving to be a drain on government budgets and infrastructure in many areas is inadequate. Typically, international airports are maintained to an acceptable standard, but smaller domestic airports and airstrips suffer from limited resources" (AusAID 2008).

Some Pacific island countries have separated control and regulation of airports, with mixed results. These may be the result of a lack of transparency in management structures and unclear roles of government and the statutory authority/corporation.

The first three conclusions of a 2006 review of airports by the PNG Consumer and Competition Commission are worth noting in full:

1	"As far as possible, airport costs, including for upgrades and maintenance, should be recovered from airlines. Where operating or capital subsidies are provided by governments or donors this should be done in a transparent manner."
2	"Investments in airport infrastructure should be based on an analysis of costs and benefits, including reasonable projections of future demand. With scarce resources it is not sensible to adopt a 'build it and they will come' approach."
3	"The process for setting airport-user charges should be transparent, with opportunities for parties to negotiate. Airports and airlines often disagree about the level of user charges but negotiating can provide an opportunity to agree on future infrastructure needs and how best to finance them."

Source: PNG Independent Consumer and Competition Commission (2006) quoted in *Pacific Economic Survey* (2008).

summary

Demography, migration, size, income, and natural disasters all impact the quality of infrastructure services in the Pacific. However they are not the only determinants. The World Bank's *Pacific Infrastructure Challenge* report points out that:

> "Pacific countries demonstrate worse infrastructure performance than could be expected for their level of GDP ... [with] infrastructure performance worse than in comparator countries (such as the Caribbean islands) with similar levels of income, and which share some 'disadvantages', such as small scale or vulnerability to natural disaster" (World Bank 2006).

There is also great variation in the quality and performance of infrastructure across countries. Electricity provision in Vanuatu is among the most efficient in the region, despite low levels of income. Similarly, shipping services in Fiji are efficient and cost effective despite serving dispersed islands on what are often non-commercial routes (government subsidies are used to attract private operators to routes that would otherwise not be served) (World Bank 2006).

Therefore, the quality of infrastructure services cannot be explained by simple reference to income, geography, population, and vulnerability to climate change and natural disasters. Institutional arrangements are also important. The next section discusses underlying reasons for why maintenance in the Pacific is suboptimal.

2.3 infrastructure maintenance

the cost of maintenance

There is a considerable backlog of maintenance that has been postponed in the Pacific. It is difficult to estimate the value of this backlog. The World Bank has estimated that ongoing annual maintenance of infrastructure requires the allocation of approximately 2.5 to 3.73 per cent of GDP (Fay and Yepres 2003:11). An estimate of the quantum of the annual allocation of funds to maintenance, in national currency, is included in Table 2.4.

The percentages of national budgets required for maintenance excludes fees and charges raised for the delivery of infrastructure services. This calculation is therefore less relevant for infrastructure sectors where services are provided using user charges (such as ICT). The figures do not include the cost of addressing the backlog of postponed maintenance. It is evident that funds required are significant.

Table 2.4: Estimated Annual Allocation to Maintenance Required to Maintain Functionality of Infrastructure

Estimated Maintenance per Pacific Island Country (PIC) as a Percentage of GDP						
		GDP (2011 current prices in national currency)[1]	Total Maintenance Requirement	Total Government Budget Sector Revenue and Grants, excluding Donor Contribution	Financial Year of Data	Total Maintenance as % of Total Budget Revenue and Grants
Country	Currency	Millions	Millions	Millions		%
Melanesia (Source: Central Banks)						
Fiji[2]	FJD	6,827.0	211.6	1,529.0	2010	13.84
PNG	KIN	29,841.5	925.1	8,279.9	2011	11.17
Solomon Islands	SBD	6,404.4	198.5	2,233.0	2011	8.89
Vanuatu	VTM	69,613.3	2,158.0	12,850.0	2011	16.79
Polynesia (Source: Budget Estimates, IMF and SPC)						
Cook Islands	NZD	348.2	10.8	126.44	2009	8.54
Niue	NZD	n/a	n/a	19.5	2005	n/a
Samoa (Budget)	WST	1545.5	47.9	489.5	2012	9.79
Tonga	TOP	783.3	24.3	151	2011	16.08
Tuvalu[3]	AUD	35.5	1.1	18	2010	6.11
Micronesia (Source: Audited Financial Statements and Budget Estimates)						
FSM (National)	USD	318.5	9.9	37.6	2011	26.26
Kiribati	AUD	176.7	5.5	77.9	2010	7.03
Marshall Islands	USD	189	5.9	52.2	2010	11.22
Nauru[4]	AUD	69.5	2.2	23.8	2011	9.05
Palau	USD	228.7	7.1	47.7	2010	14.86

Notes: 1. Source: UNStats National Accounts Aggregates

2. Fiji deficit financed by Local and foreign financing. Local financing of 298.6 is through Local Bonds, Treasury Bills and other. Foreign financing of 63.6 is through international institutions and bilateral donors.
3. Data is from a secondary source: The *Tuvalu Infrastructure Strategy and Investment Plan*, published 2012. 2010 Outturn data is used.
4. Projected full year outturn as at 31 May 2011.

barriers to maintenance

The quality of infrastructure service provision is closely linked to infrastructure asset management and maintenance. There is no single explanation for suboptimal asset management. A number of interrelated factors are responsible, as highlighted by the United Nations Human Settlements Programme (UN-HABITAT):

> "The problem results largely from a lack of awareness of the importance of maintenance and the insensitivity to this issue at the decision-making level; from unclear institutional responsibilities and the resulting lack of accountability; from a lack of trained staff, particularly at the middle-management levels; from a lack of incentives to foster good maintenance; from a lack of planning and rational budgeting; and perhaps most critically, from a lack of financial resources" (UN-HABITAT 1993).

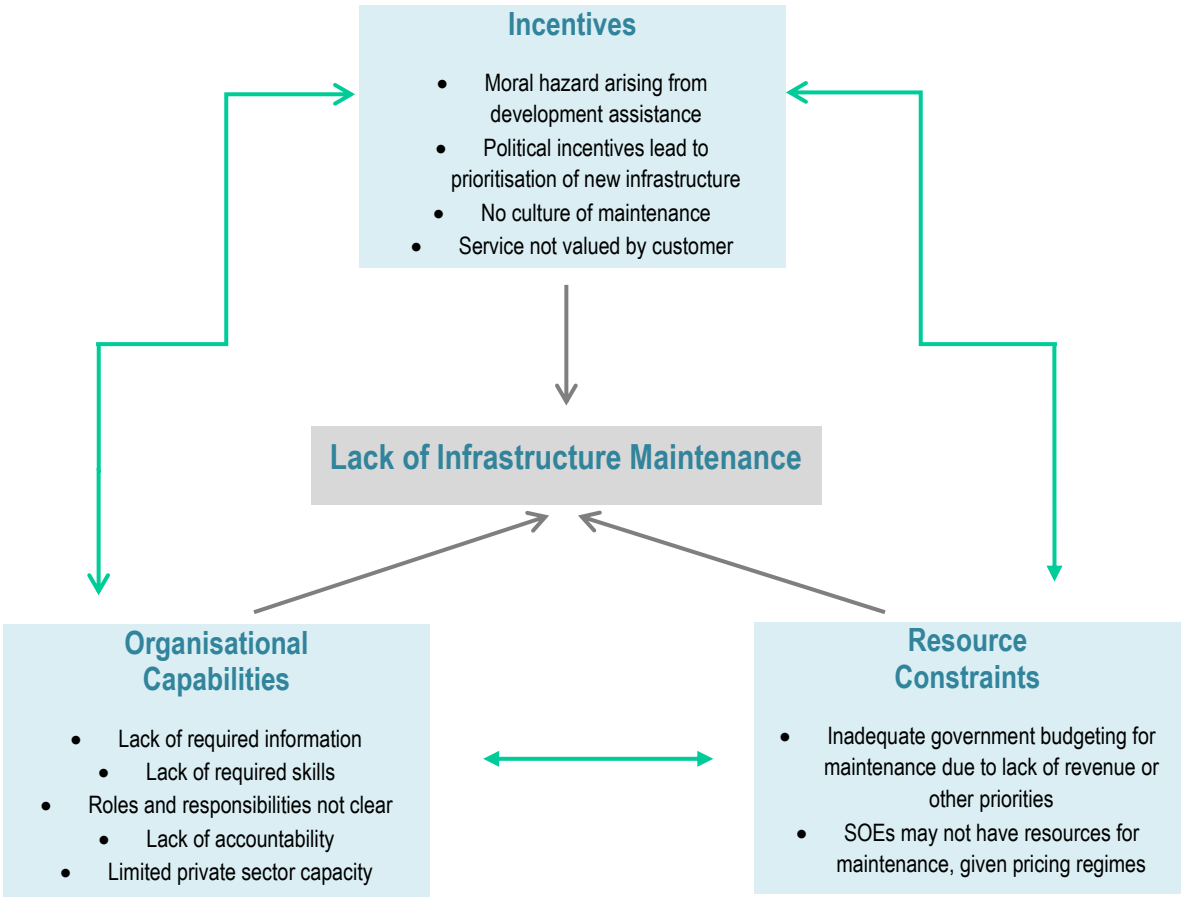
Factors responsible for poor asset management and lack of maintenance that are identified in the literature can be grouped under three headings:

i. **Resource constraints.**

ii. **Organisational constraints**, including lack of reliable information and requisite skills.
iii. **Incentives.**

These factors are illustrated in Figure 2.4, and discussed below.

Figure 2.4: A Framework for Understanding Poor Asset Management



Resource constraints

Resource constraints provide an important explanation for why asset management is often suboptimal in the Pacific. In countries where incomes are low, there may be insufficient financial resources available for maintenance activities. Resource constraints in Pacific island countries are especially evident at the fiscal level. The Pacific is one of the most aid-dependent regions in the world, with many Pacific island governments reliant on development assistance for their operations. Development assistance regularly accounts for over 30 per cent of government expenditure in Kiribati, approximately 50 per cent in Nauru, and 65 per cent in Tuvalu. In 2011, the Government of Tuvalu's recurrent budget alone was equal to 148 per cent of its revenue. The precarious fiscal position of many Pacific island governments highlights the importance of considering liabilities being created by new infrastructure, as done for selected countries in Figure 2.5.

Figure 2.5: Future Liabilities Generated by Planned Infrastructure Investments (AUD million)

	Nauru	Samoa	Tonga	Tuvalu
Capital cost	73.11	246.27	84.62	71.29
Total life-cycle cost	198.97	446.78	140.65	377.87
Estimated annual operation & maintenance costs	6.293	6.864	6.612	7.78
Annual government revenue[1]	18.66	101.47	49.50	19.44
Est. annual operating + maintenance costs as a % of govt revenue (%)	**33.72**	**6.76**	**13.36**	**40.02**

Notes: 1. Nauru 2009/10 (actual budget expenditure, which is 66 per cent of the budget estimates); Samoa 2011/12; Tonga 2011/12; Tuvalu 2011. Life-cycle costs are taken from the National Infrastructure Investment Plans of each country.

The resource constraint challenge is especially problematic where new infrastructure does not increase the productive capacity of the economy. There has often been an implicit assumption in the design of infrastructure projects, among both donors and partner governments, that core economic infrastructure will 'pay for itself' by generating economic growth. Such an assumption is problematic in Pacific island countries, especially in smaller states, which are remote and unable to take advantage of economies of scale. These economies are at a distinct disadvantage in global markets, meaning that options for economic growth may be limited (Bertram and Watters 1985; Winters and Martins 2004; Gibson and Nero 2007; World Bank 2011).

The assumption that infrastructure will 'pay for itself' is especially problematic where new infrastructure does not generate economic benefits. The aquatic centre in Samoa is one such example. The Olympic-standard aquatic centre, one of only three in the southern hemisphere, was constructed with donor funding in preparation for the Pacific games. It has barely been used for competition since, has produced little economic benefit, and is now a liability on government finances.

Resource constraints to good asset management can also result from institutional arrangements. A common problem around the world is that governments, despite having adequate resources, fail to allocate necessary funding towards maintenance. This is closely linked to the incentive problems described below. Another challenge that is common around the world is that user fees set by government or regulatory agencies are not high enough to cover service provision costs. The end result of such factors is poor service provision, as lack of maintenance leads to the premature deterioration of infrastructure. This can create a vicious circle, as customers are unwilling to pay more for a service that is sub-standard. Increasing user fees or refusing to provide services to non-paying customers can be politically difficult as a result.

Organisational capabilities

A second set of reasons for poor asset management relate to the capabilities of organisations. Capability constraints at the level of the organisation are numerous and varied. Constraints can include poor forward planning; limited technical capacity and human resources; weak internal systems and processes, including procurement and financial systems; lack of accountability; and unclear roles and responsibilities related to infrastructure assets.

Internal controls are essential to the effective operation of an organisation, forming a framework within which staff work. Internal controls are activities and procedures that give reasonable assurance to each manager that 'things are going to plan'. They include, but are not limited to, the

procedures in manuals. Without adequate internal controls, managers have little assurance that the goals and objectives of the organisation will be achieved.

Properly designed and functioning controls reduce the likelihood of significant errors or fraudulent activities remaining undetected. Internal controls are implemented at four levels: (i) national; (ii) whole of government/corporate group; (iii) organisation; and (iv) within each division/section of an organisation. Managers should be knowledgeable about and comply with internal controls at each of these levels, including:

- Whole-of-government legislation, corporate values, budget, regulations and procedures.
- Organisation plans, budgets, standards, systems and procedures, and other controls.
- Operational procedures specific to their particular division.

Internal control weaknesses affect all aspects of the infrastructure asset life-cycle, which is discussed in the next chapter. Asset management planning is a common weakness in the Pacific, and is linked to human resource constraints. It should be remembered that civil services in the Pacific are relatively young; the life span of many Pacific island countries as independent states is shorter than the life span of much of their infrastructure.

Poor asset management planning can mean that the ongoing maintenance of infrastructure is conducted on an *ad hoc* basis, and is reactive rather than preventative. Lack of capacity can affect both the public and private sectors. In context of the budget process, lack of forward planning results in inadequate consideration of recurrent funding needs for infrastructure asset management. It also means that government departments fail to make a strong case to central ministries for budget allocations. Unclear roles and responsibilities also affect the management of infrastructure assets. In many countries, there is a lack of accountability for service provision for certain asset types. This is a challenge in the case of the national road network in PNG, where maintenance activities are managed by various departments or statutory authorities, sometimes leading to conflict about relevant responsibilities.

Funding available to sub-national governments for maintenance is also often insufficient. This is a problem in many countries in the region, including PNG, Fiji, and the Solomon Islands. In the context of rapid urbanisation, the ADB notes that: “local governments … responsible for road maintenance within their jurisdictions … often have lesser technical and financial resources for carrying out road maintenance than central government” (Asian Development Bank 2012).

Incentives

Incentives are interlinked with many of the reasons for poor asset management already discussed. Managers require incentives for undertaking asset management activities. Clear roles and responsibilities for which managers are accountable are important for establishing such incentives. Similarly, internal controls and monitoring employee performance are important for developing appropriate incentives among staff.

Communities must value infrastructure services for their provision to be a success. Communities should be involved in initial planning of infrastructure, as this will generate community support for infrastructure services, and where appropriate, may also assist in maintenance of infrastructure. Unfortunately, decision-making by political leaders or donors without adequate community consultation can result in services with little relevance or value to the end users. As a result, users may have no interest in maintaining infrastructure assets and, in some cases, may deliberately damage them. Users will also have no incentive to pay for services that are not seen as having value.

A common reason for the failure of service delivery in rural areas is that communities are not involved in the planning and design of infrastructure services.

At the country level, it is well established that development assistance has the potential to create perverse incentives and moral hazard. Economists such as the Nobel prize laureate Elinor Ostrom have argued that donor funding of new infrastructure reduces the incentive of recipient countries to adequately maintain that infrastructure (Ostrom *et al.*, 1993; Ostrom *et al.*, 2001; Gibson *et al.*, 2005). In a narrow financial sense, it can be rational to underfund maintenance where recipient countries bear the full cost of maintenance but only part of the cost of new infrastructure (although such decision-making ignores the broader economic costs associated with lack of maintenance).

Political incentives also influence government provision of infrastructure and management of assets. There is often a mismatch between short-term political incentives, and asset management and maintenance activities that focus on the long run sustainability and performance of infrastructure. Reducing ongoing maintenance funding enables governments to allocate resources to other more politically rewarding areas, such as investments in new infrastructure (Ostrom *et al.*, 1993; Ostrom *et al.*, 2001; Gibson *et al.*, 2005).

summary

This chapter discussed challenges facing infrastructure sectors in the Pacific, and regional approaches that have been developed to address such challenges. It has identified the various factors that affect the allocation of funds to maintenance. There are many interrelated reasons for suboptimal asset management. This section provided an overview of these reasons, placing the underlying reasons for poor asset management into three categories. None of these explanations for poor asset management suggest that improvement is not possible. The last part of this chapter provides an example in sound asset management: the Fiji Electricity Authority (FEA). The chapter that follows discusses what asset management should look like and how it can benefit Pacific island countries.

Case Study 1

the fiji electricity authority

Monasavu Dam, Fiji.
Photo courtesy of Matthew Dornan.

The Fiji Electricity Authority has a record of good asset management, which includes complete record keeping, assets being assigned to managers who are held accountable for their condition, annual reporting and regular audit, contestable budgets for maintenance, and adequate funding being made available for maintenance activities.

The Fiji Electricity Authority (FEA) is widely regarded as one of the best performing power utilities in the Pacific. Good performance is based on sound asset management practices, with routine maintenance prioritised by FEA management.

Routine and periodic maintenance of generation, network, and other assets is planned and budgeted for through the internal annual budget cycle.

Each asset is the responsibility of a section within the FEA. Sections prepare an annual work plan for operation and maintenance of assets under their responsibility.

This work plan is submitted to management, along with relevant costings, as part of the annual budget. Work plans are vetted through a number of processes:

- Work plans are first questioned by business unit managers, who are responsible for ensuring that maintenance plans and costings within their unit are sound.
- The work plans of each business unit are then debated in 'challenge sessions' involving management from each of the business units.
- After this, work plans are considered by the Audit and Finance sub-committee of the FEA Board.
- Final work plans and budgets are approved by the Chief Financial Officer, Chief Executive Officer and the full FEA Board.

Maintenance work plans are developed using an asset management system. FEA assets are recorded in an asset register, which includes details on asset cost, performance and maintenance history. This enables sections within FEA to identify when maintenance of each asset is due, based on the age, operation history, and performance of the asset. The asset register is integrated with the financial management system used by the FEA.

Good asset management requires adequate financial resources. The level at which the electricity tariff is set is therefore an important determinant of whether the FEA is able to finance the necessary maintenance of its asset base. Since 2002, electricity tariffs in Fiji have been set by an independent regulator, the Commerce Commission, in a process that requires submissions from the FEA and other stakeholders. FEA submissions to the Commerce Commission include expected expenditure on capital investment, operations, and maintenance for the year ahead. Tariffs have doubled since 2004 under this regulatory arrangement, in recognition of investment requirements,

renewable energy targets, and higher fuel costs. Higher electricity tariffs have facilitated improved asset management, placing the FEA is in a financial position to undertake more maintenance activities.

lessons

The experience of the FEA demonstrates that good asset management is associated with good performance. Asset management at the FEA is sound for three reasons:

i. Adequate financial resources are available as a result of independent price regulation, and are dedicated towards maintenance,

ii. The FEA has the requisite skills and systems in place to manage assets effectively, and

iii. Incentives are in place among both management and staff for asset management. This is the result of both internal and external accountability. Internally, maintenance planning is scrutinised by a number of groups through the internal budget cycle, ensuring that expenditures which are planned are necessary. Externally, FEA management is accountable through tariff submissions to the independent price regulator and submission of the corporate plan to its shareholder, the Government of Fiji.

The full case study is provided in Annex 1.

3 Asset Management

Improving asset management in the Pacific involves a step-based approach whereby the basics of asset management are established before more sophisticated elements are put in place.

Asset maintenance is a vital process for maintaining infrastructure in good working condition, but it is only one component of asset management. Asset management "is a process of guiding the acquisition, use and disposal of assets, to make the most of their service delivery potential and manage the related risks and costs over the full life of the assets" (Leong 2004).[9] It involves all the activities that ensure assets contribute to the objectives of an organisation, and is therefore concerned with asset "performance, risks and expenditures" (Hooper *et al.,* 2009). In the case study of the FEA, good asset management included complete record keeping, assets being assigned to managers who are held accountable for their condition, annual reporting and regular audit, contestable budgets for maintenance, and adequate funding being made available for maintenance activities.

Asset management is a relatively new discipline, which over the last 20 years has integrated into a coherent framework a range of disparate activities, including economic and financial analysis and governance, internal control, technical knowledge, performance management, risk management, and systems engineering (Brint *et al.*, 2009; Corrigan *et al.*, 2012).

Asset management is a "process of guiding the acquisition, use and disposal of assets, to make the most of their service delivery potential and manage the related risks and costs over the full life of the assets" (Leong 2004)

What constitutes good asset management varies for different infrastructure assets. There are nevertheless common principles that are relevant across infrastructure sectors, and which form the basis for asset management as a discipline.

asset management principles

The fundamental principles of asset management are:

1. Who owns what and who is responsible and accountable?
Each organisation should be aware of the assets it owns, and the assets it uses that are owned by others.
The organisation should also be clear about who is the custodian of each asset, including who is responsible for the asset's operation and maintenance and its management.

[9] There are many definitions. Another, by the Australian Asset Management Collaborating Group (AAMCoG) defines asset management as "the process of organising, planning, designing and controlling the acquisition, care, refurbishment, and disposal of infrastructure and engineering assets to support the delivery of services" over the life-cycle of an asset (AAMCoG 2012).

2. Know your assets
Each organisation should have a full and accurate inventory and maintenance knowledge of all assets – date of 'birth', location, building contract documents, records of regular maintenance, breakdowns and repairs, replacements, upgrading, refurbishments, and details of disaster crises and remedies. This data is centralised in an asset register. Leong states: "only with the availability of accurate data of assets can asset management begin" (Leong 2004:19).

3. Asset objectives
What is the asset for? An organisation must have in place objectives for each and every asset, the services they provide to the public and the standard of service they are designed to deliver. These are the agreed levels of service.

4. Service criteria
Every asset is designed to perform a social or environmental function. A monument celebrating a historical event provides an urban or community identity. Others provide visual pleasure as an urban attraction. Complex assets, like infrastructure, perform larger and more complex services. All service objectives must be clearly defined, with service criteria established for each asset or system of assets. When objectives change, the criteria for managing the asset also change. For example, an asset may be renovated, upgraded, refurbished, redeveloped of adapted to deliver the new levels of service or asset objectives.

5. Asset functions, conditions and performance
Assets must be in a condition to deliver the agreed levels of service for which they are designed. For example, a water treatment plant is designed to deliver potable water to local communities: households, businesses, schools, hospitals, churches, recreational and tourist venues. But if equipment is faulty, or there is insufficient stock of chemicals, water may not be potable. This may result in small children getting diarrhoea and being hospitalised, or businesses providing food that fails to meet health standards.

6. User expectations
Infrastructure is often designed for many types of users with different needs. For example, a road is used by cyclists, pedestrians, taxi drivers, and government cars; as well as trucks transporting produce to markets, petrol tankers, mining equipment, visitors, and school buses. An organisation that is the owner or custodian of infrastructure must know:

- The levels of service the community wants and is willing to pay for.
- The community's acceptance of the trade-offs among the asset and other social benefits.
- Levels of costs that are within the community's capacity.
- The types of assets vital to the well-being of a community. This may include the interaction between infrastructure and local environmental assets.
- Data on user expectations, usually obtained from local area plans, to be recorded and used in making decisions.

7. Asset stakeholders
Assets are managed using a government's or an organisation's governance structure. These structures should also ensure that services meet the needs and demands of users and other groups affected by service delivery.

8. Environmental impact
Natural ecosystems provide constraints within which organisations must function. Global, regional and local ecosystems can be affected by the management of infrastructure. For example, if ports are

not designed to isolate international ships from the local ecosystem, foreign flora and fauna may invade and destroy local habitats. Infrastructure service providers should have an ongoing relationship with stakeholders responsible for the management of the local, regional and global ecosystems.

The principles above guide infrastructure management, but their implementation requires work. Each organisation has a system through which staff manages assets. This is discussed below.

asset management systems

A **simple asset management system** enables an organisation to 'know' its assets; including how much they cost, who is responsible for maintaining them, their condition and functionality and when they require rehabilitation. A simple asset management system focuses on each asset, independent of the system in which they function.

A **complex asset management system** is one in which a simple system is expanded to include photographs and plans of all assets, their component parts, their maintenance schedules and details of all activities on the asset since it was designed. It documents the system/s in which the infrastructure delivers services. A complex asset management system includes an estimate of the life-cycle costs of an asset, the actual depreciation each year, amortisation details, and possible adaption/development to better align the current components to the changing needs of users and their clients. It identifies the related infrastructure systems that affect its ability to deliver the services required, the contact people, and details of collaborative maintenance.

3.1 the asset life-cycle

Good asset management requires organisations to consider the 'whole-life-cycle' of infrastructure in

Box 1: Knowledge Management – The Use of Asset Management Systems to Improve Infrastructure Conditions

The state of Vermont's (USA) experience in adopting an asset management system linked to a sophisticated software package demonstrates potential benefits for road maintenance. Mizusawa *et.al.*, (2007) analysed the benefits of the state's pavement management system (PMS) in a 2007 study. The PMS included a detailed database on pavement conditions linked to a Geographic Information System (GIS), and was capable of:

- Exploring capital versus maintenance tradeoffs;
- Analysing projects on the basis of life-cycle agency costs and benefits;
- Analysing the impacts of alternative programs on system performance; and
- Generating information on the level of expenditure needed to meet target condition levels.

The study compared actual pavement conditions after the PMS was established against a typical 'worst-first' scenario, where in the absence of a PMS, the roads agency would have prioritised the maintenance of roads in poor condition (Mizusawa and McNeil 2008). The study found that decisions made using the PMS resulted, on average, in pavement conditions that were: "approximately 10 points higher on a scale of zero to 100" than in the worst-first scenario. Data analysis also showed that the *traffic weighted average pavement conditions* were better for pavement classes with PMS than those without.

asset management planning and activities. This means that decisions relating to investment, maintenance, upgrading and operation of assets should be made with consideration for their benefits and costs over the whole-life of an infrastructure asset. Good asset management over the whole-life-cycle of infrastructure assets involves various elements, including:

a	**Initial planning** for new infrastructure assets or asset replacement, which must take into account the current stock of infrastructure and the level and standard of service it provides, environmental factors, customer/community needs and expectations, and how these can be met using available resources. There are many factors that should be considered at this stage, including future demand for infrastructure, possible revenue sources, delivery modalities, and expected impacts of climate change.
b	**Budgeting** – a capital management plan consolidates the initiatives, objectives and strategies underlying the current and future management of an entity's asset base. It sets out a projected long-term outlook and details the asset budget funding strategies for asset acquisitions as well as projected financial impacts on the entity's financial reports. The long-term budget estimates the operation and maintenance requirements over the life-cycle of the asset to identify the future recurrent budget allocation.
c	**Detailed design specification** of new and upgraded infrastructure assets, with consideration given to the life-cycle costs and benefits/adaptability of different designs. Designs take into consideration the interaction between infrastructure assets and how they result in the delivery of services that are valued by the community.
d	**Acquisition** of new infrastructure, often involving management of external contractors. This can take various models, including contracting out of construction; build, operate and transfer models; or the auctioning of concessions. It also involves collaborating with related sectors to optimise the benefit to the community from the infrastructure.
e	**Accounting** – a comprehensive asset management policies and procedures guide is important in identifying requirements for compliance with relevant legislation and accounting standards. An effective risk-based internal control structure will ensure that assets are safeguarded against loss, damage or misappropriation.
f	**Organisational Management –** asset management is integrated into the organisational planning and strategic outlook. Asset performance indicators are applied to the non-financial asset base to establish the condition of an asset and the necessary level and frequency of maintenance. Required standards reflect the quality levels required for optimum asset efficiency and management.
g	**Operation and maintenance** (O&M) of infrastructure is an important stage of the asset life-cycle that ensures the infrastructure fulfils the function for which it was designed. O&M, combined with good design, and ongoing adaptability/development, ensures the sustainability of infrastructure. O&M is comprised of many elements, and can involve different modalities.
h	**Disposal and decommissioning** of infrastructure. The disposal and decommissioning stage can be costly, depending on the infrastructure, and although important is commonly neglected in the planning process.

Source: Adapted from Table 1.1: Phases of the Asset Life-Cycle (Australian National Audit Office 2010:10).

The importance of taking a whole-life-cycle approach to infrastructure asset management can be illustrated with reference to typical costs at each stage of the life-cycle. Life-cycle costs can be much higher than initial construction/supply costs when operation, maintenance and disposal of infrastructure are considered. Maintenance costs alone are often equal to or higher than the initial cost of infrastructure, as illustrated in Table 3.1 and Figure 3.1. If the useful life of an infrastructure asset is assumed to be 20 years (as in Table 3.1), annual spending on maintenance should be approximately between two to eight per cent of the non-depreciated value of the asset. As reliable data is collected, each sector and Pacific island country will develop their own standard costs.

The World Bank has developed rough estimates of maintenance needs for different infrastructure sectors: two per cent of the replacement cost of the capital stock for electricity generation, rail and road; three per cent for water and sanitation; and eight per cent for mobile and mainline telecommunications. For buildings, five per cent is used. These numbers represent the minimum annual average expenditure on maintenance required to maintain the network's functionality. They do not include maintenance required to rehabilitate infrastructure where routine maintenance has led to its deterioration (Fay and Yepes 2003:10).

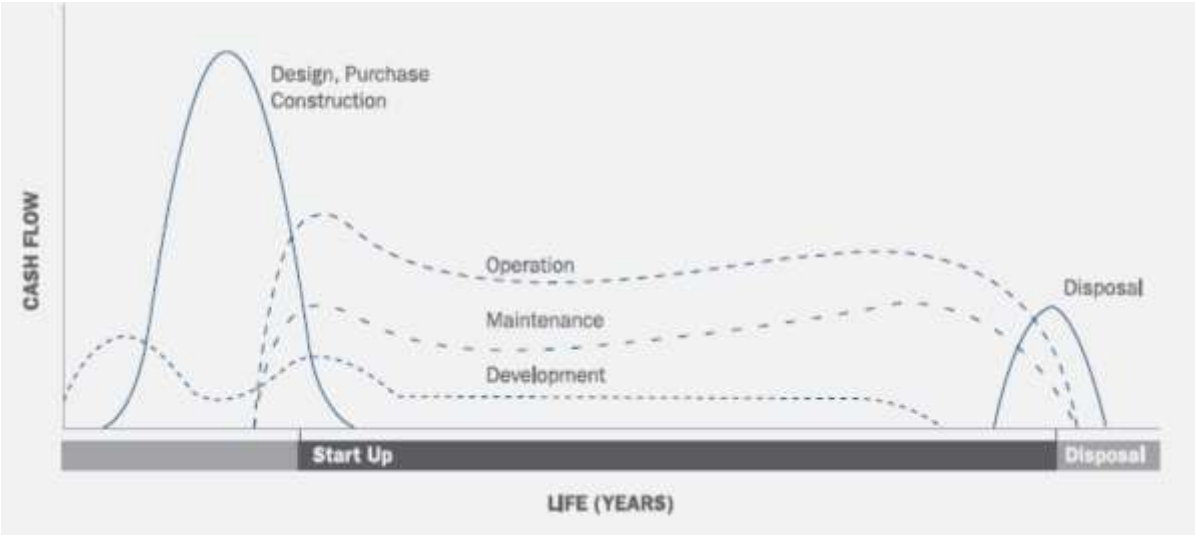
Table 3.1: Indicative Life-cycle Costs of an Infrastructure Asset per $100 of Investment

Stage	Rate (%)	Construct/ Supply only ($)	+ Other Up-front ($)	20 year Maintenance[5] ($)
Concept & planning	2-5		2-5	
Detailed design specification	5-10		5-10	
Construction/ supply		100	100	
Contingency/ escalation	10		10	
Contract supervision	2-5		2-5	
Operating [1]	variable			
Maintenance – Routine [2]	0-5			0-100
Maintenance – Periodic [3]	5-10			10-20
Disposal & decommissioning [4]	variable			
TOTAL		**100**	**120-130**	**10-120**

Notes: 1. Varies from zero (e.g. for buried pipes) to 20 per cent p.a. for mobile plant and equipment.
2. Varies from close to zero (e.g. for buried pipes) to five per cent p.a. for routine maintenance of assets such as gravel roads. See section 3.2.
3. Based on 20 year asset life with periodic maintenance every seven years. See section 3.2.
4. Varies from close to zero to 100 per cent (e.g. clean-up of toxic chemical sites).
5. Varies based on the infrastructure in question and across sectors.

Source: National infrastructure Investment Plans, various.

Figure 3.1: Infrastructure Asset Life-cycle



Source: Australian National Audit Office 2001:7.

The adoption of a life-cycle approach is also important due to links between the various life-cycle stages. Poor construction can increase maintenance requirements of an infrastructure asset. Indeed,

UN-HABITAT goes so far as to describe adequate infrastructure maintenance "as a corrective measure to faulty design and construction practices" (UN-HABITAT 1993).

Poor infrastructure maintenance practices, on the other hand, are one reason that many development partners in the Pacific design infrastructure to withstand minimal maintenance. In an environment where maintenance activities are either expensive, or likely to be suboptimal, it can be economically beneficial to pursue a 'second best option' where there is higher investment in infrastructure quality than would be required in other contexts. The World Bank and AusAID are pursuing this approach for road construction in Kiribati, given the expense of resealing road services where equipment has to be imported by ship.

3.2 the value of preventative maintenance

A. what is maintenance?

An important element of asset management is maintenance, which involves activities designed to prolong the useful life of an asset. Maintenance is primarily about service provision: organisations maintain their asset base in order to ensure that they can continue to provide a service or good. The maintenance of infrastructure assets is a central concern of this study, given that poor maintenance has adversely affected infrastructure performance and sustainability in the Pacific. There are various types of maintenance.

- **Routine maintenance** – comprises small-scale work conducted on a regular basis, which is designed to minimise wear-and-tear and maintain assets in a useful condition. The frequency of routine maintenance varies for different asset types. For a road, routine maintenance could occur every few months and involve activities such as vegetation clearing, pothole repair, and cleaning of silted ditches. For a diesel generator, routine maintenance includes oiling of the machine and other basic work, and would be implemented whenever necessary.

- **Periodic maintenance** – involves more substantive work designed to ensure the continuing operation of an asset. Periodic maintenance tends to occur on a large-scale, and often involves technical expertise and specialised equipment. An example of periodic maintenance is the resealing of roads, which might occur once every five or ten years.

- **Urgent maintenance** – or repair work, which is undertaken in response to asset failures. Expenditure on urgent repairs tends to rise where routine and periodic maintenance is lacking.

- **Rehabilitation** – is generally not considered maintenance, and is formally reported as capital spending by accounting convention. Rehabilitation or refurbishment is nevertheless important in prolonging the useful life of assets. It occurs infrequently (say every 20 years) and normally involves major work on an asset. Like urgent maintenance or repairs, rehabilitation tends to occur more frequently when routine or periodic maintenance is inadequate. Rehabilitation is often considered an alternative to investment in a new (replacement) asset.

- **Adaptation/development** – infrastructure is progressively adapted to meet the changing needs of users and to take advantage of technological change so that services stay relevant.

Routine and periodic maintenance are often grouped together under the labels **'preventative' or 'planned' maintenance**. The terms recognise that these maintenance activities prevent additional and more costly repairs or rehabilitation in the future.

Good asset management should ensure the provision of routine maintenance where appropriate, based on detailed consideration of whole-life cycle asset costs and benefits. Three fundamental elements that are required for effective routine maintenance are worth briefly highlighting. These form the basis for the analysis of maintenance in Pacific island countries in the chapters that follow.

Funding – is necessary for good maintenance; no matter how informed and adequate the planning for maintenance, it cannot occur without necessary funding.
Effective planning – involves consideration of the costs and benefits of maintenance over the life-cycle of an asset, and requires information on asset performance and condition. Knowledge management and evaluation systems can assist in this process.
Implementation modalities – comprise the third fundamental of infrastructure maintenance. Maintenance can be undertaken by various groups using different legal or contractual arrangements. There are also normally several ways in which maintenance can be performed, including labour-intensive and capital-intensive methods. Each of these different organisational and technical modalities impacts incentives and involves different costs and benefits, which need to be considered by managers.

B. measuring the benefits of preventative maintenance

The benefits of maintaining infrastructure are well documented. Actual benefits differ enormously based on the infrastructure in question, the assumptions that are used, and the infrastructure sector that is being considered. It is clear nevertheless that preventative maintenance reduces service delivery costs in the long run. Consider these cases:

- De Sitter's Law of Fives establishes the general rule that for physical concrete structures, every dollar of routine maintenance that is deferred results in a cost of $5 in repairs, or $25 in rehabilitation or replacement (De Sitter 1984).

- A study of Longfellow Bridge in Boston found that the total cost of maintaining the bridge in a useable condition would have been $80.8 million lower had an annual maintenance program equivalent to one per cent of the capital cost of the bridge been put in place (Westerly and Poftak 2007).

- The South African National Road Agency Ltd. (SANRAL) estimates that the cost of repairing roads increases to six times the cost of preventative maintenance after three years of neglect, and to 18 times after five years of neglect (Burningham and Stankevich 2005).

Preventative maintenance is equally important in Pacific island countries. Although economic analysis of the benefits of preventative maintenance in the Pacific is limited, several case studies demonstrate the impacts of poor maintenance:

- In Kiribati, a lack of routine maintenance for power generators has increased the frequency of power outages, reducing revenue for the utility, and has led to increased maintenance

and repair costs in subsequent years (see case study seven in the Annex).

- Delayed maintenance of infrastructure by the Government of Nauru caused an unexpected blow-out in repair costs, which jumped from $187,000 to $2.6 million (or 8.7 per cent of domestic budget expenditure) in 2009-10.

- Our Airline in 2010 had to operate its plane at 50 per cent of load capacity as a result of the inability to store aviation fuel in Nauru, causing a loss of $50,000 every week. The situation arose due to a leak in the main fuel storage tank, caused by a lack of routine maintenance.

It is important to distinguish between the financial and economic costs/benefits of routine maintenance. Financial cost-benefit analysis considers the monetary impact of maintenance on the organisation responsible for an asset. Economic cost-benefit analysis is broader, and considers the impact of asset maintenance on society as a whole.

The true value of maintenance from a societal perspective – the point of view of both governments and development partners – should be measured using broad-based economic cost-benefit analysis, with consideration of non-monetary externalities such as impacts on health, education, and the environment. The multi-faceted impact of infrastructure makes undertaking these assessments difficult. Financial cost-benefit analysis or least-cost analysis is more common as a result.

Box 2: Preventative Road Maintenance in Papua New Guinea

Analysis of maintenance of the national road network in PNG demonstrates the financial benefits of preventative maintenance. This study used parameters on maintenance costs and frequency adopted in the PNG Department of Works and Implementation's Road Asset Management System in order to develop a simple model comparing different road maintenance strategies. In one hypothetical scenario, a one kilometre section of sealed national road is maintained as recommended by the PNG Department of Works and Implementation. This involves provision of routine maintenance once a year, resealing every 10 years, and more significant maintenance once every 20 years.

In the second hypothetical scenario, the one kilometre section of sealed road receives no preventative maintenance whatsoever. The Department of Works and Implementation estimates that the life expectancy of a sealed road which receives no maintenance is seven years. In the model, the road in question is reconstructed/rehabilitated at the end of this seven-year period so that it can continue to be trafficked by road users. The impact of these different maintenance strategies on life-cycle costs for the Department of Works and Implementation is shown in Table 3.2.

Table 3.2: Life-cycle Costs of a Sealed Road in PNG (PNG Kina/km): A Least-Cost Analysis

	Assumptions	Maintained road (K)	Unmaintained road (K)
Capital cost		2,500,000	2,500,000
Routine maintenance	22,500K/km each year	562,500	0
Reseal	210,000K/km every 10 years	420,000	0
Program maintenance	150,000K/km every 20 years	150,000	0
Reconstruction/ rehabilitation	1,537,500K/km every 7 years where there is no maintenance	0	4,612,500
TOTAL life-cycle cost		**3,632,500**	**7,112,500**
TOTAL life-cycle cost excluding capital cost		**1,132,500**	**4,612,500**

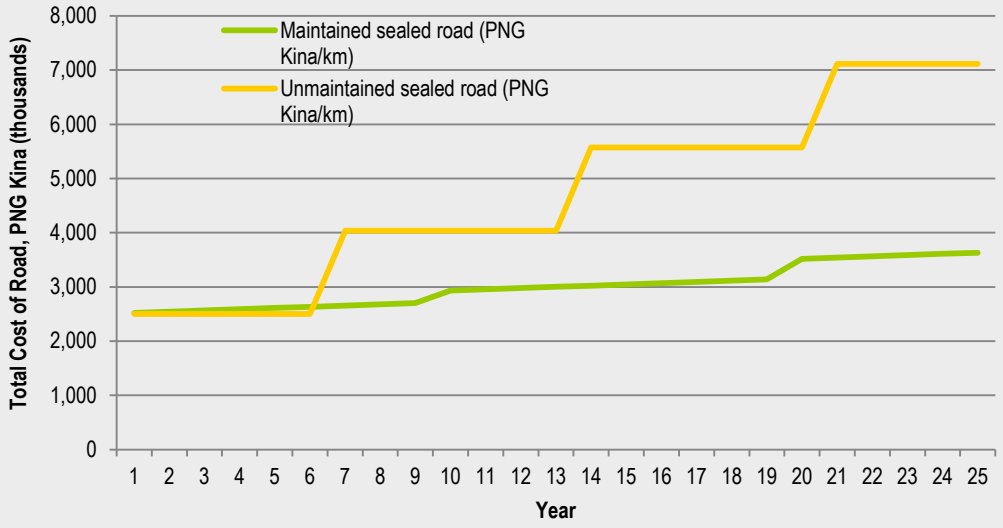
Notes: Figures are based on assumptions used in the Road Asset Management System model by the PNG Department of Works and Implementation. The expected life of a well maintained sealed road is 25 years. The expected life of an unmaintained sealed road is seven years.

The results show clearly that provision of preventative maintenance is the more cost-effective strategy for the government. The total life-cycle cost of the road over a 25 year period (the life-expectancy of a road that is maintained well) is significantly lower when it receives preventative maintenance.

The comparison is starker when capital costs are excluded from the cost calculation. This would be an appropriate comparison where the capital cost of the road is already sunk (or expended), or in the case where construction of the road is being funded by a development partner. In this case, the cost to government of maintaining the road in a useable condition is K1,132,500 under a preventative maintenance strategy, but K4,612,500 (or over four times as much) under the build-neglect-rebuild scenario (assuming the PNG Government pays for the road's reconstruction).

The incremental life-cycle cost of maintaining the section of sealed national road in question is illustrated in Figure 3.2. It shows that in the first six years, the strategy involving no preventative maintenance does deliver savings to the Department of Works and Implementation. However these savings are very small when compared to the eventual impact of this deferral of maintenance on life-cycle cost.

Figure 3.2: Costs of Maintaining a Sealed Section of National Road in PNG in Service



The conclusions from the PNG road maintenance case studies is limited because it considers only financial costs of ensuring infrastructure remains useable, not the economic costs and benefits of preventative maintenance. These economic costs and benefits are likely to be significant. A rough rule of thumb in a developing country context is that for every $1 spent on road maintenance, road users save $3 (Minc, 2003). In PNG, maintaining the road in excellent condition would ensure it remained passable during wet periods, reducing transit times and decreasing vehicle wear and tear. The importance of considering broader economic and social objectives is apparent in frameworks for asset management. These are discussed next.

3.3 a framework for asset management

A key component of asset management involves planning to ensure that assets are available to deliver certain services. Planning occurs at the strategic and operational levels. At the strategic level, governments (or organisations) determine the infrastructure services that are needed to achieve development (or corporate) goals. These plans take into consideration environmental and social constraints, and well as the changing demand for services. Changes in demand arise from a number of sources: (i) movements in population, from villages to towns and cities; (ii) changes in the demographic make-up of the population; (iii) expected density of the population; and (iv) the range of future economic activity.

Infrastructure is not delivered as an independent project. Linkages among infrastructure sectors are considered and an optimal mix of services is sought. Local area plans reflect these demands and are linked to national development plans. Planning works within the whole-of-government framework, responding to appropriate:

- Legislation;
- Policies;
- Plans, service delivery strategies and standards;
- Government budgeting;
- Public service reforms; and

- Partnerships with development partners, regional bodies, community organisations, ecosystem stakeholders, and private sector providers.

An asset management strategy provides the basis for more detailed asset management plans at the **operational level**. In smaller Pacific island countries, much of this work can be done as part of community activities and discussions that agree on levels of service and then put in writing.

Planning at the operational level is closely related to the life-cycle of an asset, and includes: (a) acquisition plans; (b) operations plans; (c) maintenance plans; and (d) disposal plans. These individual plans are integrated with the asset management strategy in order to ensure that planners consider the costs and benefits of activities over the life-cycle of the asset. The elements of an integrated strategic asset management framework are illustrated in Figure 4.2 of Annex 1.

Box 3: Strategic Planning

Strategic asset planning is often broken down into three elements:

a	**Asset management policy** – provides principles for decisions and activities relevant to each type of asset. It is closely aligned to corporate policy, including the corporate vision statement and mission statement, and is the basis for all asset management decisions and activities. The asset management policy details how, why, and by whom infrastructure will be managed to achieve corporate goals, consistent with government objectives, community needs and expectations, and concerns for the environment.
b	**Asset management objectives** – record how the organisation will implement an asset management policy. At a functional level, asset management objectives stipulate the required performance and condition of an infrastructure asset.
c	**Asset management strategy** – establishes the activities that will enable an organisation to achieve its asset management objectives, consistent with principles embodied in the asset management policy. It identifies any 'gaps' in the infrastructure asset portfolio and outlines the organisation's response by planned capital investment, maintenance and disposal.

Case Study 2

justice asset management system (jams) in the solomon islands

Court House, Auki Malaita, Solomon Islands 2010.
Photo courtesy of Kerry McGovern.

The Justice Asset Management System (JAMS) provides an indication of the backlog of maintenance ... (and) a set of processes, procedures and templates necessary to carry out all asset management functions.

A financial risk assessment in 2009 of the Solomon Islands Ministry of Justice and Legal Affairs (MJLA) found it faced a high risk in the management of its assets, with the recurrent budget insufficient to fund adequate maintenance of buildings.

The subsequent design and implementation of the justice asset management system (JAMS) generated a number of lessons that may be useful in other Pacific island countries.

The issues that the MJLA came across through preparing the asset register and completing the condition assessment and maintenance plan are as follows:

organisational capability

- Cabinet makes the decisions on the budget allocation. The Public Accounts Committee review is generally not detailed enough to identify long term costs resulting from annual budget cuts.
- Ministry of Finance (MoF) Budget Officers have no process for comparing the impact of reductions in the current year's maintenance allocation to the value of the asset, the life of the asset or to future maintenance requirements.
- No single person in the MJLA knew what assets the MJLA owned. All data was anecdotal and widely distributed among staff making management of the portfolio impossible.
- The essential data required to manage assets is large and requires a carefully constructed system. It cannot be captured in ad hoc systems. It must also be updated, especially when linked to government legislation and central policies.
- IT back up is required. Virus protection is crucial and the ministry must have licences for all software.
- Budget forms required by the MoF make no provision to include supporting documentation.
- When the budget allocation for maintenance has not been spent, whether because of natural disasters or other unforeseen events, the next year's budget is reduced by the unspent amount. It is therefore important to carefully plan and manage the implementation of the annual maintenance plan.

incentives

- New assets do not always provide the function required. Careful attention must be made to the design to ensure it met user needs.
- Titles not held for land – most of the buildings were on land not owned by the MJLA. The MJLA did not have titles to the land on which many of its buildings and houses stood. Land is a politically sensitive issue and it can be very difficult to get clear title to government land.
- Rehabilitation of MJLA buildings would minimise the future maintenance costs associated with the buildings.

obtaining resources

- Backlog could not be funded from the recurrent budget – the purpose was to reduce the backlog so that buildings were to be brought back to a good condition. Recurrent local budget funding of five per cent of the replacement value of buildings per annum for maintenance is an achievable goal for scheduled, routine maintenance if, and only if, the backlog burden can be removed.
- Development partners were prepared to rehabilitate the buildings to minimise future routine maintenance requirements.

The full case study is provided in Annex 1.

3.4 improving asset management practices in the pacific

Asset management is context-specific. The asset management framework described in the preceding section includes sophisticated capabilities, systems, and practices executable by a staff of qualified engineers. Many of these capabilities, systems, and practices are not present or necessarily appropriate in Pacific island countries, especially in Pacific microstates. In order to improve asset management, a step-based approach is required whereby the basics of asset management are established before more sophisticated elements are put in place. Reform of asset management practices must therefore consider the existing asset management base.

The Schick Principles of "getting the basics right" provide a useful framework for improving asset management practices in the Pacific (World Bank 1998:8; Corrigan *et al.,* 2012). The Schick Principles highlight the importance of the relationship between internal control and organisational performance (see Chapter 2). However they also recognise that organisations need to focus first on establishing fundamental controls over assets and expenditure, before progressing to the more complicated task of performance-based monitoring.

A recent ADB Technical Assistance program focusing on asset management in Samoa and Bangladesh, and drawing on a schema of the US Environmental Protection Agency, outlined five sequential workstreams for organisations (Corrigan *et al.*, 2012). These are summarised in Figure 3.3 below.

Figure 3.3: Five Workstreams for Improving Asset Management (an application of the Schick Principles)

1. Determine the current state of the asset portfolio of the entity	▪ Identification of all assets under the control of the entity ▪ Identification of locations of all assets ▪ Identification of condition of all assets ▪ Identification of remaining useful life of all assets ▪ Identification of replacement cost and value of all assets

2. Recognise the required standards of service of the entity	▪ Identification of the level of service required by:
	  ○ Customers
	  ○ Regulators
	▪ Identification of entity status in relation to service levels
	▪ Identify capability of asset portfolio

3. Identify the assets that are key to sustainable organisational performance	▪ Identification of how assets can and do fail ▪ Assessment of probabilities and consequences of asset failure (risk management) ▪ Assessment of repairs costs ▪ Identification and analysis of historical and current key asset failures
4. Develop minimum life-cycle costs	▪ Identification of alternative management strategies for key assets ▪ Identification of the costs of rehabilitation, maintenance or repair of key assets
5. Develop a long-term funding framework	▪ Identification of funding to maintain assets for the required level of service ▪ Identification of charging rates for sustainable system performance

Source: Adapted from Corrigan *et al.*, 2012.

a record of assets

An **asset register**, which is an inventory of all assets owned and/or managed by an organisation, is a necessary starting point. At its most basic, an asset register can take the form of a simple Microsoft Excel spreadsheet that classifies and identifies assets, their purchase price, the person responsible for the performance of that asset, as well as the person responsible for maintenance. Organisations with an asset register can more easily manage individual assets and assets as a group. An asset register is an important element in making management aware of the state of infrastructure assets and likely replacement requirements. Once asset management practices are more developed, an asset register can be fully integrated into an asset management system.

Other workstreams are dependent on fundamental controls over assets and expenditure being in place. A more sophisticated **asset management system**, which an organisation can use for ongoing management of its asset base, can only be established after an effective stocktake.

The appropriate design of an asset management system will depend on the size and technical ability, purpose, and asset base of each organisation. Asset management systems are data-intensive and can require a dedicated staff with skill in using the software application. An organisation needs to have the technical capacity to select and use appropriate systems if it is to improve asset management. The cost of proprietary systems includes the systems specification, contract management, purchase price, installation and training costs, annual upgrades and ongoing support. As illustrated in the Solomon Islands JAMS case study in Annex 1, these can be avoided by using an asset management system developed using Microsoft Office tools.

For a small organisation, the upfront costs of establishing complex asset management systems and ensuring that employees learn how to use them can be high. These costs may outweigh the benefits of a complex asset management system. The benefits of an asset management system may also not be as significant as for larger organisations. This may be due to a smaller asset base, and the fact that managers in small organisations are likely to be in a good position to track asset performance and condition without the need for a sophisticated asset management system. The efficiency gains in introducing a sophisticated information management system in a small organisation are therefore likely to be lower. These factors suggest that **for smaller organisations, simpler and less costly asset management systems are likely to be more appropriate.**

The potential benefits of smallness are demonstrated in the case study of the Cook Islands Airport Authority.

financial management

Good financial management practices rely on capable staff, incorporating regular stocktakes, financial and management accounting, and internal budgeting processes supported by strong internal controls. A basic capacity to control expenditure is essential for the effective operation of any organisation. Good internal budgeting ensures that sections of an organisation responsible for asset management receive the necessary funding for their activities.

Sound accounting systems are also crucial for good asset management. A good knowledge of the costs incurred, including depreciation, and the future costs of maintenance and replacement enable staff to estimate the full cost of meeting future demand for services. These estimated costs inform plans for infrastructure investments, maintenance, and can help managers schedule the replacement and/or adaptation of infrastructure.

For government, the calculation of costs and the accountability for fees, charges, and grant revenue

promotes ‘capital-consciousness’ among policy makers and civil servants.

Even more important than a good knowledge of costs is the transparent communication of these costs to customers. When customers understand the breakdown of the use of their fees, there is greater support for ongoing maintenance or cross-subsidisation of other activities. This is achieved by making known:

- Profit from the service;
- Maintenance; and
- Subsidies paid to some or all users.

However, some caveats established by the Schick Principles also apply. Complex financial management systems and software are not appropriate for small organisations where the capacity to use and maintain these systems is limited. It is therefore important to recognise that the first priority should be establishing basic capabilities.

Caveats also apply for government. Accrual accounting should not be adopted where cash accounting is not well developed and where organisations do not have external control over expenditure. This remains the case in many of the (relatively new) public financial management systems of Pacific island countries. A more appropriate approach involves taking steps towards development of basic public financial management systems – as discussed in the *Public Financial Management Roadmap* (2010) produced by the Pacific Islands Forum Secretariat (PIFS) and the Pacific Financial and Technical Assistance Centre (PFTAC).

3.5 summary

Asset management is an important element of infrastructure service provision. This chapter has demonstrated the economic and financial benefits of sound asset management, including routine maintenance. The chapter has also provided an overview of what asset management should involve. There is no ‘one-size-fits-all’ asset management model that can be used in the Pacific. Rather, asset management systems and practices must be tailored to the context of countries and infrastructure service providers. This is especially important in the case of small infrastructure service providers with limited capacity, which are unlikely to benefit from complex asset management systems used by large organisations. The unique position of small infrastructure service providers is discussed below in the case study of the Cook Islands Airport Authority.

Case Study 3

the cook islands airport authority

The runway at Rarotonga International Airport.
Photo courtesy of Matthew Dornan.

The ability of the Cook Islands Airport Authority to manage its infrastructure asset base effectively with limited formal policies or systems demonstrates that appropriate asset management practices are context specific. There are benefits to smallness.

The Cook Islands Airport Authority manages the two main airports of the Cook Islands, situated on the islands of Rarotonga and Aitutaki.

Airports under the responsibility of the Authority play an important role in the economy of the Cook Islands, where tourism accounts for 75-80 per cent of economic activity.

The Authority charges user fees as a state-owned commercial enterprise, however it also relies on government budget appropriations. The Airport Authority practices good asset management, consistently meeting international civil aviation standards when audited by the International Civil Aviation Organisation (some of these rules are discussed below).

International Civil Aviation Organisation (ICAO) Standards

The ICAO sets the standards for a range of activities that impact on the safety of passengers at international airports. Member countries of ICAO adopt these standards and enforce its application in the country by legislation. ICAO then audits each country for compliance against the standards set. In the Cook Islands the Ministry of Transport certifies the Airport Authority under the Civil Aviation Rules. These rules must be met for airports to remains certified by the Ministry of Transport and to comply with ICAO standards an important determinant of whether international airlines will land at the airport. Four of these rules are listed below:

Civil Aviation Rule 139 – specifies maintenance requirements and performance standards for equipment considered essential to the safe operation of an international airport. Assets covered by this rule range from runway condition to fire fighting equipment.

Civil Aviation Rule 140 – outlines security requirements for international airports, such as passenger baggage screening, secure perimeters, and training of security personnel

Civil Aviation Rule 171 – stipulates the telecommunications equipment that is required at an international airport. This rule also establishes minimum reliability requirements, with performance of equipment audited by the Ministry of Transport

Civil Aviation Rule 172 – covers the certification requirement for the Air Traffic Services provided by the Airport Authority.

The Airport Authority outsources maintenance where it does not have necessary in-house technical expertise or where the private sector can perform the maintenance at lower cost. It also has a maintenance division which is responsible for the maintenance of core infrastructure such as the runway.

An asset register is used to keep track of all assets under the ownership of the authority. This is useful for financial reasons, as it allows the Airport Authority to calculate depreciation of its assets and make the case for higher user fees. The register is not used for maintenance planning, however, and there is no formal policy or system in place for planning of asset maintenance. The Airport Authority manages its assets well despite this because of its size. The authority has only 111 full time employees, almost half of whom are security personnel involved in passenger

screening. An effective management team in this context is able to know the business and its personnel intimately, ensuring good communication and adequate focus on ongoing maintenance requirements.

Asset management arrangements at the Cook Islands Airport Authority demonstrate that appropriate asset management practices are context specific.

A sophisticated asset management system used by a major international airport like Heathrow is likely not to be cost effective in Rarotonga. Communication among the small team at the Airport Authority is more effective. This shows that systems and processes need to be adapted to suit the context in which they are to be implemented. For smaller operations, there is much to be said for keeping asset management arrangements simple.

The full case study is provided in Annex 1.

4

Infrastructure service provision in the Pacific

d performance is linked to asset management, which depends on ection and use of sound data, capable staff, clear roles and responsibilities, and adequate funding. Institutional arrangements have an impact on these requirements.

The Cairns Compact on Strengthening Development Coordination in the Pacific, in 2009, recognised that "greater investment in infrastructure would underpin greater economic development" (Pacific Islands Forum 2009). This chapter provides an overview of infrastructure service provision in Pacific island countries. It also details challenges to asset management in the region and how asset management practices commonly deviate from the best-practice principles discussed in chapter three. The first two sections describe the characteristics and relative performance of organisations that deliver infrastructure services in the region. The third section explores challenges to asset management among government departments, SOEs and statutory authorities, the private sector, and not-for-profit organisations.

4.1 characteristics of infrastructure service provision in the pacific

Core economic infrastructure in the Pacific can be divided into two broad groups.[10] At one end of the spectrum is infrastructure which is a public good. An important feature of a public good is that it is non-excludable, meaning it can be consumed by the public irrespective of whether they have contributed towards its provision. At the other end of the spectrum are private goods, which are excludable, meaning that consumption can be limited. Some goods can also be considered 'community goods' (the equivalent in economics is 'club goods'). These are not accessible to the general public, but exist to benefit a particular local community. The concept of 'community goods' may be useful in creating opportunities for mobilising community investment in establishing and maintaining infrastructure, in a situation where this produces better outcomes than would be possible through the public or private sectors.

The distinction between public, community, and private goods is important to this study because it

[10] Economists also classify goods into an additional two categories (club goods and common resource goods) on the basis of whether or not they are excludable and rivalrous. These categories are not discussed in detail here, given that the majority of infrastructure approximates a public or private good, and because the distinction that is most relevant to this study is whether goods are excludable or not, and can therefore be provided for a fee.

helps distinguish the different ways of funding infrastructure services. The provision of public goods is generally funded by government through the budget process, and normally occurs through a government department (although provision can occur through not-for-profit organisations, and can be outsourced to the private sector, as detailed below). Community goods are often provided through civil society entities or through non-government organisations (NGOs) acting on their behalf in a cross-sectoral relationship government and the private sector. In the case of private goods, infrastructure can be funded by the private sector, not-for-profit organisations, and government departments or SOEs.

It is worth highlighting that governments are commonly involved in the provision of infrastructure which is both 'public' and 'private'. Indeed, it is estimated that governments in developing countries have funded approximately 75-80 per cent of infrastructure investment over the last 15 years (Vagliasindi 2009). However the manner in which this infrastructure is provided can differ.

government departments

Government departments at both the national and sub-national level are involved in the provision of public goods, such as roads, and private goods, such as potable water. For infrastructure which is a public good, funding for ongoing management and maintenance usually comes from budget allocations to the relevant agency (although trust funds are an alternative, as discussed in Chapter Six). For infrastructure which is a private good, funding for ongoing management and maintenance normally comes from a mixture of budget allocations and user charges. The extent to which governments provide infrastructure which is a private good varies across countries and sectors. It is most common in smaller countries where there is less scope for division of responsibilities and where the private sector is not well developed. It is also most common for infrastructure services considered 'essential' like water and sanitation services.

state-owned enterprises

SOEs are very common in the Pacific and are generally used by governments to provide 'private good' infrastructure services. There are two types: statutory authorities and SOEs operating under corporations law. The main difference between the two is that statutory authorities are established by an act of Parliament, which outlines the statutory authority's mission, governance structure, and service obligations. Sometimes, enabling legislation also provides statutory authorities with regulatory powers. In contrast, SOEs operate under corporations law applicable to all companies. Government is generally a shareholder and can enter into joint ownership arrangements with private sector organisations.

private sector organisations

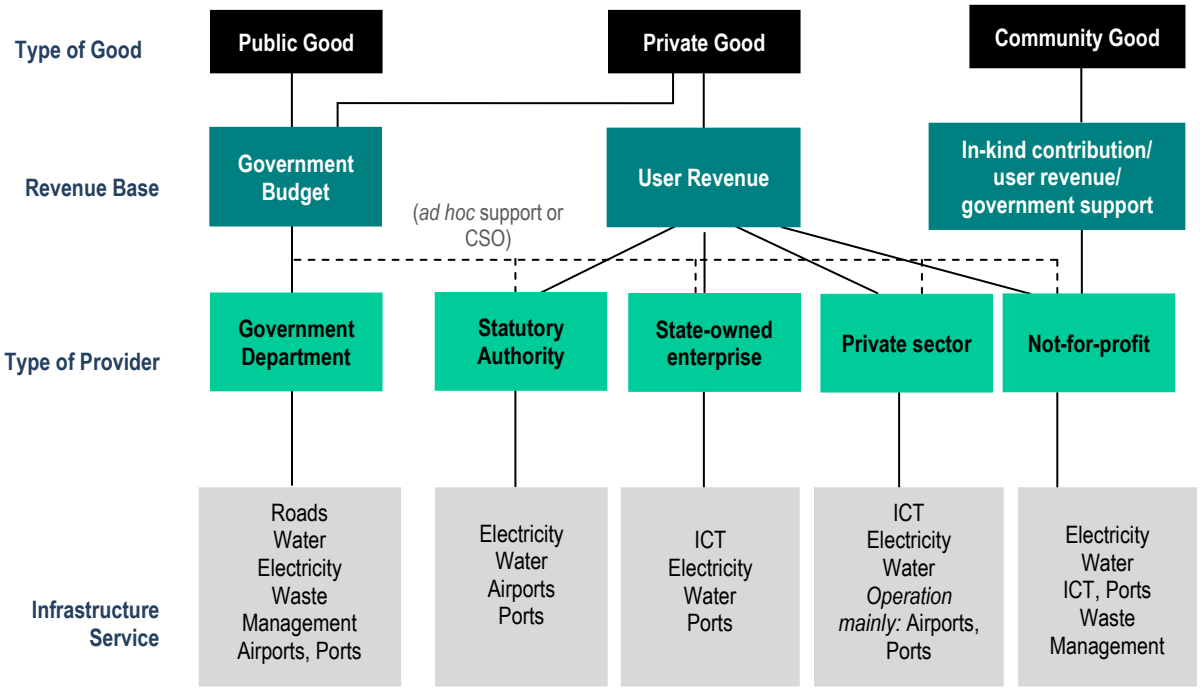
Private sector organisations responsible for core economic infrastructure are less common in the Pacific than in many other regions. The majority operate in the ICT sector, although there are also some in the power and water sectors. Private sector organisations are more often involved in the operation and maintenance of state-owned infrastructure, a topic discussed later in this report. Private sector companies are more independent from government compared to the other categories discussed in this section, and operate on a strictly commercial basis. There are nevertheless restrictions on their operations; where a monopoly service is provided, private sector companies are normally subject to regulation by an independent body, or in some cases, by a government ministry.

not-for-profit entities

Not-for-profit organisations and community associations in the Pacific are responsible for infrastructure service provision in various forms. Local or village-based community groups commonly provide infrastructure services in rural areas where government services do not extend. In some cases, government departments responsible for rural service provision fund infrastructure capital and assist with the establishment of community-based organisations to operate and maintain that infrastructure. This is a common approach used in the region for off-grid rural electrification projects and for water and sanitation projects. Increasingly, rural road maintenance funded by government and development partners utilises the labour of community groups. Not-for-profit entities also include large NGOs that operate on a national or regional basis, often supported by funding from government and development partners.

Arrangements for the provision of infrastructure services are illustrated in Figure 4.1.

Figure 4.1: Arrangements for Provision of Infrastructure Services



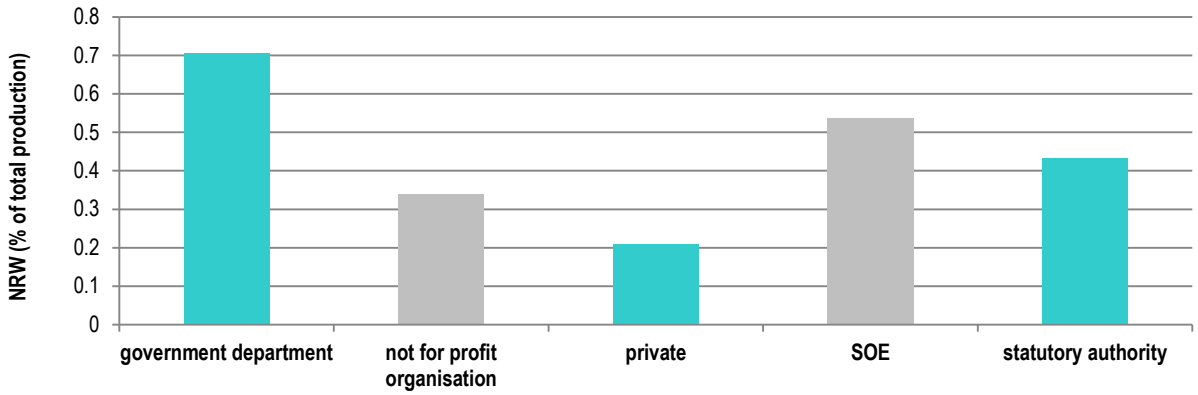
4.2 performance

The performance of infrastructure service providers depends in large part on institutional arrangements. Institutional arrangements affect funding and incentive structures, with implications for asset management. This section compares the performance of government departments, SOEs, and private sector/not-for-profit entities involved in infrastructure service provision in the Pacific. The sections that follow discuss the reasons for these differences.

It is often argued that infrastructure service provision by government departments and local governments is less efficient than that of SOEs or the private sector/civil society in the Pacific (World Bank 2006; Asian Development Bank 2010). Data in the Pacific are limited. The argument is nevertheless supported by two recent benchmarking exercises in the power and water sectors. The

report by the Pacific Water and Wastes Association (PWWA) on the water sector provides data on non-revenue water (NRW) as a percentage of total production for almost all water utilities in Pacific island countries (Pacific Water and Wastes Association 2012).[11] A higher NRW statistic means that more water is being lost; a significant issue for many Pacific island countries where small catchment areas increase vulnerability to drought. The study shows that NRW is higher for government departments than for any other legal entity, as illustrated in Figure 4.2.

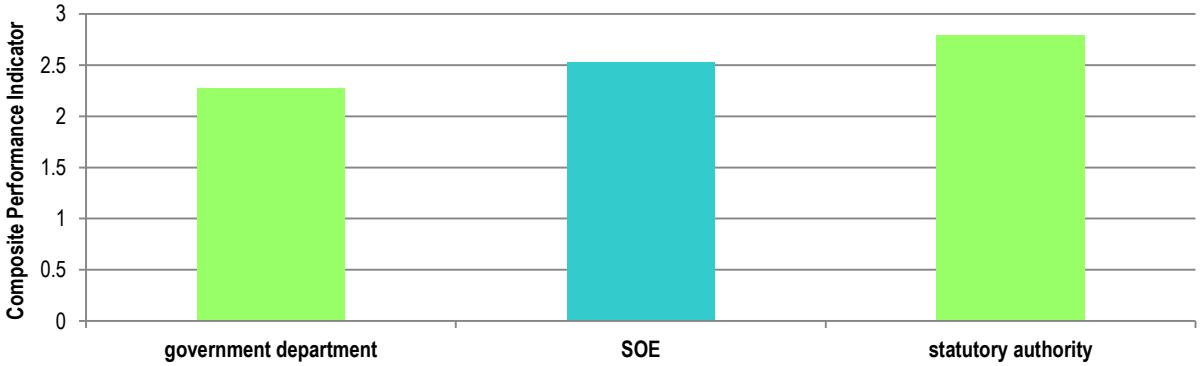
Figure 4.2: Technical Performance among Water Utilities (lower score is better)



Source: Dornan using data from the *Water Benchmarking Report* (Pacific Water and Wastes Association 2012).

Similar data are available for electricity utilities from the Pacific Power Association (PPA) performance benchmarking exercise (Pacific Power Association 2011). Analysis of a composite performance indicator measuring generation efficiency, utilisation of assets, system losses and labour productivity, demonstrates that government departments which provide electricity perform less well than the two categories of SOEs (the one private sector utility in the Pacific did not provide sufficient information for a score to be calculated).[12] This is shown in Figure 4.3.

Figure 4.3: Technical Performance among Electricity Utilities (higher score is better)*



* The composite performance indicator was calculated in the *Power Benchmarking Report* (Pacific Power Association 2011) using measures of fuel efficiency, asset utilisation (capacity factor), system losses (transmission and distribution losses), and overall labour productivity.

Both benchmarking reports suggest that government departments on average manage infrastructure assets less well than SOEs or private sector operators. However small sample sizes and a focus on one infrastructure sector mean that these results should be treated with caution. What is

[11] Non-revenue water is a measure of technical performance, and measures both commercial loss (such as unauthorised consumption) and physical loss of water (through leakage from pipes and overflows at reservoirs). A high rate indicates poor performance.

[12] This is demonstrated in a recent article in the *Pacific Economic Monitor* (Dornan *et al.,* 2013).

common in both reports is variation within each category, especially among SOEs and statutory organisations. The next section discusses the reasons for differences in performance.

4.3 factors affecting performance and asset management in the pacific

There is a direct link between the management of an infrastructure asset and the performance of that asset (appropriate infrastructure design and willingness to pay among households are also important). Effective asset management enables an organisation to deliver a service using its infrastructure assets. The following sections explore reasons for poor asset management and performance in the Pacific. The sections build on the discussion in Chapter Two of barriers to asset management, highlighting why appropriate incentives and funding are often not in place in Pacific island countries, and how organisational capacity constraints affect the planning and implementation of maintenance.

government budgeting

The failure of governments to dedicate adequate funding towards recurrent expenditure through the budget process is an important reason for the poor quality of many infrastructure assets in the Pacific. The road network in PNG is an excellent case study of what happens when a government fails to dedicate adequate resources towards routine maintenance. A lack of maintenance over many years has led to a dramatic deterioration in the condition of the road network, with almost 32 per cent of national roads in 'poor condition' in 2007 (meaning that they were passable only by four wheel drive vehicles in dry weather). This has economic as well as social impacts in a nation whose economy is dependent on primary production.

The dilemma for Pacific island governments is that the lower the income of the country, the higher the percentage of GDP required for capital investment and maintenance (as noted in Fay and Yepes 2003). In addition, the lower the density of the population, the higher is the cost of infrastructure per person (Heller 2010:6). If the estimates in a 2003 World Bank paper on infrastructure maintenance are applied to Pacific island countries, then approximately 3.73 per cent of GDP is required for maintenance for lower income countries and 2.5 per cent in middle income countries (Fay and Yepes 2003:11).

An annual maintenance requirement of 2.5 to 3.73 per cent of GDP is a sizeable proportion of annual government expenditure. In small Pacific island countries, this is often largely allocated by government. In larger Pacific island countries, user fees are likely to contribute towards maintenance costs, thus reducing the allocation required by government. The maintenance burden is also often spread over more than one level of government.

> *"Failings in maintenance are often compounded by ill-advised spending cuts. Curbing capital spending is justified during periods of budgetary austerity, but reducing maintenance spending is a false economy."*
> *World Bank (1994:4)*

Box 4: Regional Audit and Budget Support

The context within which Pacific island countries receive donor funding of infrastructure is changing (this is discussed in Chapter Five). Pacific island countries have prepared National Development Plans following the Cairns Compact on Strengthening Development Coordination in the Pacific. Pacific island countries are also participating in peer reviews of those plans.

Peer Review of National Development Plans and Budgets
Pacific island countries that are members of the Pacific Islands Forum have agreed to participate in regular peer review of their National Development Plans. This process of regular peer review aims to:

- Promote international best practice in key sectors;
- Improve effective budget allocations and implementation to achieve national development priorities; and
- Guide support from development partners.

Peer reviews have been completed, with the participation of senior officers from PIC public sectors and the PIFS, by:

Niue (2011)
Tuvalu (2011)
Vanuatu (2011)
Kiribati (2010)
Nauru (2010)

Peer reviews are carried out by up to four representatives of Pacific island countries, development partners and other stakeholders.

Pacific island countries, in response to the Paris Declaration and the Accra Agenda for Action (2005) are now working to forge their own national development strategies with their parliaments and electorates (**ownership**). Donors support these strategies (**alignment**) and work to streamline their efforts in-country (**harmonisation**).

Development policies are directed to achieving clear goals and for progress towards these goals to be monitored (**results**). Donors and Pacific island countries alike are jointly responsible for achieving these goals (**mutual accountability**). These principles were adopted by Pacific island countries as part of the Cairns Compact on Strengthening Development Coordination in the Pacific.

Budget Support
The European Union (EU), New Zealand Aid Programme, and AusAID have undertaken to provide budget support to Pacific island countries that monitor the results of their budgets to ensure they are achieving development targets. Budget support is channelled directly through the government's budget: it is disbursed according to the government's budget allocations using its procurement and accounting systems. Budget support is monitored and accounted for as part of the government's performance management system and normal financial reporting to the legislature.

Budget support is a means for delivering aid to achieve sustainable development results. Pacific island countries must meet certain eligibility criteria. The EU requires:

- *National/sector policies and reforms ('public policies')*
- *Stable macro-economic framework*
- *Public financial management*
- *Transparency and oversight of the budget*

Budget support is being received from donors by a number of Pacific island countries. For example, Australia and New Zealand provided budget support to Samoa to fund its tsunami response plan. New Zealand Aid has since entered into a two year budget support agreement to provide funding to the Government of Samoa tied to implementing policy and public finance reform (New Zealand Aid 2012). The EU is providing budget support in Vanuatu. However, development partners in the Pacific have also been criticised for slow progress towards the provision of budget support. This is discussed in Chapter Five.

Levels of government

The division of responsibilities between organisations at the national and sub-national levels can sometimes lead to confusion about their respective roles and responsibilities, and to tension regarding funding. In large and medium-size Pacific island states, the national and sub-national government divide is evident in urban areas with the management of local roads and municipal services (such as waste collection). These services are generally the responsibility of urban councils, which receive funding from national government budget allocations (Asian Development Bank 2012).

A common problem facing local governments is that their statutory responsibilities to deliver infrastructure services are not matched by an ability to address pressing issues. A 2008 review of local government in Pacific island countries found that:

> "Current levels of funding for local government, particularly when expressed in per capita terms, are not sufficient if Pacific cities and towns are to provide adequate levels of service and infrastructure development in the short-medium term. For example, expenditure in the Fiji national capital, Suva, is just FJD239 per citizen per year. Similar low per capita expenditure is found in Kiribati, where just AUD42 per annum is spent in the main urban centre, Betio" (Hassall and Tipu 2008).

The lack of funding available to local governments is apparent in the condition of local roads and bridges in the two largest urban centres of the Pacific: Port Moresby and Suva. Similar problems affect provision of services in rural areas, where the condition of local roads is commonly worse than national or urban roads, and where municipal services are generally non-existent.

The unclear division of responsibilities between national and sub-national governments emphasises the importance of a clear legislative framework. An overarching legislative framework that clearly specifies roles and responsibilities, and ensures that service providers are held accountable for performance, is necessary in order to establish incentives for asset management. A series of regional audits on infrastructure services in the Pacific have highlighted that a sound legislative framework is either not in place in many countries, or not implemented. This presents a barrier to asset management.

Budget processes

At the national level, funding dedicated to recurrent expenditure through the budget process is also generally inadequate. There are several explanations for this. One relates to weaknesses in public financial management, which are often closely related to size. A recent study of Pacific island states has found a link between the effectiveness of public financial management systems, measured using Public Expenditure and Financial Accountability (PEFA) scores, and the size of countries. Smaller states had less effective public financial management systems. The authors of the report argue that an important reason behind this finding is that: "small countries with smaller public services find it harder to recruit and retain people with appropriate skills" (Haque *et al.*, 2012).

The skills deficit is especially detrimental to implementation of the budget. Although legislation relating to the budget is generally strong in the region, implementation is not. Procurement, internal audit, and strategic budgeting are all weak among smaller states – often due to poor performance of line departments and statutory authorities.

Another explanation for the failure of governments to direct resources towards maintenance is the dual budgeting system used by most national governments in the Pacific. The development budget focuses on capital expenditure and is (usually) largely funded by development partners. The

recurrent budget is focused on operational spending. It is often dominated by the salaries and wages of civil servants, although in principle, it should also include recurrent funding for infrastructure maintenance. Development budgets commonly do not receive the same level of scrutiny as government-financed recurrent spending, given that they are partly financed by development partners. At the same time, there are strong political incentives for governments to support large construction projects over expenditure on regular maintenance of existing infrastructure. This is closely linked to the incentive problem described in Chapter Two.

The inherent nature of the budget process as an annual event also creates a short-term bias, which can be unfavourable to the funding of maintenance. In this context, reducing or postponing expenditure on infrastructure maintenance can assist governments to balance the budget and redirect spending to other areas, with any adverse impacts on infrastructure quality unlikely to surface for several years.

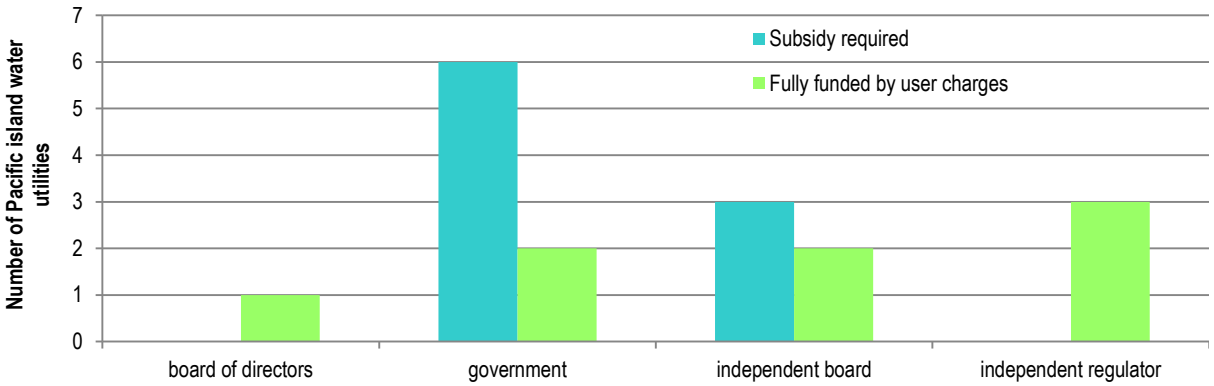
An option that has been advocated in recent years to address the short-term focus of the budget is medium-term budgeting. Medium-term budgeting extends the vision of policy makers by including estimates on spending for future years (typically three to four years into the future). However, medium-term budgeting is only useful where expenditure and revenue forecasts are sound (Pacific Islands Forum Secretariat and Pacific Financial Technical Assistance Centre 2010). This requires adequate maintenance planning among line departments responsible for infrastructure service provision – a challenge in many Pacific island countries. The timeline used in medium-term budgeting (three to four years) is also not consistent with the life-cycle of an infrastructure asset (which can range from 10 to 100 years).

price regulation

Price regulation is an important determinant of whether an infrastructure service provider is able to recover its costs through user charges. Price regulation has a mixed record in the Pacific. Regulated prices for infrastructure services are insufficient to cover costs in many sectors. This can present a barrier to private sector investment in the sector, and results in a situation where existing SOEs must rely on government budget allocations to continue operations.

Independence from political imperatives is a significant factor in determining whether regulated prices reflect costs. SOEs are less likely to be fully funded by user charges where tariffs are set by government, as shown for water utilities in Figure 4.4.

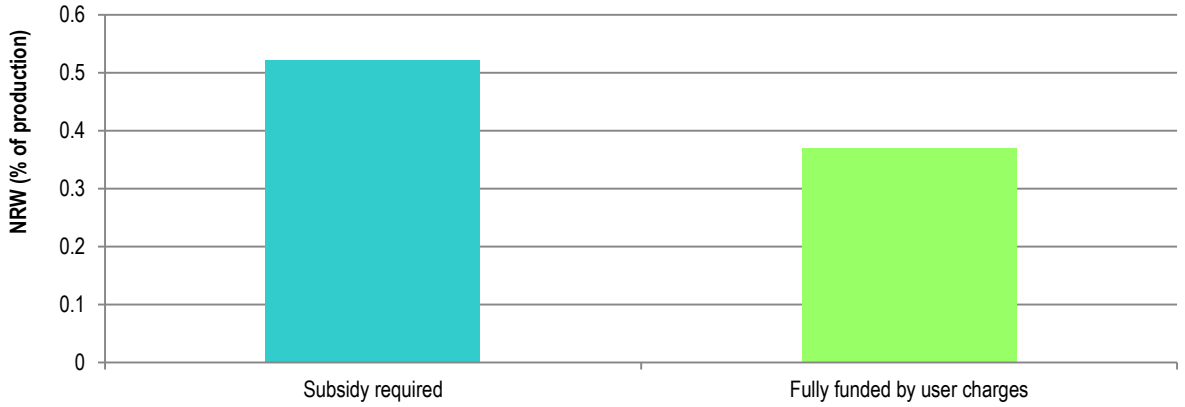
Figure 4.4: Impact of Price Regulation on Revenue Sources



Source: Dornan using data from the *Water Benchmarking Report* (Pacific Water and Wastes Association 2012).

Price regulation has an impact on asset management and service delivery. There is a clear link between funding and performance. SOEs perform better on average when they fully recover their costs through user charges, given that user fees are a more reliable source of funding than government budget allocations. SOEs that recover their costs through user charges are therefore better able to plan and implement ongoing asset management, including maintenance. Data from a benchmarking exercise of Pacific island water utilities supports this point, as illustrated in Figure 4.5.

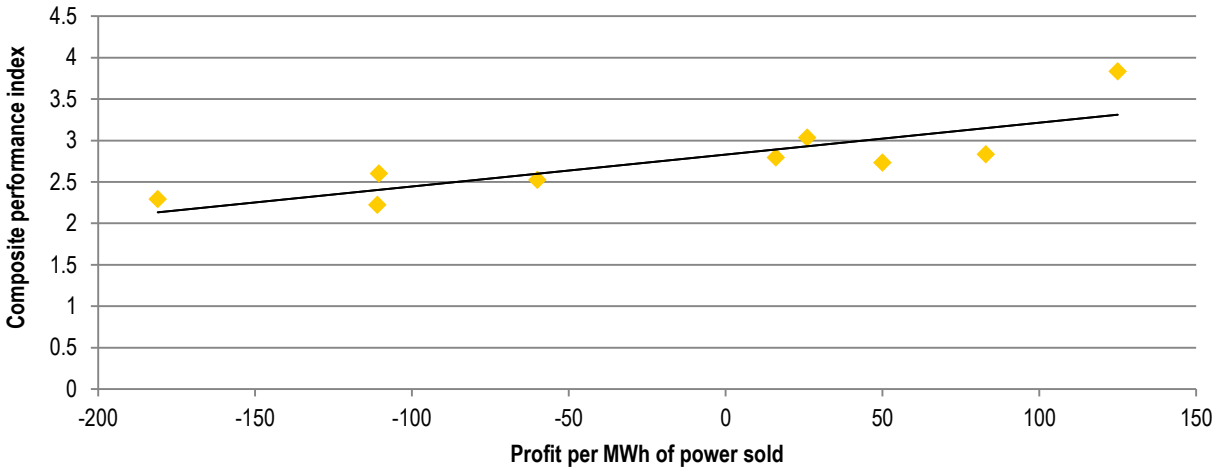
Figure 4.5: Cost Recovery has an Impact on Technical Performance for Pacific Island Water Utilities (a lower non-revenue water score is better)



Source: Dornan using data from the *Water Benchmarking Report* (Pacific Water and Wastes Association 2012).

The linkages between financial performance, asset management, and technical performance are also supported by data from Pacific power utilities. A benchmarking exercise for Pacific island power utilities in 2010 found that those utilities with the best technical performance across a range of measures also had good financial performance (a composite indicator of technical performance was developed as part of the benchmarking exercise). This is shown in Figure 4.6.

Figure 4.6: Pacific Power Utility Performance and Profit from Electricity Sales*



Source: Dornan using data from the *Power Benchmarking Report* (Pacific Power Association 2011).
Note: *The correlation is statistically significant according to conventionally accepted standards. Three outliers based on dubious data were removed.

One reason for this is that better financial performance enabled utilities to dedicate more resources towards asset management, which resulted in better technical performance. The survey found that utilities ranking in the mid-to-higher categories on technical performance spent more on maintenance (per MWh of electricity produced).[13]

Community service obligations

The full funding of community service obligations (CSOs) is another determinant of financial performance. SOEs are often required to provide services that generate a financial loss – as discussed in the case of water and power utilities. The rationale behind imposing non-commercial obligations on SOEs is sound. Governments impose CSOs in order to promote service delivery to populations that would not be served by the market. However, it can have adverse impacts on the financial performance of state-owned utilities when not formally reimbursed. This can affect asset management operations and service delivery.

There are many examples in the Pacific of CSOs that are not reimbursed. The Cook Islands Airport Authority's provision of free fire-fighting equipment and vehicles to the islands of Rarotonga and Aitutaki is not reimbursed through a formal process, despite legislation specifying this should be the case. Instead, the government allocates funding through the budget to support Airport Authority operations (the case study was discussed in Chapter Three). Similarly, the FEA incurs CSOs through the provision of electricity to rural communities at a financial loss.[14] This involves a cross-subsidy; profits from electricity supply to urban areas are used to fund provision of power to rural areas.

Two related issues include the non-payment of user charges by customers and illegal connections to services. In the utility industries, non-payment of bills by customers is a significant issue, as is illegal access to the reticulated electricity supply. Non-payment and illegal access essentially become an informal CSO when not reimbursed, and where infrastructure service providers are forced, due to political pressure or community expectations, to continue service provision to non-paying customers.

Non-payment is not always about assisting some households. In the Pacific region, government departments and SOEs are commonly the worst offenders. In the Solomon Islands, non-payment of electricity bills by the water utility caused significant financial distress to the power utility until a settlement was negotiated (under pressure from government). In Tuvalu, the corporatised power utility was strongly criticised by Parliament for cutting supply to various government departments that had not paid their bills.

planning of asset management and maintenance

Access to information and an ability to use it for asset management is important. A sound maintenance plan relies on infrastructure managers having reliable inventory records and costings of their annual maintenance program. Sound asset management capabilities enable a government department to demonstrate that it can spend budget allocations effectively, thereby supporting its budget submissions over time. The Schick Principles outlined in Chapter Three emphasise the importance of introducing fundamental internal controls. Fundamental controls over infrastructure assets include a stocktake and valuation of all asset components: providing each with a unique identifier, assessing its capacity and condition, its remaining useful life, and the current replacement cost of each asset. A fixed asset register is one of these key internal controls.

[13] Data on asset management spending are coded so cannot be presented here. The correlation between performance and profits is likely to have a number of reasons, with causality moving in both directions.

[14] The government has since 2002 considered community service obligations its dividend from the Fiji Electricity Authority.

But data on infrastructure performance in the Pacific are often poor, presenting a barrier to good asset management. This is very evident in comparisons of government departments, and more effective SOEs and private sector organisations. For government departments, the first condition for good asset management planning, an asset register, is commonly missing. Where records do exist, they are often outdated and not used for managing assets.

Budget effectiveness is undermined by poor internal controls. The lack of 'hard data' can lead departments to rely on anecdotal evidence when arguing for asset maintenance funding. Experience in the Pacific suggests that in the absence of fundamental internal controls, the premature implementation of advanced asset management system results in unreliable data ('garbage in, garbage out'). This is evident from recent regional performance benchmarking exercises in the power, and water and sanitation sectors, as well as in regional audit reports.

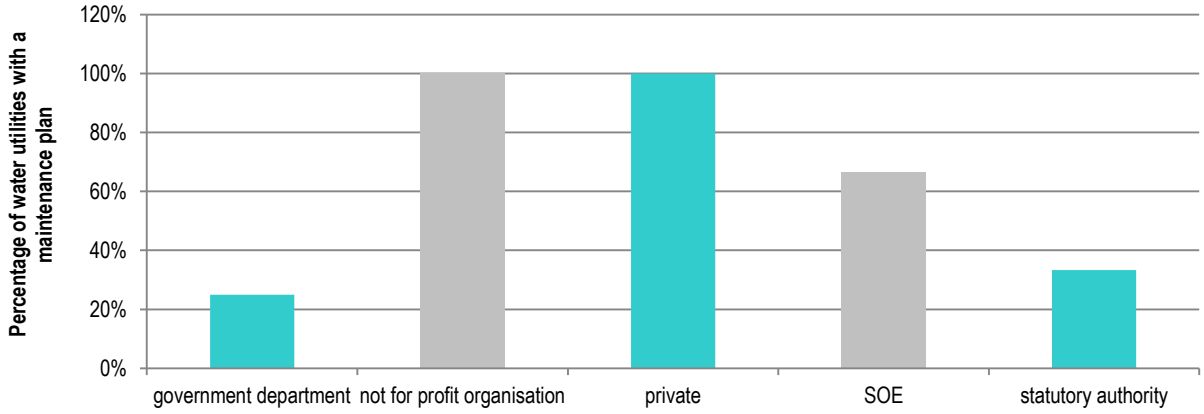
The absence of fundamental controls also makes the establishment of more advanced asset management functions impossible. Infrastructure service providers cannot monitor the performance of infrastructure assets when there is no inventory of assets. A reliable asset register enables managers to actively manage their assets, including their maintenance. Well informed managers motivate workers and other maintenance staff by providing clear job instructions, reliable funding, and good supervision.

SOEs generally have better asset management systems in place than government departments or statutory authorities, although there is enormous variation in the region. Many SOEs in the Pacific have an asset register, but thus far do not have a detailed asset management system for planning maintenance and related activities. An asset register is a useful accounting tool capturing all purchased, built, and donated assets. However, a register alone is inadequate when preparing detailed asset management plans. As discussed in Chapter Three, the asset register and an asset management system serve different purposes.

At the regional level, there is limited information available on the asset management systems being used in Pacific island countries. One regional document, the PWWA's 2011 performance benchmarking report, collected information on whether water utilities had established a maintenance plan. The survey established that government departments are less likely to have maintenance plans in place when compared with other categories, as shown in Figure 4.7 (statutory authorities also did not perform well). Though few in number, all the private and not-for-profit organisations included in the survey had established maintenance plans. The link between maintenance planning and technical performance for the same sample is shown in Figure 4.8.[15]

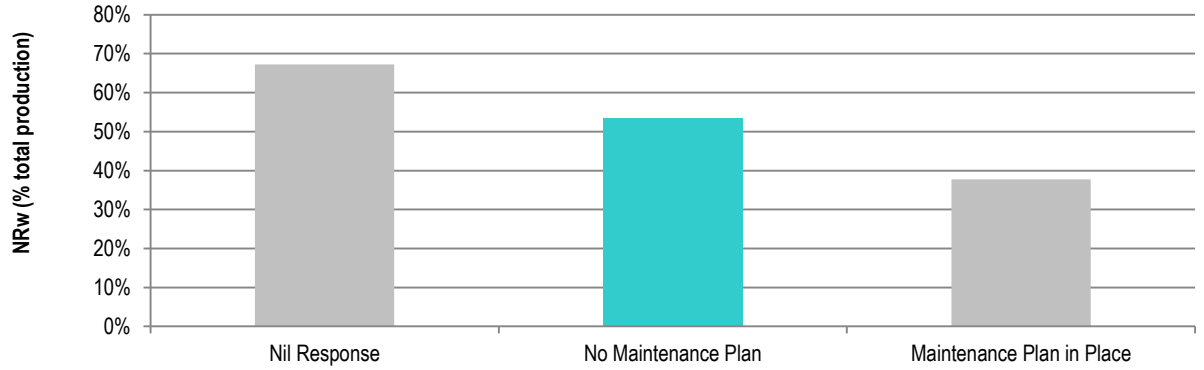
[15] Non-revenue water is used as a measure of technical performance. The result is statistically significant using conventionally accepted standards when an Ordinary Least Squares regression is run.

Figure 4.7: Percentage of Pacific Island Water Utilities with a Maintenance Plan



Source: Dornan using data from the *Water Benchmarking Report* (Pacific Water and Wastes Association 2012).

Figure 4.8: Maintenance Planning and Performance among Pacific Island Water Utilities



Source: Dornan using data from the *Water Benchmarking Report* (Pacific Water and Wastes Association 2012).

implementation of maintenance

The implementation of asset management activities can be challenging for a number of reasons.

Government departments and statutory authorities operate in accordance with legislation and regulations that apply across the civil service. Civil service rules and policies vary across countries, but some common themes can be identified. These rules and regulations mean that when budgets are being trimmed, allocations to routine maintenance are easier to cut than allocations to salaries and wages.

Wage differentials with other countries and the private sector also make it difficult to recruit people with requisite technical skills. Skills shortages are especially troublesome in smaller Pacific island countries, where civil servants often manage both policy development and implementation. In microstates, the absence of formal sub-national governments leads to civil servants managing both local and national government responsibilities. For example, a government engineer in Tuvalu may shoulder the same responsibilities that twenty or more civil servants share at the federal, state, and local government levels in Australia.

Whole-of-government procurement rules are another challenge for asset managers. A good example is procurement in the PNG Department of Works and Implementation for road maintenance and rehabilitation. It is estimated that on average, the procurement process takes 50 weeks from start to finish before work on a project can commence, as shown in Table 4.1.

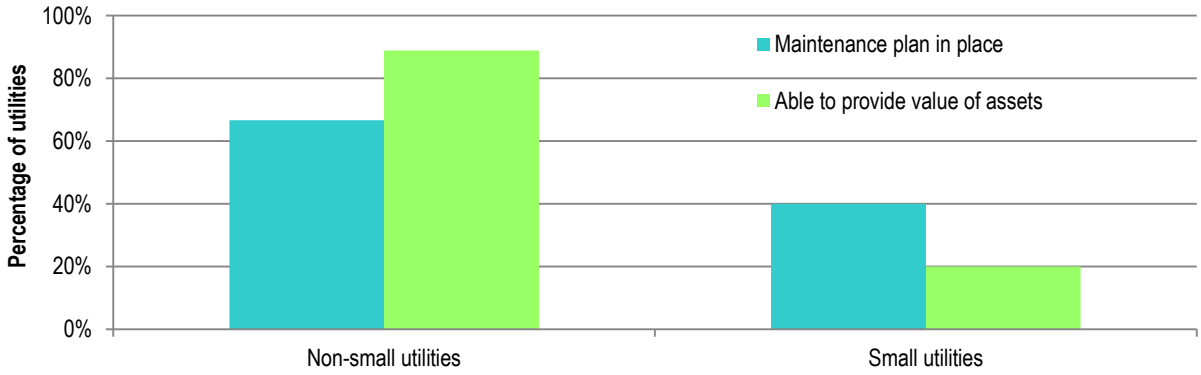
Table 4.1: Timeline of Procurement Process, PNG Department of Works and Implementation

Steps	Procedures	Time taken
1	Preparation of bid by Department of Works and Implementation (DoW)	4 – 8 weeks
2	Bid document sent to donor for approval	2 – 3 weeks
3	Published for tender by DoW	4 – 6 weeks
4	After bids are opened by the Central Supply and Tenders Board, they are sent to the DoW donor evaluation committee for evaluation	2 – 4 weeks
5	Bids evaluation	3 – 6 weeks
6	Bid evaluation report send to donor for approval	2 weeks
7	Bids evaluation report sent to the Central Supply and Tenders Board	2 weeks
8	The National Executive Council (NEC) approves contracts over K10 million in value	> 4 weeks
9	State Solicitor's legal clearance is required	> 4 weeks
10	The NEC advises the Head of State for execution of the contract	4 – 8 weeks
11	Signing of contract	2 weeks
12	Actual commencement on the ground	1 week
	TOTAL	**50 weeks**

Source: *Timeline of Procurement Process* (Papua New Guinea Department of Works and Implementation 2012).

Retaining capable staff to manage infrastructure can also be an obstacle to good asset management. The FEA identifies the emigration of labour as the number one risk facing the company, and manages this risk using succession planning and training. The loss of skilled staff is a more pronounced phenomenon in smaller Pacific island countries. This directly affects performance, as illustrated by data from the water sector. Small-size utilities are less likely to have a maintenance plan in place than medium or large-size utilities. Small-size utilities are also less likely to have provided financial information on their asset base, suggesting that in many cases this information is not readily available. These differences are shown in Figure 4.9.

Figure 4.9: Water Utility Size, Maintenance Planning and Measurement of Asset Value



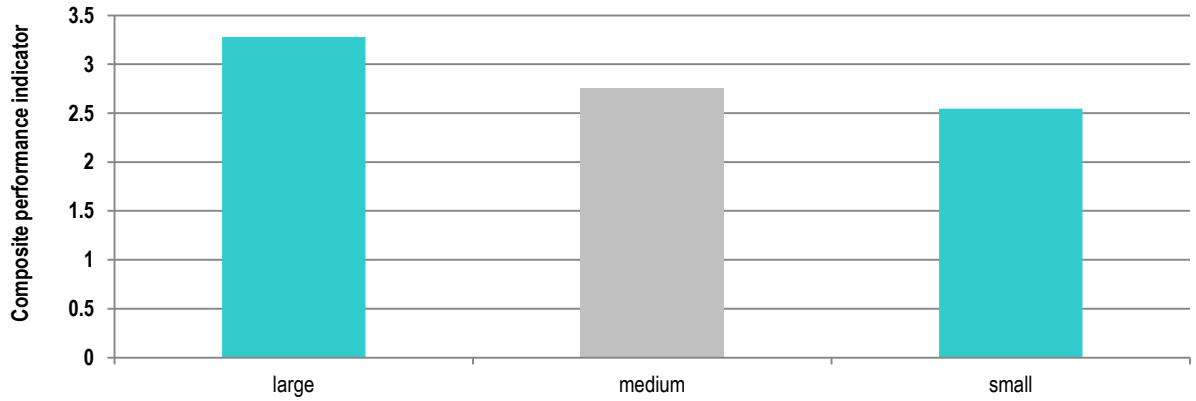
Source: Dornan using data from the *Water Benchmarking Report* (Pacific Water and Wastes Association 2012).

These findings are likely to influence the performance of small-size utilities. A link between size and performance has also been established in other countries. A 2010 performance audit of local government planning for water in New Zealand supply found that:

> "Each local authority's capacity to meet the forecast demand for drinking water was, broadly, related to their size. Generally, the smaller the local authority, the more limited the forecasting, the bigger the challenges faced, and the more expenditure (per connection to the water supply) planned to address the risks and challenges" (New Zealand Controller and Auditor-General 2010).

The same argument is supported by the results of the Pacific water and power benchmarking reports. In the water sector, small-size water utilities on average suffer higher NRW (52 per cent of total production) than non-small sized water utilities (44 per cent), despite having smaller distribution networks. 'Smallness' also appears to have some impact on performance in the power sector, as illustrated in Figure 4.10.

Figure 4.10: Size and Effectiveness in the Electricity Sector (a higher score is better)



Source: Dornan using data from the *Power Benchmarking Report* (Pacific Power Association 2011).

4.4 summary

This chapter explored the delivery of infrastructure services in Pacific island countries. It distinguished between public and private infrastructure goods, arguing that these concepts can be useful for policy-makers in the Pacific when planning service delivery. It subsequently assessed the performance of infrastructure service providers, demonstrating the link between good performance and asset management, and how it is important for organisations to collect and use sound data, recruit capable staff, and ensure that roles and responsibilities are clear.

Performance and asset management are influenced to a large degree by institutional arrangements, which affect incentives, funding, and institutional capabilities. This chapter canvassed how institutional arrangements have affected these elements of asset management in the Pacific. The case study below shows how the Tonga Water Board (TWB) has addressed such constraints, and how sound asset management is resulting in good financial and technical performance.

Case Study 4

the tonga water board

A well maintained Pump House at Mataki-eua well field.
Photo courtesy of Cori Alejandrino-Yap (PIAC).

Robust asset management practices are an important reason for the Tonga Water Board's good performance.

The Tonga Water Board (TWB) is a commercially-driven SOE responsible for water supply to the urban centres of Nuku'alofa, Neiafu and Makave, Holopeka and Pangai-Hihifo and 'Eua. The TWB performs well financially and technically. It scored well in the PWWA's 2011 *Benchmarking Report*, ranking second among 19 Pacific water utilities in the Overall Performance Indicator (OPI).

Sound asset management practices are a major factor behind the TWB's good performance. Maintenance activities at TWB are driven by an objective-oriented work plan, with key performance indicators established for the engineering department responsible for routine, periodic and preventative maintenance activities.

Key performance indicators (KPIs) flow from corporate objectives, departmental objectives, and activities. It includes:

- Unaccounted water loss target (20-30 per cent) with leak detection and reduction programme.
- Minimum 60 per cent ageing meter replacement.
- Improve water sales and debt collection by five per cent.
- Consistent water level target of 7ft (Nuku'alofa, Vava'u, 'Eua) and 8ft (Hapai).

TWB is currently working towards a more comprehensive asset management system. It has put in place: (a) a Geographic Information System (GIS) that facilitates the location of assets; and (b) an asset inventory which consolidates information from its GIS system, customer billing data (for water meter inventory) and asset register from the finance department. The TWB is also developing a more comprehensive and systematic asset management plan. Some components of the plan include:

- **Asset Information and Inventory** – the existing asset inventory will be supplemented by richer data on water networks, pumping stations, treatment facilities, and storage reservoirs.
- **Operation Planning** – will inform asset management by specifying how each asset contributes to the level of service that is required.
- **Maintenance Planning** – a systematic maintenance strategy will outline maintenance requirements that enable the TWB to meet its operational needs, including both unplanned and planned maintenance.
- **Risk Assessment and Management** – ensure the continuity of water supply to customers and a coordinated response following a disaster or a breakdown in the system.

lessons

The TWB case study demonstrates the close links between good asset management and good performance. The TWB is one the best performing water utilities in the Pacific. Its success is partly the result of good management that operates with clear direction from government, and under a regulatory regime that ensures adequate funding

is available for everyday operational and maintenance requirements. Effective maintenance is also important. Maintenance planning at the TWB is designed to meet corporate objectives, with the use of KPIs for individual units ensuring that incentives are in place for effective asset management.

Efforts are now underway to further improve asset management, with plans for better integration of the GIS and asset inventory, and for development of more systematic asset management systems.

The full case study is provided in Annex 1.

5 Development Assistance

There has been considerable effort among the major development partners in the region … to improve ongoing asset management of donor-funded infrastructure. However, assistance from other development partners, including emerging donors … remains focused on physical infrastructure with little regard for its ongoing management or sustainability.

A majority of core economic infrastructure in Pacific island countries is funded by grants or concessionary loans provided by development partners. The policies, activities, and lending modalities of developing partners therefore constitute an important influence on asset management in the region. This chapter provides an overview of development assistance for infrastructure in Pacific island countries and discusses the policies and aid/lending modalities of PRIF development partners. Chapter 6 then discusses how development partners can help improve asset management in the region.

5.1 the impact of development assistance

Development assistance is a key driver of higher living standards in the Pacific. This is especially the case in Micronesian and Polynesian countries where per capita levels of aid are among the highest in the world. Development assistance for infrastructure in these countries has contributed to nation-building, facilitating transportation, trade and service provision. However, the manner in which infrastructure assistance is delivered has also at times been a cause for concern.

Development assistance after independence focused on funding new infrastructure projects with less attention paid to other aspects of the asset life-cycle. The implicit assumption was that ongoing operation and asset management is the responsibility of recipient countries, and that the role of development partners ceased upon project completion (Ostrom *et al.,* 2001; AusAID 1999). The focus over the last decade has shifted firmly towards the management of existing infrastructure. However, it is acknowledged that the provision of new infrastructure continues to have an influence on the incentives of partner governments.

Development assistance for infrastructure is one reason for the poor record of asset management in the region. It is well recognised that external funding reduces the value of infrastructure capital from the perspective of recipients, lessening the incentive to maintain infrastructure assets or plan for their replacement.
The World Bank's *Pacific Infrastructure Challenge* report notes that:

> "Aid dependence … weakens accountability and risk management. When an infrastructure asset is created with aid money, the normal disciplines of valuing the asset and providing for its replacement in the future can be avoided … [M]aking capital free may have contributed to poor governance and poor management over time by removing the pressure to have to pay for valuable assets or provide for their eventual replacement in the absence of donor aid" (World Bank 2006:25).

Development partners have attempted to address the problem of perverse incentives using two primary strategies. One involves requiring counterparts to invest in projects. The other involves attaching conditions to development assistance. Both strategies seek to modify the incentives and behaviour of recipients. Results have been mixed. Counterpart funding lessens, but does not entirely eliminate, perverse incentives associated with development assistance. Designing conditions that will influence behaviour is also fraught with challenges. It requires development partners to respond to the actions of recipients, but this can be challenging, given the incentive structures of development partners (Ostrom *et al.*, 1993; Ostrom *et al.*, 2001; Gibson *et al.*, 2005; Riddell 2007).

There has often been an unspoken assumption in the design of infrastructure projects that core economic infrastructure will 'pay for itself' by generating economic growth. This has justified a focus on capital costs with fewer resources and attention paid to ongoing asset management. The assumption has come under the increasing scrutiny of development partners, as discussed in Chapter Two. A number of development partners have commissioned studies into the growth prospects of small and remote Pacific island states. The World Bank country partnership strategy in Samoa notes that: "[a]s with many small economies remote from major markets, continuing external financing flows are likely to be critical [to] … maintain service delivery" (World Bank 2012).

There has been a resulting shift in development assistance modalities, sometimes closely linked to the Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee agenda. In smaller Pacific island countries, grants have largely replaced lending-based aid modalities. This recognises that in small island developing states, infrastructure does not always result in economic growth, but can nevertheless produce significant social benefits. There are also gradual moves towards greater provision of general budget support and the channelling of development assistance through government budgets. Both are measures that can contribute to the development of capacity in the civil services and address the resource constraints that impede ongoing asset management.

Greater attention is also given to sustainability. Assistance from development partners is increasingly focused on the rehabilitation of existing infrastructure rather than the construction of new infrastructure; a trend which is particularly notable in the roads sector. The focus on rehabilitation is often necessary given that infrastructure assets have deteriorated to such an extent that maintenance expenditure is impractical. Infrastructure projects increasingly feature a maintenance element, where the development of new infrastructure capital is complemented by subsequent assistance for maintenance. This can take the form of a contract for ongoing maintenance by the private sector for a specified period of time – an arrangement the ADB, World Bank, and AusAID have all pursued. In some countries, trust funds are also being established with development assistance in order to ensure adequate funding for maintenance is available (as discussed in the next chapter). The Solomon Islands Transport Fund is one such example in the region, and is discussed later.

The delivery of technical assistance to address capacity constraints is also changing. It is generally recognised that technical assistance in the past, although notoriously difficult to evaluate, has produced mixed results (Riddell 2007). In many smaller Pacific island countries, skills transfer was minimal, with advisors effectively performing a capacity supplementation rather than capacity

building role (AusAID 1999; World Bank 2006; Heinecke *et al.*, 2008; Herr and Bergin 2011; World Bank 2011). Technical assistance is now increasingly linked to infrastructure provision as opposed to being delivered as stand-alone projects. It is also generally delivered over a longer period than in the past, with a greater focus on sustainable results.

There have been some notable successes in infrastructure sectors. The Solomon Islands government is now able to outsource road maintenance through competitive tenders to the private sector as a result of technical assistance; something it did not have the procurement or financial management capacity to do at end of the period of ethnic tensions. Similarly in PNG, technical assistance in development of a Road Asset Management System now provides a picture of the state of the national road network, although the challenge of maintaining the network continues.

There is nevertheless further room for improvement. A number of OECD Development Assistance Committee peer reviews have criticised development partners in the region for delaying moves towards budget support and for continuing to work outside of government systems. The PEFA scores of many Pacific island countries have been lowered as a result of development partners working outside of government systems (Haque *et al.*, 2012). The delivery of assistance through small projects, though not as prevalent as before, continues to result in fragmentation and creates unnecessary administrative burdens for Pacific island governments. Improvements in other areas vary. Technical assistance continues to achieve mixed results with some projects exhibiting a better design than others.

Progress among development partners is also mixed. Considerable effort has been made by the major development partners in the region, including most PRIF development partners, to improve ongoing asset management of donor-funded infrastructure. However, assistance from other development partners, including emerging donors such as China, remains focused on physical infrastructure with little regard for its ongoing management or sustainability. This is already producing adverse effects. The Government of Tonga is currently in a difficult fiscal position, largely because of (in some cases questionable) loans for the reconstruction of Nuku'alofa.

The next section discusses the policies and development assistance modalities of the PRIF development partners. The following chapter explores options available to development partners for improving asset management in the region.

Box 5: Reform of Road Maintenance in Samoa

Reform of the Public Works Department (PWD) in Samoa provides an excellent example of how institutional change can improve infrastructure asset management. In the early 1990s, road maintenance in Samoa had deteriorated due to a decline in overall funding levels, the loss of professional staff, ageing equipment, and increases in the length of the road network. The Government of Samoa sought to address the challenge by reforming the PWD responsible for road maintenance.

There were several aspects to reform. A key element of the strategy involved reducing the size of the PWD, which in the early 1990s had salary overheads of 45 per cent of total costs. The reforms saw road works outsourced to private sector contractors, with the PWD transitioning from a service delivery agency into its present asset management role. The World Bank and AusAID provided support for the reforms through technical assistance and advice, and through the development of asset management capacity within the PWD. The PWD processes for outsourcing improved as a result of this assistance, with maintenance of road sections advertised through public tender.

The success of the reforms is demonstrated by government spending levels. Funding from government remains approximately at its 2002 level, but is sufficient to manage a road network that has increased in size by 15 per cent. The cost savings are primarily due to the downsizing of the PWD, which transferred 80 per cent of non-core activities to the private sector. In the process, employment at the PWD declined from approximately 500 staff prior to reforms or 25 per cent of employment across the civil service, to the 60 staff that is currently employed.

Figure 5.1: Road Maintenance in Samoa

Photo courtesy of Cori Alejandrino-Yap (PIAC)

A key reason for the success of reforms is the way in which they were carried out. There was strong political and bureaucratic leadership throughout the reform process. Reforms were also designed in consultation with PWD staff. Staff members were able to choose between redundancy packages (chosen by 57 per cent), re-employment with existing contractors (one per cent), establishment of contracting businesses (25 per cent), and continuation in the new PWD (subject to selection – 17 per cent). Support provided to PWD staff was significant. It included the capacity building and training of an initially weak private sector, funding of job placements for 12 months, and direct awarding of performance-based contracts to new enterprises that had been established by former PWD staff.

The case study demonstrates that reform of inefficient public sector organisations in the Pacific is possible and, if designed effectively, can be conducted in a way that minimises harm to employees that are made redundant. The experience also demonstrates that reform can increase the resources available to government for asset maintenance activities, and can improve the asset management capacity of an organisation. Infrastructure asset management can improve as a result.

Figure 5.2: A Drainage Ditch on a Well-Maintained Road in Samoa

Photo courtesy of the World Bank

A more detailed analysis is provided as Case Study 8 in Annex 1.

5.2 prif development partners

a. asian development bank (ADB)

The ADB raises funds from its shareholders to provide development assistance to 14 Pacific Developing Member Countries (DMCs). ADB development assistance to Pacific island countries has a strong focus on infrastructure development, with approximately 80 per cent of current lending to the region targeted towards infrastructure. Between 1969 and 2010, infrastructure accounted for approximately 55 per cent of overall ADB support to the Pacific, with the transport sector accounting for 37.5 per cent (Asian Development Bank 2011). As a result, the ADB is widely recognised as having a comparative advantage in infrastructure. Development assistance in the Pacific has mainly comprised concessionary loans, although co-financing arrangements and the establishment of Asian Development Fund grants in 2005 have enabled an expansion of grant-based assistance. The ADB also finances infrastructure projects through its commercial lending operations, commonly in partnership with the private sector.

The ADB is increasingly involved in the provision of technical assistance and policy advice in

infrastructure sectors. This forms part of the ADB's *Strategy 2020* to become a 'knowledge bank', expanding on its traditional role as a lender to developing countries in the Asia-Pacific (Asian Development Bank 2008). The *Pacific Approach 2010-14* notes that "technical assistance projects have on average become substantially larger, more flexible, and longer term" (Asian Development Bank 2010). It also emphasises the comparative advantage of the ADB in infrastructure. In the ADB's Pacific Department, the comparative advantage in infrastructure is used to argue for an 'aid plus' model, which involves funding for physical infrastructure complemented by technical assistance and policy advice. In a brief examination of 13 infrastructure projects in the Pacific, six incorporated something resembling a maintenance or asset management policy into the project design.

The ADB has traditionally not provided recurrent funding for infrastructure maintenance. However, there is evidence of funding for maintenance through the increased adoption of sector-based approaches for infrastructure assistance, which are often developed in coordination with other development partners. The Transport Fund established in the Solomon Islands is a good example of this. Assistance to the transport sector of the Solomon Islands is clearly a flagship program for the ADB in the Pacific, with the *Pacific Approach 2010-14* stating that:

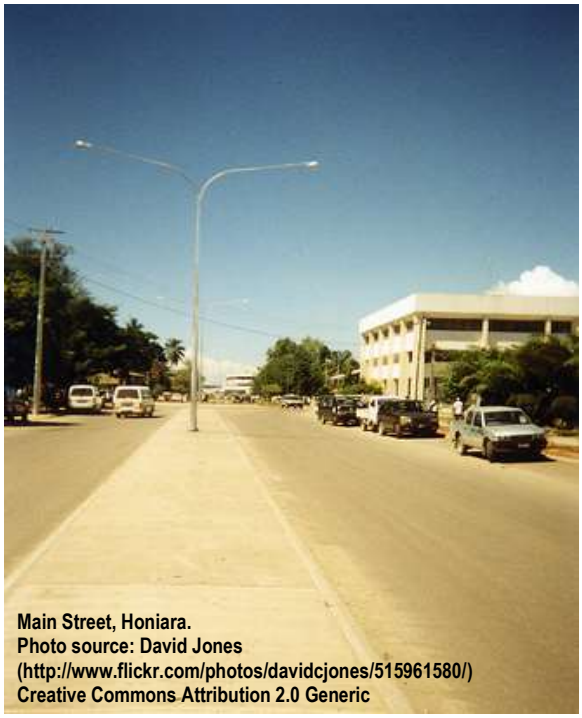
> "... infrastructure projects in Solomon Islands … have led the way as models for engagement in fragile situations, incorporating such features as community-based modalities for procurement, long-term approaches to capacity development, and catalysing significant co-financing from bilateral development partners" (Asian Development Bank 2009).

At the policy level, maintenance is considered an important component of infrastructure assistance to the Pacific. The *Pacific Approach 2010-14* cites the importance of infrastructure maintenance no less than six times. Country partnership strategies, which frame ADB operations in Pacific developing member countries, also highlight the significance of asset management and maintenance. Every single country partnership strategy in the Pacific mentions asset maintenance at least once. In some country partnership strategies, like that for PNG, there is detailed discussion of how ADB activities are improving asset management and maintenance. These activities are diverse, and include technical assistance for improved asset management; creation of dedicated revenue streams, trust funds, and the promotion of cost-recovery; and the establishment of a CSO framework to improve the financial position of SOEs and enable them to finance maintenance activities.

There is considerable overlap between the ADB's asset management agenda and its support of private sector development in the Pacific. The use of public-private partnerships to facilitate asset management and maintenance activities is actively promoted in Pacific island countries where the ADB operates. In the case of the Solomon Islands, the country partnership strategy states that: "[the] ADB will support the Ministry of Infrastructure Development in planning and managing works with contractors and to increase the involvement of the private sector and community groups in maintenance and rehabilitation of civil works". The ADB is currently analysing the developmental impacts of community-based, labour-intensive forms of road maintenance in rural areas.

Case Study 5

the solomon islands national transport fund



Main Street, Honiara.
Photo source: David Jones
(http://www.flickr.com/photos/davidcjones/515961580/)
Creative Commons Attribution 2.0 Generic

The Solomon Islands Transport Fund was established in 2010 as a means of facilitating the development and improvement of key transport infrastructure necessary for travel by road, ship, and air. The fund is financed by contributions from AusAID and the Solomon Islands Government. A board of four government appointees and one development partner representative (who is only an observer and cannot vote) oversees administration of the fund, with the support of a secretariat based within the Ministry of Infrastructure Development (MID).

The context for establishment of the fund goes back to the collapse of government service delivery during the period of civil conflict known as the 'Tensions'. It is estimated that in 2000, at the end of the tensions, only 10 per cent of the nation's roads were in good condition. Transport services had ceased to function. The MID had limited capacity to address the problem, especially outside of Honiara, with its engineering staff numbering two in 2001.

Development assistance for infrastructure commenced immediately after the conflict ended, with emergency loans used to redevelop road infrastructure along major economic corridors (the government's precarious fiscal position caused it to default on these loans, which were settled as part of the Honiara Club Agreement).

There have also been efforts to increase the capacity of the MID. Technical assistance from the ADB has been especially important, and has assisted with development of the National Transport Fund (NTF). There are now 18 engineers working in the MID. Development partners have required the Solomon Islands Government to increase funding of infrastructure maintenance and rehabilitation as a condition for assistance.

Figure 5.3: Deferred Maintenance Works on a Bridge in the Solomon Islands

Photo courtesy of Cori Alejandrino-Yap (PIAC)

The NTF has been created to ensure that adequate funding is directed towards development and ongoing management of transport infrastructure. Its establishment acknowledges the difficult fiscal position faced by government. The design of the fund has several benefits, including:

1 A sectoral approach, wherein all assistance is pooled, helps to ensure that infrastructure financing is linked to the Government's National Transport Plan (NTP). A sectoral approach also re-directs development assistance away from many individual projects, reducing fragmentation and lessening the administrative burden on government.

2 The NTP separates, and prioritises, all road rehabilitation and maintenance projects, all wharf repairs, maintenance, and new/replacement build projects, as well as airfield rehabilitation and maintenance projects. The prioritisation process used to make decisions about spending places a high value on maintenance of existing infrastructure.

3 Projects funded by the NTF are administered through the Solomon Islands Government, with the Ministry of Finance and Treasury approving expenditure initiated by the MID. Spending through government systems serves to improve public financial management capacity, and acts as an additional financial control.

4 Political will and commitment from government is vital. In the Solomon Islands, the allocation of budget funds for maintenance demonstrates this commitment.

The full case study is provided in Annex 1.

b. australian agency for international development (ausaid)

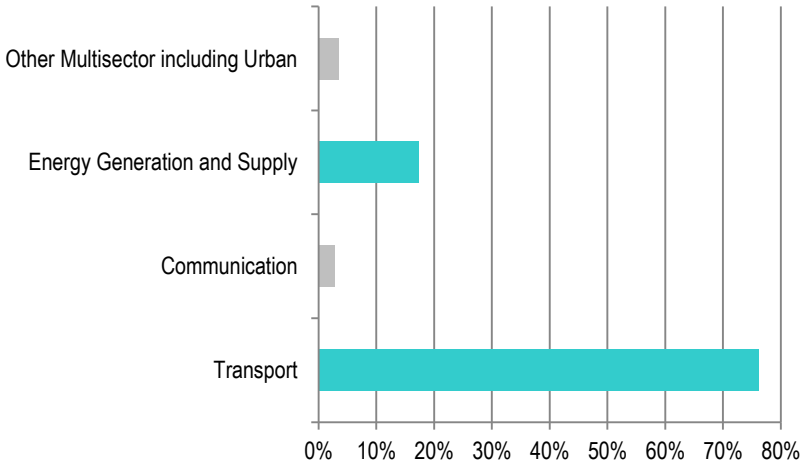
AusAID is the largest development assistance partner in the Pacific islands. Official development assistance has increased dramatically over the last five years, with the Australian Government committing to a target of 0.5 per cent of Gross National Income (GNI) by 2017-18. The increase in development assistance to the Pacific region has been proportional to this larger increase, although some countries such as the Pacific microstates have benefited more than others. At the same time, AusAID has taken steps to improve the effectiveness of its development assistance in the Pacific, consistent with principles embodied in the Paris Declaration and subsequent agreements. In some countries, this has led to a greater use of partner government systems, alignment with partner government development objectives, reduced fragmentation, and greater coordination with other development partners.

The Australian Government's official development assistance program has historically included a strong focus on technical assistance and capacity building. Technical assistance has been especially important in PNG and other Pacific island countries, given capacity constraints in counterpart governments. Technical assistance has been central to development assistance provided in infrastructure sectors, and has included policy and technical advice, training, and placement of implementation advisors in partner governments.

AusAID development assistance for infrastructure is influenced by a number of policy documents and agreements. The 2011 thematic strategy, *Sustainable Economic Development: Transport, Water, Urban, Energy and Communications Infrastructure*, provides a framework for infrastructure related assistance in the region (AusAID 2011). The strategy does not delve into detail regarding asset management, but does make clear that development assistance for infrastructure must be sustainable, and that this requires a focus on the policy environment, funding for maintenance, and the rehabilitation of existing infrastructure assets.

The majority of Australian infrastructure development assistance is for the transport sector, with roads forming the most important sub-sector (see Figure 5.4). Assistance is split between physical infrastructure projects and the provision of technical assistance and policy advice. In non-transport sectors, considerable attention is being given to the regulatory arrangements for the provision of infrastructure services.

Figure 5.4: AusAID Infrastructure Funding in 2011-12



At a country level, AusAID assistance is governed by *Pacific Partnerships for Development* that are signed with the governments of Pacific island countries (11 had been signed at the end of 2011). Attached to these agreements in the case of larger programs are schedules for different sectors. The infrastructure schedules of *Pacific Partnerships for Development* generally highlight agreed target outputs, the importance of regulatory arrangements, and sound asset management. An extract from

the *Transport Infrastructure Schedule of the Australia-PNG Pacific Partnership for Development* highlights the emphasis on asset management and maintenance:

> "Under the Partnership, the Governments of Papua New Guinea and Australia will work together to improve hard transport infrastructure and the systems needed to manage the assets on a 'whole of life basis', focusing primarily on the maintenance and rehabilitation of road infrastructure with more limited support to the aviation and ports sub-sectors. This recognises that funding for commercial/regulatory entities should be predominately sourced from the application of user charges, and that large-scale infrastructure programs would ideally be met through commercial loans, public private partnerships, and other similar funding sources.
>
> Thus, for the aviation and ports sectors, the Government of Australia will support the Government of Papua New Guinea's activities to concentrate on strengthening the operation of these institutions to be self financing, with some assistance also being provided to strengthen aviation and maritime safety and security" (Government of Australia and Government of Papua New Guinea 2011).

One feature of *Pacific Partnerships for Development* is the establishment of targets or KPIs against which Australian assistance can be assessed. In the case of the PNG transport infrastructure schedule, a key performance indicator is the percentage of the existing priority national road network that is in good condition. The establishment of targets is a positive step, focusing development assistance on tangible results and improving accountability.

c. the european investment bank (eib)

The EIB provides commercial and concessionary loans for infrastructure development in Pacific island countries. Its activities in the Pacific are relatively small, totalling approximately $20-$40 million each year. The EIB does not have any policies relating to asset management, although maintenance of EIB-funded infrastructure must comply with relevant environmental laws and regulations. As with commercial banks, the EIB considers the financial position of borrowers before proceeding with loans. Asset management is not considered explicitly, but it does influence the financial position of borrowers.

d. the european union (eu)

The EU is a significant development partner operating in the Pacific region, providing support to both independent states and non-independent territories. Development assistance from the EU has a strong focus on responding to climate change. A considerable portion of EU development assistance is for infrastructure, and much of this assistance is framed in terms of climate change mitigation (in the case of renewable energy) and adaptation (in the case of 'climate proofing' infrastructure). The 10th EU Development Fund had an emphasis on energy, and water and sanitation.

EU development assistance in the Pacific generally takes the form of grants funded from a number of financial instruments, the most important being funding for African, Caribbean and Pacific (ACP) nations and the EU Development Fund. Development assistance is framed by country strategy papers that are linked to national development plans, which are drafted as part of six to seven year EU Development Fund programming cycles. Budget support is provided using a results-oriented approach.

EU support for infrastructure is generally directed towards infrastructure construction. There has been minimal focus on ongoing asset management, with technical assistance primarily focused on helping small bureaucracies meet EU requirements (such as Environmental Impact Assessments). At the same time, the EU recognises the lack of maintenance of donor-funded infrastructure as a

problem. Projects at the design stage are assessed against sustainability criteria, which include financial sustainability and ability of infrastructure providers to manage their assets. One response to the problem of poor asset management has been establishment of long-term maintenance contracts with the private sector. These contracts vary from between two to five years in duration, but cannot be indeterminate due to funding cycles. In some cases, there is additional expenditure on infrastructure in order to lessen future maintenance requirements.

e. the new zealand aid programme

The New Zealand Aid Programme has a strong geographic focus on the Pacific region, with over half of the organisation's total development assistance flowing to Pacific island countries. In 2010-11, 10 per cent of the programme's assistance was dedicated to the transport sector and seven per cent to the energy sector, including a strong emphasis on renewable energy development. Assistance for water and sanitation infrastructure is recorded with health expenditure, which accounted for 15 per cent of total development assistance. The aid programme focuses on addressing challenges to economic development, which includes poor infrastructure. Infrastructure assistance in the aid programme is consequently classified as 'economic' and is primarily directed to capital investment.

The New Zealand Aid Programme has no specific policy to address maintenance and assistance for ongoing asset management is minimal. The issue of poor maintenance is nevertheless recognised. The Environmental and Social Impact Operational Policy (ESIOP) aims to minimise adverse social and environmental impacts from infrastructure development, and includes assistance in the effective management of infrastructure. In addition, the New Zealand Aid Programme's activity design process ensures that all its projects follow the sustainability criteria starting from the appraisal/design process through to monitoring and evaluation and this also supports an increased emphasis on maintaining assets for their full economic life.

The future challenge of the programme – shared with many other development partners – is to implement mechanisms to monitor sustainability or performance after project completion. In response, the New Zealand Aid Programme is now preparing a study on the status of past infrastructure activities. This study will evaluate the performance of New Zealand Aid-funded infrastructure over the past 10 years with the objective of gauging project sustainability and informing future development assistance for infrastructure. There is a possibility this study will be expanded and undertaken jointly with AusAID.

f. the world bank group (WBG)

The World Bank has been at the forefront of thinking regarding the infrastructure maintenance problem in developing countries. The Bank pioneered road funds for maintenance in the early 1990s in response to the persistent lack of maintenance of Bank-funded road infrastructure, with earmarking of revenue promoted in spite of opposition from other multilateral institutions.

The Bank has since developed third generation road funds, which apply commercial principles to the management and implementation of road management funding and activities. Similar arrangements are also being applied in other infrastructure sectors.

In recent years, the World Bank has explored innovative perspectives on the development challenges of Pacific island countries. A discussion note titled *Pacific Futures* (2011) raised the question of whether traditional development strategies successful in other parts of the world would be successful in the Pacific, factoring in remoteness and distance from metropolitan markets. The World Bank has modified its approach to lending in the Pacific, partly as a result of such discussions.

It now provides only grants, not loans, to countries in the region with a population of less than 100,000 people.

World Bank assistance to the Pacific has scaled up tremendously in recent years. Lending from the International Development Association to the Pacific in the last five years has been of greater value than over the preceding 30 years. The International Finance Corporation (IFC), the private sector arm of the World Bank, has recently announced additional increases in funding to the region. The World Bank is involved across infrastructure development in the Pacific through a mix of funding for physical infrastructure and technical assistance. The World Bank acknowledges the infrastructure maintenance problem in the Pacific, with its 2009 *Regional Engagement Framework for Pacific Islands* stating that:

> "… while donor funding of infrastructure is quite prevalent, insufficient attention to asset management has led to a deterioration of these investments, causing disruptions to availability of basic services. If costly rebuilding activities are to be avoided, greater attention needs to be paid to the maintenance of these physical assets."

The World Bank has traditionally not funded recurrent costs for economic infrastructure. This is gradually changing, with moves towards general budget support occurring in countries like Tonga where financial management systems are well developed. Like the ADB, the Bank has promoted user-pays arrangements for private good infrastructure, including independent price regulation. Public-private partnerships have received strong support from the Bank in the region. The World Bank *Pacific Infrastructure Challenge* (2006) report made a comprehensive case for private sector participation in infrastructure development in the Pacific. The Bank's Pacific island operations also encourage private sector participation in infrastructure asset management, including maintenance. The Samoa country strategy notes that "Samoa has also been a leader in the Pacific, with support from the Bank over more than a decade, in encouraging local private sector engagement to undertake road maintenance" (World Bank 2012b).

The World Bank has established country assistance strategies (sometimes called country partnership strategies) with a number of Pacific island countries. The strategies include references to asset management and maintenance where infrastructure-related assistance is provided. Actual support for asset management and maintenance is project specific, and generally forms part of a loan or grant for infrastructure. In an examination of 25 World Bank infrastructure projects in the Pacific, 11 had something resembling a maintenance or asset management policy built into the project design. It is also common for conditions to be attached to loans or grants for infrastructure, some of which are relevant to asset management. In the case of the Kiribati Road Rehabilitation Project, the Government of Kiribati committed to an annual budget allocation for road maintenance of at least $1,500/km of sealed roads and $500/km of unsealed roads in South Tarawa, with the amount to be adjusted annually based on the rate of inflation.

5.3 summary

Development assistance for infrastructure is significant in the region. The provision of development funding for infrastructure has been instrumental in nation-building among newly independent Pacific island states. However, the historical focus on new infrastructure has also contributed to asset management challenges – a conclusion that is broadly recognised by development partners. PRIF development partners are already working to improve development assistance for infrastructure in the region. This chapter has highlighted some of these initiatives.

There is further scope to improve asset management through change. Development partners can do

more to assist Pacific island countries enhance asset management capabilities described in Chapter Three. This should involve technical assistance linked to infrastructure projects.

There is also scope to scale-up a number of innovative arrangements that have been trialled in the region to improve asset management. This may require development partners to increase the duration of projects.

Planning and coordination are also important. Development partners in the region can do more to assist Pacific island governments plan infrastructure development, noting that new infrastructure inevitably leads to ongoing asset management liabilities. Coordination among development partners in this activity is important and will benefit Pacific island nations. PRIF development partners should continue to pursue opportunities to partner and coordinate with other providers of development assistance, and should engage with more emerging donors.

Case Study 6

the papua new guinea national road fund

Rabaul, Mango Way.
Photo source: Stefan Krasowski (http://www.flickr.com/photos/rapidtravelchai/8073778195/)
Creative Commons Attribution 2.0 Generic

The Road Fund has been able to ensure that financial resources earmarked for road maintenance are not misdirected.

The road network in PNG has suffered from a lack of maintenance over many years. Successive governments in the 1980s-1990s reduced road maintenance funding, resulting in a dramatic deterioration in the condition of the road network. In 2007, almost 32 per cent of national roads were in 'poor condition', meaning that they were passable only by four wheel drive vehicle in dry weather.

In recent years, the Government of PNG has undertaken a number of measures with support from development partners to improve road maintenance.

The PNG Government has established a road fund dedicated to maintenance of national roads in order to improve road conditions. A National Roads Authority (NRA) was established with the road fund to implement maintenance. The two entities are overseen by an independent board of directors, whose members include seven private sector representatives and four civil servants from the major road sector agencies. The full case study in Annex 1 provides an overview of this organisation.

The PNG Government has also implemented other initiatives. A Road Asset Management System (RAMS) was developed after 1999 and provides a snapshot of the condition of the national road system. Although not completely up to date, RAMS is used by government bodies and development partners involved in providing support to national roads, demonstrating the benefits of an asset inventory for maintenance provision.

Road agencies are also commencing to implement innovative contracts to help address challenges in procurement and budgetary allocations. The use of long-term road maintenance contracts of between three to 10 years is increasing, with financial bonuses and penalties providing the necessary incentive for contractors to ensure that roads remains in good condition.

Lessons

The PNG Road Fund, in a narrow sense, has achieved its objective of providing a funding source for road maintenance. Sound governance arrangements have ensured that money intended for maintenance of the road network is not misdirected. However the establishment of the fund also shows that earmarking of revenue alone is no panacea to the asset management challenge.

The revenue base of the Road Fund remains inadequate – partly due to the way in which the Road Fund was created. Establishment of the Road Fund and The NRA has also failed to address broader issues adversely affecting implementation of road maintenance. There remains a need to improve procurement systems, build the capacity of the private sector to undertake road work contracts, and increase aggregate levels of funding.

The experience with the National Road Fund highlights two points. One is that political support is required for the successful establishment of a road fund with an adequate revenue base. The second is that a road fund is only one element of broader asset management arrangements.

For asset management to work, all fundamentals must be effective, ranging from adequate funding (the aspect addressed through a road fund), planning, procurement and monitoring systems, and implementation. Further improvements in other elements of asset management are needed for the benefits of the Road Fund to be fully realised.

Figure 5.5: Photo of the Highlands Highway, Papua New Guinea

The full case study is provided in Annex 1.

6

Improving Asset Management in the Pacific

The role of government in delivering infrastructure services is … broader than direct service provision and regulation. It encompasses a range of other activities essential for ensuring that organisations deliver infrastructure services which meet community expectations. Governments must provide a legislative environment conducive to infrastructure service provision, ensure an adequate skill base for infrastructure service provision, and put in place service provision and safety standards. The government can help to improve asset management by ensuring that these functions are performed in an effective and consistent manner. Planning is crucial for this to occur.

This chapter discusses how asset management can be improved in the Pacific. It builds on earlier chapters that highlighted the importance of good asset management and routine maintenance to infrastructure service provision. The role of infrastructure in providing a platform for economic development and social service delivery means there is some urgency in efforts to improve the levels of service provided by that infrastructure. It is no exaggeration to say that lives are at stake. The careful management of infrastructure assets directly affects livelihoods and the ability of people to access essential education and health services.

Reasons for suboptimal management of infrastructure in the Pacific were discussed in Chapter Two, and relate to incentives, resource constraints, and limited organisational capabilities. The ways in which these constraints affect asset management and performance in the Pacific were explored in Chapter Four. The study noted that the challenge of good infrastructure asset management is not unique to the Pacific. Both developed and developing countries around the world have often struggled to ensure that infrastructure assets are managed well. However, Pacific island countries are different. The remoteness and small size of Pacific island countries present unique challenges for managers of infrastructure. Sophisticated solutions that rely on extensive data and are appropriate in larger countries are often unsuitable for small-scale infrastructure service providers in the Pacific.

The discussion so far has demonstrated that challenges to managing infrastructure are complex and multifaceted. There is no panacea to improve the level of services available across countries within each sector. Rather, a number of reforms are required at both macro and micro (or organisational) levels in order to ensure that organisations that deliver infrastructure services have the requisite funding, planning capabilities, data, and incentives (roles and responsibilities for which management

is held accountable), to manage assets well. It is also important to tailor approaches to different contexts. The uniqueness of each Pacific island country indicates that efforts to improve infrastructure planning and asset management must be adapted to individual countries and infrastructure service providers.

This chapter first discusses the role of government in improving infrastructure asset management. It then proceeds to discuss how institutional arrangements can be improved at the macro level for better planning, budget preparation, and regulation. The third section focuses on asset management at the organisational level. The fourth section discusses the role of the private sector in service provision and asset management. The final section explores how development partners can help improve asset management in the region.

6.1 the role of government

Governments play an important role in delivering infrastructure services in the Pacific. Governments provide infrastructure services directly through departments and indirectly through statutory authorities, SOEs, grants to community groups, and contracts with private sector entities. Governments also regulate the provision of infrastructure services.

The role of government in delivering infrastructure services is nevertheless broader than direct service provision and regulation. It encompasses a range of other activities essential for ensuring that organisations deliver infrastructure services which meet community expectations. Governments must provide a legislative environment conducive to providing infrastructure services, ensure an adequate skill base, and put appropriate standards in place.

> *Installing infrastructure without responding to user preferences or the capacity of users to pay for acquisition, operation, and maintenance operations, are unlikely to be successful (Heller 2009).*

Governments can help improve asset management by ensuring that these functions are performed in an effective and consistent manner. Planning is crucial for this to occur.

The UN-HABITAT report on *The Maintenance of Infrastructure and its Financing and Cost Recovery* (1993) provides a useful summary of the role of national government in improving infrastructure maintenance. These roles are discussed briefly below with reference to Pacific island countries.

Clear legislative and policy framework

A clear legislative and policy framework is necessary for the provision of infrastructure services. Chapter Four noted that in many countries, the roles and responsibilities of different organisations and national/sub-national governments are unclear. This situation has adverse impacts on asset management. In the Pacific, cooperative performance audit reports of water and waste management sectors in 2012 found that there were often multiple stakeholders without defined roles and responsibilities. The reports argued that clarification of the legislative and policy framework was an essential first step in improving service provision and achieving the MDGs.

Strengthening institutions

Sound institutional frameworks at the organisational level are also necessary for asset management activities. The UN-HABITAT report notes that there is scope for increasing the status of organisations tasked with infrastructure maintenance. It also argues for "effective coordination between design, construction, operation, use, and maintenance of infrastructure". National governments have a role to play in promoting increased financial and managerial autonomy among providers of infrastructure services. Governments can ensure that funding arrangements are sound and that managers are held to account for service delivery.

There is also potential for national governments to improve infrastructure services by providing technical assistance to local level authorities. National governments can assist local governments in the development of asset registers, condition and capacity assessments, valuing assets and assessing depreciation, setting maintenance standards, scheduling, and multi-year planning and budgeting. This is very important in the Pacific given limited institutional and technical capacities among local level governments.

A local skills base in place for good asset management

A range of technical skills are required for asset management activities. The emigration of skilled personnel is a constant challenge in many Pacific island countries, as noted in Chapter Four. Infrastructure service providers in small countries are often reliant on foreign labour as a result. Small Pacific island countries are different to larger developing countries; foreign labour is likely to be a permanent feature of service provision. However, there are measures that can be implemented to increase the local skills base. One approach to technical training in the region that has received considerable interest is the Australia-Pacific Technical College (APTC). The APTC has been training tradespeople in the Pacific for five years. There is considerable scope to use the APTC to develop the skills necessary for infrastructure maintenance in Pacific island countries.[16] Similar initiatives at the country level should also be considered.

The skills deficit not only applies to technical and trade skills, but also to the appreciation of sustainable asset management frameworks. Training is needed for politicians, civil servants, asset managers, and infrastructure operators to ensure a commitment to, and an understanding of, personal roles and responsibilities.

Clear procedures for planning and management of maintenance of infrastructure at the local and national levels

National and local governments must work together to improve infrastructure planning. Local service provision in the Pacific commonly takes place with no overarching plan and is not linked to national development plans. There are few urban plans for cities and towns in the Pacific. Where such plans exist, they are often prepared without knowledge of their costs and therefore, are yet to drive development. Better integration of local and national level planning can improve infrastructure development and coordination across sectors. Coordination can also benefit asset management.[17] For example, when equipment is transferred to Funafuti, Tuvalu for the rehabilitation of local roads, it makes sense to use that equipment for maintenance of the runway (Government of Tuvalu 2012).

[16] The APTC is a promising initiative. A 2012 survey of employers of APTC graduates found an 80 percent overall satisfaction rating with the outcomes of APTC training. However there is scope for improvement. The trade certificates available through the APTC are still limited. Furthermore, the initial objective of the APTC of facilitating temporary migration to Australia has not been achieved – largely due to disconnects between Australian aid and migration policy.

[17] Good social analysis and community participation has been shown to be cost effective.

Mobilise community participation through local authorities, NGOs and organisations

Planning of infrastructure service delivery can benefit from greater community participation, which can be facilitated by local governments, NGOs, and community organisations (World Bank 1994:76). A good example of community participation in planning is the Cook Islands Preventive Infrastructure Master Plan (Government of Cook Islands 2007). The Master Plan was prepared in consultation with local communities and enables the national government and development partners to prioritise infrastructure service delivery based on community expectations and needs. Maintenance at the local level can also be an effective strategy, although some caveats apply.

Experience in the Pacific would suggest that local service delivery is effective only where adequate funding and institutional support is provided to local authorities/groups. Effective alliances among government, private, and civil society organisations can result in effective infrastructure service provision. This again highlights the importance of national government support for local level authorities and community groups with limited asset management capacities.

Minimise design, equipment, and materials problems

Existing design standards and practices in the Pacific are not always appropriate for local geological and weather conditions. Work is currently underway to upgrade standards. The SPC, World Bank, and the ADB have been quantifying the financial risk that countries face because of their exposure to natural disasters. Technical solutions include applying earthquake and tropical cyclone hazard models to building codes, and relocating essential infrastructure from the shoreline. The discussion in Chapter Three suggests that infrastructure design should also be influenced by the availability of maintenance services. Importing materials is costly and can result in delays to infrastructure maintenance.

National governments can help address such problems by providing incentives for improving the quality of locally manufactured materials and equipment (where feasible, and noting that local production is likely to be very restricted in smaller states). Standardisation of equipment can also reduce the cost of infrastructure delivery – as demonstrated in the case of the Kiribati Public Utilities Board (refer to case study seven). Standardisation will often require government coordination among infrastructure service providers, in addition to negotiation with development partners.

Another important issue is ensuring that parts will be available for any new equipment or infrastructure components, and that manuals are provided in an appropriate language to enable repairs and maintenance to be carried out as intended. There is already some experience in the region of equipment being purchased from other countries (e.g. Japan, Brazil) with manuals written in languages staff members are unfamiliar with, and without an established system for obtaining parts. It is important that, at the time of purchase, there is knowledge of the timelines and cost for supply of parts, and identification of the components that need to be kept in stock.

Minimise the problems of limited funds

Funding represents a significant barrier to asset management activities in the Pacific. Chapter Four noted that lack of funding has two primary causes: (i) inadequate funding being allocated for maintenance through the budget process, and (ii) a failure to recover costs through user charges. National governments can address the budgeting issue by improving public financial management systems, strengthening cost accounting skills, and ensuring that budget submissions from line departments are rigorous. Governments should also ensure that price regulation is sound so that

user charges reflect service delivery costs (excluding any formal government subsidy). This is discussed in section 6.3.

6.2 infrastructure planning

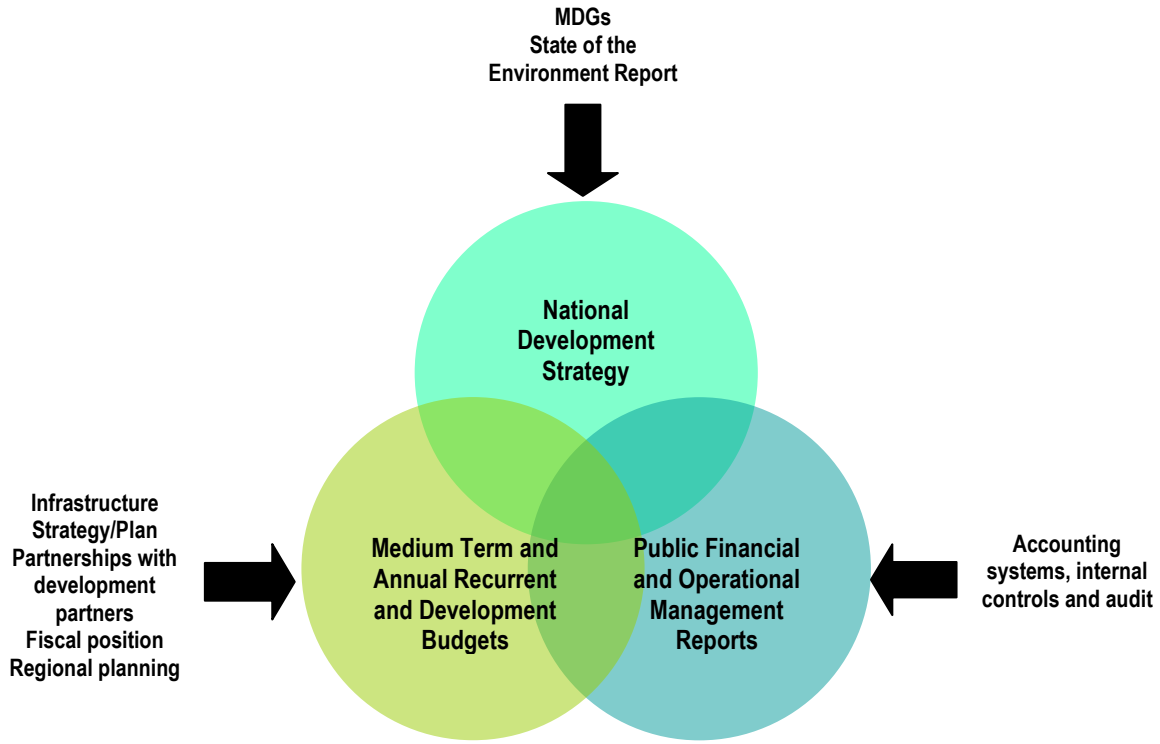
The varied roles of government in the provision of infrastructure services require a coordinated approach. Planning is therefore indispensable. Government activities in various areas best complement one another when implemented under an overarching plan supervised by a central ministry. The majority of Pacific island countries have such a framework in place. National development plans communicate a nation's ambitions and goals in the economic, social, and environmental spheres across various time frames.

PNG has also prepared medium-term development plans to put their national development strategy into practice and inform government, private sector, and civil society initiatives. Sector plans often perform this role in other Pacific island countries, complementing national development plans and providing an explicit link to budget preparation. Infrastructure development or investment plans identify new capital works planned for infrastructure within each sector plan. These are designed to communicate how new infrastructure services will contribute to a country's national development strategy. A framework for national planning is illustrated in Figure 6.1.

For planning to be effective, it is important that initiatives are guided by line ministries and that planning incorporates both a bottom-up and top-down approach. This is where national governments in Pacific island countries perform less well. Planning in many Pacific island countries is driven by a top-down approach, with significant input from central government ministries and little rigorous input from line ministries. This distorts the planning process, and is one reason for the excessive optimism of many plans. The establishment of unrealistic targets in national plans reduces the impact of targets on incentives, which is a principal benefit of a well-crafted set of targets. Planning can also be distorted by a focus on assistance from development partners. This produces national development plans that are focused on the development of new infrastructure rather than securing the ongoing delivery of services to the people.

There is considerable scope to improve asset management through better planning. The development of infrastructure plans helps Pacific island countries coordinate infrastructure development, negotiate development assistance, and prioritise infrastructure projects. The national infrastructure planning exercises conducted in five Pacific island countries has proven a useful exercise in this regard (see Box 6). National infrastructure planning can enable governments to adopt a long-term perspective to infrastructure planning. The five plans developed in the Pacific have included a focus on asset management over the life-cycle of infrastructure, and have provided estimates of the asset maintenance liabilities incurred as a result of development of new infrastructure.

Figure 6.1: The Planning Framework



Box 6: National Infrastructure Planning

Six Pacific island countries (Tonga, Nauru, Samoa, Tuvalu, Vanuatu and the Solomon Islands) have prepared national infrastructure investment plans in recent years with the support of the Pacific Region Infrastructure Facility.* National infrastructure investment plans are country owned and led, and are developed in consultation with internal stakeholders and private sector representatives.

National infrastructure investment plans are designed to:

1. Bring together the various sector and agency plans into a single source of information about infrastructure projects in the pipeline.

2. Provide a longer term view and sector-wide approach to infrastructure planning and management, and a more systematic approach to identifying future service needs and priorities.

3. Develop sustainable mechanisms for funding infrastructure delivery and maintenance based on sound economic and financial principles within partnerships and alliances among Government departments, statutory authorities, SOEs, the private sector, civil society and development partners.

4. Outline asset management and life-cycle (especially maintenance) costs generated by the stock of infrastructure, explore issues such as operating efficiencies and demand-side management, and look at the institutional and regulatory environment for infrastructure.

Source: Adapted from National Infrastructure Investment Plans

It is important that infrastructure plans include service delivery and funding arrangements. In the Pacific the majority of core economic infrastructure is provided by SOEs. This need not always be the case. There is considerable scope for the delivery of infrastructure services by private sector and civil society organisations under a number of arrangements, as discussed in section 6.5. Funding arrangements are equally important.

Infrastructure has often been developed in the Pacific without adequate consideration for how ongoing asset management costs will be met. This is due in part to development partner funding of new infrastructure. It is also attributable to the fact that infrastructure services are generally viewed as 'essential services' that should be provided by government. The existing approach means that infrastructure is often a significant financial burden for Pacific island governments. The level of services received by the population has suffered as a consequence.

6.3 funding

The distinction between public, community, and private goods provides a useful framework for identifying sources of infrastructure funding. 'Public good' infrastructure services require government funding. There are numerous ways of budgeting for these infrastructure services. The most common is the provision of funding through the budget process. An alternative is earmarking revenue (see Box 7) in the sector for infrastructure service delivery. For example, PNG dedicates four toe/L of domestically used diesel fuel to the National Road Fund (as discussed in case study six in Annex 1).

Earmarking revenue from the roads sector for road maintenance approximates a user pays system, and can be viewed as more economically efficient than the use of budget appropriations (although in the case of PNG, strictly speaking, diesel which is not used for road transport should be exempt from the tax).

However, revenue hypothecation is criticised by many Public Financial Management (PFM) specialists given its impact on the integrity of the budget process and the exclusion of related activities from normal legislative review. Considering the issue in 2006, the Australian Productivity Commission stated that "in itself, hypothecation need not bring about efficient infrastructure spending – the crucial ingredient is ensuring that charges and spending decisions are efficient" (Australian Productivity Commission 2006).

The provision of 'private good' infrastructure services are different to that of 'public goods' and 'community goods'. 'Private good' infrastructure services, because they are excludable, can be funded on a cost recovery basis. Economists consider this a more efficient way of funding infrastructure services, as demand is linked to the cost of provision. However, government support is still generally needed. The provision of infrastructure services on a cost recovery basis requires a sound legislative base, performance and safety standards, and sector regulation. The provision of these 'public goods' enables the delivery of 'private good' infrastructure services.

The provision of 'community good' infrastructure services is a further option which taps into the ability of some communities to mobilise and manage their own resources. This can be particularly cost effective for governments in rural and remote areas where both the public and private sector experience difficulty delivering services. However, community goods often need a measure of support from the public and/or private sector.

Box 7: Earmarking Revenue

The hypothecation of government revenue towards asset management in certain infrastructure sectors can be an effective mechanism for ensuring adequate funding of ongoing maintenance. Hypothecation is being trialed in the Pacific. Two examples of earmarking revenue for infrastructure service delivery were discussed in chapter five: the Solomon Islands Transport Fund and the National Road Fund in PNG.

The practice of earmarking revenue for certain purposes has been criticised in some circles. Ministries of Finance can object to earmarking given that it reduces fiscal flexibility and the integrity of the budget. In essence, this is a complaint about taking decision-making power away from elected leaders and placing it in the hands of an unelected bureaucracy. The IMF has raised similar concerns in various countries (Minc 2003).

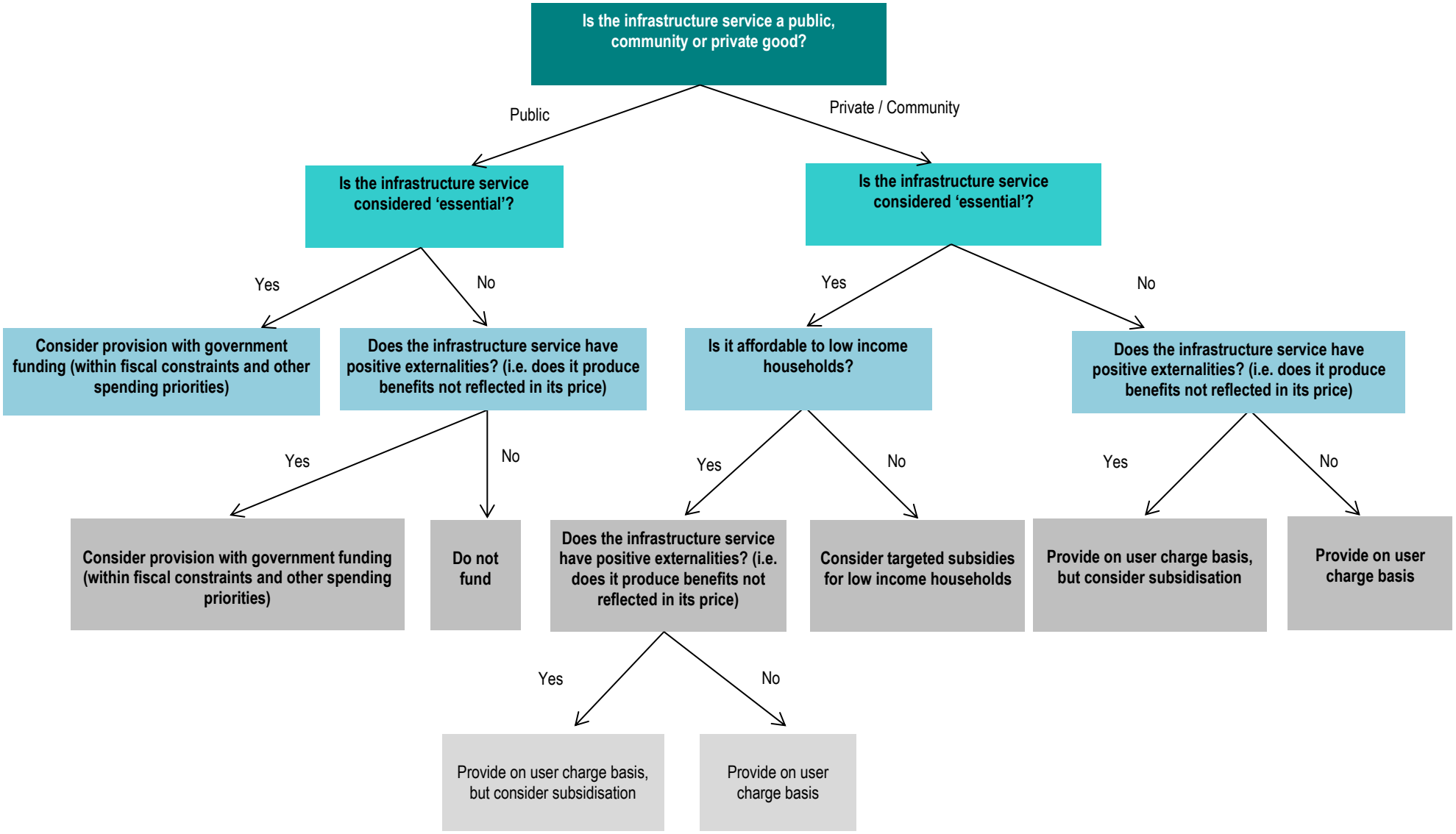
The differences between supporters and opponents of hypothecation are nevertheless often overstated. Much depends on the institutional arrangements used for earmarking and spending of revenue. The IMF's *Public Expenditure Handbook* supports the practice under certain conditions (Chu and Hemming 2001). One specification is that revenue for the fund should be sourced from beneficiaries of that infrastructure, such as use of vehicle registration fees to fund road maintenance.

The United Nations Human Settlements Programme has also noted a number of conditions that should be met for an earmarked fund to be effective. First, adequate legislation that specifies, without ambiguity, what the fund will be used for and how, should be in place. Second, the fund should be managed by an independent board and have appropriate governance arrangements in place. Third, the fund should not contradict broader fiscal policy (UN-HABITAT 1993).

The provision of accessible infrastructure services is a means of improving the quality of life of citizens. For this reason, it is often desirable for governments to provide subsidies where households cannot pay the marginal cost of necessary infrastructure services – for example through life-line tariffs in the case of utility industries. Targeted subsidies can be reimbursed by the government as a CSO, as detailed in Chapter Four. Another justification for subsidisation is the positive externalities associated with the delivery of infrastructure services. The case for government subsidisation of infrastructure that would otherwise not be provided is sometimes strong in the Pacific, especially in smaller Pacific island countries and in provincial areas. Airports and ports are essential for economic development in most countries, but are often commercially unviable. In such cases, it is important that the decision to subsidise is carefully balanced against government priorities and equity considerations. Government subsidisation of an international airport may be economically beneficial at the national level, but it is also likely to direct government resources towards high income households and international visitors.

A simplified decision tree for planning funding of infrastructure service provision is provided in Figure 6.2 on the next page.

Figure 6.2: Funding of Infrastructure Service Provision - A Decision Tree



a. budgeting

Budget allocations are essential for the provision of infrastructure services where (a) user fees are below service provision costs, or (b) infrastructure is a 'public good'. This study has detailed how governments across the Pacific and the world struggle to allocate sufficient funding to infrastructure maintenance. The result has been the premature deterioration of infrastructure and poor service provision, with secondary impacts on health, education, and economic outcomes. Reasons for the failure of Pacific island governments to dedicated resources towards infrastructure maintenance were discussed in Chapter Four. Explanations included a lack of good data, insufficient skills, weak PFM systems, the use of dual budgeting, lack of 'capital-consciousness' arising from the non-existence of asset registers, and political imperatives. These factors affect funding availability, organisational capabilities, and the incentives of infrastructure managers.

Another way of understanding the problem is in terms of a 'disconnect' between long-term planning and short to medium-term budgeting. Governments and legislatures frequently fail to approve budget appropriations to fund infrastructure plans or consider the implications for recurrent budgets of longer term national development plans. A 2012 report from the Pacific Islands Forum Secretariat, *Tracking the Effectiveness of Development Efforts in the Pacific*, noted the need for further "strengthening the links between plans and budgets". An example is the PNG Government's historical record in allocating funding towards road maintenance. Medium and long-term planning documents recognise the importance and priority of road maintenance. The government for decades nevertheless failed to allocate sufficient funding towards road maintenance; a situation that has only changed in recent years.

There are various approaches that can be taken to address this problem. The best combination of approaches, as always, depends on context. Increasing the revenue available to the public sector can help increase the availability of funds for budget allocations towards maintenance. Sound financial, asset management, and procurement systems give ministries of finance and planning greater confidence in the line department's ability to cost and deliver infrastructure services. This can result in larger budget allocations, and as importantly, ensure that funds appropriated are actually spent by line departments. Looking at the national road network PNG again, this has historically been a problem.

Performance improves when managers implement sound internal controls; regularly monitor revenue, expenditure, and the achievement of goals; and inform their plans with findings from ongoing independent audits. Establishing systems and processes to monitor the performance of an organisation improves accountability and can demonstrate to central ministries that a line department, SOE, or statutory authority is delivering services. This strengthens the case for increased funding. A lack of strong internal controls, audit, and monitoring has the opposite effect. Accountability leads to confidence and this is built through internal control, audit, and monitoring. These systems and processes help ensure that managers have incentives for good asset management.

Political leaders, ministries of finance, and ministries of planning have a responsibility to budget for maintenance. These groups can promote improved asset management practices among infrastructure service providers that are reliant on government funding. They can also, by adopting a long-term perspective, help secure greater attention towards maintenance. Concerted efforts should be made to link the annual budget cycle to long and medium-term development plans established by government. Central ministries can also become more 'capital-consciousness' by recognising the economic and fiscal value of maintaining existing infrastructure.

b. price regulation and community service obligations

Sound regulatory arrangements are important for ensuring that infrastructure service providers reliant on user fees recover their costs. Infrastructure services should generally be delivered on a user pays basis wherever infrastructure is not a 'public good'; although for various reasons governments may choose to support the consumption of some households or subsidise service provision. It is important that prices reflect service provision costs, minus any subsidy.

There are various types of price regulation in place in the Pacific. The analysis in Chapter Four suggested that regulation is more effective, and infrastructure providers less dependent on government funding, where regulatory decisions are made independent of political imperatives. Independent regulatory agencies or boards, staffed by capable personnel, are therefore preferable to regulation by civil servants with multiple responsibilities in government. It is also important that subsidies be formalised, adequately costed, and reimbursed. It is common around the world for governments to recognise their CSOs – or the obligation to serve certain groups – without adequately compensating infrastructure service providers.

> *"There is already a trend evident of donors sourcing regional technical specialists (e.g. Tuvalu providing the Financial Secretary for Nauru) and trades people (e.g. PNG providing a technician to maintain hospital equipment in Tuvalu) to provide effective services in the Pacific. Much more could be made of this modality, particularly for maintenance."*
>
> *Tuvalu Infrastructure Strategy and Investment Plan*

A formal CSO framework is being promoted by the ADB across the region, including in PNG and the Cook Islands.

There are challenges to establishing independent regulatory arrangements and CSO frameworks in small Pacific island states. The establishment of independent regulatory bodies involves fixed costs which can be excessive for small countries. The multi-sector regulatory agencies established in Fiji and Vanuatu provide examples of how this can be addressed. However, in microstates, even multi-sector regulation is apt to be costly. In these small nations, the focus should be on providing decision-making powers to an independent board or person (ideally with few ties to family or island groups, possibly somebody from another country or island state). Such structures are likely to require technical support for different industries, which can be provided regionally or outsourced by the government. The calculation of CSOs would benefit from similar arrangements.

Box 8: Independent Price Regulation in Vanuatu

There has been success in recent years with establishment of independent regulatory authorities in a number of Pacific island countries. In Vanuatu, the Utilities Regulatory Authority (URA) is responsible for regulating electricity and water utilities. The high fixed costs that threaten the viability of regulation in small island states are partly addressed through a multi-sector approach and the establishment of multiple roles for the regulator. The URA is responsible for pricing, access, standards, and the monitoring of concession agreements. It also performs the role of industry ombudsman by receiving consumer complaints, provides advice to government on industry issues, and acts as a mediator between the Government and public utilities. The URA monitors concessions across the country, including electricity operations in Luganville, Port Vila, Malekula, and Tanna islands.

Figure 6.3: Advanced Power Control System Central Monitor (UNELCO)

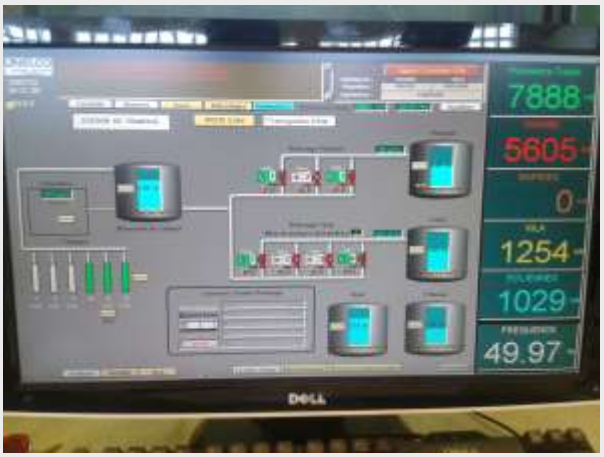


Photo courtesy of Cori Alejandrino-Yap (PIAC)

The URA was established in 2008 with financial support from AusAID and the World Bank. The objectives of the URA, according to the *Utilities Regulatory Act 2007*, are to: (i) ensure the provision of safe, reliable and affordable regulated services; (ii) maximise access to regulated services throughout Vanuatu; and (iii) protect the long term interests of consumers. Regulatory decisions are made by a three-member commission of the URA. The commission is supported by a small number of URA staff under the direction of a Chief Executive Officer, who is also a member of the commission. Commissioners are appointed by the Ministry of Finance.

Establishment coincides with a number of complementary reforms in the electricity sector. In the last four years, the Vanuatu Government has transformed the power sector by:

- Setting up an independent economic regulator for pricing, improving access, issuing standards and monitoring of concession agreements (the URA);
- Introducing competition to the electricity market through the establishment of management concessions; and
- Introducing legislative change to improve access to the monopoly electricity businesses.

The URA has been fundamental to these reforms. A longstanding pricing dispute between the government and UNELCO was resolved in 2011 with the support of the URA. Electricity prices declined 4.7 per cent as a result. The URA is also working to introduce competition to the electricity sector by establishing public tenders for electricity concessions. The establishment of the URA demonstrates that small countries can overcome financial challenges in order to establish regulation of infrastructure services. Regulation across multiple sectors and adoption of various roles has helped in this regard. Sound management and a willingness to contract relevant expertise where required have also been important.

6.4 asset management at the organisational level

The principles and fundamentals of good asset management were discussed in some detail in Chapter Three. While these constitute a guide to good asset management, they should not be interpreted as a blueprint. The considerable variation in infrastructure service provision in the Pacific points to the importance of adapting asset management principles to context. Differences in size are particularly important. Discussions of case studies in the Pacific have shown that small organisations need simpler asset management solutions than those that are appropriate for large organisations. Some common features of good asset management are nevertheless discernible.

The Schick Principles suggest that organisations should adopt a step-based approach when improving asset management. Good asset management at the level of the organisation first requires knowledge of infrastructure assets under the control of the service provider. A complete stocktake of infrastructure and related assets for which each organisation is responsible can be designed to populate an asset register. This register can record each asset, its unique identifier, classification, price, location, the person controlling it, and those responsible for its maintenance. An asset register can form the basis for a more advanced asset management system which describes each asset's function, condition, and capacity. Such a system could be expanded to also keep a record of the maintenance history of each asset and further, to record details about each asset. A system using commonly available software (e.g. Open Office or Microsoft Office) can be developed that can record all data needed to manage assets. A system is a good place to record the details of all assets, including photographs, and to identify people with the responsibility for training, repair, and component procurement for assets.

The management of individual assets can be most effective when each organisation explicitly links infrastructure asset planning to service delivery standards. These plans consider the life-cycle costs and benefits of infrastructure assets, as well as how they can be adapted over time. The use of sophisticated modelling software can be beneficial for this purpose, and can be considered once the organisation already has the basic elements of asset management in place. Detailed information on infrastructure assets can assist asset management planning, and can be used to develop accurate budget submissions.

The capacity to implement asset management activities is also important. Chapter Three highlighted the importance of engineering skills to conduct and plan infrastructure maintenance activities. Financial and accounting skills are also necessary. Appropriate processes must be in place to ensure that relevant sections within an organisation receive resources and have incentives to perform asset management activities. This is often a challenge in the Pacific. Trained staff can generally find alternative employment overseas or in more lucrative private sector industries.

Small size is another factor. The small size of infrastructure service providers in the Pacific means that organisations have limited human resources, and few have all the technical or financial/accounting skills required of them. Training existing employees and succession planning is one strategy that infrastructure service providers can use to address this problem. The FEA has implemented succession planning and trains a large pool of workers in order to address this constant challenge. Outsourcing is another strategy that is commonly used in the Pacific. This is discussed next.

Box 9: Condition and Capacity Assessments … Made Public

An inventory of infrastructure assets that details their condition can be used to plan asset maintenance activities, inform budget submissions, and provide a better picture of the financial position of the infrastructure service provider. Making an asset inventory a public document has additional benefits. The infrastructure service provider can invite information from the public on the condition of assets, enabling it to more quickly respond to problems. This requires the preparation of a basic set of condition assessment criteria that aligns with the appropriate engineering evaluation index to ensure consistent ratings.

Members of the public can text their assessment of the condition of assets, with the data entered into the asset register as a draft which is later subject to verification through asset management system controls.

A basic condition assessment for ports might appear as follows:

Rating	Standard	Definition	Example
1	Exceptional	▪ Infrastructure is in exceptional condition ▪ Infrastructure functions as intended at all times, with no downtime during periods of intended use. ▪ Infrastructure meets all legal responsibilities ▪ Infrastructure's financial and economic criteria are not the primary consideration	New port in the first years of its life, or one that is regularly maintained.
2	High	▪ Infrastructure may have minor signs of deterioration, some deterioration is tolerable over short periods of time ▪ Infrastructure functions as intended during periods of use, with a low probability of downtime acceptable ▪ Legal responsibilities for the delivery of services using the infrastructure are being met	Operating port with ongoing scheduled maintenance
3	Standard	▪ Infrastructure may have minor signs of deterioration that are to be expected considering use ▪ Infrastructure functions as intended during periods of use with some downtime acceptable except when safety or security is compromised ▪ The services provided using the infrastructure meet legal responsibilities	Main provincial / state wharf over twenty years old that is regularly maintained
4	Minimal	▪ Infrastructure has signs of deterioration ▪ Infrastructure functions as intended during periods of use with downtime acceptable ▪ The services provided using the infrastructure meet legal responsibilities ▪ Infrastructure has minimal maintenance and is not crucial the government achieving its development goals.	Outer island wharf over thirty years old that needs maintenance
5	No longer in use	▪ Deterioration of the infrastructure is not important ▪ The services provided by the infrastructure are no longer required. ▪ Infrastructure, as it stands, poses no danger to the public or other users. ▪ Basic maintenance is done to avoid the infrastructure causing damage.	Old wharf that has been replaced by a new wharf and is now mainly used for fishing and by some families to tie up their canoes.

The capacity of each asset, in this case the port or wharf, must also be known. The asset may have spare capacity, meet capacity, be under duress to provide the capacity demanded or, for a number of reasons, fail to meet demand. An asset may be brand new and yet, because of a design fault, fail to meet capacity.

A combination of this information guides the asset manager in monitoring assets and in preparing the maintenance, rehabilitation, and replacement plans.

		CONDITION				
		Excellent	Good	Acceptable	Poor	Endangered
CAPACITY	Spare capacity	Monitor	Monitor	Maintain	Refurbish	Refurbish if economic
	Meets capacity	Monitor	Monitor	Maintain	Refurbish	Refurbish / Replace
	Under duress	Monitor	Reassess	Maintain	Reassess / Replace	Replace
	Fails to meet capacity	Modify / replace	Modify / replace	Reassess	Replace	Replace

Source: Asset Management Unit, Ministry of Justice and Legal Affairs, Solomon Islands

6.5 partnerships

Partnerships have a considerable role to play in infrastructure service delivery. There are various types, including business-non-profit, business-government, government non-profit, and tri-sector arrangements (Selsky and Parker, 2005). The World Bank Business Partners in Development program has promoted tri-sector partnerships in which the community sector (including NGOs and community governance structures) has an important part to play. This is especially important where land is under community ownership, as is often the case in the Pacific.

a. infrastructure service delivery

The **private sector** can also play an important role in service delivery. This already occurs in the Pacific, as in the cases of the Samoan fuel import terminals and the Luganville electricity concession in Vanuatu. The private sector can also invest in new infrastructure. Higher feed-in tariffs are driving private sector investment in generation capacity in Fiji, with power sold by Independent Power Producers (IPPs) to the FEA. Around the world there is considerable use of build-operate-transfer arrangements with mixed results. In the Pacific, it is possible to use such arrangements to expand service provision into un-serviced areas, although for this to occur, subsidies to the private sector may be required.

The International Standards Organisation (ISO) will release ISO 55000 Asset Management Standard and related guidance in March 2014. ISO 55000 provides an overview of the subject of asset management and the standard terms and definitions to be used.

ISO 55001 is the requirements specification for an integrated, effective management system for assets. ISO 55002 provides guidance for the implementation of such a system.

Increasingly, governments are outsourcing whole operations or concessions for a period of time in order to address service provision failures. In Fiji, the government has announced that it will replace the Department of National Roads with a semi-autonomous Fiji Roads Authority, which will contract private sector operators to maintain the country's national road network. Another outsourcing arrangement has worked well in the energy sector of Samoa and American Samoa, where O&M of publicly-owned operation fuel import terminals are outsourced to private companies through three to five year tenders. The 'Samoan model' has been widely acclaimed in the region as a means of

addressing problems of monopoly power that have affected privately owned import fuel terminals, as well as the inefficiencies present in government run operations (Sanghi and Bartmanovich 2007).

In all these cases, it is important to recognise the key role played by government. The provision of 'private goods' is based on a sound legislative framework, good regulation, and various performance and safety standards. These 'public goods' therefore provide the basis for the provision of 'private goods'.

There are a number of challenges to private sector provision of infrastructure services. Attracting private sector investment can be difficult, especially in small states where the market potential is small. In some sectors, this represents a binding constraint to private sector investment. When the Government of Kiribati sought tenders for the fuel import terminal at South Tarawa, the only bidder was the former operator. The challenge of attracting private sector operators serves to emphasise the importance of government initiatives to improve the ease of doing business in Pacific island countries. The World Bank's *Ease of Doing Business* rankings demonstrate that more can be done in the region with regards to private sector investment.

A second challenge presented by private sector provision of infrastructure services relates to price. The perceived risk of some Pacific island countries can mean that investors seek a risk premium or a higher than average return on their investment, increasing prices paid by consumers. Improving the ease of doing business is again a strategy that can address this in the long-term. Prices charged by private sector infrastructure service providers also have the potential to be excessively high where government oversight or regulation is weak, with implications for affordability. Vanuatu's main power and water supplier, the private sector company UNELCO, has historically been one of the most efficient and expensive power suppliers in the Pacific. This highlights the importance of effective government oversight and regulation – a subject discussed in the last section.

A third challenge relates to access. Private sector organisations are unlikely to extend services to unprofitable areas unless they are reimbursed by government through a formal CSO system. This again points to the importance of sound oversight and regulation. It is the responsibility of governments to establish the right incentives for private sector entities. The establishment of financial incentives for providing infrastructure services to un-served areas or households is one method that can lead to better access to services. Subsidies are likely to be required for this to occur in rural and remote areas where service provision is not cost effective. The establishment of concessions where private sector organisations are paid for driving infrastructure development in un-served areas is another approach that warrants consideration. The concessions approach has proven successful in Argentina, where private investment helped increase access to electricity in rural areas and informal urban settlements.

Civil society associations can also play an important role in infrastructure service provision in the Pacific. Civil society associations include both community governed entities as well as NGOs that advocate on their behalf. Increasingly, rural road maintenance funded by government and development partners utilise the labour of community groups as part of labour-intensive road maintenance. As with other types of infrastructure service providers, the performance of not-for-profit and community organisations depend on governance arrangements operating well with skilled people and sufficient financial resources. One clear advantage of infrastructure service provision by not-for-profit organisations is community involvement. Recipients of services provided by not-for-profit organisations are more likely to be involved in the provision of that service, and in the organisation of the not-for-profit entity. This can be highly beneficial if the organisation is truly accountable to the community. The infrastructure service provider then has an added incentive to invest resources and effort into maintaining the infrastructure. Community ownership and involvement is especially important in rural areas, where remoteness can be a barrier to

infrastructure service provision and asset management. Again, it relies on community members having the skill to operate and maintain the infrastructure. This is discussed in Box 10 with reference to rural electrification in the Pacific.

Box 10: Rural Electrification in the Pacific

Approximately 70 per cent of households in the Pacific do not have access to electricity. Access to the electricity grid in many rural areas is unlikely due to remoteness and low levels of consumption. An alternative that has been pursued throughout the region is off-grid rural electrification, which involves electrification of individual households or small communities using a small isolated power system. Electricity can be generated using a range of technologies in an off-grid system; the most common in the region to date has been small diesel or petrol fuelled generators, although solar technology is increasingly being adopted. Biomass fuels are also being used.

A challenge for rural electrification is ensuring that installed systems are effectively operated and maintained. A number of institutional models have been adopted. In some cases, a government department has serviced electricity generation systems, or has outsourced maintenance to the private sector. In others, the private sector has assumed direct responsibility in return for payment. The remoteness of many rural areas, combined with resourcing and capacity constraints, has produced mixed results (Liebenthal *et al.*, 1994; Bygrave 1998; Johnston *et al.*, 2005; Wade 2005; Dornan 2011).

Figure 6.4: Hardwood Power Poles Ready for Distribution System Rehabilitation, Chuuk FSM

Photo courtesy of Cori Alejandrino-Yap (PIAC)

Community-based operation and maintenance is another institutional arrangement for service provision (Nieuwenhout *et al.*, 2000; Nieuwenhout *et al.*, 2001). In the Pacific, community-based operation and maintenance of electricity systems has commonly been combined with initial provision of generation systems by government or development-partners. Communities have been provided with training in basic operation, maintenance, and (sometimes) financial management, with responsibility for installed systems subsequently handed to the community. Results have varied. An advantage of community-based service provision is that operations are less reliant on external assistance and expertise, which for remote communities can be very intermittent. Community-based service provision also cultivates a sense of ownership which minimises inappropriate use of the system (a relevant point where batteries are involved, such as with solar systems).

However there are also significant challenges. Organisation at a village level can be difficult, especially when households are expected to contribute financial resources. The failure of households to allocate financial resources towards O&M requirements is a common reason for power outages across the Pacific. In the case of village based diesel generators, one study in northern Fiji found that systems were not operational for 30 per cent of the time (Dornan 2013). Another common problem is that personnel from rural communities that are trained to operate and maintain installed systems migrate to urban areas where their new skills are in demand.

b. outsourcing

Partnerships can also play a direct role in asset management. Small infrastructure service providers in the Pacific already outsource asset management activities, including maintenance works, to the private sector. Communities are sometimes also involved, as outlined in Box 11. Partnerships are often a response to human resource constraints. Outsourcing maintenance activities enables an organisation with limited technical capacity to improve asset management.

However, effective outsourcing does require basic planning and procurement capacity. The preparation of contracts and monitoring of activities is also important to ensure that the contracted party has incentives in place to perform the specified work. Many infrastructure service providers in the Pacific rely on force accounting, where contracted parties are paid for the time and resources expended in maintenance work. Although simple to administer, this approach does not provide incentives for the contractor to perform efficiently. The approach therefore requires careful monitoring of work, which is a potentially costly exercise where infrastructure assets are distributed over a wide geographical area.

There is scope to improve contract design in order to ensure that contractors have incentives to perform work efficiently and effectively. **Performance-based contracts** rewards contractors for provision of a service rather than for the resources expended to provide that service. For example, a contractor may be paid to rehabilitate a road to a given standard, with payment of an agreed sum made after completion of the work. The contractor in this case would be paid the same sum regardless of how the resources it dedicated to the rehabilitation project.

Performance-based contracts must include an adequate level of detail regarding the outputs of the contractor. In the case of a road, the contract would specify standards such as road roughness (an engineering term that can be measured upon completion of the work). The contract may also be drafted to include incentives and penalties. The specification of performance standards is again important in this area. A contractor may be rewarded under the contract where it meets certain criteria, and penalised where it does not. An example a performance-based contract is the FEA's contract with Telesource, which is detailed in Box 11.

Box 11: Outsourcing by the Fiji Electricity Authority

The FEA outsources some of its maintenance activities. Vegetation management along specified sections of the transmission and distribution network is outsourced to small local companies from the private sector. The operation and maintenance of the FEA's main oil-based generators is also outsourced to Telesource Fiji Ltd, a subsidiary of Pernix (a multi-national construction and energy company). Telesource was engaged to operate and maintain the FEA's generators at Kinoya and Vuda under a 20-year contract in 2003. These generation plants are integral for the supply of major population centres in Viti Levu, Fiji's largest island. Existing FEA staff at Kinoya and Vuda became part of Telesource under the agreement. This was consistent with the FEA's strategy at the time of downsizing its workforce in order to improve its financial position.

Figure 6.5: Wailoa Powerstation, FEA

Photo courtesy of Matthew Dornan.

The arrangement with Telesource has worked well to date. As part of the performance-based contract, Telesource is provided with incentives and penalties for good and poor performance. One performance indicator is the availability of generators for power generation. If availability falls below a certain level, Telesource suffers a financial penalty under the contract. Maintenance planning and implementation is organised by Telesource, which must submit annual maintenance plans to the FEA in order to ensure that generators are available when required.

What is unique about the arrangement with Telesource is the 20-year length of the contract period. This longer-than-usual contract length has both advantages and disadvantages. A potential disadvantage is that the length of the contract reduces the FEA's flexibility. It may also be more costly than if a tender was produced on a regular basis, which would maximise competition between suppliers.

However, there are a number of significant advantages. The most important is the implication for maintenance. One common challenge in O&M contracts is that the incentive of the contractor to provide maintenance may decline towards the end of the contract. This risk is especially high if the supplier does not expect (or wish) to renew the contract. Extending the length of the contract is a way to reduce this risk. The second benefit for the FEA of a long-term maintenance contract is that it can strengthen the case for tariff increases in submissions to the Commerce Commission. Rather than arguing for an increase in the maintenance component of the electricity tariff, the FEA is able to demonstrate that it has a contractual obligation to make payments to the contractor.

Outsourcing can be an effective strategy for all aspects of asset management, not just maintenance. It is common, for example, for infrastructure service providers to outsource the design and construction of new infrastructure assets. The design of the contract for this work can again influence the incentives of the contractor. A method of quality assurance for construction work involves the establishment of a **defects liability period**, where the construction company is responsible for repairs over a specified period after construction is complete. Another option involves making the construction company responsible for maintenance for a given period of time. Both arrangements give the contractor an incentive to ensure quality construction; otherwise the contractor incurs additional costs in the future. However, these measures should not be considered a 'fix-all' solution. In a commercial environment where the private sector may refuse to honour its obligations or where companies may be dissolved to avoid their obligations, the imposition of a defects liability clause may be ineffective. The introduction of performance bonds may be more appropriate in such contexts.

6.6 a role for development assistance

Development partners have a role to play in assisting Pacific island governments and organisations that provide infrastructure services with reforms described in this chapter. A focus by development partners on infrastructure asset management and maintenance is warranted on the grounds of aid effectiveness. Chapter Three established that spending on maintenance is ordinarily more cost effective, both in a financial and economic sense, than funding new infrastructure.

One approach to improving the management of infrastructure is to provide technical assistance. Development partners can provide technical assistance and support for better infrastructure planning and coordination across national/sub-national government departments. Support can also increase the technical and financial accounting capacity of infrastructure service providers. Similar assistance can be directed towards government departments, with the objective of improving PFM systems and budget processes. There is evidence that training in asset management is well received by local government staff, civil servants, and community group members. This training results in considerable commitment for future maintenance of infrastructure (UNIFEM 2009-10). Assistance should be directed towards both central ministries and line departments that actually deliver infrastructure services. Chapter Three noted that the former are generally well regarded in the region, while the latter may require additional support.

In many cases, development partners are already providing support in these areas to Pacific island countries. And yet, this support is not always shaped by the lessons of previous technical assistance. Support should have a long-term focus, longer than the short-term project cycle used by many development agencies, and should be carefully designed in order to ensure long-term impact. Technical assistance that is linked to infrastructure projects, thereby ensuring a practical application, is also generally considered a better approach than stand-alone projects. It is important that technical assistance initiatives consider all aspect of asset management, including initial design and planning, and that it continues for as long as necessary to ensure sustained results.

Central to the design of development assistance should be recognition of the fact that Pacific island countries are unique. A one-size-fits-all approach to technical assistance, even within the region, is inappropriate. Previous chapters have highlighted how asset management is especially weak in microstates, given limited technical and financial management capacity. It is important that assistance related to the development of asset management systems is tailored to such contexts. The promotion of 'best-practice' asset management is not appropriate where the necessary skills and institutional structures are absent. Development partners should also be realistic about the

impact of assistance. Technical assistance is likely to be permanent feature of microstates, and is better described as 'capacity supplementation' rather than 'capacity building'. This does not hold true in larger Pacific island countries.

Development partners can also help establish institutional frameworks for asset management. The establishment of trust funds for various infrastructure investments is one such example. Mainstreaming donor assistance through Pacific island government systems is another. As noted in the previous chapter, funds can be developed with sound governance arrangements in order to ensure money is spent on its intended purpose. Development partners can also advise governments on the establishment of sound regulatory arrangements and ways to reform state-owned infrastructure service providers. Providing training and advice can be difficult. Experience suggests that assistance with structural reforms is most likely to be effective where reform is driven by a domestic champion with sufficient political capital to ensure implementation (Duncan 2011). Reform driven by development partners alone is rarely successful (Choynowski 2004; Rosenzweig *et al.*, 2004; Besant-Jones 2006).

A focus on improving the sustainability of new infrastructure projects funded by development assistance is another area where effort is warranted. Development partners have various options available to fund new infrastructure in environments where asset management is poor. Linking technical assistance to funding for new infrastructure has already been discussed. Another option involves the establishment of maintenance programs that are attached to development of new infrastructure. In the case of road rehabilitation in PNG, the ADB and World Bank have established long-term (five to 10 year) contracts for ongoing maintenance by private sector organisations.

Construction standards are important. It can be economically beneficial to invest more in quality infrastructure in a 'second-best' world where maintenance is likely to be sub-standard. Alternatively, it may be possible to select low-maintenance options (in terms of labour costs or components) in any choice of infrastructure equipment. There are innovative ways of quality assurance for infrastructure construction. In East Timor for example, the ADB has incorporated a defects liability period in contracts with construction companies. The standardisation of infrastructure equipment, such as power generation machinery, can also play a part in making ongoing asset management simpler for infrastructure service providers. Development partners can consider this in the design stage of infrastructure projects.

Reasons for sub-standard asset management in the region can be placed under three sub-headings: resource constraints, organisational capacity, and incentives (as was detailed in Chapter Two). The measures described in this section primarily focus on resource constraints and organisational capacity, not incentives. Attaching conditions to loans/assistance can help establish incentives for maintenance, but is unlikely to completely address the challenge. A complementary approach involves the dissemination of information on the value of infrastructure maintenance; a key objective of this report.

Other options are also available to development partners for providing asset management incentives. One possibility involves making the establishment of an asset management framework a pre-requisite for donor funding. This could be complemented by a pre-qualification stage that includes some funding and technical assistance for establishing the asset management framework. When dealing with incentives, it is also important to confirm that the planning and decision-making cycle includes customer feedback on service satisfaction, and provides opportunities to progressively adapt infrastructure so it remains relevant to the needs of customers. This also could be a requirement of any donor funding for either capital or recurrent infrastructure maintenance.

Box 12: Sustainability of Infrastructure Assets

Maintenance of physical infrastructure is an indicator of the sustainability of donor projects. In their Index of Project Sustainability, Bamberger and Cheema proposed four sets of indicators, each comprising five components, to assess (a) the continued delivery of services and benefits; (b) the maintenance of physical infrastructure; (c) the long-term institutional capacity of the agencies responsible for project operation; and (d) the level of political support for the project (Bamberger and Cheema 1990).

Pacific island countries in monitoring the sustainability of infrastructure can manage the following indicators:

B-1	Condition and capacity of physical infrastructure
B-2	Condition and capacity of plant and equipment
B-3	Adequacy of maintenance procedures and resources
B-4	Efficiency of cost-recovery and adequacy of operating budget
B-5	Beneficiary involvement in maintenance procedures.

A Sustainability Index can be prepared by applying a five-point scale similar to that provided during a PEFA assessment. As PEFA does not include an assessment of assets, Pacific island countries can develop their own. As in the original condition assessment, Pacific island countries can prepare their sustainability index for the maintenance of infrastructure by, against each of the above five indicators, applying five other indicators: 1 = 'Very Poor', 2 = 'Poor', 3 = 'Average', 4 = 'Good' and 5 = 'Very Good'. A total score can thus be prepared for each sector and for maintenance of infrastructure in the Pacific island country as a whole. A maximum score would be 25 and a minimum 5.

This is an example of a management tool designed to assist Pacific island country governments to monitor and manage their portfolio of infrastructure assets overtime. The index depends on good data and skilled staff collecting it. Written guidelines are required to ensure comparability over time. These would include specific examples of how the assessment is conducted.

Bamberger and Cheem (1990) identify the specific problems that they encountered in applying the index.

Case Study 7

the kiribati public utilities board

The Public Utilities Board Generator, Kiribati
Photo courtesy of Jan Willem Overbeek(PIAC)

The Public Utilities Board (PUB) is a statutory authority responsible for providing electricity to 50,000 inhabitants of South Tarawa, Kiribati. The power utility operates four diesel generators, which were donated by the Japanese government over two stages in 2002 and 2005. The generators came with some spare parts and initial servicing that was carried out by Daikai Engineering Pte Ltd, Daihatsu's delegated maintenance agent based in Singapore.

Generator maintenance continues to be carried out by Daikai on a commercial basis, with the initial servicing period having expired. This maintenance arrangement was adopted by the PUB in order to ensure the generators continued to operate at a high capacity, and to avoid issues experienced in the past when no long term arrangement was made.

The maintenance arrangement has been ongoing, although the maintenance program has lapsed at points due to the PUB's constrained financial position and subsequent inability to pay for maintenance services.

The arrangement that has been in place since the installation of the Daihatsu generators in 2002-2005 has led to an improvement in the overall service delivery to customers. Factors that have contributed to the success are:

- Use of one generator type, allowing for economies of scale for parts, maintenance and training
- Manufacturer's delegated maintenance provider delivering a high quality service
- External maintenance provider driving maintenance schedule resulting in regular maintenance
- Long established working relationship allowing for negotiation of payment terms
- PUB management prioritising the maintenance overhauls

However, challenges remain. Because the PUB is in a poor financial state and does not have an overarching sustainable maintenance plan, it often faces difficulties in paying for maintenance services. This has led to engines operating well past their recommended running hours before maintenance can be financed, reducing fuel efficiency, increasing the incidence of power outages, and shortening generator life. Daikai's leadership has resulted in a lack of involvement from PUB staff in the maintenance program. Consequently, there is a failure to check that work has been adequately completed, and there is a lack of clarity at PUB about what is included in the overhaul service. There appear to be gaps in the maintenance of system components that fall outside the scope of the outsourcing arrangement, and opportunities to build the capacity of PUB technicians have been neglected.

Other challenges are also apparent. There is concern that the PUB could be paying excessive prices for the maintenance servicing, an issue that could potentially be addressed through improved procurement practices. Delivery of spare parts can also take considerable time (up to two months), highlighting the obstacle that remoteness presents to infrastructure service providers in the Pacific.

Lessons

Despite various challenges, the outsourcing of maintenance by the PUB does appear to be improving performance. Since the engagement of Daikai, there has been an improvement in the reliability and efficiency of operations. This is translating into reduced generation outages, good fuel efficiency, and improved overall generation performance.

The experience of outsourcing by the PUB highlights the need for:

- Sustainable plan/arrangement for maintenance funding
- Comprehensive maintenance programs that include asset management plans
- Sound planning for overhauls (with adequate timeframe for delivery of parts)
- Clear maintenance contract terms
- Leadership from the utility in managing and driving maintenance activities
- Active capacity building within the utility
- Documentation of maintenance arrangements and activities

The full case study is provided in Annex 1.

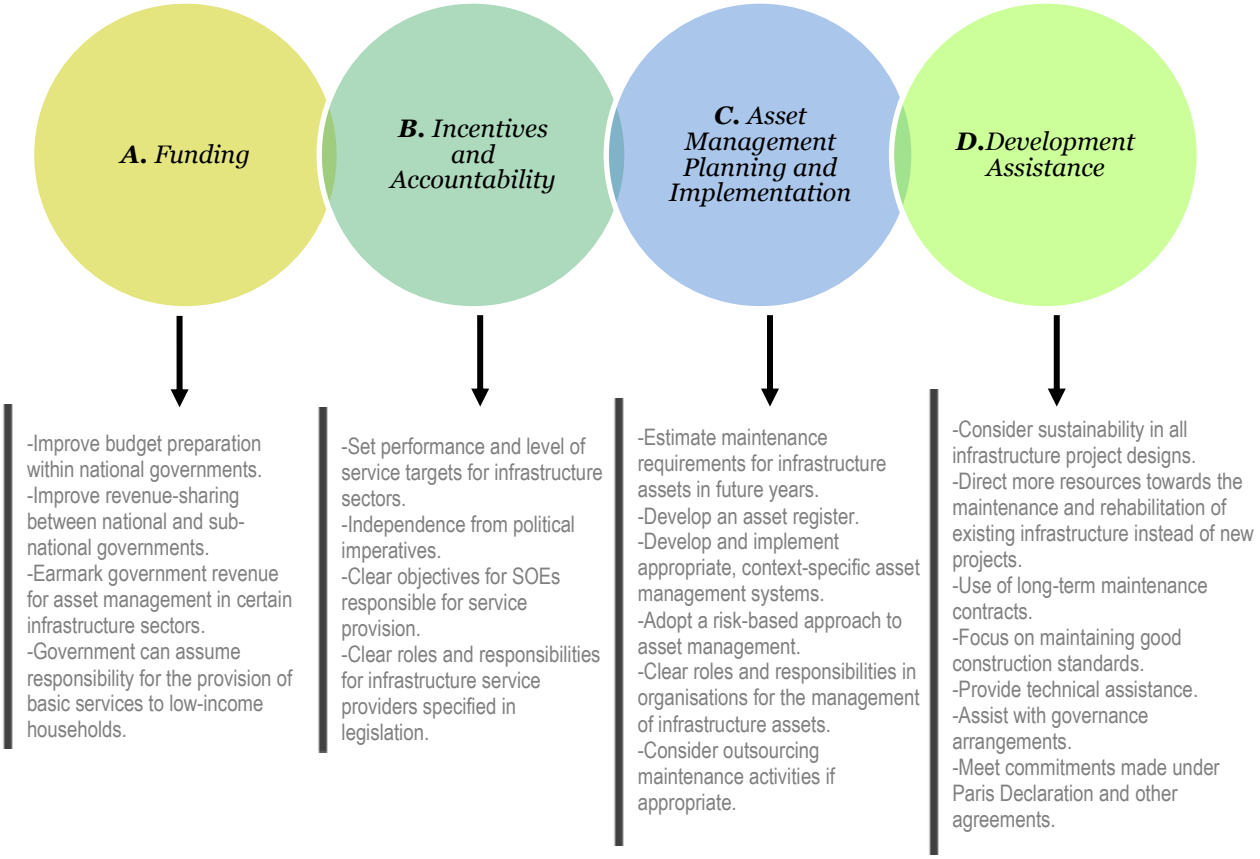
7 Recommendations

Asset management and maintenance continue to be a challenge in the Pacific. This report has detailed how lack of routine maintenance leads to the premature deterioration of infrastructure assets, with adverse consequences for Pacific Islanders. Improving asset management is a complex and multifaceted task. Asset management involves any activity that ensures an infrastructure asset provides the service for which it was constructed. Routine maintenance of infrastructure is especially important, and must be adequately funded, planned, and implemented in order to be effective.

The previous chapter discussed options that are available for improving asset management in the Pacific. Recommendations were wide-ranging and covered the institutional reforms necessary to provide adequate funding and incentives for asset management, as well as technical solutions that can improve asset management planning and implementation at the organisational level. Options available to development partners to help ensure the sustainability of infrastructure funded by development assistance were also examined.

A summary of recommendations for improving asset management in the Pacific is provided in Figure 7.1. The recommendations address the three sets of barriers to asset management: resource constraints, organisational capability, and incentives. The recommendations have been written with Pacific ministries of finance as the primary audience, although many of the recommendations will also be useful for political leaders and managers of infrastructure service providers. Development assistance can also play a useful part in addressing these constraints.

Figure 7.1: Summary of Recommendations



a. funding to address resource constraints

Financial resources dedicated towards asset management activities are often inadequate in the Pacific. Addressing this requires a number of reforms.

1. Budget preparation within national governments needs to improve.

- Budgeting for maintenance should be informed by good data on infrastructure assets, including information on the condition of infrastructure and the scope and cost of work to be completed. This requires greater communication between sector managers and budget decision-makers.

- Budget preparation can become more forward looking through adoption of a medium term budget framework under which multi-year maintenance plans are developed. However forward planning is only effective where inputs from line departments are sound. Medium-term budgeting needs to be introduced over time and should only be considered where basic year-by-year budgeting is reasonably effective.

- The introduction of accrual accounting, which incorporates the value of depreciated capital into the budget process, can increase the 'capital-consciousness' of civil servants and political leaders. However, accrual accounting is only appropriate in certain countries; it should not be attempted where cash-based accounting is not well developed or where the appropriate skill sets are unavailable within the accounting profession.

2. **Local Government often shares responsibility with national government entities (departments and SOEs) for the delivery of waste management and transport infrastructure (in some cases this is also the case for water and power).**

   The statutory responsibilities of local government to deliver infrastructure services are generally not matched by access to revenue. Revenue sharing between national and sub-national governments needs improvement. A first step involves a focus on sub-national government budget submissions to national government.

3. **Earmarking government revenue towards asset management in certain infrastructure sectors can be an effective mechanism for ensuring adequate funding of ongoing maintenance.**

   Revenue for the fund should ideally be sourced from beneficiaries of that infrastructure, such as the use of vehicle registration fees to fund road maintenance. A number of other conditions also need to be met for an earmarked fund to be effective. First, adequate legislation that specifies what the fund is for and how it will be used should be in place. Second, the fund should be managed by an independent board and have appropriate governance arrangements in place. Third, the fund should not contradict broader fiscal policy. Fourth, staff in oversight agencies should have adequate capacity to administer funds.

4. **SOEs need adequate financial resources for asset management activities.** Regulatory authorities should ensure that prices for infrastructure services recognise costs, including the cost of asset management and ongoing maintenance activities, even when price subsidies are then applied.

   - Experience suggests that an effective, independent authority responsible for price regulation can help. A multi-sector regulatory body has proven effective in several Pacific island countries.

   - Regional provision of regulatory services may have the potential to address the high costs of national regulation in small Pacific island countries.

5. **Governments should assume financial responsibility for the provision of basic services to some households where affordability is a problem**.

   This can be done by reimbursing SOEs and private sector entities for the provision of CSOs that are not commercially profitable. Some indirect cost recovery may be possible, for example through the taxation system. Governments can also open service provision to the market through competitive tender.

b. establishing accountability and appropriate incentives

Incentives must be in place for the delivery of infrastructure services. It is important that managers are held responsible for meeting performance standards where they have the authority and resources to deliver services to the required standard. Ongoing evaluation of performance is needed for this to occur.

1. **Asset managers should be required to set performance and level of service targets for the infrastructure they are responsible for.**

   Ministries of finance have the role of ensuring management in line departments are accountable for meeting these targets. They can also influence the management of assets by other bodies.

2. **Experience in the Pacific suggests that independence from political direction leads to better infrastructure service provision.**

   Infrastructure in many sectors, with the notable exception of roads, is best provided by an organisation that is required to generate a return on the asset (in some cases government subsidisation is also appropriate, in which case this should be done in a formal and transparent manner). Moving service provision from government departments to an independent body has the potential to improve asset management, although economies of scale in smaller island states also need to be considered.

3. **SOEs should be provided with clear objectives to deliver infrastructure services at a pre-determined standard.**

   The performance of SOEs should be monitored against key performance indicators. Ministries of finance can ensure the timely and reliable (audited) production of accrual-based financial statements by SOEs. Management and SOEs should be held accountable for performance.[18]

4. **The roles and responsibilities for infrastructure service provision of different organisations, and of sub-national and national level governments, must be clearly specified in legislation.**

c. building organisational capacity for asset management planning and implementation

There are a range of initiatives that can be undertaken at the organisational level to improve asset management planning and implementation.

1. **Infrastructure service providers should estimate the maintenance requirements of infrastructure assets in future years.**

   For the year ahead, this involves bringing together the results of condition assessments, defining quality and quantity standards, and estimating the cost of maintenance tasks, including labour, materials and equipment, transport, management, and administration costs.

   - Infrastructure management departments should use these estimates in budget submissions (the same budgeting software can be used across government departments to minimise cost and improve efficiency).

   - SOEs, statutory authorities, private sector organisations, and not-for-profit entities can use these estimates in the tariff determination process.

2. **An asset register helps to generate 'capital-consciousness' and is an essential first step in improving asset management.**

   An asset register should be used for accrual accounting by SOEs and private sector organisations. Government departments should also develop asset registers. Information from the asset registers of government departments and SOEs can be fed into a centralised asset register that is managed by the ministry of finance in order to inform infrastructure and budget planning at the national level.

[18] In some countries other government bodies may be involved in monitoring of SOEs. These might include ministries of public enterprises or independent holding companies/trusts.

3. **Infrastructure service providers can benefit from the use of an asset management system, which includes detailed inventories of the condition of all infrastructure assets and their components.**

   An asset management system goes beyond asset registers used for financial accounting, containing information on individual infrastructure assets and their condition, performance, maintenance requirements, and annual maintenance program (including materials and resources required to deliver maintenance, and monthly job sheets and reports). GIS can form one component of an asset management system.

4. **The appropriateness of asset management systems is context specific.** Smaller operations may benefit most from simple systems using commonly available software solutions (e.g. Open Office or Microsoft Excel).

5. **Infrastructure service providers should adopt a risk-based approach to asset management.** This can identify priorities by assessing the impact of potential service failure and the nature of other risks associated with delivering services.

6. **It is important that roles and responsibilities are clear within an organisation for the management of each infrastructure asset.** An organisation should have appropriate technical and financial skills in place for good asset management.

7. **Outsourcing of asset management activities, including maintenance, should be considered where this can decrease costs, improve service, or address capacity constraints within an organisation.**

   Public-private partnerships for infrastructure service provision are one option that is available. Outsourcing is most beneficial where procurement systems are sound and where outsourced work is subject to ongoing monitoring and evaluation by a capable contracting agent.

d. development assistance

Development assistance funds a considerable portion of infrastructure in the region. The activities of development partners are therefore also important.

1. **Development partners need to consider sustainability in the design of all infrastructure projects,** which should include analysis of the asset management liabilities associated with new infrastructure. This analysis should ideally by conducted by an independent body that does not have an incentive to underestimate the recurrent funding requirements of infrastructure.

2. **It is recommended that development partners direct more resources towards the rehabilitation and maintenance of existing infrastructure rather than new projects, given that on average, this is a more efficient use of scarce resources.**

3. **The use of long-term maintenance contracts by development partners can ensure good asset management for a period of time, and can assist in the development of private sector contracting capabilities.**

4. **There needs to be greater focus on construction arrangements and standards.**

   - A number of partnership arrangements are available in order to ensure good performance from contractors responsible for construction. One involves use of a

defects liability period, where the contractor is held responsible for any defects that arise within a defined period. A second involves paying the contractor to maintain the asset for a defined period after construction (potentially through a build-operate-transfer arrangement). A third involves the imposition of performance bonds.

- Construction standards determined by development partners should also take into consideration the level of service that is required and the institutional context for asset management. In environments where maintenance is likely to be inadequate, it may be appropriate to adopt a 'second best' option involving 'better than normal' construction standards. There may be scope to meet additional costs associated with 'better than normal' construction from climate change financing, or selection of low-maintenance infrastructure options.

- Standardisation of infrastructure assets can assist infrastructure service providers to plan and undertake maintenance.

5. **Development partners can usefully provide technical assistance in a number of areas, including:**

   - Regulatory reform of SOEs, especially around tariff regulation and CSOs.

   - Improvement of PFM systems, including budget preparation and procurement processes.

   - Public-private partnerships.

   - Asset management at the level of the organisation.

6. **The use of earmarked funding can be appropriate in some circumstances (Recommendation A.3).**

   Development partners can assist with the development of governance arrangements for earmarked funding, and should in certain circumstances consider providing financial support to trust funds.

7. **Development partners should continue to reform their assistance in line with commitments made under the Paris Declaration and subsequent agreements.**

   This should lead to better donor coordination, as is occurring through the PRIF, as well as the alignment of assistance with government objectives and systems. The general budget support monitoring framework can be extended to include the maintenance of infrastructure in Pacific island countries.

8 Next Steps

The next steps to improving the management of core economic infrastructure in Pacific island countries can be taken by four sets of stakeholders:

a. **Central ministries** – Pacific island ministries of finance and economic development;
b. **Asset managers** – ministries, SOEs, statutory authorities and community organisations;
c. **Regional organisations** – sector-focused infrastructure organisations, advisory and political bodies; and
d. **Development partners**.

Pacific island countries and sectors within each country differ in their starting point. Each Pacific island country's stakeholders will identify the appropriate sequence of activities to strengthen their management of infrastructure.

8.1 implementation activities

Each set of stakeholders undertake the following activities in managing infrastructure:

a. central ministries

Ministries of finance manage cash flow and account for cash and debt. Considerable developments of core economic infrastructure have taken place in the last thirty years and this has implications for current and future cash flow. Computerisation now enables close management of assets, including maintenance and funding of assets. Central agencies can prepare directives and/or regulations that require SOEs and line departments to record all infrastructure assets in asset registers, prepare asset management plans, identify and implement reliable and useful asset management systems, and report on the infrastructure they manage. Ministries of finance can monitor actual maintenance expenditure against the budget, and also monitor the condition and function of infrastructure as part of the budget process. Ministries of finance can also estimate the future cash flow required to maintain all current and planned infrastructure, and savings from the funding of routine maintenance.

The next steps for central agencies are:

- **Policy Framework**
  - Advocate for legislative and policy frameworks for the delivery of infrastructure services in each sector, which include clear roles and responsibilities among infrastructure providers: national government, SOEs, local government, community groups, and private sector entities.

- Policy frameworks to include guidance on fee collection and allocation amongst asset managers, for example: ensuring adequate budget allocation to local governments, reimbursement for CSOs, and price regulation in cases of monopoly.
- Prepare a policy framework for asset management by SOEs, line departments and private sector contractors.
- Consolidate these into a toolkit for use by sector asset managers in each PIC.

- **Budget**
  - The World Bank has estimated that ongoing annual maintenance of infrastructure requires the allocation of approximately 2.5 to 3.73 per cent of GDP. In the absence of reliable data, this figure can provide a guide for how much should be spent on recurrent infrastructure maintenance in PICs. The public sector is responsible for the majority of infrastructure in the Pacific, and so the majority of this maintenance spending will be from public funds. The figure will vary according to sectors. It does not include rehabilitation costs for bringing infrastructure up to appropriate condition. The backlog of maintenance is an extra call on the budget. Neither does it include rehabilitation required as a result of damage from natural disasters. These will require additional budget allocations.
  - In each organisation, monitor and evaluate actual expenditure on maintenance against budget and cash flow forecasts as part of normal budget and performance review processes.
  - Use an initial standard cost of between two and eight per cent of the capital replacement cost of infrastructure as a starting point to assess organisations' annual budget submissions and to forecast the cost to future budgets of capital project estimates. Each sector will have different maintenance requirements.

- **Performance Management**
  - Monitor the performance of infrastructure.
  - Monitor levels of service being provided by infrastructure against performance indicators on a regular basis.
  - Include the maintenance of infrastructure in budget support programs negotiated with development partners.
  - Provide training and development to line departments, SOEs etc., in meeting the goals of the infrastructure management framework.

- **Internal Audit**
  - Schedule internal audits of infrastructure and their maintenance.
  - Assess internal controls for the management of infrastructure.

- **Private Sector Development**
  - Negotiate with funders for the financing of contracts with maintenance service providers.

b. asset managers

SOEs, statutory authorities, national and local governments, private sector businesses, and community organisations are responsible for delivering services from infrastructure. Next steps that these organisations can take include:

- Keep good records of the routine maintenance required to deliver the agreed level of service.

- In the absence of detailed data, incorporate in the annual budget submission an estimate for routine maintenance equal to between 2 and 8 percent of the capital replacement cost of infrastructure depending on the sector.

- Budget separately for backlog maintenance.

- Prepare cash flow forecasts for expending the allocated amount over the year, taking into consideration impacts on services from changes in the seasons, availability of maintenance personnel and other local factors.

- Closely plan and manage maintenance work so that the budget is spent as planned. Where events prevent this, inform ministries of finance/SOE boards as soon as possible.

- Perform annual or more frequent stocktakes of infrastructure assets, noting asset condition and function, and record data in the asset register.

- Use the stocktake results to prepare maintenance plans and to establish priorities to ensure ongoing agreed levels of service.

- Schedule maintenance over the life of each asset.

- Keep detailed records of each infrastructure component in the asset register. This includes all maintenance scheduled and undertaken and all costs, as well as condition and function, plans, title deeds, contracts, photos etc.

- Negotiate with educational and trade bodies for the availability of skilled workers for infrastructure maintenance.

- Make maintenance plans public where services are to be obtained from the private sector.

- Brief the private sector and related stakeholders annually on infrastructure management plans and consequent maintenance requirements.

c. development partners

Development partners can take a number of steps to improve the sustainability of infrastructure projects that they fund. These steps include:

- Work with developing partners to agree on maintenance program and appropriate resource allocation to sustain infrastructure at the agreed level of service.

- In all capital project estimates, in the absence of verifiable standard costs, include an annual amount for maintenance to replace the asset over its life-cycle using the standard cost of between two and eight per cent of the capital replacement cost of the infrastructure, depending on the sector.

- PRIF partners should consider their current infrastructure management and maintenance policies for the Pacific in light of the recommendations of this study.

- Collaborate with Pacific island countries in identifying levels of service expected from all economic infrastructure over its asset life-cycle.

- PRIF sub-sector coordination groups to consider the recommendations of the study and provide feedback to PRIF partners on how they, either collectively or individually, propose to address the maintenance challenge.

- Institutional strengthening projects to support asset managers.

- Include the maintenance of infrastructure in budget support programs.

d. regional organisations

There are a number of regional organisations that play a role in supporting those that deliver infrastructure services in the Pacific. These bodies have regional plans that can be informed by this report, and can work with the Pacific Islands Financial Managers Association[19] through the Pacific Financial Technical Assistance Centre to prepare materials for use in the Pacific. Next steps for these organisations include:

- Prepare materials to use in completing regular stocktakes of assets in each sector.

- Collect the ranges of standard cost data on components of infrastructure. Validate this data and advocate its use in the preparation of maintenance plans and budgets throughout the region.

- Prepare a methodology for organisations to use in optimising the allocation of the maintenance budget across infrastructure.

- Develop the capacity of people maintaining assets in each sector.

- Advocate for effective legislative and policy frameworks for each sector.

- Advocate for the preparation of national and local infrastructure plans to deliver the required levels of service.

- Establish standards for the maintenance of infrastructure in each sector and make them public.

The actors capable of tackling the major reasons for poor maintenance are set-out above using the report's framework for understanding poor asset management. With their different starting points, it is important that stakeholders in each Pacific island country fund the routine maintenance of infrastructure and select the most appropriate sequence of activities for the provision of infrastructure services.

8.2 implementation process and timeline

For each stakeholder, the flowchart on the next page sets-out a proposed timeline, priority action theme, and the overall role of the PRIF as the peak coordination mechanism for provision of infrastructure assistance by development partners.

[19] See: pifma.pftac.org

Phase One
Building Awareness
6 months

- Adopt a **communications strategy** for disseminating key messages and recommendations of the paper and engaging with the four stakeholder groups)
- Promote key message and recommendations of this report at regional meetings of central ministries, asset managers and regional bodies
- Develop an **engagement strategy** through conferences, workshops, internet, universities, professional associations, technical assistance, in-house training)

Phase Two
Capacity Building
6 months
and beyond

- **Build and strengthen institutional capacity** of professional organisations in the region (i.e. professional qualifications, accountants, engineers, lawyers, asset management qualifications) to educate their members on implementing the new ISO55000
- Develop an Asset Management toolkit for PICs (disseminated through country and regional workshops and during country missions and NIIP work)

Phase Three
Implementation Activities
2 year period
and beyond

- Develop a framework to guide and sustain the asset management and maintenance agenda:

- **1) PIC Central Ministries and Asset Managers**
- Seek technical support to implement good infrastructure maintenance.
- At least two Pacific island countries, at differing starting points in their sectors, to lead implementation of the recommendations as outlined in Chapter 7.
- Ensure that development partner and regional body programmes support these PICs to implement recommendations.

- **2) Regional bodies**
- Develop codes of practice for legislative/policy framework, stocktake of assets
- Develop standards for management of components of infrastructure
- Design a workplan for liaising with PFTAC to support central ministries to implement the above agenda

- **3) Development partners** - adopt standards or best practices in:
- managing and funding backlog of infrastructure maintenance
- managing and funding maintenance of infrastructure
- asset management and maintenance policy - PRIF partners in commitment to principle 6 consider their asset management and maintenance policy for the Pacific in light of the recommendations from this study
- asset management institutional strengthening - to support the relevant ministries develop asset management policies that incorporate relevant recommendations from this and other regional reports.
- infrastructure maintenance in budget support program
- Include the maintenance agenda in each of the PRIF sector working groups where each sub-sector would design a workplan to implement **the sector plans so that they incorporate the above agenda to** promote **as** culture of maintenance.

references

AAMCoG. 2012. *Guide to integrated strategic asset management*. Brisbane.

Asian Development Bank. 2010. *Finding balance: making state-owned enterprises work in Fiji, Samoa, and Tonga*. Manila.

Asian Development Bank. 2007a. *Improving the delivery of infrastructure services in the Pacific: working paper asset maintenance*. Manila.

Asian Development Bank. 2007b. *Oceanic voyages: aviation in the Pacific*. Manila.

Asian Development Bank. 2007c. *Regional: Pacific regional transport analysis*. Manila.

Asian Development Bank. 2008. *Strategy 2020*. Manila.

Asian Development Bank. 2009. *ADB's Pacific approach, 2010 - 2014*. Manila.

Asian Development Bank. 2010. *Pacific Approach 2010 - 2014*. Manila.

Asian Development Bank. 2011. *Transport sector in the Pacific developing member countries (1995–2010): evaluation study*. Manila.

Asian Development Bank. 2012. T*he state of Pacific towns and cities: urbanization in ADB's Pacific developing member countries.* Manila.

Asian Development Bank & GlobalWorks. 2007. *Improving the delivery of infrastructure in the Pacific*. Manila: Asian Development Bank.

AusAID. 1999. *Asset maintenance: the impact of the underfinancing of recurrent costs*. Canberra.

AusAID. 2008. Connecting the region. *Pacific Economic Survey*. Canberra.

AusAID. 2011. *Sustainable economic development: transport, water, urban, energy and communications infrastructure*. Canberra.

Australian National Audit Office. 2001. *Life-cycle costing: better practice guide*. Canberra: Commonwealth of Australia.

Australian National Audit Office. 2010. *Better practice guide on the strategic and operational management of assets by public sector entities*. Canberra: Commonwealth of Australia.

Australian Productivity Commission. 2006. Road and rail freight infrastructure pricing. *Productivity Commission Inquiry Overview*, No. 41. Canberra.

Bamberger, M. & S Cheema. 1990. *Case studies of project sustainability*. Washington: The World Bank.

Bertram, G. & Watters, R. 1985. The MIRAB economy in South Pacific microstates. *Pacific Viewpoint*, 26: 497–512.

Besant-Jones, J.E. 2006. *Reforming power sector markets in developing countries: what have we learned*. Washington D.C.

Brint, A., Bridgeman, J. & Black, M. 2009. The rise, current position and future direction of asset management in utility industries. *Journal of the Operational Research Society*, 60: S106-S113.

Burningham, S. & Stankevich, N. 2005. Why road maintenance is important and how to get it done. Washington D.C.

Bygrave, S. 1998. Sustainable energy for the environment and development: the diffusion of renewable energy technologies to Pacific island communities. Australian National University.

Cave, D. 2012. Digital islands: how the Pacific's ICT revolution is transforming the region. *Lowy Institute Analyses*.

Choynowski, P. 2004. *Restructuring and regulatory reform in the power sector: review of experience and issues*. Manila: Asian Development Bank

Chu, K.-y. & Hemming, R. 2001. *Public expenditure handbook*. Washington D.C.

Corrigan, P., O'Donnell, M. & Tagaloa Sua, F. 2012. *Strengthening of public financial management through improved fixed asset management*, TA 7544. Manila: Asian Development Bank

De Sitter, W.R. 1984. Costs for service life optimization: the law of fives. *CEB-RILEM Workshop Durability of Concrete Structures*. Copenhagen.

Dornan, M. 2011. Solar-based rural electrification policy design: the Renewable Energy Service Company (RESCO) model in Fiji. *Renewable Energy*, 36: 797-803.

Dornan, M. 2013. Renewable technologies for energy security: institutions and investment in Fiji's electricity sector. The Australian National University.

Dornan, M., Austin, J. and Alejandrino-Yap, C. 2013. Power benchmarking in the Pacific: assessing key influenced on operational performance. *Pacific Economic Monitor*, March 2013. Manila: Asian Development Bank.

Duncan, R. 2011. The political economy of economic reform in the Pacific. *ADB Pacific Studies Series*. Manila: Asian Development Bank.

Fay, M. and Yepes, T. 2003. Investing in infrastructure: what is needed from 2000 to 2010? *Policy Research Working Paper 3102*. Washington D.C. World Bank

Gibson, C.C., Andersson, K., Ostrom, E. & Shivakumar, S. 2005. *The samaritan's dilemma: the political economy of development aid*. Oxford: Oxford University Press.

Gibson, J. & Nero, K.L. 2007. Are the Pacific island economies growth failures? *Pasifika Series Working Papers*. Department of Economics: University of Waikato.

Government of Australia & Government of Papua New Guinea. 2011. Schedule to the Papua New Guinea – Australia partnership for development: transport infrastructure. Port Moresby.

Government of Cook Islands. 2007. Preventive infrastructure master plan (PIMP). Rarotonga.

Government of Nauru. 2011. Economic infrastructure strategy and investment plan. Yaren.

Government of Samoa. 2011. Samoa national infrastructure strategic plan. Apia.

Government of the Kingdom of Tonga. 2010. Tonga national infrastructure investment plan. Nuku'alofa.

Government of Tuvalu. 2012. 'Fakafoou – to make new': Tuvalu infrastructure strategy and investment plan. Funafuti.

Government of Vanuatu. (draft). Vanuatu infrastructure strategic investment plan. Port Vila.

Haberkorn, G. 2008. Pacific slands' population and development: facts, fictions and follies. *New Zeland Population Review*, 33/34: 95-127.

Haque, T., Knight, D.S. & Jayasuriya, D. 2012. *Capacity constraints and public financial management in small Pacific island countries*. Washington D.C.

Hassall, G. & Tipu, F. (2008). Local government in the Pacific islands. *Commonwealth Journal of Local Governance*, 1: 1-24.

Heggie, I.G. 2000. *Second generation road fundings: the way ahead*. Kent, United Kingdom: World Highways.

Heggie, I.G. 1995. Management and financing of roads: an agenda for reform. *Technical Paper 275*. Washington DC: World Bank.

Heller, P. 2009. Do demographic factors influence investment in infrastructure? *Working Paper*.

Heller, P. 1989. An IMF perspective on earmarking, in *Earmarking, road funds and toll roads*, A World Bank Symposium Paper, World Bank Develeopment Department Report INU 45. Washington, D.C.

Heinecke, D., Dollery, B. & Fleming, E. 2008. The Samaritan's dilemma: The effectiveness of Australian foreign aid to Papua New Guinea. *Australian Journal of International Affairs*, 62: 53-71.

Herr, R. & Bergin, A. 2011. *Our near abroad: Australia and Pacific islands regionalism*. Canberra.

Hooper, R., Armitage, R., Gallagher, K.A. & Osorio, T. 2009. *Whole-life infrastructure asset management: good practice guide for civil infrastructure*. London.

International Monetary Fund. 2001. *Government finance statistics manual*. Washington D.C.

Intergovernmental Panel on Climate Change. 2007. Climate change 2007: impacts, adaption and vulnerability, contribution of Working Group II to the *Fourth assessment report of the intergovernmental panel on climate change*. Cambridge: Cambridge University Press.

Johnston, P., Wade, H., Sauturaga, M., Vega, L. & Vos, J. 2005. *Pacific regional energy assessment 2004: Fiji*. Apia.

Lal, P., Saloa, K. & Uili, F. 2006. *Economics of liquid waste management in Funafuti, Tuvalu*. Apia, Samoa.

Leong, K.C. 2004. *The essence of asset management: a guide*. United Nations Development Programme

Liebenthal, A., Mathur, S. & Wade, H. 1994. Solar energy: lessons from the Pacific island experience, *Technical* Paper, No. 244. Washington D.C.

McGovern, Kerry 2011. Asset Management Standards Project, Management of Public Assets – A Systemic Framework *EAROPH 43rd Regional Seminar – An EAROPH-IFHP Joint Conference on "Managing Urban Growth and Its Challenges*", Bandar Seri Begawam, Brunei Darussalam, 8-10 November 2011.

McGovern, K., L. Drennan, E. Meier, 2007. Merging sustainability costs and benefits with government plans and budgets, *Journal of Asia-Pacific Centre for Environmental Accountability*, Volume 13, Number 4, December.

Mohanty, N. 2005. Moving to scale, in *India's water economy: bracing for a turbulent future*. Oxford: Oxford University Press.

Minc, M. 2003. *Road funds and road maintenance: an Asian perspective.* Manila.

Mizusawa, D. & McNeil, S. 2008. *Measuring the benefits of implementing asset management systems and tools.* Madison.

Mizusawa, D. Selle, B., Lyon-Surrey, R. & McNeil, S. 2007. Demonstrating the benefits of asset management system implementation in Vermont, *7th National Conference on Transportation Asset Management*.

National Parliament of Solomon Islands. 2009. *Bills and legislation committee report on the National Transport Fund bill 2009*. National Parliament Paper No.4 of 2009: 4. [Online]. Available: http://www.parliament.gov.sb/files/committees/bills&legislationcommittee/2009/Reports/Report%20on%20NTF%20Bill%202009%20FINAL2.pdf [2 May 2013].

New Zealand Aid Programme. 2012. New Zealand budget support for Samoan reform. [Online]. Available: http://www.aid.govt.nz/media-and-publications/development-stories/may-2012/new-zealand-budget-support-samoan-reform [3 April 2013].

New Zealand Controller and Audit-General. 2010. *Local authorities: planning to meet the forecast for drinking water*. Wellington.

Nieuwenhout, F.D.J., van Dijk, A., Lasschuit, P.E., van Roekel, G., van Dijk, V.A.P., Hirsch, D., Arriaza, H., Hankins, M., Sharma, B.D. & Wade, H. 2000. *Monitoring and evaluation of solar home systems*. Amsterdam.

Nieuwenhout, F.D.J., van Dijk, A., Lasschuit, P.E., van Roekel, G., van Dijk, V.A.P., Hirsch, D., Arriaza, H., Hankins, M., Sharma, B.D. & Wade, H. 2001. Experience with solar home systems in developing countries: a review, *Progress in Photovoltaics: Research and Applications*, 9: 455-474.

Ostrom, E., Gibson, Clark., Shivakumar, S. & Andersson, K. 2001. *Aid, incentives, and sustainability: an institutional analysis of development cooperation*. Stockholm.

Ostrom, E., Schroeder, L. & Wynne, S. 1993. *Institutional incentives and sustainable development*. Boulder: Westview Press.

Pacific Association of Supreme Audit Institutions. 2010. *Pacific regional report on cooperative performance: audit of solid waste management*. Auckland.

Pacific Islands Forum. 2009. Cairns Compact on Strengthening Development Coordination in the Pacific, Forum communique fortieth Pacific Islands Forum, August.

Pacific Islands Forum Secretariat & Pacific Financial Technical Assistance Centre. 2010. *A public financial management roadmap for forum island countries*. Suva.

Pacific Islands News Association. 2010. Solomon Islands establishes national transport fund. [Online]. Available: http://www.pina.com.fj/?p=pacnews&m=read&o=513684284c0ec1e3cd497b4ac8e4bb [17 May 2013].

Pacific Power Association. 2011. *Performance benchmarking for Pacific power utilities: benchmarking report*.

Pacific Region Infrastructure Facility. 2009. *Kiribati infrastructure sector review*. Sydney.

Pacific Region Infrastructure Facility. 2011. *Pacific infrastructure performance indicators*. Sydney.

Pacific Region Infrastructure Facility. No date. Water and sanitation sector coordination meeting. Suva, Fiji.

Pacific Water and Wastes Association. 2011. *Development of a water utility benchmarking system: benchmarking report.*

Pacific Water and Wastes Association. 2012. *Pacific water and wastewater utilities: benchmarking report*.

Permanent Secretary at the Ministry of Infrastructure Development. 2010. Solomon Islands establishes national transport fund. [Online]. Available: http://www.radioaustralia.net.au/pacific/radio/onairhighlights/solomon-islands-establishes-national-transport-fund?autoplay=326801 [2 May 2013].

PNG Independent Consumer and Competition Commission. 2006. *Review of the PNG air transport industry*. Port Moresby.

Riddell, R.C. 2007. *Does foreign aid really work?* Oxford: Oxford University Press.

Rosenzweig, M.B., Voll, S.P. & Pabon-Agudelo, C. 2004. Power sector reform: experiences from the road. *The Electricity Journal,* 9: 16-28.

Sanghi, A. & Bartmanovich, A. 2007. Harnessing competitive forces to reduce fuel costs in small island economies. *Pacific Economic Bulletin*, 22: 175-179.

Secretariat of the Pacific Community. 2010. *Towards an energy secure Pacific:framework for action on energy security in the Pacific*. Noumea.

Selsky, J.W.A. & Parker, B. 2005. Cross-sector partnerships to address social issues: challenges to theory and practice. *Journal of Management*, 31: 849-873.

SOPAC. No date. *Pacific regional action plan on sustainable water management*. Sigatoka, Fiji: South Pacific Applied Geoscience Commission.

SPREP. 2010. *Pacific regional solid waste management strategy 2010-2015*. Apia, Samoa.

UNIFEM. 2009-10. *Sustainable asset management training in women improving markets*.

United Nations Centre for Human Settlements (UN-HABITAT). 1993. *The maintenance of infrastructure and its financing and cost recovery.* Nairobi: United Nations.

van Dissel, S.C. 2013. *Encouraging private sector development in the road sector in Pacific island countries*. Pacific Region Infrastructure Facility.

Vagliasindi, M. 2009. *Governance arrangements for state owned enterprises*. Washington D.C.

Wade, H. 2005. *Pacific regional energy assessment 2004: regional overview report*. Apia.

Westerly, D. & Poftak, S. 2007. *Our legacy of neglect: The Longfellow Bridge and the cost of deferred maintenance*. Boston.

Winters, L.A. & Martins, P.M. 2004. When comparative advantage is not enough: business costs in small remote economies. *World Trade Review*, 3:347-383.

World Bank. 1994. *World development report: infrastructure for development*. New York: Oxford University Press.

World Bank. 1998. *Public expenditure management handbook*. Washington D.C.

World Bank. 2003. *World development report: making services work for poor people*. Washington D.C.

World Bank. 2006. *The Pacific infrastructure challenge*. Washington D.C.

World Bank. 2011. *Pacific futures*. World Bank discussion note. Sydney.

World Bank. 2012a. *Beyond the annual budget: global experiences with medium term expenditure framework*. Washington D.C.

World Bank. 2012b. *Country partnership strategy for the independent Republic of Samoa: 2012-16.* Sydney.

annexes

annex 1

Case Studies of Asset Management in Pacific Island Countries

Annex 1 reproduces in full the collection of eight case studies used in this report, including:

Case Study 1

fiji electricity authority: a case study in good asset management

In the case study of the Fiji Electricity Authority, good asset management includes complete record keeping, assets being assigned to managers who are held accountable for their condition, annual reporting and regular audit, contestable budgets for maintenance, and adequate funding being made available for maintenance activities.

introduction

The Fiji Electricity Authority (FEA) is widely regarded as one of the best performing power utilities in the Pacific. Reforms over the last decade have served to improve efficiency and technical performance at the organisation. Good performance is based on sound asset management practices, with routine maintenance prioritised by the FEA's management.

Complementary to this is a focus on accountability and performance of both FEA staff and management. As the FEA's power system expands, new asset management systems[1] are being put in place in order to ensure adequate planning of (and budgeting for) maintenance. This case study outlines these changes and highlights some of the regulatory reforms that have led to improvement in FEA operations over the last decade.

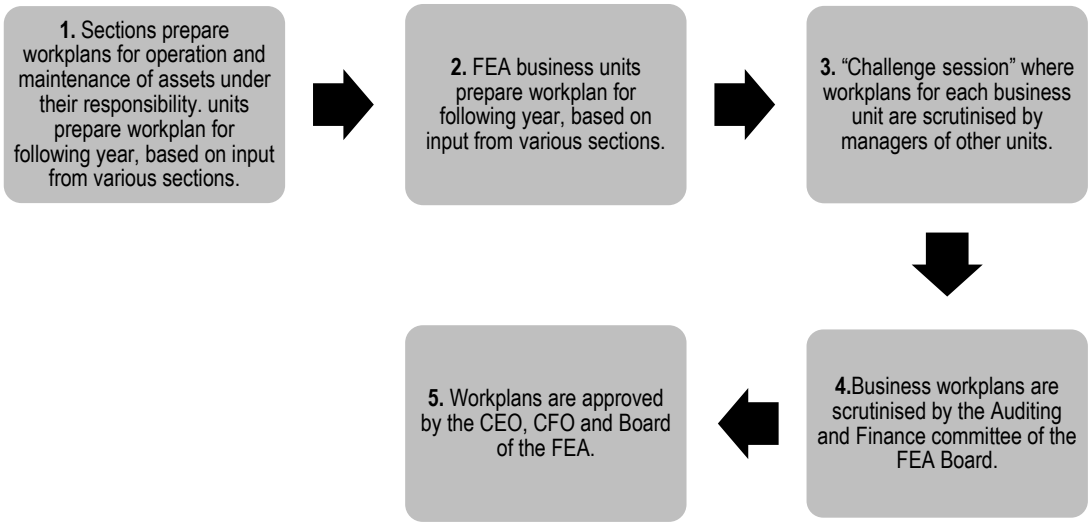
asset management in the fea

The FEA has a robust asset management system in place. Routine and periodic maintenance of generation, network, and other assets is planned and budgeted for through the internal annual budget cycle.[2] Each asset is the responsibility of a section within the FEA. Sections prepare an annual work plan for operation and maintenance of assets under their responsibility. This work plan, along with relevant costings, is submitted to management as part of the annual budget.

Work plans are vetted through a number of processes. Work plans are first questioned by business unit managers, who are responsible for ensuring that maintenance plans and costings within their unit are sound. The work plans of each business unit are then debated in 'challenge sessions' involving management from each of the business units. After this, work plans are considered by the Audit and Finance sub-committee of the FEA Board. Final work plans and budgets are approved by the Chief Financial Officer, Chief Executive Officer and the full FEA Board. This process is illustrated in Figure 1.1.

[1] Asset management systems are addressed in chapter three.
[2] See section 3.2 for discussion of types of maintenance.

Figure 1.1: The Budgeting Cycle of the Fiji Electricity Authority



Maintenance work plans are developed using an asset management system. FEA assets are recorded in an asset register, which includes details on asset cost, performance, and maintenance history. This enables sections within the FEA to identify when maintenance of each asset is due, based on the age, operation history, and performance of the asset.

The asset management system was formerly based on a simple spreadsheet system. Last year, the asset register was incorporated into 'Navision', a financial management system that has been recently implemented at the FEA. The decision by the FEA's management to incorporate asset management into Navision was a response to the growing asset base of the FEA. It was believed that the integration of financial management and asset management systems would improve efficiency, given the increasing number of assets that need to be accounted for and maintained.

A Geographic Information System (GIS) is also being established at the FEA in order to facilitate asset management. This is especially useful for maintenance of the transmission and distribution network. It is expected that the GIS and Navision systems will be integrated with one another in the long run.

financial resources are important for good asset management

Good asset management requires adequate financial resources. The level at which the electricity tariff is set is therefore an important determinant of whether the FEA is able to finance the necessary maintenance of its asset base. Since 2002, electricity tariffs in Fiji have been set by an independent regulator, the Commerce Commission, in a process that requires submissions from the FEA and other stakeholders.

FEA submissions to the Commerce Commission include expected expenditure on capital investment, operations, and maintenance for the year ahead. Tariffs have doubled since 2004 under this regulatory arrangement, in recognition of investment requirements, renewable energy targets, and higher fuel costs. Higher electricity tariffs have facilitated improved asset management, placing the FEA in a financial position to undertake more maintenance activities. This is demonstrated by recent work on the half-life refurbishment of the Monasavu dam. The (delayed) impact of higher maintenance expenditure on technical performance is shown in Figure 1.2. Greater financial resources from 2008 have allowed more spending on maintenance, with power outages (measured by the SAIDI) declining over time as a result.

Figure 1.2: FEA Repair and Maintenance (R&M) Spending as % of Assets and SAIDI, 2003–11

Note: The system average interruption duration index (SAIDI) is used as a proxy of technical performance in this graph. SAIDI measures in minutes the total length of time that the average customer is without power over the year.

the role of outsourcing

The FEA outsources operation and maintenance of its main oil-based generators to Telesource Fiji Ltd, a subsidiary of Pernix (a multi-national construction and energy company). Telesource was engaged to operate and maintain the FEA's generators at Kinoya and Vuda under a 20-year contract in 2003. These generation plants are integral for the supply of major population centres in Viti Levu, Fiji's largest island. Existing FEA staff at Kinoya and Vuda became part of Telesource under the agreement. This was consistent with the FEA's strategy at the time of downsizing its workforce in order to improve its financial position.

The arrangement with Telesource has worked well to date. As part of the performance-based contract, Telesource is granted incentives and penalties for good and poor performance. One performance indicator is the availability of generators for power generation. If availability falls below a certain level, Telesource suffers a financial penalty under the contract. Maintenance planning and implementation is organised by Telesource, which must submit annual maintenance plans to the FEA in order to ensure that generators are available when required.

The unique aspect of this arrangement with Telesource is the 20-year length of the contract period. This longer-than-usual contract length has both advantages and disadvantages. A potential disadvantage is that the length of the contract reduces the FEA's flexibility. It may also be more costly than if a tender was produced on a regular basis, which would maximise competition between suppliers.

However, there are a number of significant advantages. The most important is the implication for maintenance. One common challenge in operation and maintenance contracts is that the incentive of the contractor to provide maintenance may decline towards the end of the contract. This risk is especially high if the supplier does not expect (or wish) to renew the contract. Extending the length of the contract is a way to reduce this risk.

The second benefit for the FEA of a long-term maintenance contract is that it can strengthen the case for tariff increases in submissions to the Commerce Commission. Rather than arguing for an increase in the maintenance component of the electricity tariff, the FEA is able to demonstrate that it has a contractual obligation to make payments to the contractor.

lessons

The experience of the FEA demonstrates that good asset management is associated with good performance. The FEA provides an excellent case study in how asset management should be conducted. Roles and responsibilities are clearly defined, with each asset assigned to a section within the FEA. An asset management system facilitates planning for maintenance, and by linking it with the financial management system, it ensures that funding for maintenance is provided to responsible units. In some cases, maintenance is outsourced, with the long-term arrangement with Telesource being particularly noteworthy.

Accountability is also important. Internally, maintenance planning is scrutinised by a number of groups through the internal budget cycle, ensuring that expenditures which are planned are necessary. Externally, the FEA's management is accountable to its shareholder as a state-owned entity, and must submit annual corporate plans to government. An independent regulator ensures that the FEA receives sufficient revenue for asset maintenance, with pricing based on a user-pays principle and life-line tariffs in place for low income households.

This case study was prepared by Matthew Dornan with the assistance of the Fiji Electricity Authority.

Case Study 2

justice asset management systems (jams) in the solomon islands

The Justice Asset Management System (JAMS) provides an indication of the backlog of maintenance ... (and) a set of processes, procedures and templates necessary to carry out all asset management functions.

introduction

The following case is from the Solomon Islands in the years following the tensions. The investment in good governance and the rule of law resulted in the direction of funding from development partners toward the law and justice sector. As part of the regional assistance mission to the Solomon Islands (RAMSI), a financial risk assessment was undertaken in 2009. It identified that the Ministry of Justice and Legal Affairs (MJLA), which includes the National Judiciary (NJ), faced a high risk in the management of its assets.

The recurrent budget was insufficient to fund adequate maintenance of the buildings. There were no data on which to base an assessment of the financial risk, but there was general agreement of the risk among the Ministry's Financial Controller, Chief Infrastructure Officer and RAMSI's maintenance officer.

Figure 2.1: Court House, Auki Malaita

Photo courtesy of Kerry McGovern.

process

The Ministry of Finance revised the 'Financial Instructions' that apply to all public sector entities, including the justice sector, to include a requirement that non-current asset registers are to be kept. The changes meant that the Permanent Secretary Finance:

> "in consultation with all ministries, must develop and implement an Asset Management Framework for the effective, efficient and sustainable management and safeguarding of the Government's property, and subsequently amend and augment any asset instructions as required by the framework. The framework must include a capitalisation threshold value and policy that describes whether expenditure would be capitalised under an accrual accounting system, or recorded as recurrent expenditure" (TI-4).

An inventory of the non-current assets of the MJLA, was prepared in 2010. An inventory was also prepared for Corrections. An Australian Managing Contractor (AMC) was hired by AusAID to work with the Ministry of Infrastructure Development (MID) to prepare the system and guidelines and to supervise staff to prepare the inventory. This was done in May-June 2011 by the AMC project team working in MID, assisted by the Chief Infrastructure Officer at the MJLA.

Moveable assets [Furniture Fittings and Equipment (FF&E)] were recorded and labelled, and entered into the FF&E Database. Built assets were recorded in the Built Assets Database, which was designed to collect all known data about each asset. Where essential data did not exist, such as titles or surveys, separate projects were undertaken to obtain those data.
The condition of each asset was ascertained and was entered into the relevant database. The FF&E database is simple and was built in Microsoft Excel. The Built Assets Database was constructed using interlinked files in Microsoft Excel, Word, Adobe Acrobat, and Windows Explorer. It also summarises key data on each asset into a Master Asset Register. A decision

was taken to use this platform, as experience from other countries indicates that proprietary software requires licences, maintenance and training that are not sustainable, and is geared to asset management practices that are not appropriate for small states. Even Microsoft Access was not used because it imposes significant barriers of training and licensing, and is unsustainable. The project team decided to use only Microsoft Office, as most government offices have licensed versions and provide regular training in its use.

For the building condition assessments, the AMC adapted a system they used in managing complex buildings in Australia. It contained data on the maintenance costs of each asset component provided by a quantity surveyor. The MJLA then developed local procedures and templates to complete tasks. While part of the JAMS, the templates are locally developed.

the ff&e register

The FF&E register:

1 Provides a summary of the condition of moveable assets controlled by MJLA.
2 Allows MJLA to track the movement of items through undertaking audits.
3 Can be filtered and printed to do audits of Fixtures and Fittings and Equipment by any of the column headings.
4 Calculates depreciation to Treasury requirements.

The MJLA developed its own procedures for maintaining and using the register and with the assistance of an international asset advisor who also managed the implementation of the maintenance plan. The FF&E database was constructed by the Asset Management Unit but is now handed over to and maintained by MJLA Finance, which undertakes all purchasing and is able to capture these in the FF&E before items are allocated across the MJLA. The Built Assets Register is managed by the Asset Management Unit because they must manage the buildings.

built asset condition report

The purpose of the Built Asset Condition Report was to provide an objective technical assessment of asset's condition and maintenance budget requirements, in order to:

- Enable management to identify maintenance needs and projects;
- Identify problem areas, secure and allocate funds for maintenance work; and
- Prioritise maintenance work.

The condition criteria were originally designed to identify the maintenance action required: preventive maintenance (excellent condition), condition based maintenance – minor repairs (good condition), repairs required (fair condition), major repairs required (poor condition), replacement requirements (very poor condition).

However, in practice the initial condition assessment did not drive the preparation of the maintenance plan. A general condition report accompanied by a scope of works to bring each asset back to the function required was all that was needed. The contents of the Condition Assessment Report are a reference when preparing maintenance strategies and plans for future maintenance work programmes and support MJLA budget bids. The key driver for maintenance has been the capacity of an asset to meet its service delivery requirements. This has sometimes meant postponing work on buildings in great need of maintenance because they still actually function, or, alternatively, investing in a building that is in reasonable condition but cannot deliver its required services.

The condition assessment was based on a 'walk through' and visual inspection. The conditions recorded formed the basis for:

- Life-cycle cost analysis, although this proved too sophisticated a concept to introduce at the time;
- Short and long term maintenance planning;
- Critical information for refurbishment and change of function decisions;
- Assessing the extent of backlog maintenance;
- Identifying code compliance deficiencies; and
- Providing the Facility Manager with a complete picture of the status of each building.

justice asset management system (jams)

The JAMS was not designed or implemented by Solomon Islanders and is not yet fully sustainable. It does, however, provide a number of benefits.

Firstly, it provides an indication of the **backlog of maintenance**. Backlog maintenance is historical maintenance that should have been done routinely but was neglected. Because of political decisions made amid administrative and financial constraints very little had been done for over the last thirty years. The backlog of maintenance and associated repairs were estimated to be SBD34 million when JAMS was established. The asset portfolio was in such poor condition that there was effectively no routine *scheduled maintenance* done at all, all maintenance work was *unforseen maintenance* to fix buildings as they fell apart from day to day.

The asset stock has an estimated replacement cost of SBD182 million. If normal recurrent maintenance is set at five per cent per annum of the value of the asset portfolio, the scheduled maintenance should be about SBD9 million. This gives an estimated preservation cost in any year of SBD43.3 million and rising annually. The MJLA and NJ have a combined annual recurrent budget of approximately SBD26.5 million, including salaries and all operating expenses. So the removal of the maintenance backlog, which was now twice the total recurrent budget, was unrealistic without external assistance. The total recurrent maintenance budget achieved has risen in the last two years but remains at about SBD3.0 million, or one third of what is actually required.

The goal was to achieve a sustainable government-funded recurrent maintenance budget by removing the backlog maintenance burden as a capital cost while encouraging the government to meet the recurrent maintenance load as it became manageable. Donor funding (AusAID) has substantially reduced the backlog between 2010 and 2013 making a realistic government-funded recurrent maintenance budget in the next three or four years an achievable possibility.

The study also identified a number of assets that were in such poor condition that they were on the verge of being lost entirely, mostly the circuit courts. Donor funding has targeted these assets in order to at least stabilise them sufficiently to make them available for future use.

The concept of life-cycle costs of the assets is an advanced concept that cannot be applied to asset portfolios such as this where the historical management of the portfolio is so confused and neglected. The MJLA is concentrating on achieving a sustainable recurrent maintenance budget in the reasonably near future but the design of new buildings will consider life-cycle costs with the goal of minimising the long-term annual cost of ownership.

Secondly, JAMS provides **a sheet for each asset item** linked to photos, survey plans, drawings, condition assessment, geospatial data, and title deeds. As part of the stocktake, all assets were surveyed and copies of the survey entered into the system. This enables asset management staff to 'see' the building and to measure, for example, for a compactus. Separate donor funded projects (AusAID) were required to collect missing data; for example almost no asset had any cadastral, topographical survey or a land title; even the High Court and Central Magistrates Courts were found to sit on unsurveyed land with no security of tenure. The properties now all have proper surveys and land titles are currently being sought.

Thirdly, JAMS provides a set of **processes, procedures and templates** necessary to carry out all **asset management functions**.

Lastly, the system is designed to meet the needs of the agency. Further data can be included, for example, contracts with links to legal requirements, government policies and guidelines. The way in which the JAMS was established also provided benefits. The system enables staff to gain access to **all the data they need on each asset** through one system. The Built Assets Database includes:

a	Every built asset, including land assets, however small.
b	A description of the FUNCTION of the asset: its purpose, number of people accommodated etc.
c	A CAPACITY STATEMENT describing how well it serves its designed function. This might include the number of staff accommodated and the hours it must be operational, or a specific requirement that cultural sensibilities demand that male and female toilet doors are not visible by the other gender. The capacity statement should be reviewed annually or when policies change. Such changes may make some assets obsolete.
d	A current CONDITION ASSESSMENT of each asset. This records the current condition of the asset, but not its capacity which is separate information.

e	SCOPE OF WORK required to bring the asset up to the state where it can meet its capacity and condition requirements. Each requirement should have a costed Bill of Quantities.
f	VALUATIONS are recorded for the original land purchase price, the original construction cost of the building, and the current replacement cost and a current land valuation not more than five years old.
g	A DRAWING REGISTER contains copies of all known drawings of the structure and modifications, both in .pdf format so everyone can read them, and .cadd format so architects can modify them.
h	GEOSPATIAL DATA enables all asset locations to be exported to Google Earth or a GIS system.
i	TITLES REGISTER records the rights over the land and buildings. It includes all perpetual estates and any forms of lease or rental agreements.
j	PHOTOGRAPHS of the land and buildings taken when completing the condition assessment.
k	A SUMMARY sheet that rolls up all the principal data on a single screen and aggregates all the Bill of Quantities and Evaluation bottom lines so we know what our asset portfolio is worth, what it would cost to replace and what the maintenance backlog is.

The **computerised asset register** also met the following **requirements**:

a	It is capable of being searched and viewed by people without training. The content to be editable with no more than one day's training and the structure to be editable with no more than three day's training.
b	No proprietary software of IT licences is used outside of MS Office (and excluding Access).
c	Everything can be operated by someone with "normal" skill sets.
d	The system resides on a secure server, and can be backed up automatically.
e	Viewable by all staff via intranet if one is available. It should be a tool that any staff member can use if required, not just staff in facilities management. For example, if the Attorney General needs a floor layout of the AG Chambers so his PA can put names on the desks in the plan, then he should be able to get that information from the intranet.
f	The original system, populated by the AMC, has evolved towards interconnectivity, simplification and sustainability.

lessons learned

The design and implementation of the JAMS identified a number of lessons that may be useful to other PICs. The issues that the MJLA came across through preparing the asset register and completing the condition assessment and maintenance plan are as follows:

1	No single person in the MJLA or NJ knew what assets the MJLA owned. All data was anecdotal and widely distributed among staff making management of the portfolio impossible.
2	The essential data required to manage assets is large and requires a carefully constructed system. It cannot be captured in ad hoc systems. And it must be updated, especially when linked to government legislation and central policies.
3	Titles not held for land – most of the buildings were on land not owned by the MJLA. The MJLA did not have titles to the land on which many of its buildings and houses stood. Land is a politically sensitive issue and it can be very difficult to get clear title to government land.
4	Backlog could not be funded from the recurrent budget – the purpose was to reduce the backlog so that buildings were to be brought back to a good condition. This would minimise the future maintenance costs associated with the buildings.
5	Recurrent local budget funding of five per cent of the replacement value of buildings per annum for maintenance is an achievable goal for scheduled, routine maintenance if, and only if, the backlog burden can be removed.

6	IT back up is required. Virus protection is crucial and the ministry must have licences for all software.
7	Budget forms required by the Ministry of Finance (MoF) make no provision to include supporting documentation. Therefore, Budget Officers are not influenced by the work done to improve asset management.
8	When the budget allocation for maintenance has not been spent, whether because of natural disasters or other unforeseen events, the next year's budget is reduced by the unspent amount. Therefore it is crucial to plan and manage carefully the implementation of the annual maintenance plan so that the best value can be obtained within the financial year from the budget allocated.
9	MoF Budget Officers have no process for comparing the impact of reductions in the current year's maintenance allocation to the value of the asset, the life of the asset or to future maintenance requirements.
10	New assets do not always provide the function required. Careful attention must be made to the design to ensure it will provide the function those who will use the asset require.
11	Cabinet makes the decisions on the budget allocation. The Public Accounts' Committee review is generally not detailed enough to identify long term costs resulting from annual budget cuts.
12	These funding problems are not unique to PICs. They are common worldwide.

This case study was prepared by Kerry McGovern with the assistance of the Asset Management Unit, Ministry of Justice and Legal Affairs, Solomon Islands.

Case Study 3

the cook islands airport authority

The ability of the Airport Authority to manage its infrastructure asset base effectively with limited formal policies or systems demonstrates that appropriate asset management practices are context specific. There are benefits to smallness.

introduction

The Cook Islands Airport Authority manages the two main airports of the Cook Islands, situated on the islands of Rarotonga and Aitutaki. Airports under the responsibility of the Authority play an important role in the economy of the Cook Islands, where tourism accounts for 75-80 per cent of economic activity. The Authority charges user fees as a state-owned commercial enterprise, however it also relies on government budget appropriations. This case study outlines how the Airport Authority is able to manage its operations effectively despite its small-scale.

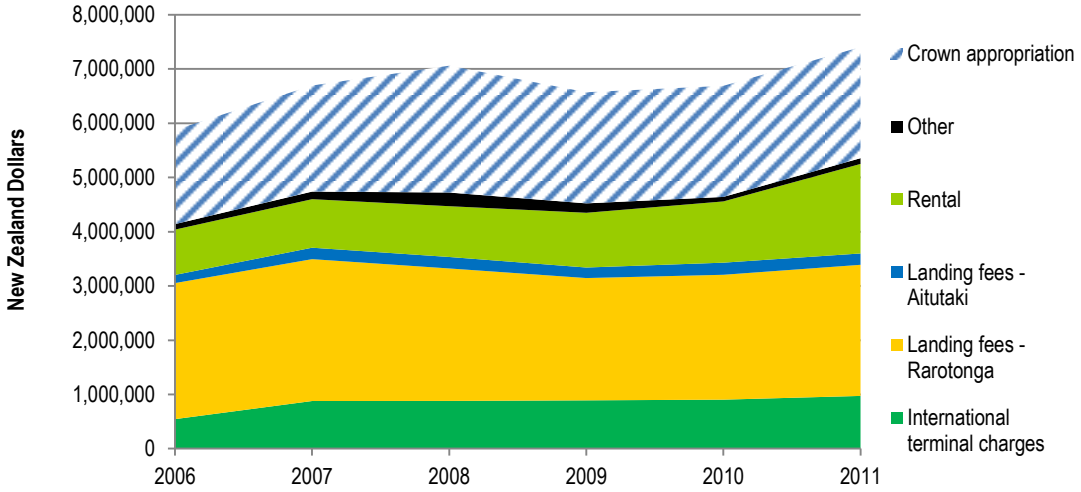
regulation and financial performance

The Airport Authority is one of six state-owned enterprises (SOEs) under the control of a holding corporation called the Cook Islands Investment Corporation (CIIC). SOEs are required by the *Cook Islands Investment Corporation Act* (1998) to act on a commercial basis, and must prepare annual business plans/annual reports and four-yearly Statements of Corporate Intent for approval by the CIIC. In practice, there is minimal review of these reports and plans by the CIIC. The CIIC also appoints the Airport Authority's board of directors.

The Airport Authority receives adequate funding through user fees and government budget allocations to fund its operations and maintenance activities. Revenue sources include:

1	**Landing fees** – are charged every time an aircraft lands and are based on the weight of an aircraft. These fees recover the Airport Authority's cost for all the services it provides to that aircraft, from the time it enters Cook Island's airspace to the time it lands and parks on the apron.
2	**International terminal fees** – is a charge the Airport Authority imposes on every arriving passenger for the use of the passenger terminal. It covers the cost of providing baggage conveyor systems, air conditioning, lighting and the cleaning and maintenance of the terminal building.
3	**Commercial rents** – are paid to the Airport Authority by businesses that operate within the airport terminal building and in other properties owned by the Airport Authority.
4	**Budget appropriations** – are provided by the Government of the Cook Islands to fund Airport Authority operations. Budget appropriations are generally one quarter of the revenue collected by the government through the Departure Tax (discussed below).

Figure 3.1: Revenue of the Airport Authority, 2006-11



However, the Airport Authority does not receive sufficient revenue to offset depreciation expenses; which are considerable given that the authority's asset base was valued at over NZD59 million in 2011 (approximately 17 per cent of Cook Island's GDP). It is unclear what will happen when the runway, which has an estimated economic life of 99 years and is the most valuable asset controlled by the authority, eventually needs replacing. No 'sinking fund' or other mechanism for setting aside money is currently in place or being considered.

The government is opposed to increasing fees at the airport, given the impact on tourism and the fact that user fees are the fifth highest in the world (among international airports). This demonstrates a common challenge faced by many airports in Pacific island countries: relatively low traffic volumes result in diseconomies of scale and make commercial operations difficult. For now, government budget allocations have been sufficient for operations and asset management costs. However, budget allocations vary from year to year and cause considerable uncertainty for Airport Authority management.

asset management

The Airport Authority has been able to practice good asset management despite these challenges, consistently meeting international civil aviation standards when audited by the International Civil Aviation Organisation (some of these rules are discussed below).

International Civil Aviation Organisation (ICAO) Standards

The ICAO sets the standards for a range of activities that impact on the safety of passengers at international airports. Member countries of the ICAO adopt these standards and enforce its application in the country by legislation. The ICAO then audits each country for compliance against the standards set. In the Cook Islands the Ministry of Transport certifies the Airport Authority under the Civil Aviation Rules. These rules must be met for airports to remains certified by the Ministry of Transport and to comply with ICAO standards an important determinant of whether international airlines will land at the airport. Four of these rules are listed below:

Civil Aviation Rule 139 – specifies maintenance requirements and performance standards for equipment considered essential to the safe operation of an international airport. Assets covered by this rule range from runway condition to fire fighting equipment.

Civil Aviation Rule 140 – outlines security requirements for international airports, such as passenger baggage screening, secure perimeters, and training of security personnel

Civil Aviation Rule 171 – stipulates the telecommunications equipment that is required at an international airport. This rule also establishes minimum reliability requirements, with performance of equipment audited by the Ministry of Transport

Civil Aviation Rule 172 – covers the certification requirement for the Air Traffic Services provided by the Airport Authority.

The Airport Authority maintains its considerable stock of infrastructure through a combination of in-house maintenance and outsourcing. The authority outsources maintenance where it does not have necessary in-house technical expertise or where the private sector can perform the maintenance at lower cost. It has a continuing technical services agreement with Airways Corporation of New Zealand in place, where it pays a fixed annual fee in return for technical advice and expertise. It also outsources specific work, such as specialised repair of cracks that appear on the concrete slaps that form the runway, and vegetation control which is undertaken by a local company.

The Airport Authority has a maintenance division which is responsible for the maintenance of core infrastructure such as the runway. An asset register is used to keep track of all assets under the ownership of the authority. This is useful for financial reasons, as it allows the Airport Authority to calculate depreciation of its assets and make the case for higher user fees. However, the register is not used for maintenance planning. There is also no formal policy or system in place for planning of asset maintenance.

lessons

The ability of the Airport Authority to manage its infrastructure asset base effectively without formal policies or systems demonstrates two related points. First, it shows that there are benefits to smallness. The reason the Airport Authority manages its assets well despite not having documented internal controls for the management of assets in place is because of its size. The authority has only 111 full time employees, almost half of whom are security personnel involved in passenger screening. An effective management team in this context is able to know the business and its personnel intimately, ensuring good communication and adequate focus on ongoing maintenance requirements.

Asset management arrangements at the Cook Islands Airport Authority also demonstrate that appropriate asset management practices are context specific. A sophisticated asset management system used by a major international airport like Heathrow is likely not to be cost effective in the Cook Islands, given the ease of communication among the small team in Raratonga. Systems and processes need to be adapted to suit the context in which they are to be implemented. For smaller operations, there is much to be said for keeping asset management arrangements simple.

This case study was prepared by Matthew Dornan with the assistance of the Cook Islands Airport Authority.

Case Study 4

the tonga water board: asset management and improved performance

Robust asset management practices are an important reason for the Tonga Water Board's good (financial) performance.

introduction

The Tonga Water Board (TWB) is a state-owned enterprise (SOE) responsible for water supply to the urban centres of Nuku'alofa, Neiafu and Makave, Holopeka and Pangai-Hihifo and 'Eua. The TWB has been in operation since 1966, but was restructured in 2000 with a mandate to operate commercially. The TWB does not receive subsidies from the government and consistently pays dividends of 20 per cent of net profit after tax to the government. The TWB scored well in the Pacific Water and Wastes Association's 2011 *Water Benchmarking Report*, ranking second among 19 Pacific water utilities in the Overall Performance Indicator (OPI) developed for the study. Among the factors influencing operational efficiency are asset management practices, along with efforts to manage physical water loss.

financial performance and regulation

The TWB's excellent performance ranking among Pacific water utilities is reflected in improved financial performance over the past five years (2007 to 2011). Revenues have grown by 11.8 per cent, from TOP3.7 million in 2006/07 to TOP5.7 million in 2010/11. The improved financial performance is attributed to higher water revenue, which grew by 35 per cent, and improved bill collection rate, which increased from 88 per cent to 94 per cent from 2007 to 2011. Total operating costs during this period increased by only 16 per cent. The TWB charges its customers TOP2.97 per 1,000 litres, enabling it to cover ongoing operations and maintenance costs (although it does not fully cover the cost of asset depreciation).

Good financial performance has been driven by clear direction from government. The *Public Enterprises Act* requires SOEs such as the TWB to be self-funding. Directors are held accountable for poor performance. The TWB also sets levels of service in the business plan that is agreed with the Minister of Public Enterprises, with performance against set objectives reported in semi and annual reports. Management at the TWB therefore have clear incentives to ensure good performance, including effective asset management.

The TWB has established funds for asset replacement as part of its corporate strategy. The Sinking Fund Reserve was established for the replacement of distribution lines, water meters and other minor items, while the Asset Replacement Reserve was put in place for bigger capital requirements. The TWB sets aside revenue each month to the Sinking Fund Reserve and the Asset Replacement Reserve, although the size of transfers can differ based on financial performance and operational spending requirements. Over time these measures are likely to reduce the reliance on development assistance that has been a feature of the TWB's capital investments. At this stage however, contributions are not sufficient to cover the cost of asset depreciation.

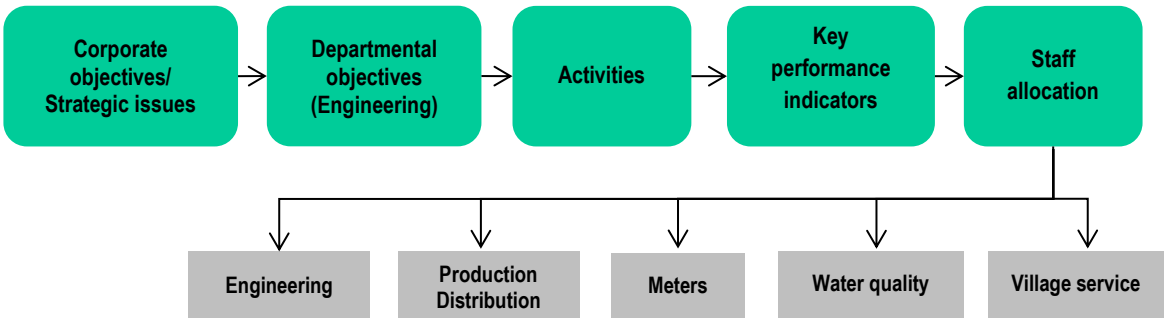
asset management

Robust asset management practices are an important reason for the TWB's good performance. Maintenance spending has increased in recent years, rising from TOP389, 483 (2.3 per cent of fixed assets) in 2007/08 to TOP 545,014 (3.1 per cent of fixed assets) in 2010/11. Maintenance activities are driven by an objective-oriented work plan, with key performance indicators established for the engineering department responsible for routine, periodic and preventative maintenance activities. Key performance indicators (KPIs) flow from corporate objectives, departmental objectives, and activities (see Figure 4.1). KPIs include:

- Unaccounted water loss target (20-30 per cent) with leak detection and reduction programme
- Minimum 60 per cent ageing meter replacement
- Improve water sales and debt collection by five per cent
- Consistent water level target of 7ft (Nuku'alofa, Vava'u, 'Eua) and 8ft (Hapai)

KPIs are allocated to teams and individuals within the engineering department.

Figure 4.1: Maintenance Objectives



The TWB is currently working towards a more comprehensive asset management system. It has put in place: (a) a Geographic Information System (GIS) that facilitates the location of assets, and (b) an asset inventory which consolidates information from its GIS system, customer billing data (for water meter inventory), and asset register from the finance department. The TWB is also developing a more comprehensive and systematic asset management plan. Components of the plan include:

Figure 4.2: Components of the Asset Management Plan

- **Asset Information and Inventory** – the existing asset inventory will be supplemented by richer data on water networks, pumping stations, treatment facilities, and storage reservoirs.
- **Operation Planning** – will inform asset management by specifying how each asset contributes to the level of service that is required.
- **Maintenance Planning** – a systematic maintenance strategy will outline maintenance requirements that enable the TWB to meet its operational needs, including both unplanned and planned maintenance.
- **Capital Expenditure Planning** – capital projects will be identified based on the TWB's three main drivers: (a) expansion and growth; (b) compliance/levels of service; and (c) replacement/ renewal.
- **Risk Assessment and Management** – ensure the continuity of water supply to customers and a coordinated response following a disaster or a breakdown in the system.
- **Water Quality Risk Assessment** – ensures a coordinated response across TWB centres to a drinking water incident.
- **Infrastructure Risk Assessment** – ensures that a contingency plan is developed where appropriate. The likelihood of an incident will be assessed in relation to assets' condition and locations. For the water supply system, network modelling will be used to determine the impact of a pipe break in terms of reduced flow and pressure.
- **Five-year expenditure forecasts** – will identify a five-year forecast for operations and maintenance and capital expenditures. The five-year expenditure forecast will link to the TWB operation budget.

Additional human and financial resources are required to realise the new asset management plan. This will be aided by the TWB's twinning arrangement with Manukau City Council and the ADB's Nuku'alofa Urban Sector Project.

Figure 4.3: Old Pump House at TWB's Mataki'eua well-field (left); Replaced and now well-maintained Pump House at Mataki-eua well field (right)

Photo courtesy of Cori Alejandrino-Yap (PIAC)

challenges

Although the improved performance of the TWB over time is commendable, some challenges remain. The TWB does not generate sufficient revenue to offset depreciation, and relies on development assistance for new infrastructure investment. This has not yet been fully addressed by the sinking funds established by the TWB. The TWB also sometimes defers maintenance due to financial constraints. Both challenges are partly the result of the regulatory environment within which the TWB operates. Although water tariffs cover operation and routine maintenance costs, they are insufficient to allow for larger maintenance requirements and adequate deposits in the sinking fund. The TWB is also obliged by government to provide community services such as water for fire-fighting services and rural villages, at a financial loss. The government does not compensate the TWB for these services. Non-reimbursement of community service obligations (CSOs) affects the TWB's finances.

lessons

The TWB demonstrates effective asset management. Maintenance planning is designed to meet corporate objectives, with the use of key performance indicators for individual units ensuring that incentives are in place for effective asset management. Incentives therefore cascade from organisational objectives established by management in consultation with government, to individual workers in the engineering department. Efforts are now underway to further improve asset management, with plans for better integration of the GIS and asset inventory, and for development of more systematic asset management systems.

The TWB case study demonstrates the close links between good asset management and good performance. The TWB is one the best performing water utilities in the Pacific, with a relatively sound financial position and excellent technical performance. Its success is the result of good management that operates under clear direction from government. The regulatory regime currently ensures that adequate funding is available for everyday operational and maintenance requirements. However, there is room for improvement. Properly accounting for water that is distributed as part of CSOs, and fair reimbursement from government for these CSOs, would better enable the TWB to address deferred maintenance and to set aside funding for asset replacement.

This case study was prepared by Cori Alejandrino-Yap with the assistance of the Tonga Water Board.

Case Study 5

the solomon islands national transport fund

The National Transport Fund (NTF) provides a framework for the institutionalisation of maintenance funding for the transport sector. It is providing an important funding source for transport sector maintenance in the Solomon Islands. The experience with the NTF's design highlights four benefits/lessons for Pacific island countries.

introduction

There are approximately 1,875km of roads in the Solomon Islands, forming the third most substantial network among 12 smaller Pacific countries (excluding Fiji and PNG) ranging from 22km to 2,337km.

The state of infrastructure was in good condition in the 1980-90s, but rapidly deteriorated during the period of civil conflict known as the 'Tensions'. The road network and other core economic infrastructure suffered from lack of maintenance as a result. It is estimated that in 2000, at the end of the Tensions, only 10 per cent of the nation's roads were in good condition. Transport services had ceased to function. The Ministry of Infrastructure Development (MID) had limited capacity to address the problem, especially outside of Honiara, with its engineering staff numbering two in 2001.

Figure 5.1: Deferred Maintenance of a Bridge in the Solomon Islands

The deferred maintenance of this bridge in the Solomon Island led to new construction under an ADB financed project. Photo courtesy of Cori Alejandrino-Yap (PIAC)

the creation of the solomon islands national transport fund

Development assistance for infrastructure commenced immediately after the conflict ended, with emergency loans used to redevelop road infrastructure along major economic corridors (the government's precarious fiscal position caused it to default on these loans, which were settled as part of the Honiara Club Agreement[3]). The Solomon Islands Government (SIG) also showed political will and commitment to re-establishing transport infrastructure services, establishing the Solomon Islands National Transport Fund (NTF) with support from development partners. There have been complementary efforts to increase the capacity of the Ministry of Infrastructure Development. Technical assistance from the ADB has been especially important, and has assisted with development of the NTF.

[3] This was a debt moratorium agreement by the Solomon Islands government (SIG) with a group of international creditors. Creditors agreed to write-off debt and the SIG agreed to voluntarily place limits on its ability to borrow.

The NTF has served various purposes. In the years prior to the fund's conception, the government's implementation of the transport sector plan experienced poor donor and government coordination, which resulted in an expensive and scattered project environment (National Parliament of Solomon Islands 2009). Its establishment acknowledges the difficult fiscal position faced by the government. The process of designing and implementing the fund has been central to pooling resources and streamlining coordination. At the same time the NTF has ensured that adequate funding is directed towards development and ongoing management and maintenance of transport infrastructure in accordance with the Solomon Islands National Transport Plan (NTP). The NTP sets out the strategic policy direction of the sector, identifies key priorities for expenditure as well as institutional development, and presents the methodology for identifying those priorities.

potential benefits

The Solomon Islands NTF provides an interesting case study, given that there are very few examples of earmarked funds for maintenance in smaller Pacific island countries. Although the performance of the NTF still cannot be rigorously evaluated given its relative infancy, lessons can be learned as to the process and factors that led to its successful establishment.

The Solomon Islands example is assessed against the following international best practice principles/criteria:[4]

International Best Practice	How does the NTF compare?
The fund should be 'owned' by and initiated by the country	The fund was flagged as a major turning point in the country's approach to infrastructure which signalled that the **"government is at last getting serious about the problem"** (Permanent Secretary at the Ministry of Infrastructure Development 2010).[5] The SIG understood the magnitude of the problem, passed legislation, and took ownership as the implementing agency for the NTP and its work program.
Should align with donor development strategies	Donors contributing to the fund are able to stipulate that their contributions be used for specific purposes (s 5(4)). Development partners have required the SIG to increase funding of infrastructure maintenance and rehabilitation as a condition for assistance. For instance, the ADB and other development partners leveraged the NTF and NTF Board mechanism as a condition for its assistance to the transport sector, through a covenant which required immediate doubling of the recurrent maintenance budget.
Trust funds reduces risks for donors and creates a culture of collective management	AusAID has contributed $30 million to the NTF. Other donors have indicated support and are expected to channel their support in the transport sector through the Fund. The fund represents a "sector-wide approach, wherein all sources of assistance are pooled" (Pacific Islands News Association 2010; R Guild, pers.comm., 2012) and used by the government for investment and maintenance.
Trust funds do best in a robust, well managed fiscal management system that is transparent	The SIG will continue to run a balanced budget or small surpluses over the next few years and is precluded from borrowing under the terms of the Honiara Club Agreement. Although the fiscal situation remains fragile, the country is making good progress in the use of aid to develop its infrastructure sector. The post-conflict situation has required a high level of donor coordination and agreement.
Ensure that a special/trust fund is the best way to address the identified problem	The government understood that there is shortage of resources in the long term and that a special fund could help address the problem.

[4] Criteria are based on a review of the literature, including: Minc, M.2003. *Road funds and road maintenance: an Asian perspective*. Manila; Heggie, I.G. 1995. Management and financing of roads: an agenda for reform, *Technical Paper 275*. Washington D.C.: World Bank; Heggie, I.G. 2000. *Second generation road funds: the way ahead*. Kent, United Kingdom: World Highways; Heller, P. 1989. An IMF perspective on earmarking, in *Earmarking, road funds and toll roads*, A World Bank Symposium Discussion Paper. World Bank Development Department Report INU 45. Washington, D.C.

[5] The statement was confirmed in a follow-up interview by the author (March 2012).

Managed by Board of Directors with private sector representation	The fund's supporting governance structure comprises an oversight body, the NTF Board which is comprised of four government appointees and one non-voting development partner representative rotating periodically between donor representatives. The Board oversees administration of the fund, with the support of a secretariat based within the MID. Only government members can vote on decisions. The NTF Board of Directors does not have private sector representation.
Planning and forecasting must be quantified and accompanied by clear investment strategies	Use of multi-criteria analysis in project selection. An asset management mechanism has been included as an important component of the NTP.
Service providers, consultants and advisors must be reputable, knowledgeable and independent Maintenance works should be contracted out to private firms	Follows procurement rules in accordance with the SIG's Financial Instructions and prevailing MID procurement guidelines. Maintenance words are contracted out to private firms and community-based organisations.
The trust fund should be created and formalised through legislation	The NTF has been established by the *National Transport Fund Act 2009* (NTF Act) and the *National Transport Fund Regulations 2010* (NTF Regulations). These procedures have been developed to provide more details on the processes to be followed by the NTF Board and its Secretariat.
Made up of charges or levies paid by road users	Currently there are no charges or levies contributed by users to the Fund with only the SIG and donor contribution to the Fund.
Secretariat department responsible for supervising its finances	The Transport Policy and Planning Department of the MID is responsible for the roles and functions of the Secretariat.
Subject to annual independent Audit **Open to public scrutiny and transparent**	The fund is audited and is accountable to Parliament (s 6(3)). The NTF Board procedural guidelines requires MID to properly administer only genuine contracts and record accurately all contracts entered into in the NTF Board's records. All records, correspondence and any extracts of the minutes of the NTF Board meetings regarding contracts must be properly filed and kept by the Secretariat to the Board.
Should give priority to expenditures on maintenance	Through the fund, SIG has been able to pursue their NTP which embraces a commitment to financing maintenance as a high priority. The NTP specifically requires that expenditure on transport infrastructure will be concentrated on the rehabilitation and maintenance of the existing infrastructure. The scoring system to identify its priorities into essential, desirable and luxury projects shows that maintenance and rehabilitation made up of about 90 per cent of the essential expenditure. As of late 2012, the entire maintenance of the network is from the NTF.
Separate from the general budget but funds must be integrated into the broader public finance context **Fees and costs must be reported and monitored**	In line with normal SIG procedures, payment vouchers are raised and authorised by appropriate officers at the NTF and sent to the Ministry of Finance and Treasury (MoFT) for processing. The MoFT ensures that all required SIG processes have been complied with before drawing the cheques. Cheque signatories are MoFT officers, not NTF officers. The reconciliation of the NTF bank accounts is the responsibility of the MoFT, not the NTF. The separation of the powers to initiate and authorise payments is an important financial management control.

It is not always easy for Pacific countries to allocate funds towards maintenance because of competing demands. It takes political will to do so. Although the SIG is not able to match the contribution by donors dollar for dollar, it demonstrated increasing commitment in funding infrastructure maintenance expenditures, as evident in the 2012 National Budget which allocates SBD32 million to the NTF.

This commitment and intention of the SIG is also evidenced by allocating another SBD68.98 million for infrastructure development and SBD9.68 million for recurrent, a total of SBD110.65 million for 2012. This represents a 61.25 per cent increase in the government allocation for the recurrent and development budget.

Capacity within the MID has also been boosted. From two engineering staff members in 2001, there are now 18 engineers working in the MID.

challenges

There are currently no charges or levies contributed by users to the NTF, which relies on SIG and donor contributions. This is potentially a threat to the sustainability of the fund. Support from the development partners also needs to broaden. Currently, AusAID is the only development partner making financial contributions to the fund.

The composition of the NTF Board lacks representation from the private sector, including relevant stakeholders such as chamber of commerce and industry, and the automobile and transport association. Private sector participation is common in more developed road authorities and funds, and ensures that those actually using the roads are involved in decision-making. Despite these potential institutional constraints, there has been strong growth in the number and size of private contractors. This has been helped by the certainty of the Fund, which provides contracts of two years.

lessons learned

The NTF is achieving its objective of providing a funding source for transport sector maintenance. The experience with the NTF's design highlights a number of benefits and lessons:

1 A sectoral approach, wherein all assistance is pooled, helps to ensure that infrastructure financing is linked to the Government's NTP. It also re-directs development assistance away from many individual projects, reducing fragmentation and lessening the administrative burden on government.

2 The NTP separates, and prioritises, all road rehabilitation and maintenance projects, all wharf repairs, maintenance, and new/replacement build projects, as well as airfield rehabilitation and maintenance projects. The prioritisation process used to make decisions about spending places a high value on maintenance of existing infrastructure.

3 Projects funded by the NTF are administered through the SIG, with the MoFT approving expenditure initiated by the MID. Spending through government systems serves to improve public financial management capacity, and acts as an additional financial control.

4 Political will and commitment from government is vital. In the Solomon Islands, allocation of budget funds for maintenance demonstrates this commitment.

This case study was prepared by Cori Alejandrino-Yap with the assistance of the Solomon Islands Ministry of Infrastructure Development (MID).

Case Study 6

the papua new guinea national road fund

The Road Fund has been able to ensure that financial resources earmarked for road maintenance are not misdirected.

introduction

There are approximately 30,000km of roads in Papua New Guinea (PNG), forming the most substantial road network in the Pacific. Roads are critical to the livelihoods of many Papua New Guineans, providing access to markets, and health and education services. The 'national road' system, comprising 9,000km of roads that fall under the jurisdiction of the PNG Government, is especially important to the national economy. The road network in PNG has suffered from a lack of maintenance over many years. Successive governments in the 1980s-1990s reduced road maintenance funding, resulting in a dramatic deterioration in the condition of the road network. In 2007, almost 32 per cent of national roads were in 'poor condition', meaning that they were passable only by four wheel drive vehicle in dry weather.

In recent years, the PNG Government has undertaken a number of measures with support from development partners to improve road maintenance. A Road Asset Management System (RAMS) was developed after 1999 and provides a snapshot of the condition of the national road system. Although not completely up to date, RAMS is used by government bodies and development partners involved in providing support to national roads, demonstrating the benefits of an asset inventory for maintenance provision. Road agencies are also commencing the implementation of innovative contracts to help address challenges in procurement and budgetary allocations. Long-term road maintenance contracts of between three to 10 years are increasingly being used. Financial bonuses and penalties for good and poor performance provide necessary incentives for the contractor to ensure the road remains in good condition.

the road fund

The creation of a road fund dedicated to maintenance of national roads is another measure undertaken by the PNG Government to improve road conditions. The Road Fund was established by the *National Road Authority Act 2003* with the objective of reducing reliance on annual budget allocations and ensuring that adequate financial resources are directed towards road maintenance. Its establishment was supported by development partners. A National Road Authority (NRA) was also set up to implement maintenance. The two entities are overseen by an independent board of directors, whose members include seven private sector representatives and four civil servants from the major road sector agencies. This ensures that resources earmarked for road maintenance are not diverted to other purposes.

The Road Fund has achieved some important successes. It has been able to ensure that financial resources earmarked for road maintenance are not misdirected despite attempts on the part of some political leaders and central ministries to use the Road Fund for other purposes. The NRA has also led the way in use of innovative procurement arrangements. Long-term road maintenance contracts of between three to 10 years have been demonstrated by the NRA, and are as a result increasingly used by the Department of Works and Implementation (DoW). Financial bonuses and penalties for good and poor performance provide the necessary incentives for the contractor to ensure the road remains in good condition.

challenges

However, challenges remain. The decision to gradually transfer responsibility for routine maintenance of the road network to the NRA has created some confusion regarding NRA and the DoW's roles. Funding is also inadequate. The Road Fund currently receives revenue from the earmarking of an existing levy on domestically refined diesel fuel, equivalent to four toe/L (approximately two US cents/L). No revenue is available from additional levies on diesel or other fuels, heavy vehicle charges, or vehicle registration fees; all measures that had been anticipated when the Road Fund was established.

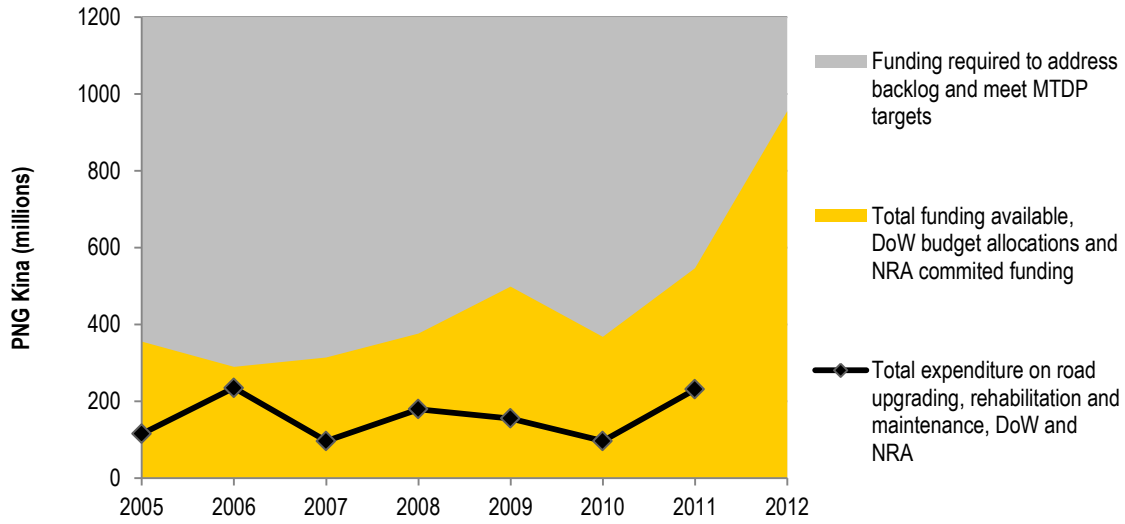
This means that the NRA does not receive sufficient funding from the Road Fund to provide maintenance to sections of road for which it is responsible, as shown in Figure 6.1.

Figure 6.1: Financial Position of the Road Fund and Funding Requirements of NRA (PNG Kina, millions)

Year	Actual Deposits in Road Fund (PNG Kina, millions)	Funding Allocations to NRA in the Development Budget	Funding Required by NRA (for roads under NRA responsibility)
2006	16.58	_	_
2007	20.03	_	_
2008	21.48	_	_
2009	16.27	_	_
2010	11.99	_	57.93
2011	26.64	_	75.51
2012 (to Sept)	11.00	15.00	80.75

The PNG Government in 2012 allocated K15 million (USD7.5 million) to the NRA in recognition of this funding shortfall; however this defeats the underlying purpose of the Road Fund, which is to reduce reliance on government budget. Broader government budget allocations for road maintenance and rehabilitation also remain insufficient (despite increases in recent years). Modelling using RAMS data suggests that an annual allocation of K1.2 billion over five years would be required to meet the Medium Term Development Plan (2011-15) (MTDP) target of 65 per cent of national roads in good condition. Actual spending on road maintenance and rehabilitation is much, as shown in Figure 6.2

Figure 6.2: Funding Gap for Meeting MTDP National Road Targets



There are also broader challenges to effective road maintenance in PNG that are not addressed by establishment of a road fund. Both the NRA and DoW face problems in procurement and contracting due to civil service procedures. There is a serious lack of capacity for implementing large contracts in the private sector. Most provinces in the country only have one or two private sector contractors capable of undertaking contracts, resulting in considerable delays and cost overruns (final expenditure over 50 per cent of contract value is not uncommon). The difficult topography of PNG further contributes to delays and cost overruns, as does negotiations with landowners for road work (including access to requisite raw materials).

lessons

The PNG Road Fund, in a narrow sense, has achieved its objective of providing a funding source for road maintenance. Sound governance arrangements have ensured that money intended for maintenance of the road network is not misdirected. However the establishment of the fund also shows that earmarking of revenue alone is no panacea to the asset management challenge. The revenue base of the Road Fund remains inadequate – partly due to the way in which the Road Fund was created. The establishment of the Road Fund and the NRA has also failed to address broader issues adversely affecting implementation of road maintenance. There remains a need to improve procurement systems, build the capacity of the private sector to undertake road work contracts, and increase aggregate levels of funding.

The experience with the National Road Fund highlights two points. One is that political support is required for the successful establishment of a road fund with an adequate revenue base. The second is that a road fund is only one element of broader asset management arrangements. For asset management to work, all fundamentals must be effective, ranging from adequate funding (the aspect addressed through a road fund), planning, procurement and monitoring systems, and implementation.

Further improvements in other elements of asset management are needed for the benefits of the PNG Road Fund to be fully realised.

Figure 6.3: Photo of the Highlands Highway, Papua New Guinea

This case study was prepared by Matthew Dornan with the assistance of the National Roads Authority, PNG Department of Works, PNG Department of Transport, and the Asian Development Bank (Port Moresby).

Case Study 7

the kiribati public utilities board: outsourcing power generation maintenance

Outsourcing of generator maintenance by the PUB is resulting in reduced generation outages, good fuel efficiency, and improved overall generation performance.

introduction

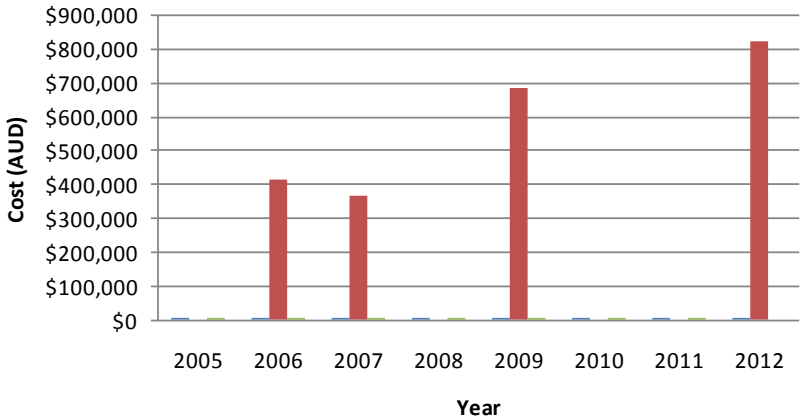
The Public Utilities Board (PUB) is a statutory authority responsible for providing electricity to 50,000 inhabitants of South Tarawa, Kiribati. The power utility has an installed capacity of 5.45MW delivered by four diesel generators, which were donated by the Japanese government in two stages in 2002 and 2005. The generators came with some spare parts and initial servicing that was carried out by Daikai Engineering Pte Ltd, Daihatsu's delegated maintenance agent based in Singapore. Generator maintenance continues to be carried out by Daikai on a commercial basis, with the initial servicing period having expired. This maintenance arrangement was adopted by the PUB in order to ensure the generators continued to operate at a high capacity, and to avoid issues experienced in the past where no long term arrangements were made. The maintenance arrangement has been ongoing, although the maintenance program has lapsed at points due to the PUB's constrained financial position and subsequent inability to pay for maintenance services.

The technical specifications for the generators recommend maintenance overhauls every 6000hrs, with a major service at 12,000hrs, and the largest overhaul at 24,000hrs. Typically a generator runs approximately 6000hrs per year and so a maintenance overhaul is required annually, with more major overhauls every two years (at 12,000hrs and 24,000hrs). Each overhaul has a specific list of inspections, activities, and parts replacement required in order to keep the generators running in optimal condition.

impact on performance

Figure 7.1 shows the history of the PUB's maintenance over the past eight years. Maintenance overhaul of the four generators costs $380,000-$800,000 and appears to be increasing, possibly due to the lapse in overhauls in 2008, 2010, and 2011. Like many Pacific island country power utilities, the state-owned PUB has been operating at a financial loss since its establishment. A reason for financial losses is inappropriately low electricity tariffs that do not cover the PUB's operation and maintenance activities. Despite increases in diesel prices and overall operating costs, the PUB's electricity tariff has remained unchanged since February 2008. As a result of financial constraints, maintenance of the generators is not always carried out. This reduces the operational efficiency of generators and increases the incidence of power outages.

Figure 7.1: PUB Cost of Generation Maintenance

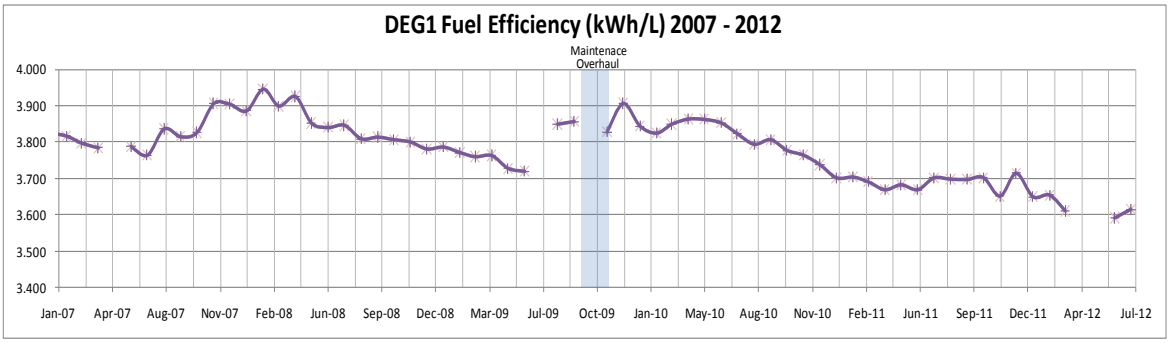


In the Pacific Power Association's

2011 *Power Benchmarking Report*, the PUB rated among the top third of power utilities in the Pacific. Specific fuel consumption, a measure of efficiency of fuel use, is a key performance indicator because fuel accounts for the bulk of costs (approximately 75 per cent) in diesel run power operations. The PUB ranked in the top half of utilities with an average specific fuel consumption of approximately 3.8kWh/L. An analysis of fuel efficiency for generator 'DEG 1' over the period of 2009 and 2012 is provided in Figure 7.2 and shows a fuel efficiency of 3.95-3.60kWh/L. As would be expected, the fuel efficiency deteriorates over time, reflecting the age of the generator. However, a positive correlation between fuel efficiency and generator overhauls can also be seen.

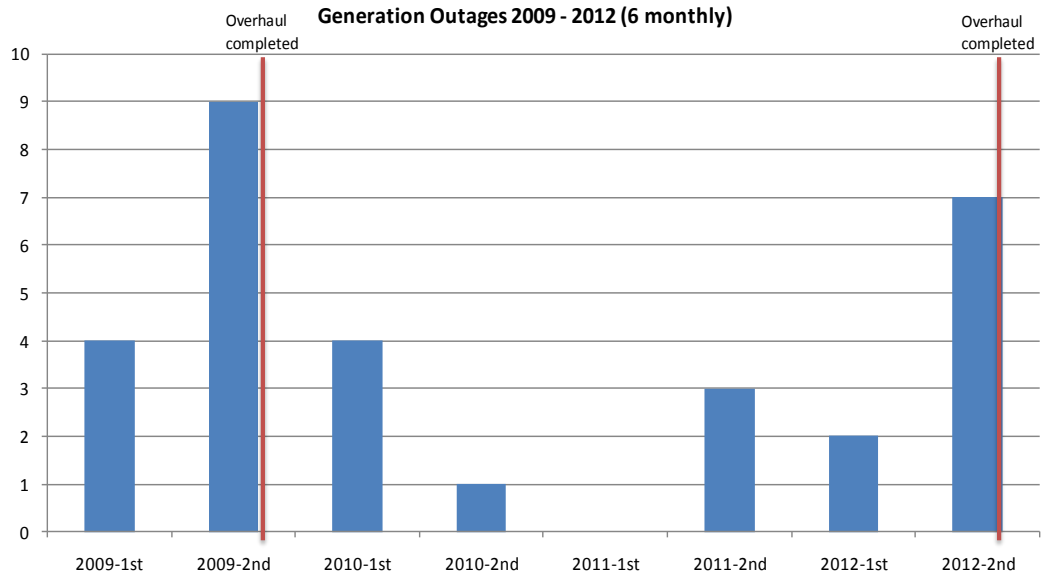
The maintenance overhaul in late 2009 resulted in an increase in fuel efficiency from 3.71kWh/L in June 2009, to 3.86kWh/L in early 2010. A more detailed analysis of generator performance in Kiribati found that for each year maintenance was delayed, fuel efficiency of generators declined by 0.125kWh/L. This translates into additional expenditure on fuel of $225,000 when a diesel price of $1.27/L is used. The calculation excludes any impact on life span of the generators, power outages and the need for repairs, customer complaints, environmental, social and safety problems.

Figure 7.2: Generator DEG1 Fuel Efficiency (kWh/L) 2007 – 2012



Maintaining generators also provides other benefits for the PUB. In the long-term, appropriate maintenance extends the generator's life and reduces environmental and safety risks. It also increases generator reliability, reducing breakdowns and power outages. Analysis shows that the incidence of generation outages at the PUB (analysed on a half yearly basis) decreases immediately after maintenance overhauls (see Figure 7.3). This increases electricity sales for the PUB, and provides economic benefits for South Tarawa.

Figure 7.3: Generation Outages 2009 – 2012



impact on performance

The arrangement that has been in place since the installation of the Daihatsu generators in 2002-2005 has led to an improvement in overall service delivery to customers. Factors that have contributed to the success are:

- Use of one generator type, allowing for economies of scale for parts, maintenance and training.
- Manufacturer's delegated maintenance provider delivering a high quality service.
- External maintenance provider driving a regular maintenance schedule.
- Long established working relationship allowing for negotiation of payment terms.
- The PUB management prioritising the maintenance overhauls.

However, significant challenges remain. Because the PUB is in a poor financial state and does not have an overarching sustainable maintenance plan, it often faces difficulties in paying for maintenance services. This has sometimes led to engines operating well past their recommended running hours before maintenance can be financed, reducing fuel efficiency, increasing the incidence of power outages, and shortening generator life. Daikai's leadership has resulted in a lack of involvement from the PUB staff to drive the maintenance program. Consequently, there is a failure to check that work has been adequately completed, and there appears to be a lack of clarity at the PUB about what is included in the overhaul service. Documentation is poor and the absence of daily communication meetings represents a lost opportunity to build the capacity of the PUB's technical staff, who, though increasingly involved in the maintenance overhauls, have found it difficult to demonstrate their competence to management. There also appear to be gaps in the maintenance of system components that fall outside of the scope of the outsourcing arrangement.

Other challenges are also apparent. There is concern that the PUB might be paying excessive prices for the maintenance servicing, an issue that could potentially be addressed through improved procurement practices. Delivery of spare parts can also take considerable time (up to two months), highlighting the obstacle that remoteness presents to infrastructure service providers in the Pacific.

lessons

Since the PUB has engaged external maintenance provider Daikai to carry out maintenance of their Daihatsu diesel generators, there has been an improvement in the reliability and efficiency of operations. This is resulting in reduced generation outages, good fuel efficiency, and improved overall generation performance. The case study demonstrates the potential benefits of outsourcing in a remote microstate, although significant challenges remain.

The experience of outsourcing by the PUB highlights the need for:

- Sustainable plan/arrangement for maintenance funding.
- Comprehensive maintenance programs that include asset management plans.
- Sound planning for overhauls (with adequate timeframe for delivery of parts).
- Clear maintenance contract terms.
- Leadership from the utility in managing and driving maintenance activities.
- Active capacity building within the utility.
- Documentation of maintenance arrangements and activities.

This case study was prepared by Pauline Muscat with the assistance of the Public Utilities Board, Kiribati.

Case Study 8

reform of road maintenance in samoa

Reform of the Public Works Department in Samoa provides an excellent example of how institutional change has improved road infrastructure performance. The case study demonstrates that sector reforms can both increase resources available for asset maintenance activities, and improve the asset management capacity of an organisation.

introduction

There are approximately 2,337km of roads in Samoa, of which 85km are main roads and approximately 677km (65 per cent) of the main roads are paved, forming the most substantial network among the 12 smaller PRIF Pacific countries.[1]

In the early 1990s, road maintenance in Samoa had deteriorated due to a decline in overall funding levels, the loss of professional staff, ageing equipment, and increases in the length of the road network. The Government of Samoa set about reform in response to these challenges.

Figure 8.1: Road Maintenance in Samoa

Photo courtesy of Cori Alejandrino-Yap (PIAC)

the reform process

There were several aspects to the reform agenda. A key element of the strategy involved changing the respective roles of the PWD and the private sector. Most road works were carried out by the PWD through force accounting up until 2002. The Government of Samoa sought to transform the PWD into a policy and project management organisation, with the devolution of road work services to the private sector. This meant reducing the size of the PWD, which in the early 1990s had salary overheads of 45 per cent of total costs.

The reforms of the PWD occurred over a long period, and involved considerable consultation with staff and the private sector. It involved retrenching some staff, while retaining others that were required for the PWD's new management

[1] Excluding Fiji and PNG.

and policy role. The PWD was provided with assistance during the transition. Staff numbers were reduced, with 25 per cent opting to create their own company with a guaranteed contract with the new Ministry for three years, 57 per cent opting for redundancy packages, and 17 per cent successfully applying for new positions within the Ministry (van Dissel 2013:10).

The reforms saw road works outsourced to private sector contractors, with the PWD transitioning from a service delivery agency into its present asset management role. In 2001, the PWD became the Ministry of Works (MoW), reflecting these changes. The official transition took place in 2002, with staff numbers reducing from 403 to 58 (P Kelly, pers.comm., 2013).

The World Bank and AusAID provided support for the reforms through technical assistance and advice, and through the development of asset management capacity within the PWD. The Samoa Asset Management System (SAMS) was developed, and a full condition inventory and traffic survey was implemented. PWD processes for outsourcing improved as a result of this assistance, with maintenance of road sections advertised through public tender.

Shortly after the reform, the MoW was merged with the Ministry of Transport to become the Ministry of Works, Transport and Infrastructure (MWTI). Problems remained in filling staff positions with competent professionals. Budgets for the road sector were inadequate at approximately WST3 million, only 60 per cent of the required funding, with most of the budget going to routine maintenance. To address all these challenges, the Land Transport Authority (LTA) was set up in 2009 to be responsible for the management of the road sector. The creation of the LTA aims to ensure greater autonomy and long-term objective planning of road sector investments (van Dissel 2013; L Galuvao, pers.comm., June 2012).

The success of the reforms is demonstrated by higher government spending levels on road infrastructure arising from cost savings in the downsizing of the PWD. By 2010, all maintenance contracts and construction (now under the LTA) was being outsourced - funding WST10.4 million in contracts for the private sector in 2009/10, increased to WST13.3 million in 2010/11 and further increased to around WST17 million in 2011/12 (L Galuvao, pers.comm., June 2012).[2]

Funding from government is sufficient to manage a road network that has increased in size. The cost savings are primarily due to the downsizing of the PWD, which transferred 80 per cent of non-core activities to the private sector. In the process, staff numbers at the PWD was reduced by approximately 75 per cent.

challenges

A road fund was created to generate sustainable financing for the road sector on the basis of user charges, managed by the LTA. However, there is no clear division of responsibilities between the LTA and the government, with Parliament strongly influencing budget allocations. Funding for the road fund provided by vehicle registration and some fines is inadequate, and the fund is highly dependent on annual budget allocations by government.

Although, the government showed political will in the success of the reforms and its commitment to maintenance as demonstrated by its increased budget allocation, funding is highly susceptible to change and to political priorities of the government of the day. This also has the spillover effect of an unstable market for the private sector.

lessons

A key reason for the success of the reforms is the way in which they were implemented. There was strong political and bureaucratic leadership throughout the reform process. Reforms were also designed in consultation with PWD staff. Staff members were able to choose among three options: redundancy, re-employment with existing contractors or a transition into the new PWD.

Support provided to PWD staff was significant. It included capacity building of an initially weak private sector, funding of job placements for 12 months, and the direct award of performance-based contracts to new enterprises that had been established by former PWD staff.

The case study demonstrates that reform of inefficient public sector organisations in the Pacific is possible and, if designed effectively, can be done in ways that minimise harm to affected employees. The experience also

[2] Note that at the time of the interview with Leasi Galuvao (CEO, LTA), the WST17 million for 2011/12 was just an estimate. It demonstrates, however, the government's commitment for maintenance through increased budget allocation for maintenance.

demonstrates that reform can increase the resources available to government for asset maintenance activities, and improve the asset management capacity of an organisation. Infrastructure asset management can improve as a result.

Figure 8.2: A Drainage Ditch on a Well-Maintained Road in Samoa

Photo courtesy of the World Bank

This case study was prepared by Cori Alejandrino-Yap with input from the Land Transport Authority (LTA) in Samoa, and information provided by the World Bank and AusAID.

annex 2

Public Financial Management Data on Pacific Island Countries

List of Tables in Annex 2

The tables in this annex collate financial information from fourteen Pacific Island Countries (PICs). The use of the data for analysis is subject to a number of caveats. Sources of the data differ from country to country. Methodologies used to prepare the data differ and the data refer to different entities. Therefore caution must be taken in reaching conclusions based on comparisons of data in the table. Nor is the data a complete record of all public sector activities in each PIC.

Sources of data

An explanation of the sources of the data follows:

1. Melanesia
Financial data on Melanesian countries have been taken from Central Bank reports.

2. Polynesia
Financial data on Polynesian countries have been taken from Ministry of Finance reports, except for the data for Niue and Tuvalu. Niue's data are taken from the General Finance Statistics Report issued by the Economic, Planning, Development and Statistics Unit of the Premiers Department for year ended 2005. The data for Tuvalu have been taken from the Tuvalu Infrastructure Strategy and Investment Plan February 2012 which quotes government outturns.

3. Micronesia
There are two types of Micronesian PICs. The financial statements of the Compact States (FSM – National, Palau and Marshall Islands) are prepared to comply with the Government Accounting Standards Board of the USA. Data for these have been taken from the single audit reports on the websites of the respective Office of the Public Auditor.

Data for Kiribati are taken from a briefing note to the Donor Partners meeting on the Medium Term Budget Framework report of the Ministry of Finance. The data for Nauru are the projected outturn for the 2011 year taken from the 2012 budget papers. It was obtained from AusAID's website.

Year of data

1. Melanesia
The financial year for all PIC countries in Melanesia is for the calendar year: 1 January to 31 December. Central Bank Government Finance data for the year ended 2011 are provided for PNG, the Solomon Islands and Vanuatu. This was not yet available for Fiji and 2010 data are provided

instead. The changes from year to year in Melanesia countries can be substantial, so the latest data have been provided.

2. Polynesia
The financial year differs among Polynesian PICs. Cook Islands, Samoa and Tonga have fiscal years 1 July to 30 June. Tuvalu has a calendar year and Niue's financial year is 1 April to 31 March.

Government Finance data are not provided by central banks in Polynesia. Therefore, Ministry of Finance audited financial statement data are provided. Statistics Office data are provided for Niue.

However, the latest financial years for which data are available vary. The latest for Cook Islands is 2009, for Niue is 2005.

Recent audited financial statements are not yet available online for Samoa, Tonga and Tuvalu. Therefore, budget data have been used for Samoa and Tonga. A secondary data source has been referred to for Tuvalu. The Tuvalu Infrastructure Strategy and Investment Plan quotes outturn data from the Government of Tuvalu and this is used.

3. Micronesia
The financial year for the Compact States is 1 October to 30 September. Kiribati's financial year is the calendar year 1 January to 31 December. Nauru's financial year is 1 July to 30 June.

Audited financial statements, in accordance with the Office of Management and Budget Circular A-133 are the source of data for the Compact States. FSM (National Government)'s statements are available for year ended 30 September 2011. Palau and RMI's are available for year ended 30 September 2010.

The briefing note to the Donor Partners Meeting on the Medium Term Budget Framework is the source of data for Kiribati. The actual data are for the 2010 year.

Nauru's data are taken from the projected outcomes figures in the 2012 budget on AusAID's website.

Methodologies

The **Monetary and Finance Statistics Manual** offers guidelines for the presentation of monetary and financial statistics. It contains a conceptual framework and is not a compilation guide. This manual is used by central banks.

The **Government Finance Statistics Manual (GFSM)** describes the macroeconomic statistical framework designed to support fiscal analysis. It is issued by the IMF and is applied by all governments.

Government revenue includes all current and capital revenues. Current revenue is the revenue accruing from taxes, as well as all current nontax revenues except transfers received from foreign governments and international institutions. Major items of nontax revenue include receipts from government enterprises, rents and royalties, fees and fines, forfeits, private donations, and repayments of loans properly defined as components of net lending. Capital revenue constitutes the proceeds from the sale of nonfinancial capital assets.

Government expenditure includes current and capital expenditures. Current expenditure comprises purchases of goods and services by the central government, transfers to non-central government units and to households, subsidies to producers, and interest on public debt. Capital expenditure, on the other hand, covers outlays for the acquisition or construction of capital assets and for the purchase of intangible assets, as well as capital transfers to domestic and foreign recipients. Loans and advances for capital purposes are also included.

The **System of National Accounts** is the framework for preparing national accounts. It is harmonised with the MFSM and the GFSM.

Government Accounting Standards Board (GASB) issues Statements of Government Accounting Standards for use by USA state and local governments. These standards are used in preparing the financial statements of the US Compact Countries.

The **International Public Sector Accounting Standards Board** issues International Public Sector Accounting Standards (IPSAS). These standards are for the use of public sector agencies around the world for the preparation of general purpose financial statements. Few PICs prepare their financial statements in accordance with IPSAS.

GASB does not yet harmonise with IPSAS.

Caveats

Many of the statistical records in PICs are poorly kept or are incomplete. Data do not always accord with the frameworks and definitions in these worldwide standards.

Tables of data frequently give the impression that complete, accurate and timely data exists. This assumption does not hold true for PICs. The extensive call on Statistics Office for data from many international agencies, donors and NGOs exceeds their capability. Many international agencies, such as the World Bank and IMF, undertake their own surveys. The underlying systems do not yet provide reliable data which governments can use to evaluate programs and plan future implementation.

Few PIC governments are able to finalise their financial statements within six months of year end. Therefore governments are making decisions without the benefit of recent whole-of-government financial information.

Table A: information profile on public financial management data on pacific island countries

				Government Operations, excluding Donors					Government Operation Funded by Donors					
Region/Country	National Currency	Financial Year	Financial Year of Data	Total Revenue and Grants excluding Donors	Total Expenses, excluding Donors	Net Operating Balance or Structural Deficit	Net Acquisition of Non-Financial Assets	Fiscal Deficit / Surplus	Total Revenue	Total Expenses	Net Operating Balance	Net Acquisition of Non-Financial Assets	Fiscal Deficit / Surplus	Total Fiscal Deficit / Surplus
				Millions	Millions	Millions	Millions	Millions	Millions	Millions	Millions	Millions	Millions	Millions
Melanesia (Source Central Banks)														
Fiji[1]	FJD	1 Jan - 31 Dec	2010	1529	1105.2	423.8	794.9	-371	8.9	0	9	0	9	-362
PNG	KIN	1 Jan - 31 Dec	2011	8279.9	5412.6	2867.3	3976	-1109	1045	0	1045	0	1045	-63.7
SI	SBD	1 Jan - 31 Dec	2011	2233	1842	391	347.1	44	395	0	395	86.3	309	352.6
Vanuatu	VTM	1 Jan - 31 Dec	2011	12850	13333	-483	426	-909	2883.1	2101.2	782	854.5	-73	-982
Polynesia (Source: Budget Estimates, IMF and SPC)														
Cook Islands	NZD	1 Jul - 30 June	2009	126.44	135.21	-8.77	0	-8.8	7.2	5.9	1.30	0	1	-7.5
Niue	NZD	1 Apr - 31 Mar	2005	19.5	21.9	-2.4	-0.2	-2.6	0.2	0	0		0	-2.4
Samoa (Budget)	WST	1 Jul - 30 June	2012	489.5	540.3	-50.8	200.7	-251.5	133.7		134		134	-117.8
Tonga	TOP	1 Jul - 30 June	2011	151	186.7	-35.7	-74.4	-110.1	52.8		53		53	-57.3
Tuvalu[2]	AUD	1 Jan - 31 Dec	2010	18.0	30.6	-12.55	5.9	-18.5	24.5		25	17	42	23.1
Micronesia (Source: Audited Financial Statements and Budget Estimates)														
FSM (National)	USD	1 Oct - 30 Sept	2011	37.6	51.5	-13.9	0.5	-14.4	13.6	0	13.6	51.5	65	50.7
Kiribati	AUD	1 Jan - 31 Dec	2010	77.9	94.6	-16.7		-16.7			0		0	-16.7
Marshall Islands	USD	1 Oct - 30 Sept	2010	52.2	98.6	-46.4	0.2	-46.6	46.7		46.7	13.9	61	14.0
Nauru[3]	AUD	1 Jul - 30 June	2011	23.8	23.4	0.4	0	0.4	20.9	20.9	0		0	0.4
Palau	USD	1 Oct - 30 Sept	2010	47.7	106	-58.3	2.1	-60.4	27.4		27	20.1	48	-12.9

				Donor Funded	Financed By							
Region/Country	National Currency	Financial Year	Financial Year of Data	Unappropriated capital expenditures	Domestic Sources	Foreign Sources	Trust Funds	Est. Public Debt[4]	GDP (2011 current prices in national currency)[5]	GDP in USD 2011[5]	Population (UN Stats 2011)	Est. Annual Infrastructure Maintenance Requirement
				Millions	Millions	Millions	Millions	Millions	Millions	Millions	Millions	Millions (USD)
Melanesia (Source Central Banks)												
Fiji[1]	FJD	1 Jan - 31 Dec	2010		298.6	63.6	n/a	3,700.23	6,827.0	3,812.75	868,406	118.2
PNG	KIN	1 Jan - 31 Dec	2011		38	25.7	n/a	7,460.38	29, 841.5	12,586.17	7,013,829	390.2
SI	SBD	1 Jan - 31 Dec	2011	1572.0	n/a	n/a	n/a	1191	6,404.4	838.15	552,267	25.99
Vanuatu	VTM	1 Jan - 31 Dec	2011		n/a	n/a	n/a	13,922.66	69,613.3	778.07	245,619	24.12
Polynesia (Source: Budget Estimates, IMF and SPC)												
Cook Islands	NZD	1 Jul - 30 June	2009					114.8	348.2	275.14	20,414	8.53
Niue	NZD	1 Apr - 31 Mar	2005						n/a	n/a	n/a	n/a
Samoa (Budget)	WST	1 Jul - 30 June	2012					618.2	1545.5	667.34	183,874	20.69
Tonga	TOP	1 Jul - 30 June	2011					284.34	783.3	453.09	104,509	14.05
Tuvalu[2]	AUD	1 Jan - 31 Dec	2010					5.15	35.5	36.56	9,847	1.13
Micronesia (Source: Audited Financial Statements and Budget Estimates)												
FSM (National)	USD	1 Oct - 30 Sept	2011					87.1	318.5	318.45	111,542	9.87
Kiribati	AUD	1 Jan - 31 Dec	2010			-0.6	17.3	53.01	176.7	182.31	101,093	5.65
Marshall Islands	USD	1 Oct - 30 Sept	2010					109.5	189	189.01	54,816	5.86
Nauru[3]	AUD	1 Jul - 30 June	2011					n/a	69.5	71.682	10,308	2.22
Palau	USD	1 Oct - 30 Sept	2010				12.9	39.3	228.7	228.68	20,609	7.09
											TOTAL	**633.56**

Table A Notes:

1. Fiji deficit financed by Local and foreign financing. Local financing of 298.6 is through Local Bonds, Treasury Bills and other. Foreign financing of 63.6 is through international institutions and bilateral donors.
2. Data is from secondary source: The Tuvalu Infrastructure Strategy and Investment Plan, published 2012. 2010 Outturn data is used.
3. Projected full year outturn as at 31 May 2011
4. IMF Government Debt as percentage of GDP. Where not available, IMF available data is used. This may be domestic debt plus gross external debt figures are used, or external debt. Caution should therefore be used in analysing this debt data. Central Bank data differs.
5. Source: UNStats National Accounts Aggregates

Table B: information profile on budget frameworks in pacific island countries

Country	Medium Term Expenditure Framework (MTEF)		Costed Sector Strategies	Accrual Based Budgets	Cash Based Budgets	Year of Last PEFA Assessment
Melanesia						
Fiji	MTFF[1]	Budget year + two out years	N		Y	2005
PNG	MTFF				Y	2005[2]
SI	MTFS 2011		N	N	Y	2008
Vanuatu	-		N		Y	2009
Polynesia						
Cook Islands	MTBF 2012-15		N	Y		2011
Niue	MTBF 2009				Y	2011
Samoa	MTBF 2010				Y	2010
Tonga	MTBF 2013		N		Y	2010
Tuvalu	-				Y	2011
Micronesia						
FSM	MTB (by law)				Y	2011
Kiribati	MTBF	MTFF and MTEF	N	N	Y	2011
RMI	MTBF 2009 scope				Y	2011
Nauru	-				Y	2010
Palau	MTBF				Y	2012

Notes: 1. MTFF = Medium term fiscal framework; MTBF=medium term budget framework
2. PNG assessment was updated in 2009. A sub-national PEFA report was prepared in 2011.

The World Bank describes the establishment of medium term expenditure frameworks as a sequence of three increasingly demanding stages in the following terms:

"A medium-term fiscal framework (MTFF) – encompasses the top-down specification of the aggregate resource envelope and the allocation of resources across spending agencies.
A medium-term budgetary framework (MTBF) – In addition to the features of an MTFF, an MTBF includes both the bottom-up determination of spending agency resource needs and reconciliation of these with the resource envelope.
A medium-term performance framework (MTPF). Starting from an MTBF, an MTPF completes the shift in focus from inputs to outputs, with an emphasis on the measurement and evaluation of performance." (World Bank, 2012a)

Annex 3

Infrastructure Sector Data in Pacific Island Countries

List of Tables in Annex 3

The tables in this Annex provide information on infrastructure sectors across fourteen Pacific Island Countries.

There is a scarcity of data on infrastructure sectors in the Pacific. This supports a central recommendation of this report: that there should be greater collection of data relevant to infrastructure asset management. There was more information available in some sectors than others. Analysis of the water and power sectors benefited from the recent benchmarking exercises (Pacific Water and Wastes Association 2012; Pacific Power Association 2011). Some of the data in these reports, especially financial data, are confidential and could not be included in the information profile.

Source of information that were especially useful in the collation of data include:

- Asian Development Bank. 2007b. *Oceanic voyages: aviation in the Pacific* – airports.
- Asian Development Bank and GlobalWorks. 2007. *Improving the delivery of infrastructure in the Pacific* – across all sectors.
- Asian Development Bank. 2007c. *Pacific regional transport analysis* – ports.
- AusAID. 2008. *Pacific economic survey: connecting the region* – across all sectors, but especially roads, ports and airports.
- Pacific Association of Supreme Audit Institutions. 2010. *Pacific regional report on cooperative performance: audit of solid waste management.*
- Pacific Region Infrastructure Facility. 2011. *Pacific infrastructure performance indicators.*
- World Bank. 2006. *Pacific infrastructure challenge* – across all sectors, but especially roads, ports and airports.

A large number of reports and plan prepared with support from development partners were also useful in the collation of data. A list of comprehensive reports/plans that were especially useful included:

- Government of Nauru. 2011. *Economic infrastructure strategy and investment plan.*

- Government of Tuvalu. 2012. *'Fakafoou – to make new': Tuvalu infrastructure strategy and investment plan.*
- Government of Samoa. 2011. *Samoa national infrastructure strategic plan.*
- Government of Tonga. 2010. *Tonga national infrastructure investment plan.*
- Pacific Region Infrastructure Facility. 2009. *Kiribati infrastructure sector review.*
- Government of Vanuatu. draft. *Vanuatu infrastructure strategic investment plan.*

Caveats and Notes

The data presented here are accurate to the best of knowledge of the authors. **Tables are coloured grey where information was not available, or in cases where information is presented, to indicate that information taken from a source may be inaccurate.**

The use of the data for analysis is subject to a number of caveats. The data are collated from various sources. Methodologies used to prepare the data differ, meaning that readers should exercise caution in reaching conclusions based on comparisons of data in the table. Neither are the tables a complete record of infrastructure sectors in each Pacific island countries.

Some data may be out of date. Given the scarcity of data, information in various sectors was taken from reports that are more than five years old. This again points to the need to use this data with caution.

Table C: information profile on national planning

Country	National Development Plans	Infrastructure Master Plans	Sub-sector Plans/Strategies						
			Energy /Power	Telecom/ ICT	Water Supply, Sanit'n	Solid Waste	Transport		
							Land	Air	Sea
Cook Islands	●	● being updated			◐	◐			
FSM	●	● being updated	○						
Kiribati	●	○		◐					
Nauru	●	●			●	●			
Niue	●			◐	◐	●			
Palau	●	●	●	○	◐	●			
RMI	●	●	●	●		●			
Samoa	●	●	●		●				
Solomon Islands	●	●	◐	●	○		●	●	●
Tonga	●	●	●				◐	◐	
Tuvalu	●	●	●		●				
Vanuatu	●	●	◐	◐	● Port Villa Only		●	●	●

Symbols: ● **Yes/Present** ◐ **In Preparation** ○ **Planned/Under Consideration**

Table D: information profile on water and sanitation

Country	Service Provider	Legal Status	Price Regulation	Fully funded by user revenue	User fees as a percentage of income	Collection rate (percentage collected/ billed)	Non-revenue water (percentage production)	Value of assets recorded	Maintenance plan in place	Private sector participation
Cook Islands	Ministry of Infrastructure and Planning	Government department	Government	No	5.14			Yes	Yes	Yes
Federated States of Micronesia	Chuuk Public Utility	Statutory authority	Independent board	No	26.45	61	40	No	Yes	Yes
Federated States of Micronesia	Kosrae	Statutory authority	Government					No	No	No
Federated States of Micronesia	Pohnpei	Not for profit	Independent board	No	98.40	99	21	Yes	Yes	No
Federated States of Micronesia	Yap – North	Statutory authority	Independent board	Yes	100	100	9	No	Yes	Yes
Federated States of Micronesia	Yap – Central	Not for profit	Independent board	Yes	100	89	47	No	Yes	No
Federated States of Micronesia	Yap - South	Statutory authority	Independent board	Yes	100	89		No	No	Yes
Fiji	Water Authority of Fiji	Statutory authority	Government	No	41.19	100	50	Yes	No	Yes
Kiribati	Public Utilities Board	Statutory authority	Government	No	61.35	25	80	Yes	No	
Nauru	Nauru Utilities Corporation	State-owned enterprise	Government	No	8.6	77	48	No	No	
Niue	Water Supply Division, PWD	Government department	Government	Yes	100	60	100	No	No	Yes
Palau	Palau Water & Sewerage Corporation PWSC	Government department	Government	No	41.03	100	41	No	No	Yes

Annex 3: Infrastructure Sector Data in Pacific Island Countries

Country	Service Provider	Legal Status	Price Regulation	Fully funded by user revenue	User fees as a percentage of income	Collection rate (percentage collected/ billed)	Non-revenue water (percentage production)	Value of assets recorded	Maintenance plan in place	Private sector participation
Papua New Guinea	Eda Ranu	State-owned enterprise	Independent regulator	Yes	100		55	Yes	Yes	Yes
Papua New Guinea	PNG Water Board	Statutory authority	Board of Directors	Yes	100	90	38	Yes	No	Yes
Republic of the Marshall Islands	Majuro Water & Sewer Co.	State-owned enterprise	Government	No	90.97	92	72	No	No	Yes
Samoa	Samoa Water Authority	State-owned enterprise	Independent board	No	72.50	74	66	Yes	Yes	Yes
Solomon Islands	Solomon Islands Water Authority	State-owned enterprise	Government	Yes	100	83	55	Yes	Yes	
Tonga	Tonga Water Board	State-owned enterprise	Independent regulator	Yes	100	95	26	Yes	Yes	No
Tuvalu	Public Works Department	Government department	Government					No	No	
Vanuatu	UNELCO	Private sector organisation	Independent regulator	100	100	100	21	Yes	Yes	Yes

Table E: information profile on power

Country	Service Provider	Legal Status	Price Regulation	Composite performance indicator	Govt/cabinet appoints board	Regulation/ legislation for IPPs/PPAs	Self-funding[1]
Cook Islands	Te Aponga Uira O Tumu Te-Varovaro	Statutory authority	Board of Directors	2.62	Yes	Yes	Yes
Federated States of Micronesia	Kosrae Utilities Authority	Statutory authority	Board of Directors	2.22	Yes	No	
Federated States of Micronesia	Yap State Public Service Corporation	Statutory authority	Board of Directors	2.6	Yes	No	
Federated States of Micronesia	Chuuk Public Utility Corporation (CPUC)	Statutory authority	Board of Directors	2.29	Yes	No	
Fiji	Fiji Electricity Authority	Statutory authority	Independent regulator	3.83	Yes	Yes	Yes
Kiribati	Public Utilities Board	Statutory authority	Government	3.03	Yes		No
Nauru	Nauru Utilities Authority	State-owned enterprise	Government	2.52	No board	Being prepared	No
Niue	Niue Power Corporation	Government department	Government	2.27	No board	No	
Palau	Palau Public Utilities Corporation	Statutory authority	Independent board	3.03	No	Yes	
Papua New Guinea	PNG Power Limited	Statutory authority	Independent regulator	2.73		Yes, IPPs operate in PNG	Yes
Republic of the Marshall Islands	Kwajalein Atoll Utilities Resources Inc						
Republic of the Marshall Islands	Majuro Electric Corporation	Statutory authority	Government	2.39	Yes	No	
Samoa	Electric Power Corporation (EPC)	Statutory authority	Government	2.79	Yes	No	Yes
Solomon Islands	Solomon Islands Electricity Authority	Statutory authority	Government	2.75	Yes	No	
Tonga	Tonga Power Limited	Statutory authority	Independent regulator	3.1	Yes		Yes
Tuvalu	Tuvalu Electricity Corporation	Statutory authority	Board of Directors	2.83	Yes	No	No
Vanuatu	UNELCO	Private sector organisation	Independent regulator		No	Yes	Yes

Notes: 1. A self-funding organisation receives sufficient revenue from user charges and formal reimbursement of Community Service Obligations for it to meet operating expenditure requirements.

Table F: information profile on information and communication technology

Country	Service Provider/s	Legal Status	Price Regulation	Monopoly/Competition
Cook Islands	Telecom Cook Islands Limited (TCI)	Statutory authority		
Federated States of Micronesia	FSM Telecommunications Corporation (FSM Telecom)			
Fiji	Ten providers in 2008	Mix of private sector corporations and government owned entities	Regulation in some areas	Competition
Kiribati	Telecom Services Kiribati Ltd (TKSL), Television Kiribati Ltd	State-owned enterprises		Monopoly; limited competition between SOEs and with Sky television
Nauru	Digicel	Private - concession	Prices regulated in agreement between GoN and Digicel	Monopoly
Niue	Department of Post and Telecommunications; Internet User's Society of Niue	Government; Not for profit	Government; Board of Directors	Monopoly
Palau	Palau National Communications Corporation (PNCC); private sector company	Not for profit/government; private sector organisation	Board of Directors	Competition
Papua New Guinea	Telikom PNG; Digicel - PNG	State-owned enterprise; Private sector organisation	Independent regulator	Competition
Republic of the Marshall Islands				
Samoa	BlueSky; Digicel - Samoa	State-owned enterprise; Private sector organisation	Independent regulator	Competition
Solomon Islands	Solomon Telekom Company Limited; B-mobile	Private sector organisations (govt is a shareholder in STKL)		Competition
Tonga	Tonga Communication Corporation (TCC); Digicel - Tonga	Statutory authority; Private sector organisation	Government regulation in some areas	Competition
Tuvalu	Tuvalu Telecom Corporation	Statutory authority	Board of Directors	Monopoly (attempts to attract competition not successful to date)
Vanuatu	Telecom Vanuatu Limited (TVL) Digicel Vanuatu	Private sector organisations (govt is a shareholder in TVL)	Independent regulator	Competition

Table G: information profile on aviation

Country	Service Provider/s	Legal Status	Independent Regulation	Self-funding
Cook Islands	Cook Islands Airport Authority	State-owned enterprise	Prices set by Board of Directors, with informal approval by government	No
Federated States of Micronesia	Pohnpei Port Authority		No	Yes
Federated States of Micronesia	Yap State Public Works Department	Government department	No	No
Fiji	Airports Fiji Limited	State-owned enterprise	Civil Aviation Authority of the Fiji Islands (CAAFI) establishes/enforces safety regulations	Yes (cross subsidy)
Kiribati	Ministry of Communications, Transport and Tourism Development	Government department	No	No
Nauru	Department of Civil Aviation	Government department	No	No
Niue				No
Palau				
Papua New Guinea	National Airports Corporation	State-owned enterprise	Independent regulator	No
Republic of the Marshall Islands	Marshall Islands Port Authority	State-owned enterprise		
Republic of the Marshall Islands	Marshall Islands Airport Authority (Amata Kabua International Airport in Majuro)	Statutory authority		
Samoa	Samoa Airport Authority	Statutory authority	Civil Aviation Authority establishes safety regulations	No
Solomon Islands	Ministry of Communications and Aviation	Government department	No	No
Tonga	Tonga Airports Ltd	State-owned enterprise	Civil Aviation Authority establishes/enforces safety regulations	Yes
Tuvalu	Department of Civil Aviation	Government department	No	No
Vanuatu	Airports Vanuatu Limited (AVL) (3 primary airports)	State-owned enterprise	Department of Civil Aviation (DCA)	
Vanuatu	Department of Civil Aviation (DCA) (secondary airports)	Government department	Department of Civil Aviation (DCA)	No

Table H: information profile on ports

Country	Service Provider/s	Legal Status	Port Ownership	Private sector participation in port operations	Self-funding	Price Regulation
Cook Islands	Ports Authority	State-owned enterprise	Government	No	Yes	Board of Directors
Federated States of Micronesia	Pohnpei Port Authority	State-owned enterprise	Government	Yes	Yes	Government
Federated States of Micronesia	Kosrae Ports Authority	Government	Government	Yes	No	Government
Federated States of Micronesia	Chuuk State Division of Planning	Government department	Government	Yes	No	Government
Federated States of Micronesia	Yap State Public Works Department	Government department	Government	Yes	No	Government
Fiji	Fiji Ports Corporation Ltd (FPCL) (primary ports)	State-owned enterprise	Government	Yes (Suva)	Yes	Board of Directors, approved by Cabinet and Commerce Commission
Fiji	Department of Public Works (minor ports in rural areas)	Government department	Government	No	No	
Kiribati	Kiribati Port Authority	State-owned enterprise	Government	No	Yes	
Kiribati	Island Councils	Sub-national Government	Government	No	No	Sub-national Government
Nauru	Marine Department	Government department	Government	No		
Niue			Government			
Palau			Government	Yes (Koror)	Yes	Board of Directors
Papua New Guinea	Ports PNG Limited	State-owned enterprise	Government	Yes (PoM, Lae)		Independent regulator
Republic of the Marshall Islands	Marshall Islands Port Authority	State-owned enterprise	Government	Yes		
Samoa	Samoa Ports Authority	State-owned enterprise	Government	Yes (Apia)	Yes	Government
Solomon Islands	Solomon Islands Ports Authority	State-owned enterprise	Government	No	No	
Tonga	Ports Authority of Tonga (Nuku-alofa)	State-owned enterprise	Government	Yes (Nuku-alofa)	Yes	Board of Directors

Country	Service Provider/s	Legal Status	Port Ownership	Private sector participation in port operations	Self-funding	Price Regulation
Tonga	Maritime Authority (under Ministry of Transport) – secondary ports	Government department	Government			
Tuvalu	Department of Marine and Port Services	Government department	Government	No	No	Government
Vanuatu	Department of Ports and Harbours (aka Ports Authority) – primary ports	Government department	Government	Yes (Port Vila)	Yes	Government
Vanuatu	Public Works Department – secondary ports	Government department	Government			

Table I: information profile on roads

Country	Service Provider/s	Private sector participation in construction/maintenance	Road/Transport fund
Cook Islands	Public Works Department		No
Federated States of Micronesia	Pohnpei Transport Authority (PTA)		
Federated States of Micronesia	Kosrae State Department of Transportation and Public Works		
Federated States of Micronesia	Chuuk State Division of Planning		
Federated States of Micronesia	Yap State Public Works Department (PWD)		
Fiji	Fiji Roads Authority	Yes	No
Kiribati	Ministry of Public Works – primary roads Island Councils – secondary roads	No	No
Nauru	Department of Transport	No	No
Niue			
Palau	Bureau of Public Works (BPW)	Yes	
Papua New Guinea	National roads – Department of Works and Implementation; National Road Authority Provincial and Local roads – Provincial Governments and city councils	Yes	Yes
Republic of the Marshall Islands			
Samoa	Public Works Department	Yes	No
Solomon Islands	Ministry of Infrastructure Development	Yes	Yes
Tonga	Ministry of Works (MOW) is responsible for maintaining primary roads, while secondary and access roads are a community responsibility with government subsidy	Yes	No, although a road fund has been considered
Tuvalu	Department of Public Works	Yes (donor-funded construction)	No
Vanuatu	National roads – Public Works Department Local roads – Municipalities		

Table J: information profile on waste management

Country	Service Provider/s	Integrated waste management plan	Recommendations	Cost recovery
Cook Islands	Aitutaki Waste Facility Ministry of Works Ministry of Health National Environment Service Rarotonga Waste Facility Islands Administrations (AIT, MGS, AIU, MUK, MOI, MHX, PYE, PZK, NAS, JRAK) Private Sector – T&M Health Ltd Households	Draft National Waste Management Strategy (NWMS)	Environment Act 2003 Public Health Act 2004 Monitor actual practices vs key performance indicators NWMS be endorsed by Cook Islands Government to give it legal status Obtain reliable estimate of life span of landfill Monitor collection by private sector provider	Environmental levy for visitors and landfill tipping fees
Federated States of Micronesia	State Dept of Public Works - Chuuk, Yap, Kosrae and Pohnpei Pohnpei Waste Management Services Waste Recycling Facility DPW - Weno Recycling Facility DPW - Tomoas Islands Municipality Dumpsites Kosrae - Lelu, Tafumele, Malem, Utwe, Watung Yap - Dept of Works and Transport WAAB Transportation Co.	Not yet	Roles and responsibilities of all parties be determined and communication protocol developed. Legislation be drafted. Minimisation Study be conducted. EPA develop strategic to ensure compliance with EPA Regulations Inspect to ensure hazardous waste is incinerated prior to removal from medical facilities.	Disposal fee on some imported items
Fiji	Fiji Waste Management Authority Dept of Environment Waste Management and Pollution Control Unit Dept of Local Government Central Board of Health Ministry of Finance Dept of National Planning Dept of Town and Country Planning Private waste operations Ministry of Labour (OHS Dept) Municipalities Rural Authorities Rural Villages Ministry of Health Ministry of Fijian Affairs HG Leach	National Solid Waste Management Strategy (2011-2014)	Waste Management Regulations under the EMA 2005 Fijian Affairs Act Public Health Act Environment Management (EIA Process) Regulations 2007 Environment Management (Waste Disposal and Recycling) Regulations 2007 Litter Promulgation 2008 Biosecurity Promulgation 2008	Budget allocation to DOE, DOLG, CBH Tipping fees at Naboro Landfill Separate annual garbage collection rate Households general rates including waste charge

Country	Service Provider/s	Integrated waste management plan	Recommendations	Cost recovery
Fiji	Carpenters Waste Corp Waste Recyclers Waste Clear Central Board of Health			
Kiribati	Betio Town Council Teinainano Urban Council Island Councils	Draft National Solid Waste Management Strategy 2007	n/a	Collection fee for HH but revenues only partly used for SWM
Nauru	Nauru Ronphos Corporation (SOE) ?? Nauru Rehabilitiation Corporation Dept of Environment Ports Authority NFMRA		n/a	No
Niue	Unknown			No
Palau	Ministry of Public Infrastructure, Industry and Commerce Bureau of Revenue, Customs and Taxation Ministry of Finance Solid Waste Management Office Environment Quality Protection Board (EQPB) Public Health Safety Inspection Each State Government x 15 Palau State Government (Koror) - Collection	Draft Solid Waste Management Plan 2008	Regulations under the Recycling Act (RA) 2006 awaiting review and approval by the President EQPB impose performance bond on the SWM to provide guarantee of proper operation and closure of M-Dock Landfill. Agencies to meet to discuss budget for M-Dock Landfill and to familiarise stakeholders on its operation and need for adequate budget. Tipping Regulations be reviewed to enable implementation. SWM be funded to provide public outreach programs to educate public. Testing and inspection of sites be carried out regularly. Wastes be segregated in the landfill. Performance reports be submitted as required.	No
Papua New Guinea	Dept of Health (Trade Waste) Dept of Environment and Conservation (DEC) Environmental Protection Authority National Capital District Commission Provincial and Local Level Governments		No legislation deals specifically with solid waste management. The following acts cover some aspects: The Environment Act, 2000 Public Health Act 1973 Public Health (Sanitation & General) Regulation 1973	

Country	Service Provider/s	Integrated waste management plan	Recommendations	Cost recovery
Republic of the Marshall Islands	Ministry of Health Ministry of Public Works Majuro Atoll Waste Co (Management) Majuro Atoll Local Government (Collection) Marshall Islands Conservation Society OEPPC National Environment Protection Authority (EPA) Chamber of Commerce Marshall Islands Tourism Association Households	Draft Environmental Management Plan	National Environmental Protection Act 1984 and Public Health, Safety and Welfare Act to be updated (not updated since 1989). Regulations to be designed for RMI conditions. National Solid Waste Strategic Plan be prepared.	In Majuro, revenues from fees, subsidies and sales recyclables
Samoa	Ministry of Natural Resources, Environment and Meteorology Government of Samoa	Yes (2010)		No fees for collection, tipping fees at landfills
Solomon Islands	Honiara City Council - Environmental Health Division Provincial Towns BJS Agencies Ltd. Leksmetol Trading National Referral Hospital	No	No waste management legislation	Council Taxes include waste management
Tonga	Waste Authority Ltd Tongan Environmental Community Action Network	Draft prepared (2010)	Waste Management Act 2005	Fees exist but only 6% is paid
Tuvalu	Ministry of Home Affairs Municipalities (Kaupule) Solid Waste Agency of Tuvalu Private sector recycler	Not yet Integrated Solid Waste (ISW) Plan for Funafuti 2005	Wastes and Operations Services (WOS) Act 2009 National Solid Waste Strategy (NSWS) to be developed. Agencies to know their responsibilities. Revise ISW Plan Environmental and Public Health Standards and monitoring arrangements be developed. Waste collection procedures be developed. Match collection fees to costs Train staff. Collect data on waste.	Collection fees on Funafuti
Vanuatu	Port Vila Municipal Council Villages	Draft Vanuatu National Waste Management Strategy and Action Plan 2010-2015	Support waste management with legislation Make waste management financially self sustaining Develop skilled and trained people Reduce waste Dispose in environmentally sound manner Upgrade waste collection systems Coordinate national waste management activities and monitor	Revenues from property tax, tipping fees and pre-paid bags

Annex 4

Acknowledgements and List of Persons Consulted for this Report

The authors would like to extend sincere thanks to all the peer reviewers and participants who generously shared their time and expertise, including the PRIF Partners and Daisuke Mizusawa (Infrastructure Specialist, ADB) for peer reviewing the report. Pauline Muscat (Energy Sector Specialist, PIAC) prepared the PUB case study included in this report.

We are also indebted to the following people for providing information used in this study. The list of organisations is placed in alphabetical order, while the names under each are in no particular order.

Asian Development Bank

- Robert Guild – Director
- Andrea Iffland – Regional Director
- Richard Phelps – Senior Infrastructure Specialist
- Rishi Adhar – Senior Project Officer
- David Ling – Project Officer
- Aaron Batten – Country Economist, PNG
- Marcelo Minc – Country Director, PNG
- Wen Zhang – Infrastructure Specialist, ADB Subregional Office, Fiji
- Maria Paniagua – Project Officer, ADB Subregional Office, Fiji
- Laure Darcy – Private Sector Development Initiative (PSDI)
- Kymberley Kepore – Private Sector Development Initiative (PSDI)
- Hayden Everett – Financial Sector Specialist (Public Finance)
- Milovan Lucich – Senior Economist
- Anthony Gill – Country Specialist

Australian Agency for International Development

- Peter Kelly – Senior Infrastructure Advisor
- Matt Harding – Senior Economist
- Rob Harden – Senior Economist
- Patrick Dennis – Transport Sector Support Program, Australian High Commission in PNG
- Kirsten Hawke – Deputy Development Coordinator (RAMSI)

Cook Islands Airport Authority

- Joseph Ngamata – Chief Executive Officer
- Noo Maui – Manager of Technical Service
- Tony Macquarie – Manager of Maintenance
- Akanoa Williams – Manager of Terminal Services
- Nga Jassie – Chief Fire Officer, Airport Authority

Cook Islands Investment Corporation

- Tamarii Tutangata – Chief Executive Officer

Cook Islands Port Authority

- Nooroa (Bim) Tou – Chief Executive Officer

European Union

- Renato Mele – Head of Infrastructure and Energy section, Fiji Office

European Investment Bank

- Katrin Bock – Business Analyst, Sydney Office

Fiji Electricity Authority

- Anand Nanjangud– Chief Information Officer
- Bobby Naimawi – Chief Financial Officer
- Hasmukh Patel – Chief Executive Officer
- Eparama Tawake – General Manager, Generation
- Om Dutt Sharma – General Manager, Network

Fiji Ministry of National Planning

- Kamal Gounder – Infrastructure Manager

Justice Asset Management System (JAMS)

- Jeremy Watson – Assets and Infrastructure Advisor, RAMSI Law and Justice Program

New Zealand Aid Programme

- Jonathan Fletcher – Principal Development Manager
- Andrew Kibblewhite – Senior Evaluation Advisor
- Matthew Howell – Solomon Islands Post
- Luke Kiddell – First Secretary Development, Honiara

Pacific Financial Technical Assistance Centre

- Matt Davies – PFTAC Coordinator
- Ron Hackett – PFM specialists, Fiji
- Stephen Mayes – PFM specialists, Fiji

Pacific Islands Forum Secretariat

- Scott Hook – Economic Infrastructure Adviser
- Seini O'Conner – Executive Officer on Pacific Plan

Papua New Guinea Department of Transport

- Philemon Meapa – a/g First Assistant Secretary, Policy and Research Division
- Manfred Ruzsicska – Policy Development Advisor under TSSP

Papua New Guinea Department of Works and Implementation

- Stephen Pup – Manager Contracts
- Eddy Sangador Jr – Assistant Secretary of Road Asset Management System
- Karo Keana – Assistant Secretary of Budget and Project Coordination

Papua New Guinea National Road Authority

- Roy Mumu – Chief Executive Officer
- Pogene Poya – Manager for Contracts
- Jacob Gele – Manager of Bridge Asset Management System (BAMS)

Public Utilities Board, Kiribati

- Kevin Rouatu – CEO, PUB
- Kiriati Birita – Power Engineering Manager
- Kautoa Karaiti – Mechanical Engineer, Betio
- Tenikoria Katauea – Mechanical Engineer, Bikinebeu
- Agesta Ruoikabuti – Finance Manager
- Rameka Takirua – Consultant (former PUB Finance Manager)

Samoa

- Tupa'imatuna Iulai Lavea – CEO, Ministry of Finance
- Leasiosiofaasisina Oscar Malielegaoi – Assistant CEO, Ministry of Finance
- Leiataua Isikuki Punivalu – Managing Director, IPA Ltd.
- Leasi Vainalepa Galuvao – CEO, LTA

Solomon Islands

- Moses Virivilomo – Permanent Secretary, Ministry of Infrastructure Development
- Paula Uluicaneva – Development Coordinator

Te Aponga Uira O Tumu-Te-Varovaro (Cook Islands Power Utility)

- Tama Heather – Distribution division

Telesource Fiji

- Michel El-Rahi – General Manager

Tonga Water Board

- Simone Helu – Chief Executive Officer
- Pita Moala – Head Engineering & Project Manager
- Susitina S F Kolo – Financial Accountant, Head of Finance

Water Authority of Fiji

- Opetaia Ravai – Chief Executive Officer

World Bank Group

- Michel Kerf – Sustainability Leader, Sydney Office
- Tobias Haque – Economist, Suva
- Scott Wilkinson – Junior Professional Associate Road and Transport, Sydney Office
- James Reichert – Senior Infrastructure Specialist
- Roberto Gabriel Aiello – Senior Energy Specialist

The authors would also like to thank the following people for their thoughts during informal discussions (in no particular order):

- Cedric Saldana – ADB Consultant
- Paul Barker – PNG Institute of National Affairs
- Matt Morris – PNG Independent Public Business Corporation
- Anthony Swan – Development Policy Centre
- Serge Cartier Van Dissel – PRIF Consultant
- David Hammond – PRIF Consultant
- Terry Heap – ADB Consultant

- Robin Davies – Development Policy Centre
- Stephen Howes – Development Policy Centre
- Angus Barnes – Sinclair Knight Merz (SKM)
- Eleanor Fenton – RAMSI, Sinclair Knight Merz (SKM) Consultant
- Dr Jane Stanley – Director, FOCUS Pty Ltd
- K C Leong – Author of “The Essence of Asset Management”
- Pim van den Berg – Researcher, Netherlands