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National Infrastructure Investment Plan

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Executive Summary

Background

This National Infrastructure Investment Plan (NIIP) outlines the Government of Tonga's priorities and plans for major initiatives in the economic infrastructure sector (energy, telecommunications, water, solid waste management, transport) over the next 5-10 years. It responds to a number of challenges facing Government:

- the need for a comprehensive overview that brings together the various sector and agency plans into a single source of information about infrastructure projects in the pipeline;
- the need for a longer term view and sector-wide approach to infrastructure planning and management, and a more systematic approach to identifying future priorities;
- Government's constrained budget position and the need to work with Public Enterprises, the private sector, and development partners to develop sustainable mechanisms for funding infrastructure delivery and maintenance based on sound economic and financial principles; and
- the need for greater attention to strategic asset management and consideration of the life cycle (especially maintenance) costs generated by new investments, including issues such as operating efficiencies and demand-side management, and the institutional and regulatory environment for infrastructure.

The Plan is country owned and led, and was developed with full participation of and consultation with internal stakeholders and private sector representatives. The process involved the following key steps:

- assembling a comprehensive long list of economic infrastructure projects in the pipeline based on information from Government, Public Enterprises, and development partners;
- developing and applying a robust prioritisation methodology that reflects national objectives as outlined in the *National Strategic Planning Framework 2009/2010 – 2014/2015*, and the infrastructure development priorities of the private sector;
- screening the long list of projects to identify the investments projects that are already underway or have committed funding, and those additional investments that are "high priority" for implementation in the next 5 years;
- considering the whole-of-sector planning implications of the high priority projects, including linkages and related projects and complementary (non-infrastructure) initiatives required to obtain best long-term value from investments;
- assessing the financial sustainability and level of cost recovery of existing infrastructure and the proposed investments, and linkages with public sector financial management framework; and
- assessing the current infrastructure funding position of Government and Public Enterprises, and potential funding mechanisms that can form the basis for discussion between Government and development partners.

The findings are brought together in this National Infrastructure Investment Plan.

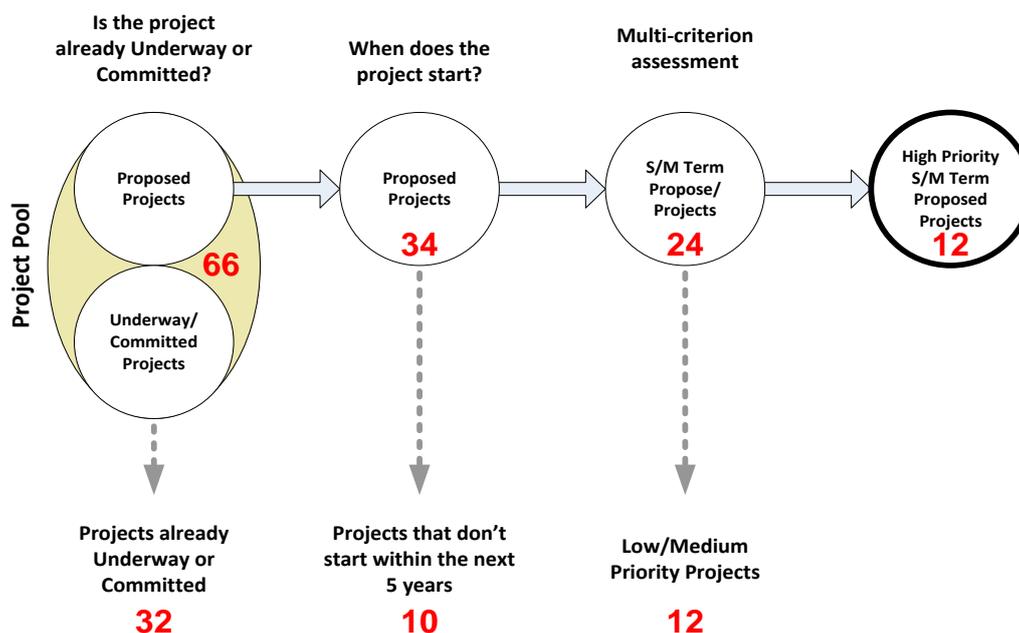
Key Findings

Government recognises that while infrastructure investment projects are important, they are only part of the story. They go hand in hand with improved management of existing and new infrastructure, and initiatives to improve the overall institutional and regulatory environment for infrastructure development. As a result, this NIIP is much more than a list of project proposals. **The NIIP is an integrated program of new investments, supporting complementary initiatives, and linked projects.** Complementary initiatives are non-infrastructure measures (planning road maps; policy changes; institutional/regulatory/financial reforms; technical assistance; etc) that support the Government priority to make the most of existing infrastructure and obtain best value from new investments.

The complete list of investment projects identified by the NIIP includes 66 projects spread across the economic infrastructure sectors, totalling around \$540 million of investment over the next 5 years; and an additional \$150 million in years 5-10 (note that all costs are in Tongan pa’anga, TOP). This includes projects that are currently underway; projects that are not underway but have committed funding; and proposed projects with possible implementation within the next 5-10 years. Almost \$360 million of investment is already underway or committed for the next 10 years. This includes more that \$80 million of investment self-funded by Public Enterprises.

These figures reflect a peak in infrastructure investment that is expected over the next 3-5 years as a number of major projects are implemented. Major projects that are already underway or committed include the National Roads Improvement Program (\$80m); electricity generation and distribution upgrades (\$60m); Nuku’alofa CBD infrastructure redevelopment and Vuna Wharf cruise ship terminal (\$50m); delivery of the new inter-island ferry (\$25m); and Vaipua Bridge reconstruction (\$14m).

Within the next 5-10 years, it is unlikely that it will be possible to fund all of the projects that have been proposed. Therefore, priorities need to be set. Projects that are not already underway or have committed funding were progressively screened to identify projects that are planned to proceed in the next five years, align well with national priorities, and deliver strong benefits to the Tongan people. A formal Multi-Criterion Assessment process was used to prioritise these projects into Low/Medium/High priority bands. The process and the number of projects at each stage of the process are shown in the following diagram.



The outcome of the prioritisation process is twelve “high priority” proposed projects for the next five years, totalling some \$146 million. The projects are listed in the following table, along with the estimated total cost of projects already underway or committed for the next five years. If all of the priority projects are implemented, the total investment in economic infrastructure over the next five years would be some \$480 million. Almost 70% of this investment is in projects already underway (\$220 million), or already committed (\$110 million).

Summary of high priority proposed projects

Sector	Ref	Project	Estimated Cost (\$m)	2011-2015					
Energy	E11	Solar generation (Tongatapu - Additional 1MW)	\$14.0						
	E12	Renewable energy pilots (Coconut Oil/land fill gas)	\$3.0						
	E13	Energy Roadmap TGIF Projects	tbd						
Telecoms	T5	Upgrading of TBC Radio Towers	\$1.5						
	T6	International Fibre-Optic Cable	\$60.0						
	+ T7	Local Reticulation of High Speed Internet	\$8.0						
Water	W2	Upgrade Tongatapu (wells, storage, distribution)	\$6.5						
Solid Waste	S3	Vava'u Semi-Aerobic Landfill Facility	\$4.0						
Ports	P9	Inter-island port and terminal upgrades	\$10.0						
Airports	A8	Resurfacing of Fua'amotu runway, apron, taxiway	\$28.0						
	A10	Resurfacing of Vava'u runway, apron, taxiway	\$4.0						
	A11	Resurfacing Ha'apai runway, apron, taxiway	\$7.0						
Sub-total – high priority proposed projects			\$146						
+ Projects Underway			\$221						
+ Committed Projects			\$112						
TOTAL			\$479						

However to obtain full value from any new capital investments, the investment must be supported with initiatives to improve management of existing and new infrastructure, and initiatives to improve the overall institutional and regulatory environment. This integrated framework of priority investments and complementary initiatives is the essence of the NIIP. The framework is summarised in the following table, structured in terms of the Government’s four priority themes for development of economic infrastructure over the next five years: *Greener Energy and more Stable Prices; Better Access to Markets; Better Management of the Water and Waste Cycle; and Better Asset Management.*

Summary of priority projects and complementary initiatives by theme

Theme	Sector	Priority Investment Projects	Complementary Initiatives
Greener Energy and more Stable Prices	Energy	<p>Energy Roadmap implementation</p> <ul style="list-style-type: none"> Renewable energy installations (solar \$14m) and pilot plants (biogas, coconut \$3m) Infrastructure components of the Energy Roadmap demand-side management program Tonga Green Incentive Fund (infrastructure components) 	<p>Energy Roadmap implementation</p> <ul style="list-style-type: none"> Technical assistance for policy, legal, regulatory adjustments DSM and other non-infrastructure aspects of the Energy Roadmap Tonga Green Incentive Fund (other components) Improved fuel supply chain and price stability (e.g. hedging, upgrade tank farm, etc)
Better Access to Markets	Telecoms	<ul style="list-style-type: none"> Under-sea optic fibre cable linking Tonga with international networks (\$60m) Upgrading of TBC AM radio transmitter (\$1.4m) 	<ul style="list-style-type: none"> Local reticulation of high speed internet by appropriate technology (such as cabling) Private sector and Government initiatives that take advantage of opportunities emerging from improved internet access (such as the E-Government Initiative)
	Ports	<ul style="list-style-type: none"> Rehabilitate outer island ports to improve safety/reliability/ efficiency and support economic development (follow-up to immediate works to reconfigure ports for the new ferry) (\$10m) 	<ul style="list-style-type: none"> Develop post harvest facilities (handling, storage, processing) in conjunction with inter-island and international ports so that fishing and agricultural produce can be prepared, processed and stored for export and domestic markets. (initial support by EU)
	Airports	<ul style="list-style-type: none"> Resurface airport runways (Tongatapu \$28m, Ha'apai \$4m, Vava'u \$7m) 	<ul style="list-style-type: none"> Update the policy environment for domestic aviation (study supported under the TSCP program). Government's response to the TSCP recommendations may require the support of specialist technical assistance. Develop post harvest facilities (handling, storage, processing) in conjunction with airports (initial support by EU)

Theme	Sector	Priority Investment Projects	Complementary Initiatives
Better Management of the Water and Waste Cycle	Water	<ul style="list-style-type: none"> Accelerate the existing program to rehabilitate and upgrade water supply systems (especially Nuku'alofa) to increase efficiency, reduce losses etc. (\$6.5m) 	<ul style="list-style-type: none"> Prepare a roadmap for the Water Sector that examines the full water cycle, including waste water and drainage. The roadmap should address <ul style="list-style-type: none"> (a) institutional responsibilities in the water and waste sectors, including an organisational and business model for managing urban drainage (b) the TWB financial and pricing model and revenue collection; (c) drainage plan for Nuku'alofa; (d) a water and drainage investment plan for the next 10 years. Prepare a sector roadmap that addresses current issues and required improvements to the institutional, financial and operational model for the sector and provides a 5-10 year investment plan.
	Solid Waste	<ul style="list-style-type: none"> <u>Delay</u> new infrastructure investments, pending the results of the proposed sector roadmap New semi-aerobic landfill at Vava'u, depending on the outcome of the sector roadmap (\$4m) Other recommendations of the sector roadmap 	
Better Asset Management	All Sectors		<ul style="list-style-type: none"> Institutional reform to clarify and simplify institutional responsibilities across all sectors. Develop a national policy for strategic asset management, that promotes asset management as a core function of agencies and incorporates a longer-term view of infrastructure needs and asset management. Investigate the potential for establishing a multi-sector regulatory regime that reviews and make recommendations regarding pricing of common-user services (power, water, waste, telecom wholesaling)
	Roads	<ul style="list-style-type: none"> No <u>additional</u> priority projects over the next five years. The priority is to complete the projects already underway or committed 	<ul style="list-style-type: none"> Implement new arrangements for sustainable road maintenance funding and delivery (study supported under the TSCP program). Government's response to the TSCP recommendations may require the advisory support of specialist technical assistance.
	Domestic Ports		<ul style="list-style-type: none"> Implement new institutional/financial arrangements for sustainable management and maintenance of domestic ports.

Capacity to Sustain Existing and Fund Proposed Infrastructure

As already mentioned, there is expected to be a peak in infrastructure investment over the next 3-5 years. This creates a major challenge for Tonga to fund and sustainably maintain existing infrastructure and high priority new investments. Under current arrangements, responsibility for economic infrastructure operation and maintenance is split between Public Enterprises and Ministries, with all economic infrastructure except roads and outer islands ports currently under the management of Public Enterprises.

Government has very limited capacity for financing economic infrastructure activities either from its Budget or through borrowing:

- over the last two years, the economy has been in recession and a Budget deficit is forecast for 2010/11. Although the outlook is expected to improve in the medium-term, Budget conditions are expected to remain tight;
- the level of existing Government debt and impending principal and interest repayments will also pose significant challenges. Tonga's total debt as a percentage of revenues is currently sitting at 236%, which is above the Government's target of 200%. The country's present value of debt to GDP and present value of debt to exports are expected to exceed their debt sustainability thresholds of 100% and 30% until at least 2018; and
- dividends from Public Enterprises are not a significant revenue source, nor are they likely to be so in the medium term.

These conditions severely limit the capacity of Government to self-fund infrastructure initiatives.

For Public Enterprises, the picture is mixed. The following table summarises the results of an analysis of the capacity of Public Enterprises to self-fund infrastructure maintenance and renewal.

Analysis of capacity for self-funding infrastructure costs

Sector	Agency	Operations	Maintenance	Small CAPEX	Medium CAPEX	Large CAPEX
Energy	Tonga Power					
		High	High	High	High	Medium
Telecoms	Tonga Communications Corp. (TCC)					
		High	High	High	High	Medium
	Tonga Broadcasting Commission (TBC)	High	Medium	Medium	Low	Low
Water	Tonga Water Board (TWB)	High	Medium	Medium	Low	Low
Waste	Waste Authority Ltd	Medium	Low	Low	Low	Low
Transport	Tonga Airports Ltd (TAL)					
		High	High	High	Medium	Low
	Ports Authority Tonga (PAT)	High	High	High	High	Low

Several Public Enterprises (Tonga Power, TCC, PAT, TAL) have effective maintenance and investment programs in place and can fully fund routine maintenance and small-medium asset renewal from their own resources. However, these Public Enterprises would struggle to self-fund investments to replace or rehabilitate the largest item of infrastructure that the Public Enterprise already owns (such as the airport runway) or is required in order to transform the sector (such as an undersea fibre-optic cable). TBC and Tonga Water are struggling to keep pace with maintenance requirements, resulting in a gradually deteriorating infrastructure condition. Both can partially fund required maintenance and small infrastructure projects, but do not have the financial strength to keep pace with demand. Waste Authority cannot fully fund the cost of operations and maintenance from its own resources and requires a Government subsidy to remain financially viable. In addition, Public Enterprises (with the possible exception of Tonga Power and TCC) have limited capacity for additional borrowings based on an analysis of their debt carrying capacity.

Funding Strategy

Tonga does not currently have the capacity to finance substantially more infrastructure assets without substantial assistance from development partners, even if those investments are high priorities. As already noted:

- Government Budget position is weak and projections of future surpluses are fragile based on recent experience;
- Government capacity for further borrowing and loan guarantees is very limited; and
- capacity of Public Enterprises to finance infrastructure from internal sources varies, but generally is not sufficient to replace/rehabilitate major infrastructure items, or introduce significant new innovations to transform the sector.

In addition, Tonga has a small local capital market, which means that while offshore sources of finance remain important, options are limited because Tonga does not have a credit rating.

Funding is required for three basic infrastructure activities: maintenance, complementary initiatives and priority investments. The funding of NIIP priority investment projects is uncertain, although tentative plans are already in place for the larger of these projects (including the submarine fibre optic cable, and elements of the *Energy Road Map* implementation). Bringing these investment projects to fruition in a way that the Government's debt sustainability plans are not compromised will be important.

Maintenance of existing and new infrastructure is a high priority. Government policy is that the cost of operations and maintenance of economic infrastructure should be funded from user charges wherever possible. Government intends to work closely with Public Enterprises, the private sector, and development partners to lift the overall performance of the economic infrastructure sector, and as a minimum, achieve self-funding of operations and sustainable maintenance by Government and Public Enterprises.

In the short- to medium-term, making better use of existing infrastructure is a priority. Government considers that despite current financial constraints, substantial progress can be made towards optimising the use of existing and new infrastructure assets, through improved asset management and operating efficiencies. In particular, much progress can be made with relatively modest budgets and development partner support for complementary initiatives (mostly technical assistance) aimed at:

- improving the financial and operational performance of infrastructure management;
- improving asset management and maintenance; and
- creating an improved environment for infrastructure development and financing.

In addition to specific complementary initiatives, Government intends to strengthen the policy and operational environment for funding and managing infrastructure by:

- promoting the principles of strategic asset management as a framework for an improved approach to infrastructure management by Ministries and Public Enterprises. All proposed investments should be supported by an asset life-cycle costing and asset management plan;
- establishing appropriate maintenance expenditure levels and requiring that Public Enterprises and Ministries cover the cost of infrastructure maintenance and operations from user fees, including cost recovery and price setting under regulatory arrangements, and where this is not possible, to have transparent funding arrangements. Government may delay support for further investments until a minimum level of financial sustainability has been achieved;
- exploring the option of setting aside funds for maintenance into reserve accounts which can only be used for maintenance purposes;
- strengthening forward planning requirements by requiring all economic infrastructure sectors to have a 10-year infrastructure strategy and a 3-year investment plan;
- reviewing the overall institutional structure of the economic infrastructure sector to clarify and simplify responsibilities and streamline procedures, so that lines of responsibility are clearly drawn and there is a single coordinating agency for each sub-sector;
- working with Public Enterprises to accelerate progress on improving the financial performance of Public Enterprises as a way of strengthening capacity to meet maintenance needs;
- engaging further with the private sector and continuing the reform processes already started by the Government. In the short- to medium-term, private sector involvement is most likely to involve further outsourcing of infrastructure activities, but in the longer term, Government supports the concept of the private sector taking on more significant roles in infrastructure and service delivery; and
- working towards obtaining a credit rating would help Tonga progress towards a more robust capital market that will benefit not only the capital-intensive economic infrastructure sector, but other economic activities as well.

In summary and bearing in mind current economic and budgetary conditions in Tonga, the following Table provides an assessment of the current suitability of different financing sources for priority new investments, maintenance, and complementary activities.

Updating the NIIP

Starting with this report, the NIIP will be updated on a regular basis to align with the latest planning and budget priorities, and reflect progress on implementation. There are several sector development plans currently under preparation, with most expected to be finalised by mid-2011. Building on the outputs of these sector plans, it is proposed that the NIIP will be updated in the second half of 2011.

Suitability of funding sources for in infrastructure functions and priority investments

Project	Internal Finance	Budget	Development Partners			Commercial Finance
			CAPEX Grant	Concessional Loan	TA & Other	
1. Maintenance	●	○	○	○	○	○
2. Complementary Activities	◐	◑	○	○	●	○
3. Priority Projects						
Solar generation (Tongatapu - Additional 1MW)	◑	○	●	◑	○	◑
Coconut Oil/waste Pilot Plant	◐	○	●	◑	◐	○
Implementation of Energy Roadmap (TGIF)	○	○	◑	◐	◑	○
Upgrading of TBC Radio Towers	◐	○	◑	◐	○	○
International Fibre-Optic Cable	◐	○	●	◑	◐	◐
Local reticulation of high speed internet	◐	○	◑	◐	◐	◐
Upgrade Tongatapu (wells, storage, distribution)	○	○	◑	◐	◑	○
Vava'u Semi-Aerobic Landfill Facility	◐	○	●	◑	◑	○
Outer-island Port Upgrades	◐	○	◑	◐	◑	○
Resurfacing of Fua'amotu runway, apron, taxiway	◐	○	◑	◐	○	○
Resurfacing of Vava'u runway, apron, taxiway	◐	○	◑	◐	○	○
Resurfacing Ha'apai runway, apron, taxiway	◐	○	◑	◐	○	○

- Not a realistic option or not applicable ○
- Low likelihood of financing interest ◐
- Average likelihood of financing interest ◑
- Strong likelihood of financing interest ◒
- Very Strong likelihood of financing interest ●

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Abbreviations

ADB	Asian Development Bank	NDC	Nuku'alofa Development Corporation
AusAID	Australia's official aid agency	NEDC	National Economic Development Council
CBD	Central Business District		
DSM	Demand-Side Management	NIIP	National Infrastructure Investment Plan
EBIT	Earnings before Interest and Tax		
EBITDA	Earnings before Interest, Tax, Depreciation and Amortisation	NZAID	New Zealand's official aid agency
		PAT	Ports Authority of Tonga
EU	European Union	PE	Public Enterprise
FIAT	Fisheries Industry Association of Tonga	PUMD	Planning and Urban Management Department
ICAO	International Civil Aviation Organisation	QSW	Queen Salote Wharf (Nuku'alofa)
IMO	International Maritime Organisation	TAL	Tonga Airports Ltd
IUDP	Integrated Urban Development Project	TBC	Tonga Broadcasting Commission
JICA	Japan International Cooperation Agency	TCC	Tonga Communications Corporation
MCA	Multi-Criterion Assessment	TCCI	Tonga Chamber of Commerce and Industry
MECC	Ministry of Environment and Climate Change	TCL	Tonga Cable Ltd
MFNP	Ministry of Finance and National Planning	TPL	Tonga Power Ltd
MLSNR	Ministry of Lands, Survey & Natural Resources	TSCP	Transport Sector Consolidation Project
MIC	Ministry of Information and Communications	TWB	Tonga Water Board
MOT	Ministry of Transport	UPMS	Urban Planning and Management System Project
MOW	Ministry of Works	WAL	Waste Authority Ltd
MPE	Ministry of Public Enterprises	WB	The World Bank

Exchange rates

All figures quoted in the NIIP are in Tongan pa'anga (TOP). Exchange rates as at 28 July 2010 are:

TOP 1 =	USD 0.519	NZD 0.713	RMB 3.519
	AUD 0.580	EUR 0.402	

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- Ministry of Public Enterprises
- Ministry of Transport
- Ministry of Works
- Nuku'alofa Development Council
- Ports Authority Tonga
- Tong Broadcasting Commission
- Tonga Communications Corporation
- Tonga Airports Ltd
- Tonga Power
- Tonga Water Board
- Waste Authority Ltd
- Tonga Chamber of Commerce and Industry
- Fisheries Industry Association of Tonga
- Growers Association of Tonga
- Tourism Association of Tonga
- ANZ Bank
- Westpac Bank
- MBf Bank
- ADB/World Bank Focal Office Tonga
- AusAID
- Embassy of the People's Republic of China
- European Union
- JICA
- Embassy of Japan
- NZAID
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- Transport Sector Consolidation Project team
- Urban Planning and Management Study team

1. Context

1.1 About the National Infrastructure Investment Plan (NIIP)

The National Infrastructure Investment Plan (NIIP) outlines the Government of Tonga's priorities and plans for major infrastructure initiatives over the next 5-10 years. This is the first NIIP and it is the Government's intention that the Plan will be regularly updated as part of the national planning and budgeting process. The Plan covers infrastructure initiatives with national, regional or local significance, and looks at the next five years to 2015 in detail and the five years from 2015 to 2020 in terms of broad directions for infrastructure development. It is the result of extensive consultation with infrastructure managers, users and funding partners.

Infrastructure is a well-known term and most people understand what it is, but there are many different types of infrastructure and it is not so easy to give a precise definition. This Plan focuses on the basic infrastructure facilities that support everyday life and business activity, such as energy supply systems, telecommunications, water and waste management and transportation. These types of physical facilities and the supporting organisational structures are known collectively as *economic infrastructure*. In particular, the NIIP includes priorities and plans for major infrastructure initiatives in the following sectors:

- energy (electricity, fuel)
- telecommunications (telephone, internet, broadcasting)
- water and waste related services (water supply, waste water, drainage, solid waste)
- transport (airports, roads, sea ports, shipping)

The other main category of infrastructure is *social infrastructure*, such as education, healthcare and correctional services. Social infrastructure is not included in this Plan, but may be included in future updates.

1.2 Why is the plan needed

Tonga has a quite mature infrastructure system in terms of the availability and capacity of basic services and has some of the best human development outcomes in the region, in terms of the Millennium Development Goals (MDGs). But in other areas of infrastructure asset management, such as the cost, quality and sustainability of infrastructure and services, Tonga is not keeping pace with needs and community expectations.

This Plan is a step towards a more systematic approach to infrastructure planning, coordination and asset management. It is needed for a number of reasons:

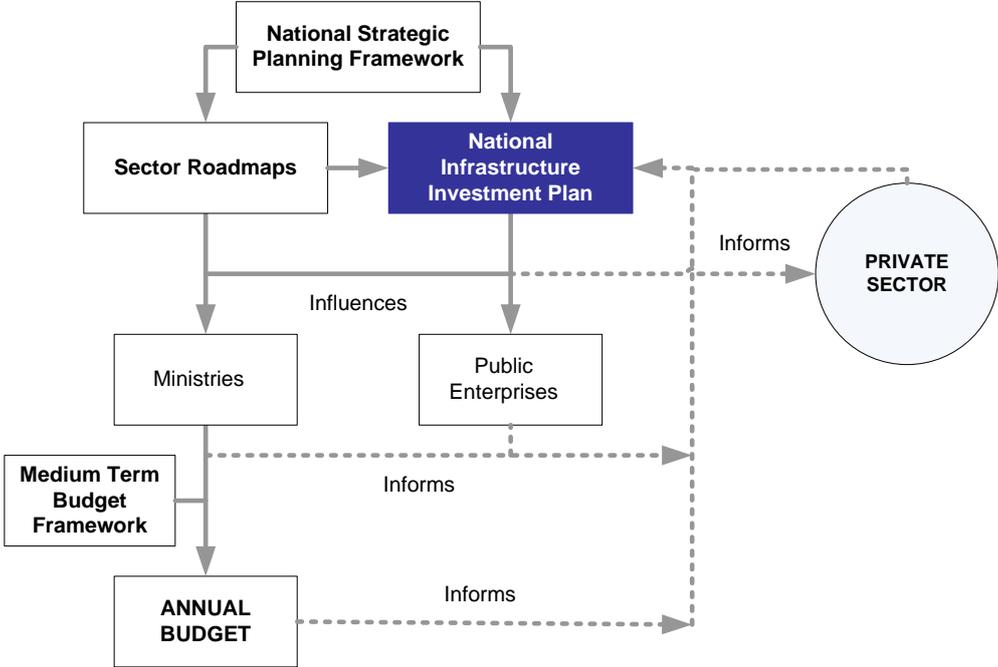
- information about Government priorities and current and planned investments in the economic infrastructure sector is currently fragmented. Planning is undertaken separately in each sub-sector, often on a project basis. The NIIP takes a sector-wide approach that brings together the various sub-sector and agency plans into a single source of information about infrastructure priorities and plans. This provides a catalyst for a more coordinated and integrated approach to infrastructure planning, development and service delivery by Government agencies, Public Enterprises and the private sector;
- the NIIP is also a step towards establishing asset management as a core function of Government and infrastructure managers; instilling greater emphasis on maintenance; and incorporating a life-cycle approach to infrastructure management;

- in addition, the NIIP is a key input to medium and longer term budget planning. It provides a picture of the scale and sequencing of future investment and financing needs, and ongoing maintenance requirements; and
- finally, by providing greater certainty about the nature and timing of infrastructure projects, the NIIP improves the investment environment for the private sector. It also provides development partners with clear information about Government priorities and plans for infrastructure development, and the areas where assistance is most needed.

1.3 How does NIIP relate to other plans

The NIIP is an important part of the national planning and budgeting process. This process and the role of the NIIP in the overall infrastructure planning process is summarised in Figure 1.1.

Figure 1.1 Relationship between NIIP and the planning process



The overall direction and priorities of national infrastructure planning and the NIIP are shaped by the National Strategic Planning Framework 2009/2010 – 2014/2015 (NSPF). The NSPF is the Kingdom's principal document for setting economic and social development objectives together with developing a plan for those objectives to be realised. The NSPF looks forward over the next five to ten years and sets the following development vision for the Kingdom:

“to create a society in which all Tongans enjoy higher living standards and better quality of life through good governance, equitable and environmentally private sector-led economic growth, improved education and health standards and cultural development”.

Infrastructure plays a major part in meeting the NSPF goals, featuring prominently in three of the seven primary outcome objectives and several enabling themes:

- firstly, the NSPF aims to develop and maintain infrastructure to improve the everyday lives of the Tongan people. In this regard, the Government plans to improve economic infrastructure to enable better access to business opportunities and social, educational and health-related

activities. Access to markets and improving aviation and maritime linkages to outer islands are identified as NSPF special priorities, especially in relation to their role in supporting growth in tourism and revitalising the agriculture and fisheries sectors;

- secondly, the need to integrate environmental sustainability and climate change into all planning and delivery of programs is highlighted as a primary outcome objective. In particular, this includes an emphasis on developing renewable sources of energy, improved management of water resources and solid waste, and disaster risk management;
- thirdly, the NSPF sets out to bolster the private sector, in part by improving physical infrastructure and also by reducing business costs. In particular, the NSPF notes the infrastructure challenges of the widespread nature of the Tongan island groups, and the key role that having good quality physical infrastructure and maintenance plays in private sector development. In addition, the NSPF sets out to improve the performance of training institutions so that infrastructure can be better maintained and developed; and
- fourthly, the importance of infrastructure maintenance and improved asset management is emphasised in the NSPF as a key cross-cutting priority. The NSPF includes a commitment from Government to “ensure the maintenance of infrastructure in the Kingdom”.

These themes, and in particular the NSPF emphasis on quality of life, improved access to business and social opportunities, sustainability (renewable energy, resource management), and maintenance, provide an integrating framework for the NIIP and identifying infrastructure priorities.

As well as being influenced by the NSPF, the NIIP is also shaped by sector development strategies/ roadmaps, although many of the sectors do not have an up-to-date roadmap at this stage. Together the NSPF, NIIP and sector roadmaps then influence Ministries and Public Enterprises in their corporate and investment planning.

The Corporate Plans and the Annual Management Plans of Ministries are formulated under the umbrella of the NSPF and reflect its objectives and priorities. They set out a three-year strategic plan for the Ministry and a one-year management plan for allocation of resources. This aligns closely with the annual budgeting process of Government, and the planned Medium-Term Budget Framework (MTBF) which incorporates forward projections of aggregate expenditure and revenue. A similar process occurs in Public Enterprises where Statements of Corporate Intent play an equivalent role in forward planning and budgeting. The NIIP also provides important information on planned future investments that can be used by the private sector in its planning and decision-making.

Finally, each update of the NIIP will be informed by national and corporate investment plans and budgets plus the priorities of the private sector, and the planning loop is completed.

1.4 How to read the plan

The NIIP outlines Government priorities and plans for economic infrastructure for the next 5-10 years and lists priority initiatives planned for this period. The Plan is organised as follows:

- it starts by analysing the current situation, economic and social factors that drive the need for infrastructure, the specific challenges for Tonga, and the way that the Government of Tonga intends to respond to these challenges;
- the next section looks at current plans for each of the economic infrastructure sub-sectors. It provides a brief overview of Government objectives for each sub-sector and describes planned projects for each over the next 5-10 years;

- the results of the analysis of infrastructure challenges, priority directions, planned investments and supporting systems are then brought together in terms of a set of initiatives that Government sees as priority areas for development of the economic infrastructure sector. This section also briefly describes the process that was used to determine these priorities;
- the following section examines broader issues of life cycle costing, maintenance, and the implications of existing infrastructure and proposed new investments in terms of ongoing funding requirements;
- this is followed by a discussion of how the infrastructure will be delivered, including demand for infrastructure finance, funding strategy, and partnership arrangements;
- the next section focuses on the broader issues relating to planning, managing and operating infrastructure assets, and what Government can do (and is doing) to facilitate better outcomes from the economic infrastructure sector; and
- finally, the Plan concludes with a brief description of how it will be updated. It is Government's intention that the plan will be regularly updated to reflect progress on implementation of the Plan's milestones and changing needs.

2. The Need for Infrastructure

Infrastructure investment responds to needs. The starting point for this NIIP is an understanding of the economic and social factors that drive the need for infrastructure in Tonga, the current situation and the specific challenges for Tonga, and the way that Government intends to respond to these challenges.

2.1 What drives infrastructure needs

In general terms, growth in demand for basic infrastructure capacity and services is driven by population growth and economic activity. At another level, demand for infrastructure is also linked to the needs of individuals and businesses, and to national development objectives regarding issues such as economic growth and sustainability. Individuals want, as a minimum, for their basic needs to be met so that they can live comfortably and have a good quality of life. In addition, the services delivered by economic infrastructure are an intermediate input into production, and affect business efficiency and economic growth.

There has been a great deal of international research about the linkage between infrastructure and economic growth. There is much that is still debated about this, particularly over the size of infrastructure impacts on economic output; short-term versus long-term benefits; which infrastructure categories give the best results; and the influence of certain policies and practices. However, there is consensus that:

- there is a positive correlation between infrastructure and economic outcomes;
- investment in infrastructure is a major driver of productivity rather than the other way around;
- core economic infrastructure (such as transport, electricity, telecommunications, sewerage and water systems) leads to the greatest levels of productivity;
- maintenance is not “visible” but is more likely to positively influence output than new projects;
- when access to core infrastructure has been addressed, the best economic responses come from improving efficiency and then from reducing service prices; and
- ultimately, infrastructure investment only adds value if it is allocated in the right way.

But the reverse is also true. Inadequate infrastructure is a bottleneck to economic activity, and also reduces the day-to-day well being of people; their quality of life; and their ability to withstand and respond to disasters. Sustainability is also compromised because resources are used wastefully. Inadequate infrastructure does not necessarily mean that there is not enough infrastructure. It extends to cover whether or not existing infrastructure is being used and managed effectively. When it is not, service coverage, pricing and quality are all compromised, and the benefits of appropriate infrastructure are not realised. As a result, this NIIP focuses not just on physical infrastructure but also on the way that it is used and managed.

In summary, the demand for infrastructure is driven by a complex interaction of factors with economic, social and sustainability dimensions. Infrastructure can be both an enabler of economic development and improved quality of life; and also a bottleneck.

2.2 Infrastructure drivers in Tonga

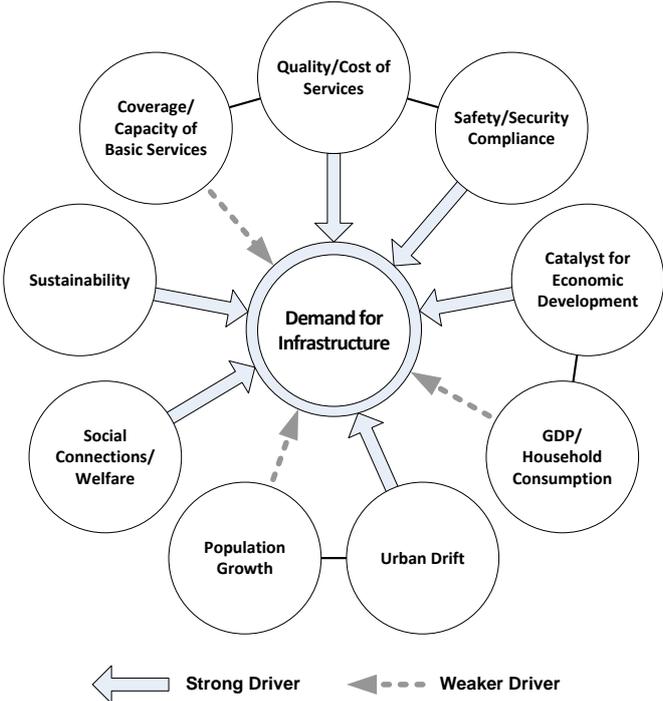
Tonga has essentially the same drivers for infrastructure as all other countries, but there are also some differences that need to be taken into account. Over the last 10-20 years, annual growth in Tonga’s population has averaged only 0.3-0.4% and annual growth in real GDP has been mixed,

ranging from around 3% at the start of the decade to -1.2% in 2009/10. The combined effect¹ is that overall growth in underlying demand for infrastructure over the last decade has averaged only around 1% per year and has been stable for about the last five years. Current forecasts indicate that GDP growth may recover in the short-medium term, but overall, the effect of growth in population and economic activity is not expected to be a major force driving infrastructure investment to address unserved demand.

In addition, Tonga is generally well-placed regarding access to basic economic infrastructure and associated services and the coverage and capacity of those services. A snapshot of the current state of the economic infrastructure sector is shown in Table 2.1. The overall picture is that basic services and service coverage are good, with full national coverage of basic telecoms and improving; a high level of access to reticulated power and water and off-grid arrangements in place elsewhere; one of the highest levels of road density in the region; and a strategically located network of ports and airports throughout the country. This provides a good platform on which to continue to build and improve economic infrastructure, and place an increasing emphasis on areas such as sustainability, efficiency, reliability, safety and security. These factors and the role of economic infrastructure as a catalyst for economic growth and improved quality of life are the main drivers for infrastructure investment in Tonga in the short-medium term.

Figure 2.1 summarises the linkages between driving forces and investment in economic infrastructure in Tonga. It identifies the key drivers for infrastructure and indicates how much influence each of these has over demand for infrastructure. It shows that in addition to the role of infrastructure as a catalyst for economic growth, the factors that are expected to strongly influence infrastructure demand in Tonga include quality and cost of services, safety and security compliance, urban drift as more people move to Nuku'alofa, welfare, and sustainability.

Figure 2.1 Drivers of demand for Infrastructure in Tonga



¹ Assuming an elasticity of demand for infrastructure with respect to real GDP of 1-1.2.

Table 2.1 Overview of the economic infrastructure sector

Sector	Notes
Energy	15 MW total installed capacity (Tongatapu, Vava'u, Ha'apai, 'Eua) 1,300 km of distribution network (total of overhead, underground, submarine and low voltage cables) 16,500 domestic, 4,000 commercial customers 85% of population on-grid 17-18% line losses
Telecommunications	Telephone access available throughout the country (fixed line or mobile) 13,000 landline subscribers (estimated 70% of households) 50,000 mobile customers (TCC, Digicel) 3,000 internet connections
Water and sanitation	100% of population have access to safe drinking water (reticulated supply, rainwater tanks, wells, etc) 85% of households have piped water 4 x reticulated water supply schemes (Nuku'alofa, Nieafu, Pangai-Hihifo, 'Eua) 15-60% Total losses (Nuku'alofa 60%) No central sewage collection and treatment system (septic tanks)
Solid Waste	1 x sanitary landfill (Tapuhia, Tongatapu) Household collection of solid waste on Tongatapu only No regular system for collection of recyclables
Transport	
Airports	1 x International/Domestic airport (Fua'amotu 2,700m asphalt runway) 2 x Domestic airport – bitumen runway (Ha'apai, Vava'u) 1 x Domestic airport – gravel runway ('Eua) 2 x Domestic airport – grass runway (Niuafu'ou, Niuatoputapu) 80,000 international and 50,000 domestic departures per year 14 international flights per week (5 international destinations)
Roads	880 km (including community roads) 40% sealed 15,500 registered vehicles
Sea Ports	2 x International/Domestic ports (Nuku'alofa – 2 international, 2 inter-island berths; Vava'u – 1 international, 1 inter-island berth) 5 x domestic ports ('Eua, Ha'afeva, Pangai, Niuafu'ou, Niuatoputapu) 6,000 international container movements per year (full TEU) (90% imports)

Sources: Infrastructure managers (TPB, TWB, TCC, PAT, TAL, Ministries); Tonga Census; various feasibility studies.

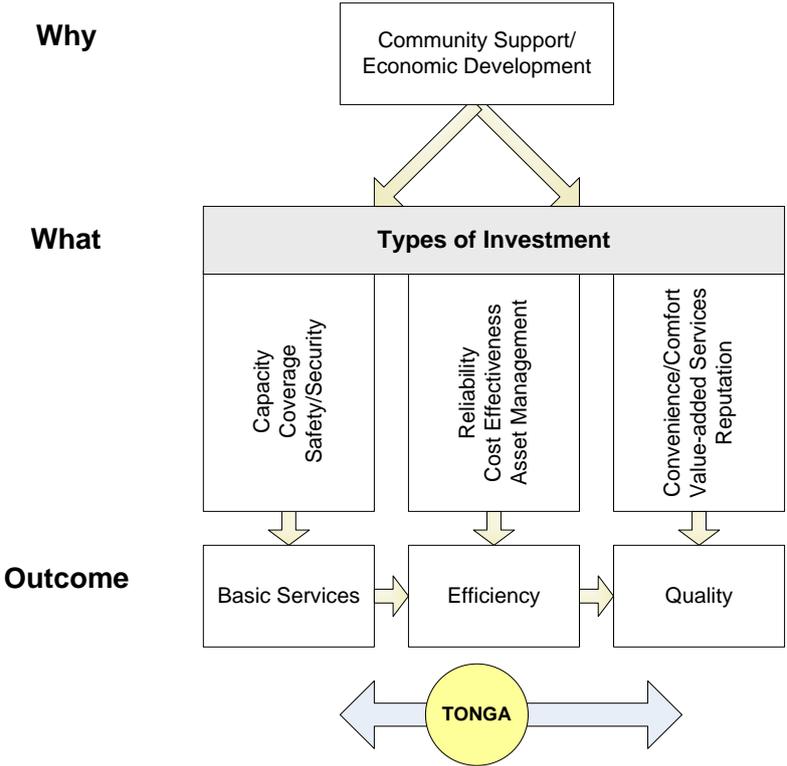
2.3 The infrastructure challenge for Tonga

The small dispersed population, multi-island geography, remoteness from markets, and small market size of Tonga creates special challenges for development and operation of economic

infrastructure². In particular, this adds significantly to the cost and difficulty of supplying economic infrastructure services throughout the country. But despite these challenges, Tonga has a reasonable level of basic economic infrastructure and associated services, and coverage and capacity of services. Meeting these basic needs will always be the foundation requirement for economic infrastructure, but with these basic needs mostly being met, the national challenge for further investment in economic infrastructure is now to move on to higher-level goals.

The situation is explained in Figure 2.2. To serve the two main drivers of infrastructure development (community support and economic development) a range of types of investment activities are needed and these will deliver different outcomes. As stated earlier, the initial focus is on providing basic services: capacity, coverage and safety/security. Once these questions have been addressed attention moves to the reliability and cost effectiveness of infrastructure services, and asset management. Ultimately, infrastructure investments centre on convenience and comfort, value-added services, and building the reputation of organisations and the nation as a whole for infrastructure quality and services. By reference to this spectrum, Tonga has largely achieved the provision of basic services, but the infrastructure is at a relatively early stage regarding delivery of reliable and efficient services and managing the infrastructure assets well. This sets the challenge for the next phase of infrastructure development in Tonga.

Figure 2.2 Status of infrastructure development in Tonga



The main priority now for development of Tonga’s economic infrastructure is to continue improving basic services, but at the same time, to improve the infrastructure delivery environment so that infrastructure is able to deliver good macroeconomic, social and environmental outcomes

² For a general overview of the challenges facing Tonga and other Pacific nations, see ADB (2004) *Swimming Against the Tide*.

by using infrastructure resources efficiently. In other words, to use economic infrastructure to improve the quality of life and underpin economic development. This means making the most from existing infrastructure and investing in new infrastructure when there is a strong case to do so.

There is also a wider issue that remains one of Tonga's greatest infrastructure challenges. The role of government in relation to economic infrastructure is changing. Government has largely moved away from taking responsibility for infrastructure investment and service delivery, to being a facilitator of infrastructure service outcomes. Under current arrangements, all economic infrastructure except roads and outer islands ports is now under the management and operation of Public Enterprises. This change is consistent with international good practice, but it requires a continuing focus by Government on the policy, legislation, institutional and regulatory environment that underpins the infrastructure management system. As result, this Plan takes an integrated approach that considers the need for investment in economic infrastructure and also the need for continual improvement in infrastructure management and the infrastructure policy environment.

3. Infrastructure Sector Investment Plans

There is already a substantial amount of infrastructure investment underway, committed or proposed³. This part of the NIIP provides an overview of the current investment program for economic infrastructure and a summary of planned projects for each sector over the next 10 years. To provide a more complete picture of investment plans for each sector, it includes Government and Public Enterprise projects that are underway or in the planning pipeline.

For each sub-sector, planned projects over the next 5-10 years are tabulated in a consistent format which includes a short descriptive name for the project; estimated cost; project status and funding source; and the expected timing of project implementation.

Ref	Project	Estimated Cost (\$m)	Status	Funding Source	2011-2015					2016-2020	
X1	Example Project #1	\$X.X	U	PE							
X2	Example Project #2	\$X.X	C	DG							
X3	Example Project #3	\$X.X	P	U							↔

When reading these tables, it is important to understand the following background details:

- The tables list major projects only. Projects must be of national/regional/local significance and deliver widespread community benefits. Generally, project size is around \$1m or more. Projects must also have had at least some preliminary planning undertaken.
- The definition of infrastructure is broad. The projects are mostly physical infrastructure, which may include major items of mobile infrastructure, but the scope also extends to large information infrastructure projects (such as major new systems, whole-of-Government website development, electronic commerce systems, etc). Projects that involve new infrastructure, replacement of existing infrastructure and major refurbishment are included in the scope of the tables, but generally routine maintenance, planning and technical assistance are not included.
- Project costs are in million pa'anga (TOP). For most projects, the cost is an estimate of the construction/supply costs only. It is an estimate for planning purposes only, and is not a firm cost based on detailed design/specifications. The cost estimate does not include up-front costs, contract supervision and escalation contingencies, and can be expected to change as more information becomes available. Where the project cost is confidential, it is marked as “-“. Where the investment details are not fully defined at this stage, the cost is marked as “tbd” (to be defined).
- Years are financial years (July to June) with the timing of project implementation shown on a year-by-year basis for the first 5 years, and on an indicative basis for years 6-10. For projects

³ In this Plan, a project is defined as *committed* if funding has already been identified and confirmed for the investment and there is a high probability that it will proceed, and *proposed* if it is proposed for future implementation but funding has not been confirmed and timing is less certain. Planned investments include all those projects that are underway, committed or proposed.

planned for the period 2016-2020 such as Example Project #3, timing is generally less certain.

- Projects are classified according to the status of the project and source of funding using the following codes.

Table 3.1 Project categories

Project Status	Source of Funding
U <u>Underway</u>	G <u>Government</u> budget allocation
C <u>Committed</u>	PE <u>Public Enterprise</u>
P <u>Proposed</u>	DG <u>Development partner Grant</u> (approved)
	DL <u>Development partner Loan</u> (approved)
	PR <u>Private Finance</u>
	U <u>Unknown/Unfunded</u>

The status of a project is classified as:

- Underway – project implementation has already started
- Committed – funding has already been identified and confirmed for the investment and there is a high probability that it will proceed, but the timing may change
- Proposed – these are planned investments for which funding has not been confirmed and timing is not certain

The source of funding is classified as:

- Government – funded from Government of Tonga budget allocation
- Public Enterprise – self-funded by a Public Enterprise from its own resources (cashflow or commercial loan)
- Development partner Grant – funded by an approved grant from an official development partner. This includes in-kind assistance.
- Development partner Loan – funded by an approved loan from an official development partner
- Private finance – funded (at least in part) by private investment
- Unknown/Unfunded – the funding source is currently not certain. This includes projects for which discussions are underway with a potential financing partner (such as bank or development agency) but are not confirmed.

3.1 Energy

Tonga has one of the highest levels of access to electricity in the region with around 85% of the population on-grid and high levels of supply reliability. But at the same time, Tonga has the

highest cost of electricity in the region⁴. In part, this is a result of Tonga’s almost 100% reliance on diesel-powered generation for on-grid services. System losses are also high at around 17% but are coming down and are expected to be reduced to around 13% by 2015. This is more consistent with international benchmarks.

In the short term, projects underway and planned in the energy sector (Table 3.2) are aimed at improving the efficiency, safety and reliability of electricity supply, and ultimately reducing the cost of electricity. This includes projects to:

- upgrade the electricity distribution network to reduce losses and replace poor quality “stick poles” in village distribution networks;
- upgrade and expand the capacity of diesel-powered generation in Tongatapu, Vava’u, Ha’apai and ‘Eua with newer technology; and
- extend the use of solar generation in off-grid areas and introduce solar generation into the Tongatapu grid.

These projects are being implemented by Tonga Power as part of its program to upgrade the electricity generation and distribution network and keep pace with demand.

Table 3.2 Energy sector – major projects underway, committed or proposed

Ref	Project	Estimated Cost (\$m)	Status	Funding Source	2011-2015	2016-2020
E1	Distribution Network Improvements (multi-year)	\$18.0	U	PE	█	↔
E2	Additional/Replacement Generators (Tongatapu)	\$28.6	U	PE	█	↔
E3	Additional/Replacement Generators (Vava’u)	\$2.0	C	PE	█	↔
E4	Additional/Replacement Generators (Ha’apai)	\$4.0	C	PE	█	↔
E5	Additional/Replacement Generators (‘Eua)	\$3.5	C	PE	█	↔
E6	Village Networks (electricity pole replacement)	\$27.0	U	DG	█	
E7	Outer-island Off-Grid power (solar)	\$12.0	U	DG	█	
E8	Improved Street Lighting	\$2.0	U	G	█	
E9	Upgrade Bulk Fuel Logistics (Tank Farm, Bunkering)	\$11.0	P	U	█	
E10	Solar generation (Tongatapu – Meridian Energy)	\$14.0	C	PR/DG	█	
E11	Solar generation (Tongatapu - Additional 1MW)	\$14.0	P	U	█	
E12	Renewable energy pilots (Coconut Oil/land fill gas)	\$3.0	P	U	█	
E13	Energy Roadmap TGIF Projects	tbd	P	U	█	↔

TOTAL \$ 139.1

⁴ Castalia (2006) *The Pacific Infrastructure Challenge*. The World Bank.

In the medium-longer term, the emphasis of planned projects shifts to reducing reliance on imported petroleum and a move towards greater energy self-sufficiency, by increasing the use of renewable energy sources and other measures. This program may include on-grid solar generation capacity; pilot plants for the investigating the potential for blending coconut oil with fuel and extraction of methane gas from landfills; demand-side conservation measures to reduce energy consumption; and the establishment of a Tonga Green Incentives Fund (TGIF) to support the conversion process to renewable energy. The details are set out in the *Tonga Energy Road Map 2010-2020*⁵.

3.2 Telecommunications

In terms of access to basic telecommunications services, Tonga is well positioned. Mobile phone and internet services are already available throughout the country, including smaller and more remote communities. These services are being progressively improved and the next step is the introduction of value-added services, such as mobile internet. Competition and private sector involvement in the telecommunications sector has been a strong force driving these developments.

However in some areas, Tonga is lagging behind the rest of the region. In particular, satellite-based internet is a significant constraint that limits internet speed to a maximum of 1024 kbps and limits the available bandwidth (the volume of internet traffic that the connection can handle). It also increases the cost of internet access. This means that existing users are experiencing high prices and slow internet response, and it constrains the development of new internet-based community applications and local business opportunities. It also limits development of internet-based Government services.

Another major challenge facing the telecommunications sector is the continuation of reliable AM Radio coverage throughout the country. AM Radio plays an important role in sending messages to outer island communities including information about scheduled arrivals of shipping and airline services, and has a vital role in broadcasting regular weather reports and cyclone and tsunami warnings. It is a vital lifeline during times of natural disasters.

In the short term, planned projects in the telecommunications sector (Table 3.3) focus on expanding digital mobile and FM radio services to less-populated islands; upgrading the fixed line and mobile telephone networks to accommodate emerging applications (such as distribution of higher speed internet services, and multi-media and interactive applications); and upgrading the TBC AM radio transmitter. In the medium- to longer-term, the focus shifts to improving voice and data connection to the rest of the world through the planned installation of an undersea fibre-optic cable to connect Tongatapu with international cable networks⁶; local reticulation of high speed internet access; development of Government services that take advantage of enhanced internet capability; and in the longer term, expansion of the high speed fibre optic network to other island groups.

⁵ World Bank (2010) *Tonga Energy Road Map 2010-2020*.

⁶ Various options are available for connecting with international networks, for an overview of issues see, World Bank (2010) *Technical, Economic and Financial Connectivity Study for Tonga and Samoa*.

Table 3.3 Telecommunications – major projects underway, committed or proposed

Ref	Project	Estimated Cost (\$m)	Status	Funding Source	2011-2015				2016-2020
T1	Upgrade TCC Fixed line services and cabling	-	C	PE	█	█			
T2	TCC Mobile phone Next Generation Network (NGN)	-	C	PE	█	█	█		
T3	Relocation of TCC Transmission Towers (Nuku'alofa)	-	C	PE	█				
T4	Outreach – Expanding Services to small islands	\$3.0	U	DG	█	█			
T5	Upgrading of TBC AM Radio Towers	\$1.4	P	U	█	█			
T6	International Fibre-Optic Cable	\$60.0	P	U		█	█		
T7	Local Reticulation of High Speed Internet	\$8.0	P	U		█	█		
T8	E-Government	\$20.0	P	U		█	█	█	
T9	Fibre-Optic Cable to Ha'apai, Vava'u etc	\$35.0	P	U					↔

TOTAL (excluding TCC) \$ 127.4

3.3 Water and sanitation

All Tongans have access to clean drinking water and around 85% of households have piped water supply. So in terms of meetings MDGs and providing basic access to clean water, the water sector is performing well.

However problems exist in the efficiency of water supply, and a major challenge facing the reticulated water supply system is to reduce water losses. The levels of non-revenue water are up to 60% in some areas. Non-revenue water is an important measure of efficiency. It refers to the difference between system input volume and the billed or authorised consumption, and includes un-billed consumption from faulty meters, illegal connections or under-billing as well as physical losses from leakages and overflows. Current levels vary from 15-60%. This compares to benchmark levels of 20-30% achieved by some developing countries in the Asia-Pacific region and 10% in developed countries⁷.

In the short-term, planned projects in the water sector (Table 3.4) focus on reducing water losses and upgrading the efficiency of the Nuku'alofa water supply and distribution system; upgrading village water supplies throughout the country; and upgrading the Neiafu water supply system on Vava'u. Tonga Water Board (TWB) is implementing these projects in association with development partners.

⁷ Castalia (2006); ADB (2003) *Asian Water Supplies: Reaching the Urban Poor*.

Planning is less well advanced for the medium- to longer-term, but at this stage, there are anticipated needs for work on upgrading the efficiency of the Nuku'alofa water supply system, and investment in extending the Nuku'alofa supply area and capacity to cater for urban growth⁸. The water sector currently does not have an up-to-date medium- to long-term development roadmap. The preparation of a long-term master plan has been proposed under the UPMS project and is supported by TWB. The plan would define further investment needs over the next 10-20 years.

Table 3.4 Water and sanitation – major projects underway, committed or proposed

Ref	Project	Estimated Cost (\$m)	Status	Funding Source	2011-2015					2016-2020
W1	Upgrade village water supplies	\$5.0	U	DG						
W2	Rehabilitate the Nuku'alofa water system	\$6.5	U	U						
W3	Upgrade Neiafu water supply (wells, distribution)	\$4.0	P	U						
W4	Expand Nuku'alofa system to growth areas	\$11.4	P	U						↔
W5	Development of a new Tongatapu well-field	\$10.0	P	U						↔

TOTAL \$ 36.9

In many countries, the water sector also includes sanitation as part of the overall water cycle. Although Tonga does not currently have a central sewerage system in any urban area, important issues relating to disposal of grey water and septage (sludge pumped from septic tanks) are emerging and are likely to require a coordinated response in the short- to medium-term. As a partial response, a grey water collection system is being considered as part of the Nuku'alofa CBD redevelopment project. Sanitation is an area where Government is planning to place greater emphasis in the future. One approach that the Government is considering is to address sanitation issues as part of an overall water sector roadmap.

3.4 Solid Waste

In 2007, a new solid waste collection system was implemented on Tongatapu and the Waste Authority Limited (WAL) was established to take control of solid waste collection and disposal. This includes responsibility for disposal of septage at the Tapuhia facility. On most other islands, formal arrangements for solid waste collection are not in place. However the operational model for solid waste collection, charging and management on Tongatapu is not working as well as expected. In particular, current arrangements for revenue collection are not proving effective, resulting in levels of cost recovery from household and commercial customers that are very low. As a result, the Waste Authority is not financially viable; is unable to fund adequate maintenance; and has a growing maintenance backlog. In addition, there are problems with the design of existing equipment and facilities, and an emerging problem with illegal dumping of waste.

⁸ For more details of Nuku'alofa urban infrastructure plans, see ADB (2010) *Urban Planning and Management System - Final Report*.

In the short- to medium-term, several smaller investments are planned (Table 3.5) with the aim of improving waste management equipment and facilities on Tongatapu (including improved septage disposal facilities), and possibly developing a new semi-aerobic landfill facility on Vava'u. Initial investigation of a land fill facility on Vava'u is underway with assistance from development partners (JICA). But it appears that investment in infrastructure is not the whole answer to current problems. A review of the operational model and investment needs; clarification of responsibilities; and development of a new long-term strategy may be required to place this sector on a more sustainable long-term footing prior to further investment.

Table 3.5 Solid Waste – major projects underway, committed or proposed

Ref	Project	Estimated Cost (\$m)	Status	Funding Source	2011-2015	2016-2020
S1	Additional capacity for septage treatment	\$1.0	P	U	■	
S2	Equipment Renewal Program	\$1.0	P	U		■
S3	Vava'u Semi-Aerobic Landfill Facility	\$4.0	P	U		■

TOTAL \$ 6.0

3.5 Roads

Tonga has an extensive network of roads and one of the highest levels of road network density in the region⁹. This network provides good access links to communities in terms of connectivity, but in some areas the condition has deteriorated significantly due to insufficient emphasis on maintenance.

Government is addressing this problem through several road rehabilitation and upgrading programs over the next 3-5 years in association with its development partners (Table 3.6). The National Roads Improvement Project will rehabilitate selected trunk roads throughout the country; the Integrated Urban Development Sector Program (IUDSP) will upgrade the major routes into Nuku'alofa from the south; the Agricultural Road Program will improve selected plantation and market access roads throughout the country; and the Transport Sector Consolidation Project (TSCP) will trial a new approach to road maintenance that makes greater use of private sector involvement. Studies underway as part of the TSCP program will also provide a strategy for road maintenance over the next 5-10 years, including recommendations for road maintenance programming, institutional reform, sustainable funding mechanisms, and the role of the private sector. These studies are expected to be completed by early 2011 and their outcome will be reported in the next update of the NIIP. In addition to these broader programs, commitments are already in place for specific investments to rehabilitate the Vaipua Bridge (Vava'u) and Foa Causeway (Ha'apai).

In the longer term, Government will continue this emphasis on road maintenance and rehabilitation, and may also consider options for a new road linking Nuku'alofa with the southern side of Fanga'uta Lagoon by bridge or causeway. This road would provide better access to the southern and eastern sides of Tongatapu and the airport, and could provide an alternative evacuation/access route in case of natural disaster. However, it will require environmental approval and identification of a suitable funding source.

⁹ Measured in terms of road length/square km of land area (Castalia, 2006).

Table 3.6 Roads – major investments underway, committed or proposed

Ref	Project	Estimated Cost (\$m)	Status	Funding Source	2011-2015					2016-2020
R1	National Roads Improvement Project	\$80.0	U	DL						
R2	Integrated Urban Development Sector Program	\$11.0	U	DL						
R3	Transport Sector Consolidation Project (Roads)	\$11.6	C	DG						
R4	Vaipua Bridge (Vava'u)	\$13.6	C	DG						
R5	Foa Causeway (Ha'apai)	\$3.2	C	DG						
R6	Agricultural Road Program	\$3.0	C	DG						
R7	Upgrading of Toula Causeway (Vava'u)	\$2.0	P	U						↔
R8	New road link to southern side of Fanga'uta Lagoon	\$30.0	P	U						↔
TOTAL		\$ 154.4								

3.6 Ports and shipping

The maritime sector plays a vital role in the Tonga economy and community. It supports tourism; inter-island and international commerce; and inter-island travel for social, educational and medical needs. The existing ports have sufficient capacity for foreseeable needs and there are no plans to build any new ports for commercial shipping operations. In addition, the international ports comply with relevant international and IMO operating requirements. Although the port system meets basic needs for coverage, capacity and compliance, the standard of infrastructure has suffered from a lack of investment in core infrastructure and facilities; and insufficient emphasis on maintenance of outer-island ports and channels.

In the short-term, investments underway or committed for the ports sector (Table 3.7) focus on addressing some of these issues. This includes minor works at all ports necessary for the operation of the new inter-island ferry; upgrading ship and cargo handling facilities and equipment at Queen Salote Wharf (forklifts, fenders, pavements); and completing the cruise ship terminal at Vuna Wharf (Nuku'alofa). Responsibility for implementing these projects is split between Ports Authority Tonga (PAT) which is responsible for Queen Salote International and Domestic Wharves at Nuku'alofa, and the Ministry of Transport which is responsible for all other ports.

For the medium- to longer-term, investment planning for the port sector is less well developed. The sector does not have a current development roadmap, but studies underway by the Ministry of Transport and expected to commence soon under the TSCP will provide greater certainty regarding investment needs for outer-island ports. These investigations are expected to be complete in early 2011 and will be incorporated into the next NIIP update. PAT is also reviewing its long-term plans for development of Queen Salote International and Domestic wharves at

Nuku'alofa. As shown in Table 3.7, medium-long term investments may include further upgrades at outer-island ports to improve passenger facilities and freight storage and handling; completion of the Vuna Wharf marina; and a range of port and waterfront works at Nuku'alofa. Medium- to long-term investment plans for the ports sector will be updated in the next NIIP.

Table 3.7 Ports and shipping – major investments underway, committed or proposed

Ref	Project	Estimated Cost (\$m)	Status	Funding Source	2011-2015					2016-2020
P1	Replacement inter-island ferry	\$25.0	U	DG						
P2	Reconfigure Inter-island wharves for new ferry	\$2.1	C	G/DG						
P3	Reseal Queen Salote Wharf (QSW Int. and Dom.)	\$11.3	C	PE						
P4	Refurbish Slipway at QSW	\$0.5	C	PE						
P5	Upgrade Container Handling (Forklift) for QSW	\$2.0	C	PE						
P6	Replace Fender at QSW International Wharf	\$0.7	C	PE						
P7	Vuna Wharf (Stage 1 Cruise ship wharf)	\$30.0	C	DL						
P8	New Pilot Boat for QSW	\$1.5	P	U						
P9	Inter-island port and terminal upgrades	\$10.0	P	U						
P10	Vuna Wharf (Stage 2 Marina)	\$20.0	P	U						
P11	Upgrade of the Queen Salote Domestic Wharf	\$9.0	P	U						↔
P12	Yellow Pier Upgrade	\$7.5	P	U						↔
P13	Slipway at Sopu	\$1.5	P	U						↔
P14	Barge for Deep Water Dredging	\$1.0	P	U						↔
P15	Upgrade of Vava'u port	\$25.0	P	U						↔

TOTAL \$ 147.1

3.7 Airports

Aviation also plays a vital role in the Tongan economy and community in terms of tourism; inter-island and international commerce; and travel for social, educational and medical needs. The existing commercial airports provide sufficient coverage to all island groups and at this stage

have sufficient capacity for foreseeable needs. There are no plans to build any additional airports. However, much of the infrastructure is nearing the end of its useful life or requires upgrade to continue to meet international and national safety and security standards. Tonga already meets required service standards and complies with ICAO requirements, or has been granted a temporary exemption from some requirements during a transition period. All commercial airports in Tonga are managed by Tonga Airports Ltd (TAL).

Planned investments in the airport sector in the short term (Table 3.8) focus on meeting safety and security compliance requirements in terms of fire and rescue capability, security screening, navigational aids, and runway condition. In particular, the runways and associated aprons and taxiways at Fua'amotu, Vava'u and Ha'apai will require resurfacing within the next five years to ensure safe operation and ongoing compliance at an estimated total cost of around \$40 million.

Table 3.8 Airports – major investments underway, committed or proposed

Ref	Project	Estimated Cost (\$m)	Status	Funding Source	2011-2015				2016-2020
A1	Additional Fire Tender (Fua'amotu)	\$1.8	U	DG					
A2	Upgrade Navigations Aids (Fua'amotu DVOR)	\$2.0	U	PE					
A3	Upgrade 'Eua runway	\$3.0	C	DG					
A4	Upgraded Departure area (Fua'amotu)	\$1.0	P	DG					
A5	New fire station at Fua'amotu airport	\$1.2	P	DG					
A6	Upgraded Arrivals area (Fua'amotu)	\$1.0	P	PE					
A7	Additional Fire Tender (Vava'u)	\$1.0	P	U					
A8	Resurfacing of Fua'amotu runway, apron, taxiway	\$28.0	P	U					
A9	Expand apron area at Fua'amotu	\$4.1	P	U					
A10	Resurfacing of Vava'u runway, apron, taxiway	\$4.0	P	U					
A11	Resurfacing Ha'apai runway, apron, taxiway	\$7.0	P	U					

TOTAL \$ 54.1

In the medium- to longer-term, additional investments will be required to maintain compliance with increasingly stringent safety and security requirements; to ensure that current aircraft types and new international aircraft likely to be used on Tonga services can operate without weight restrictions; and to keep Tonga competitive as an exporter and international travel destination. Master planning for Tonga airports is currently underway (supported under the TSCP) and is expected to be completed by late 2010. This will define further investment needs over the next

10-20 years. A medium- to long-term investment plan for airports will be included in the next update of the NIIP.

3.8 Multi-sector

Several multi-sector projects are also underway or proposed (Table 3.9). The Nuku’alofa CBD redevelopment involves investment of around \$20 million in upgrading basic infrastructure in the CBD area, including roads, underground power and additional high voltage supply, drainage, grey water collection system, footpaths, and street lighting. This project is currently underway with assistance from the Government of China and is being managed by the Nuku’alofa Development Corporation (NDC). The project is expected to be completed by early 2011.

In the medium term, a range of infrastructure projects is likely to arise from the *Joint Action Plan on Climate Change Adaptation and Disaster Risk Management 2010-2015* which has been prepared with assistance from GEF, SOPAC and UNDP. This may involve a combination of measures (such as foreshore protection, sea walls, relocation of services, etc) aimed at reducing vulnerability to natural disasters and the effects of climate change. The details of associated infrastructure projects will solidify as the Action Plan is implemented and will be included in future updates of the NIIP. At this stage, a climate change adaptation project is included but without costs.

Table 3.9 Multi-sector – major projects underway, committed or proposed

Ref	Project	Estimated Cost (\$m)	Status	Funding Source	2011-2015				2016-2020
M1	Nuku’alofa CBD Redevelopment	\$20.0	U	DL					
M2	Climate change adaptation (e.g. coastal protection)	tbd	P	U					↔

TOTAL \$ 20.0

Another multi-sector project that is currently underway is the reconstruction effort following the 2009 tsunami. Most of the basic economic infrastructure on Niuatoputapu has already been restored and further investment in tsunami-hit areas will now focus mainly on social infrastructure (housing, schools, health care facilities). Because of its focus on social infrastructure, the reconstruction program is not included in the NIIP.

3.9 Overview of planned investments

The NIIP identifies a long list of planned program of economic infrastructure investments totalling around \$540 million over the next 5 years; and an additional \$150 million in years 5-10 (Table 3.10). This includes proposed projects, which at this stage, do not have a confirmed funding source.

Over the next 3-5 years, there is expected to be a peak in infrastructure investment as a number of major projects are implemented. Major projects that are already underway or commencing during this period include the National Roads Improvement Program; Nuku’alofa CBD infrastructure redevelopment and Vuna Wharf cruise ship terminal; Vaipua Bridge reconstruction; and delivery of the new inter-island ferry. In addition, planned major investments that may commence during this period include an undersea fibre-optic cable linking Tonga with

international networks; resurfacing of airport runways at Fua’amotu, Ha’apai and Vava’u; and initiatives to increase use of renewable energy sources.

The split of planned investments by sector over the next five years is shown in Figure 3.1. Over the next five years, more than \$100 million is expected to be invested in each of the road, energy, telecoms and maritime sectors. Around 70% of total infrastructure investments will be made by Public Enterprises using a combination of self-funding from their own resources and participation in a range of development partner programs. Government will make the remaining investments mostly with assistance from grants and loans from development partners. Almost all of these investments under Government programs over the next five years are in the roads sector.

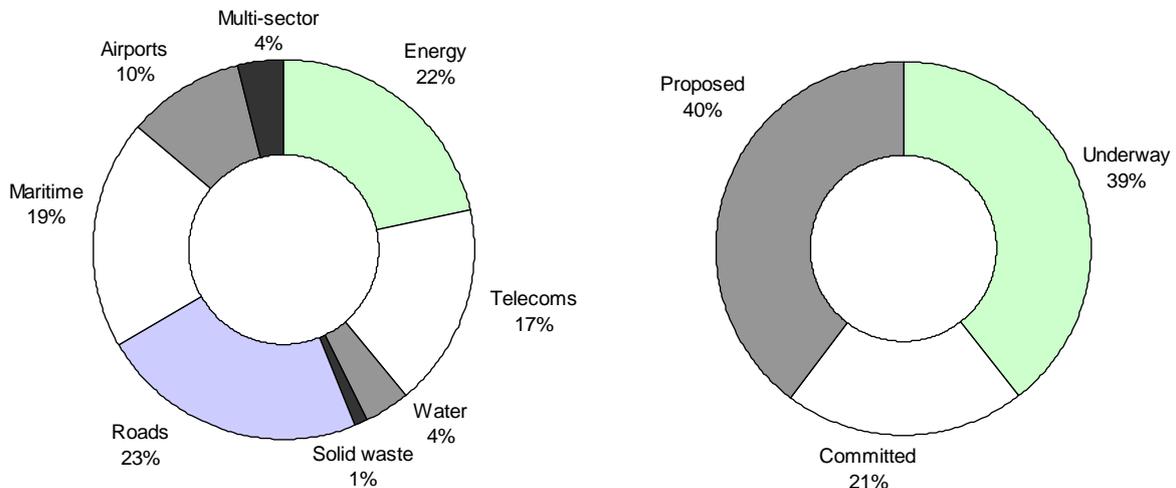
Planning is less well advanced for the period 2016-2020. At this stage, around \$150 million of planned investments has been identified, and this is expected to increase as medium- to longer-term planning solidifies.

Table 3.10 Planned investment by sector and year

Project ¹	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2016-2020	TOTAL
Energy	29.4	43.6	30.5	3.3	8.0	24.3	\$ 139.1
Telecommunications ²	6.2	48.2	37.0	5.0	5.0	35.0	\$ 136.4
Water	2.0	5.1	6.4	3.3	3.3	16.8	\$ 36.9
Solid waste	0.5	0.5	3.0	2.0	0.0	0.0	\$ 6.0
Roads	36.5	39.9	26.0	12.0	8.0	32.0	\$ 154.4
Ports and shipping	54.1	12.3	8.3	14.3	14.3	44.0	\$ 147.3
Airports	7.8	2.7	43.6	0.0	0.0	0.0	\$ 54.1
Multi-sector	20.0	0.0	0.0	0.0	0.0	0.0	\$ 20.0
TOTAL	\$ 156.5	\$ 152.3	\$ 154.8	\$ 39.9	\$ 38.6	\$ 152.1	\$ 694.2

Notes: 1. Includes investment projects that are underway, committed or proposed.
 2. Excludes TCC.

Figure 3.1 Planned investment by sector over the next 5 years



The planned investment projects can also be classified by purpose, that is, in terms of the type of outcome to be delivered by the project. Table 3.11 shows the breakdown of projects using the Balanced Scorecard format consistent with Ministry Corporate Plans. This approach highlights the underlying key purpose of each planned initiative by classifying it as focused on improving organisational performance in one (or several) of four areas: customers (quality of services delivered), internal processes (efficiency of service delivery), learning and growth (planning, management and new technology/opportunities), and finances (financial sustainability of the organisation).

Table 3.11 Planned investment by sector and year

Customers	Internal Processes
<p>Projects Underway or Committed</p> <ul style="list-style-type: none"> ▪ E7 Outer island Off-Grid Power (Solar) ▪ E8 Improved Street Lighting ▪ T1 Upgrade TCC Fixed line services ▪ T2 TCC Next Generation Mobile Network ▪ T4 Expanded telecom services to small islands ▪ W1 Upgrade village water supplies ▪ R1 National Roads Improvement Project ▪ R2 Integrated Development Sector Program ▪ R4 Vaipua Causeway (Vava’u) ▪ R5 Foa Causeway (Ha’apai) ▪ R6 Agriculture Road Program ▪ P1 Replacement of inter-island ferry ▪ M1 Nuku’alofa CBD Redevelopment 	<p>Projects Underway or Committed</p> <ul style="list-style-type: none"> ▪ E1 Electricity Distribution Network Improvements ▪ E2 Additional/Replacement Generators (Tongatapu) ▪ E3 Additional/Replacement Generators (Vava’u) ▪ E4 Additional/Replacement Generators (Ha’apai) ▪ E5 Additional/Replacement Generators (‘Eua) ▪ E6 Village Networks (electricity pole replacement) ▪ T3 Relocation of TCC Transmission Towers ▪ W2 Upgrade Nuku’alofa water system ▪ P2 Reconfigure inter-island wharf for new ferry ▪ P3 Reseal Queen Salote Wharf ▪ P4 Refurbish Slipway at Queen Salote Wharf ▪ P5 Upgrade Container Handling (Forklift) for QSW ▪ P6 Replace Fender at QSW ▪ A1 Additional Fire Tender (Fua’amotu) ▪ A2 Upgrade Navigations Aids (Fua’amotu DVOR) ▪ A3 Upgrade ‘Eua runway
<p>Proposed Projects</p> <ul style="list-style-type: none"> ▪ T7 Local Reticulation of High Speed Internet ▪ W4 Expand Nuku’alofa water system ▪ R7 Upgrading of Toulua Causeway (Vava’u) ▪ R8 New Fanga’uta Lagoon road link ▪ P12 Yellow Pier Upgrade ▪ P13 Slipway at Sopa 	<p>Proposed Projects</p> <ul style="list-style-type: none"> ▪ E9 Upgrade Bulk Fuel Facilities ▪ T5 Upgrading of TBC AM Radio Towers ▪ W3 Upgrade Neiafu water system ▪ W5 Development of a new Tongatapu well-field ▪ S1 Additional capacity to septage treatment ▪ S2 Equipment Renewal Program

Customers	Internal Processes
	<p>Proposed Projects</p> <ul style="list-style-type: none"> ▪ S3 Vava’u Semi-Aerobic Landfill Facility ▪ P8 New Pilot Boat for Queen Salote Wharf ▪ P9 Inter-island port and terminal upgrades ▪ P11 Upgrade of Queens Salote Domestic Wharf ▪ P14 Barge for Deep Water Dredging ▪ P15 Upgrade of Vava’u port ▪ A4 Upgrade Departure area (Fua’amotu) ▪ A5 New Fire Station at Fua’amotu Airport ▪ A6 Upgrade Arrivals area ▪ A7 Additional Fire Tender (Vava’u) ▪ A8 Resurfacing of Fua’amotu runway etc ▪ A9 Expand apron area at Fua’amotu ▪ A10 Resurfacing of Vava’u runway etc ▪ A11 Resurfacing of Ha’apai runway etc
Learning and Growth	Finances
<p>Projects Underway or Committed</p> <ul style="list-style-type: none"> ▪ E10 Solar Generator (Tongatapu – Meridian) ▪ R3 Transport Sector Consolidation Project ▪ P7 Vuna Wharf (Stage 1 cruise ship wharf) 	
<p>Proposed Projects</p> <ul style="list-style-type: none"> ▪ E11 Solar generation (Tongatapu - Additional 1MW) ▪ E12 Renewable energy pilots (Coconut Oil/land fill gas) ▪ E13 Energy Roadmap TGIF Projects ▪ T7 International Fibre-Optic Cable ▪ T8 E-Government ▪ T9 Fibre-Optic Cable to Ha’apai, Vava’u etc. ▪ P10 Vuna Wharf (stage 2 Marina) ▪ M2 Climate change adaptation 	

4. Priorities for Infrastructure Development

The full list of identified investment projects for the next five years includes more than \$330 million in projects that are already underway or committed, and an additional \$210 million of proposed projects for which funding is not confirmed. It is unlikely that it will be possible to fund all of these proposed projects within this timeframe from resources available to Government and Public Enterprises. Therefore priorities need to be set. This part of the NIIP brings together the results of the analysis of infrastructure needs and challenges, planned investments and supporting measures to identify a set of initiatives that Government sees as priority areas for development of the economic infrastructure sector over the next 5-10 years.

4.1 The investment priorities and how they have been determined

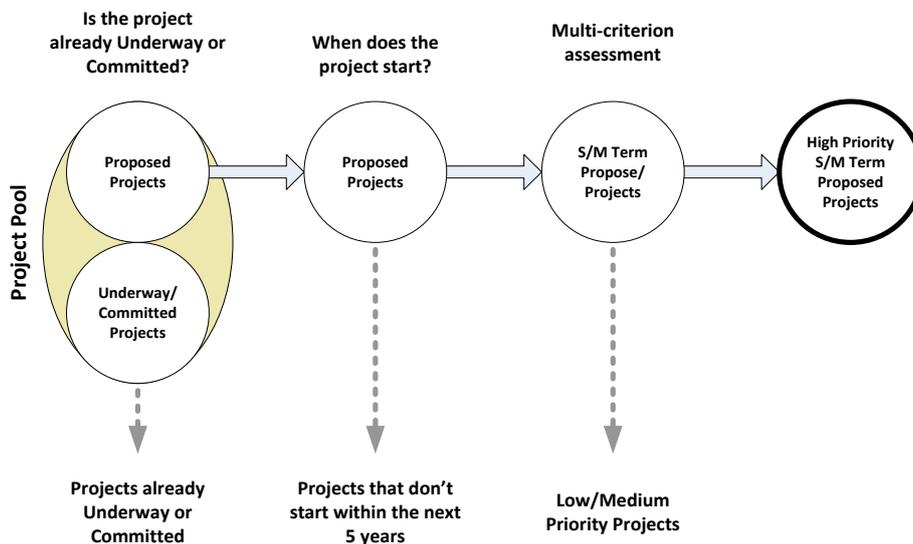
The prioritisation focused on screening the planned investments to identify those that align strongly with national priorities and deliver significant benefits to the Tongan people, the economy and the environment. The overall pool of projects (underway, committed, proposed) was first split into two components:

- Committed projects (including those already underway); and
- Proposed projects.

The immediate priority of Government is to complete investment projects already underway or committed, so those projects automatically become part of the NIIP priorities.

The Proposed projects were then progressively screened to identify projects that are planned to proceed in the next five years and which deliver strong benefits to the Tongan people. The process is shown in Figure 4.1.

Figure 4.1 Project prioritisation process



The first step was to set aside all projects that are not planned to commence in the next five years. The timing of projects beyond five years is less certain and in most cases, these longer-term proposals are still in the development phase. The remaining proposed projects were then assessed using a formal multi-criterion assessment (MCA) methodology which ranked the projects into high, medium or low priority bands, based on social, environmental and economic criteria linked to the key NSPF outcome objectives of improving the daily lives of Tongans (social,

economic), environmental sustainability, and economic development, especially by the private sector. A fourth criterion was included to assess whether the preparatory work and institutional and financial structures are in place that will enable full value return from the investment. These headline criteria are defined as follows:

- social: the extent to which project enhances the quality of life of Tongans (especially those on outer islands), taking into account factors such as access to social/educational/health services and quality of basic services (coverage, safety/security, reliability);
- environment: the positive/negative impact on environmental sustainability and climate change;
- economic: the extent to which the project supports and is likely to be a catalyst for economic development, or conversely the adverse impact if the project does not go ahead; and
- readiness: this criterion has two dimensions (a) whether preparatory work has already defined the project in sufficient detail to make it ready to proceed; and (b) whether adequate institutional and financial structures are in place that will allow full value return from the investment. For projects that fail this criterion, preparatory work (such as institutional strengthening or business model reform) is necessary before the project proceeds.

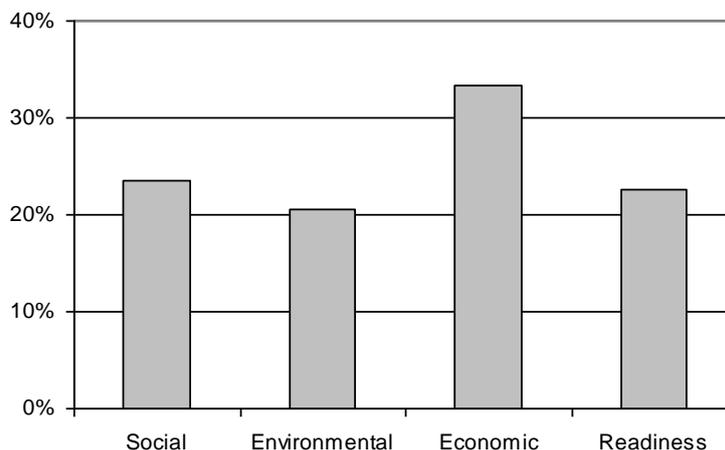
Each headline criterion was also split into several sub-criteria (Table 4.1) that reflect the different aspects that make up, for instance, the potential economic benefit of projects.

Table 4.1 Hierarchy of criteria

Headline Criterion	Sub-Criterion	Description
Economic	Access to Markets	Whether the project creates new economic opportunities, especially through access to markets, with flow-on effects such as job creation (indirect), import substitution, etc
	Jobs	Whether the project creates new jobs in the sector (direct generation)
	Cost/Efficiency	Whether the project reduces the cost to consumers and/or the cost of supply (through efficiency gains)
	Service Capacity	Whether the project maintains or increases capacity to cater for demand for services, especially demand arising from increased economic activity
Social	Social Access	Access to social opportunities and services, such as social, recreational, education, health, etc
	Service Coverage	Whether the project extends access to basic services
	Service Quality/Reliability	Whether the project improves the reliability and overall quality of infrastructure services delivered to consumers
	Safety/ Security	Whether the project improves the service safety and security
Environmental	Land	Impact/benefits to wildlife, vegetation, soils, etc
	Water	Impact/benefits to maritime environment and water quality
	Air quality/GHG emissions	Impacts/benefits to air quality and GHG emissions
Readiness	Project	Whether preparatory work has already defined the project in sufficient detail to make it ready to proceed. A project has a higher level of readiness if it is further advanced along the project pipeline (concept, pre-feasibility; feasibility; detailed design)
	Institutions	Whether adequate institutional and financial structures are in place that will allow full value return from the investment

For each criterion, the performance of each candidate project was assessed against the base case of the project not going ahead, and then the resulting scores were weighted according to the relative importance of the headline criteria to derive an overall score for each candidate project. These criterion weights and cut-off points defining High/Medium/Lower priority bands were defined through a consultative process involving input from executive representatives of the MFNP. The relative weight attached to the each of the headline criteria is shown in Figure 4.2.

Figure 4.2 Criterion weights



Economic benefits emerged as clearly the most important driver for project prioritisation. Social benefits, project Readiness, and Environmental benefits have lower ratings, but all have weightings in the 20-25% range which means that they will still be strongly influential in the overall project assessment.

The outcome of the prioritisation process is 12 proposed projects (Table 4.1) that are assessed as high priority because they are:

- planned to commence within the next five years;
- have strong alignment with the objectives of the National Strategic Planning Framework and deliver a high level of economic/social/environment benefits to Tonga; and
- sufficiently well advanced (ready) in terms of project preparation and underpinning institutional/ financial structures.

Most of these projects are independent but there are two projects that are very closely linked. Construction of an undersea fibre-optic cable linking Tonga to international networks (T6) and local access of high speed internet (T7) go hand-in-hand. As a stand-alone project and without the undersea cable in place, local reticulation of high speed internet is not a high priority. But with the cable in place it becomes a high priority because it delivers the same benefits as the cable, and in turn, the cable would not deliver its full value without matching local distribution. Therefore, they are closely linked projects and in combination are rated as high priority.

Table 4.2 High priority proposed projects

Sector	Ref	Project	Estimated Cost (\$m)	2011-2015					
Energy	E11	Solar generation (Tongatapu - Additional 1MW)	\$14.0						
	E12	Renewable energy pilots (Coconut Oil/land fill gas)	\$3.0						
	E13	Energy Roadmap TGIF Projects	tbd						
Telecoms	T5	Upgrading of TBC Radio Towers	\$1.4						
	T6	International Fibre-Optic Cable	\$60.0						
	+ T7	Local Reticulation of High Speed Internet	\$8.0						
Water	W2	Upgrade Tongatapu (wells, storage, distribution)	\$6.5						
Solid Waste	S3	Vava'u Semi-Aerobic Landfill Facility	\$4.0						
Ports	P9	Inter-island port and terminal upgrades	\$10.0						
Airports	A8	Resurfacing of Fua'amotu runway, apron, taxiway	\$28.0						
	A10	Resurfacing of Vava'u runway, apron, taxiway	\$4.0						
	A11	Resurfacing Ha'apai runway, apron, taxiway	\$7.0						

\$145.9

4.2 NIIP is an integrated strategy

These investment projects cannot be considered in isolation because “hard” infrastructure cannot be separated from its supporting framework of “soft” infrastructure (institutional/policy/regulatory/legal/financial/planning). In addition, some projects rely on other initiatives happening first or at the same time so that they can deliver their full value. As a result, the NIIP priorities for development of the economic infrastructure sector extend beyond investment projects. **The NIIP is an integrated program of investment projects and supporting complementary initiatives.** These complementary initiatives are mostly non-infrastructure measures that support the investments and will lead to achieving better long-term and sustainable value from the investments.

Taking into account all these factors, the overall NIIP priority program has four components:

- projects already underway or committed;
- proposed projects that are assessed to be a high priority;
- complementary initiatives that support these projects and their life cycle management; and
- linked projects rely on another initiative (project, complementary initiative) proceeding first, to enable the full benefits to be realised.

Some of the priority measures relate to cross-sectoral issues, while others are specific to a particular sector. For convenience, the integrated strategy for development of the economic infrastructure sector as a whole is presented in the following sections in two ways: firstly, on a

sector-by-sector basis (energy, telecoms, water, solid waste, transport, multi-sector), and then in terms of the cross-sectoral themes identified in Section 1.3.

4.3 Priorities programs by sector

Priority programs identified for each of the sectors are presented below in a consistent format. For each sector, there is a background overview and statement of Government priorities for proposed initiatives; a brief description of the components; and a flowchart that summarises the ongoing program in the sector, the priority investments, supporting complementary initiatives, and linked projects.

Energy

The energy sector is in a phase of rebuilding and transformation. Tonga Power is investing heavily from its own resources to rehabilitate the electricity generation and supply system to increase efficiency and safety; and is working with development partners (EU, NZAID, WB) to upgrade village power supply systems and off-grid supply (JICA). At the same time, initiatives are underway to transform the energy sector with a move towards greater stability and self-sufficiency. In 2009, Government responded to the twin challenges of reducing the Tongan contribution to global Greenhouse Gas (GHG) emissions and improving national energy security by approving a policy to supply 50% of electricity generation through renewable resources by 2012. This is an ambitious target that provides a clear indication that environmental sustainability and reducing the vulnerability of the country to future oil price shocks are key Government objectives. Renewable energy is expected to be a major element of the strategy to enhance energy security for the Kingdom.

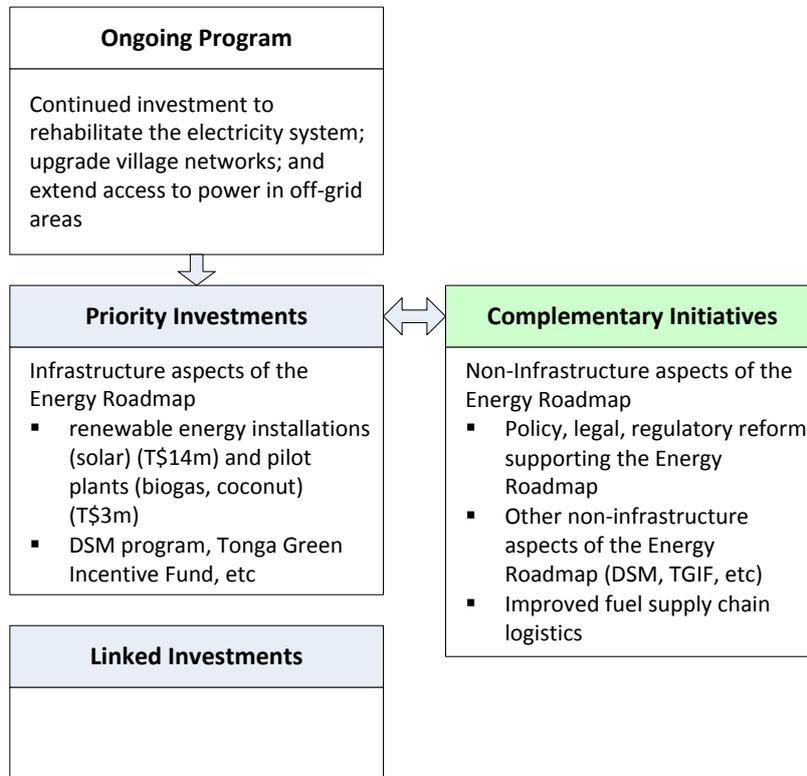
Responding to this challenge with measures outlined in the *Energy Road Map*¹⁰ is the main Government priority in the energy sector. This will involve a range of investments and supporting initiatives, in particular:

- technical assistance for policy, legal, regulatory adjustments necessary to transform the energy sector; feasibility of establishment of the Tonga Green Incentive Fund (TGIF), data gathering, resource assessments and technical studies. The proposed TGIF is a dedicated fund that would provide incentives for private sector investment in renewable energy and/or for the long-term finance of consumer owned renewable energy installations. (total around \$5 million but can be split into specific activities/sub-projects);
- end-use efficiency and demand-side management initiatives aimed at reducing inefficient use and waste of electricity (ongoing with an initial investment of around \$4 million but can be split into specific activities/sub-projects);
- introduction of additional solar (photovoltaic) generation capacity into the grid (around \$14 million per MW);
- trialling alternative sources of energy, such as Coconut Oil (CNO) blended with or replacing diesel in existing or slightly modified engines, and gas extracted from landfills (estimated \$3-5 million for initial trials); and
- initiatives to stabilise and potentially reduce the cost of fuel by measures such as hedging and/or improving the fuel supply chain (for instance by increasing the fuel storage capacity at Nuku'alofa at an estimated cost of \$11 million).

¹⁰ World Bank (2010) *Tonga Energy Road Map 2010-2020*.

This is in addition to a \$12 million program of investment in off-grid solar power systems for households in outer-islands, that is underway with support from the Japanese Government.

The priority program for the Energy sector is:



Telecommunications

Competition in the telecommunications sector is producing a vibrant market with strong private sector and Public Enterprise investment. However, further development is constrained largely by the speed and bandwidth of existing satellite-based international communications.

Government priorities in the telecoms sector are:

- installation of an under-sea optic fibre cable linking Tonga with international networks (\$60m), and local reticulation of high speed internet access using one or a combination of appropriate technologies, such as fibre-optic cable or wireless (the cost will depend on the technology or technologies adopted, but one available estimate is \$8m); and
- upgrading of TBC AM radio transmitter (\$1.4m).

The Government supports moves to have an international fibre-optic cable link in place as soon as possible. This is a project with potential to redefine telecommunications in Tonga; offset some of the geographical disadvantage experienced by Tonga; and create new economic and social opportunities. Considerable preparatory work has already been done¹¹ and the priority is now to move to the implementation phase. When the cable link proceeds, an important supporting investment is the rollout of local distribution of high speed internet within Nuku'alofa using appropriate technologies (such as cabling, high speed wireless, etc). The purpose is to ensure

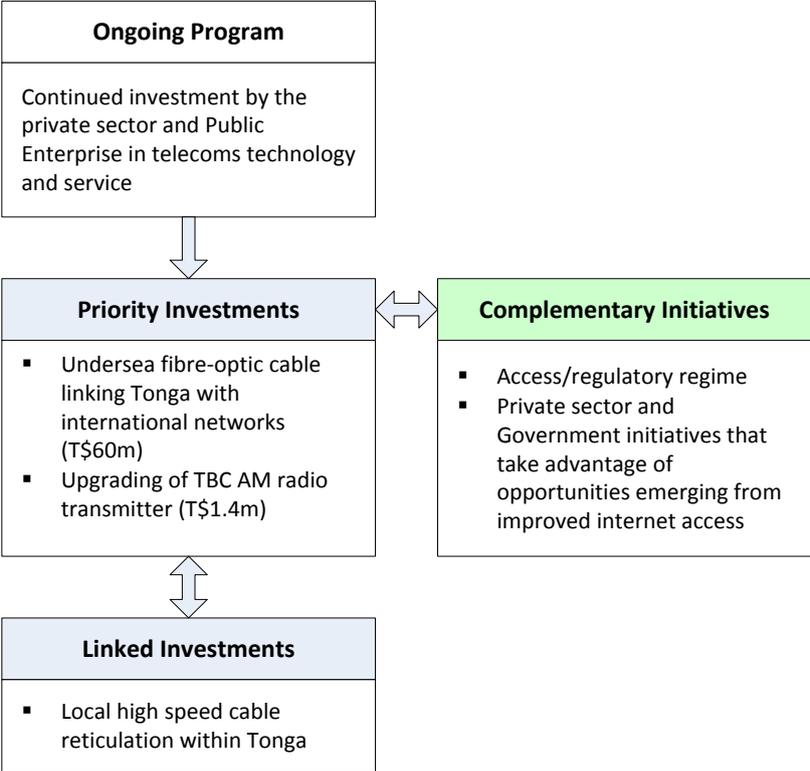
¹¹ For an overview of issues see World Bank (2010) *Technical, Economic and Financial Connectivity Study for Tonga and Samoa*.

that the full benefits of the increased speed and bandwidth are delivered to business and the community.

In addition, there are two complementary initiatives that support the fibre-optic cable link and high-speed in internet distribution. These are firstly, the establishment of an appropriate regulatory and access regime for wholesaling of high-speed internet access; and secondly, follow-up private sector and Government initiatives that build on opportunities emerging from improved internet access, such as e-commerce and E-Government services. These follow-up activities are critical to maximising the national benefits from investment in the cable.

The second investment priority in this sector is upgrading the TBC AM radio transmitter at Nuku’alofa (estimated cost \$1.4 million). AM Radio plays an important role in sending messages to outer island communities, and has a vital role in broadcasting regular weather reports and cyclone and tsunami warnings. The existing equipment is almost 40 years old, has rapidly increasing maintenance costs, and is delivering poor reception in some outer islands. It is important to maintain this communications lifeline to the outer islands for regular broadcasting and as a backup to other systems during natural disasters.

In summary, the priority program for the Telecoms sector is:



Water

The Tonga Water Board has commenced a program of rehabilitating the water supply system (with some initial support from SOPAC and EU), but the program is now progressing too slow and needs additional input. The Government priority for the water sector is to:

- accelerate the program to rehabilitate and upgrade water supply systems (especially the Nuku’alofa system) to increase efficiency, reduce losses etc.

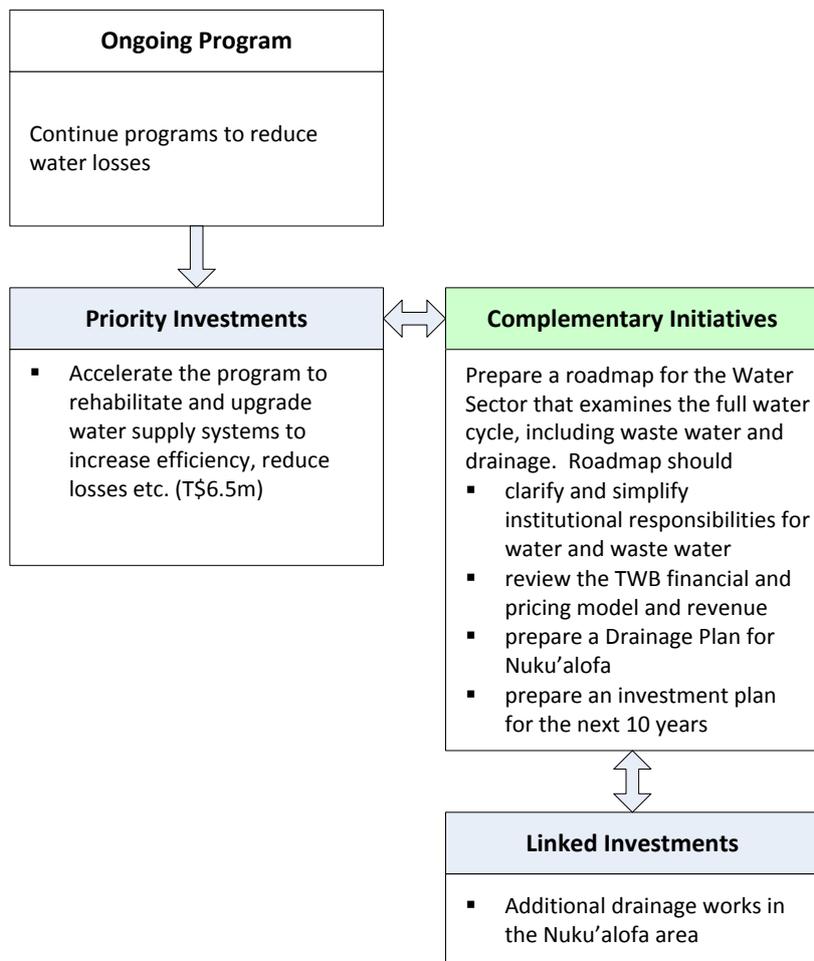
This will provide benefits to consumers and business in terms of improved water supply and reduce the cost of water production. In the longer term it will reduce the pressure on existing underground resources and delay the need for additional wells and other new investment.

The water sector currently does not have an up-to-date medium- to long-term development strategy. The preparation of a long-term master plan has been proposed under the ADB-supported UPMS project and is supported by TWB. Preparing a Water Roadmap is now a priority. In addition to setting a long-term agenda for developments and investments in water supply nationwide over the next 10-20 years, the roadmap should examine:

- the full water cycle, including waste water, sanitation and drainage because of institutional gaps in these areas; and
- the TWB financial and pricing model as part of a broader review of TWB. The aim is to strengthen the financial performance of TWB to make it better able to keep pace with funding investment and maintenance needs from its own resources.

The roadmap should also include a comprehensive drainage plan for Nuku’alofa and a water sector investment plan for the next 10 years.

The priority program for the Water sector is:



Solid Waste

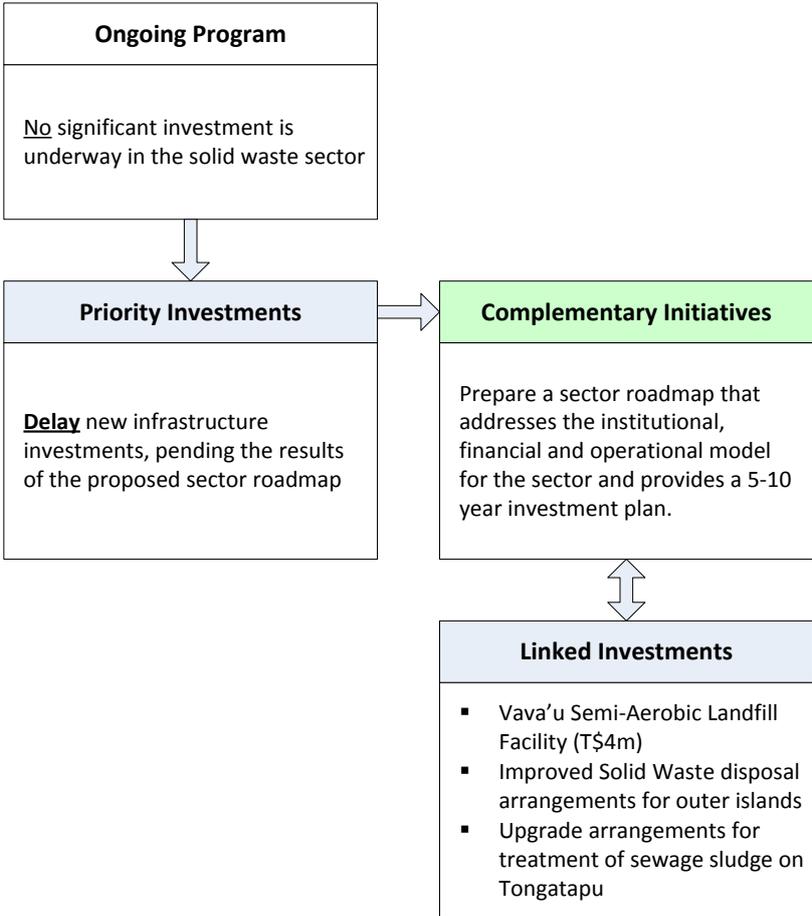
Several proposed investments in the solid waste sector are listed in Chapter 3 of this Plan and there are targets to extend solid waste collection and disposal services to each island group¹². But as observed earlier in this Plan, the existing operational and financial model for solid waste collection, charging and management is not working as well as expected. There is a risk that short-term investments in this sector will not deliver long-term value without complementary initiatives.

The Government priority in the solid waste sector is to update the institutional, financial and operational model for the sector as a precursor to further infrastructure investment. Therefore, the immediate priority is to undertake a review of the sector that includes:

- an analysis of current operations and assessment of reform options, with recommendations for consideration by Government; and
- a short/medium/long-term strategy and investment plan for the sector.

Based on the outcomes of the sector review, further infrastructure investment in solid waste management infrastructure is likely to be warranted. In particular, the construction of a waste management/disposal facility for Vava’u has been identified as a high priority project. Other important issues that should be addressed in the sector roadmap include solid waste disposal arrangements for outer islands and sewage sludge treatment/disposal arrangements on Tongatapu.

In summary, the priority program for the Solid Waste sector is:



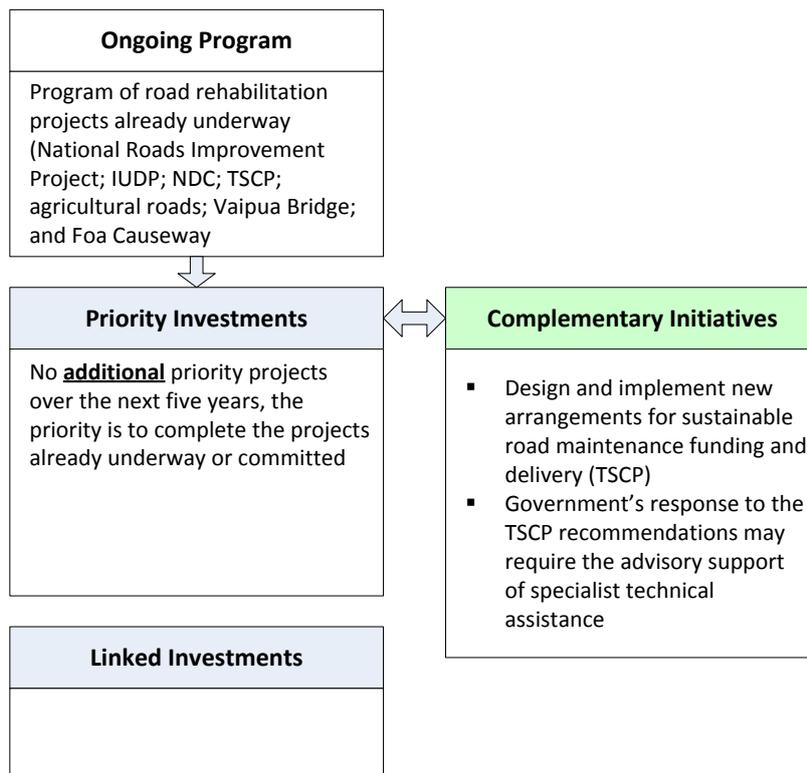
¹² (Draft) National Integrated Waste Management Strategy for Tonga 2010.

Roads

Over the next five years there will be a substantial peak in road rehabilitation activity. Projects already underway or committed include the National Roads Improvement Project; the Integrated Urban Development Sector Program; the Nuku’alofa Redevelopment Program; an agricultural road program; and the Transport Sector Consolidation Project. In addition, projects to rehabilitate the Vaipua Bridge (Vava’u) and Foa Causeway (Ha’apai) are expected to commence within the next year. In total, this means that more than \$120 million will be spent on road rehabilitation over the next five years.

The Government priority for the roads sector over the next five years is to complete these projects to a high standard, and to support them with complementary initiatives aimed at strengthening the capacity to sustainably maintain Tonga’s roads in the long term. This will require reform of the way that Tonga funds and manages the road maintenance task. Studies underway as part of the TSCP program will develop a strategy for road maintenance over the next 5-10 years, including recommendations for road maintenance programming, institutional reform, sustainable funding mechanisms, and the role of the private sector. These studies are expected to be completed by early 2011. The Government will then be in a position to select and implement a new approach to road maintenance.

This means that no additional major projects are proposed for the Roads sector over the next five years, the priority program for the sector is:



Ports

Ports Authority Tonga (PAT) has commenced a program of investment in rehabilitating and upgrading core cargo and ship handling facilities, funded from its own resources. It is important to Government that PAT continues this program of operational investments at Queen Salote Wharf.

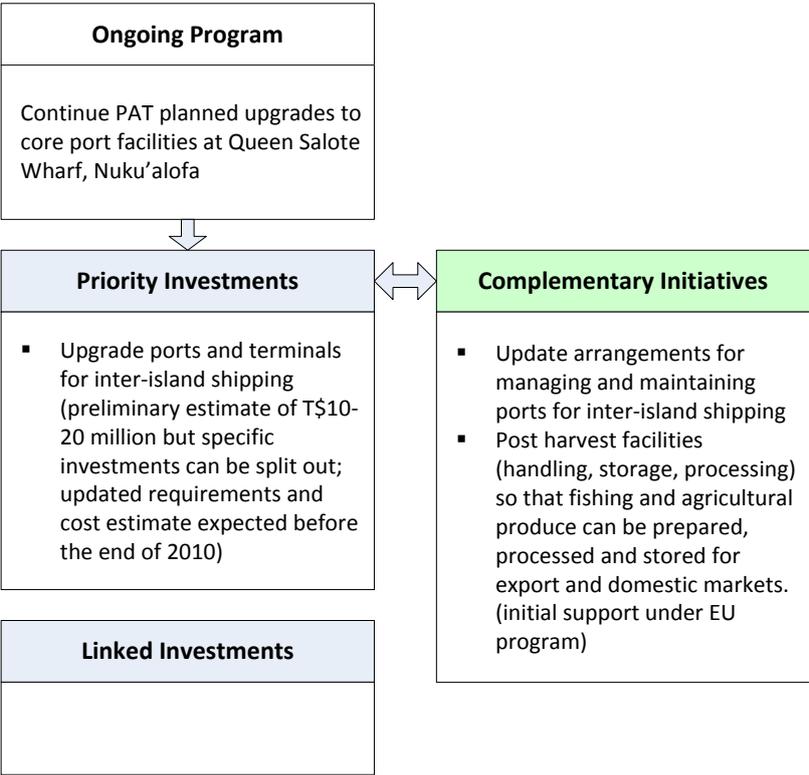
The Government priority in the ports sector is to rehabilitate outer islands ports as part of a more comprehensive revitalisation of inter-island shipping that also includes introduction of a new ferry in late 2010 and possible development of improved terminals and post harvest facilities at ports. The last major upgrading of outer-island ports was completed in 2000 and there has been little in the way of further investment. Necessary works will be undertaken to reconfigure the ports for operation of the new ferry, but these works will not include a more comprehensive update of port and terminal facilities.

The Government priority for investment in the seaports sector is:

- further upgrade ports and terminals for inter-island shipping to ensure efficient and reliable operation of the new ferry. Required investments and cost estimate to be determined by a study underway by the Ministry of Transport, with assistance from AusAID. Findings are expected to be available in late 2010.

This will provide substantial benefits to outer-islands in terms of better and more reliable access to markets and social activities, and could be a catalyst for economic development in areas such as tourism, agriculture and fisheries. Under the NSPF and other Government strategies, revitalisation of agriculture and fisheries exports and further development of tourism are high priorities. The benefits from upgrading ports and terminals for inter-island shipping can be complemented by the development of post harvest facilities (handling, storage, processing) so that fishing and agricultural produce can be prepared, processed and stored for export and domestic markets. EU is assisting with implementing investments and supporting activities in this area. A second complementary initiative is to update the institutional/financial arrangements for sustainable management and maintenance of domestic ports. The aim is to ensure that domestic port infrastructure and facilities are kept in good condition and to maximise the value of the new inter-island ferry and investments in port facilities.

This combination of investments and complementary initiatives means that the priority program for the Ports sector is:



Airports/Aviation

The key priority for airports is to maintain compliance with required international and national safety, security and operational requirements. Tonga Airports Ltd (TAL) has an ongoing investment program aimed at meeting these requirements, and also at enhancing the airport user experience. TAL is funding these initiatives from its own resources and with the assistance of the IDA-funded TSCP. It is important to Government that TAL continues this program of safety, security and operational investments.

A critical safety and operational issue is the condition of airport runways. The runway at 'Eua will be rehabilitated and extended within the next year, with assistance from NZAID, but the runways at other sealed airstrips (Fua'amotu, Vava'u, Ha'apai) will require resurfacing within the next five years to ensure safe and unrestricted operation. The main runway at Fua'amotu International Airport was upgraded and extended by 600 metres in 1990, but since then, only minor routine maintenance has occurred. If resurfacing works are not undertaken in the near future then there is a risk that operational limits will be placed on aircraft take-off-weight, which could adversely affect international air services to Tonga.

In addition to TAL's ongoing program of safety, security and operational investments, the Government's priority for further investment in the airports sector is to

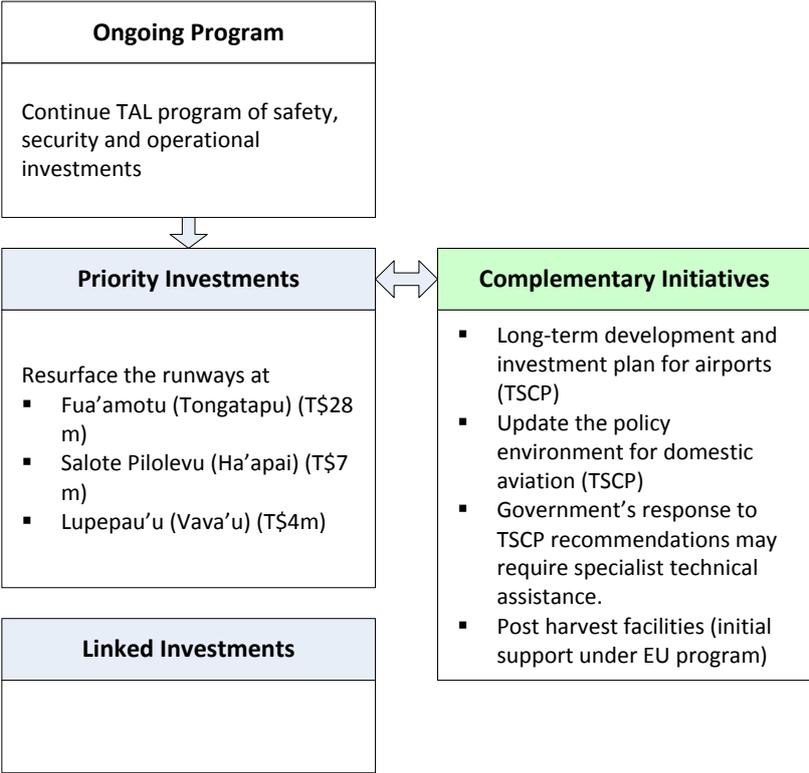
- resurface the runways at Fua'amotu (Tongatapu), Salote Pilolevu (Ha'apai) and Lupepau'u (Vava'u) Airports. (estimated cost of \$28 million for Fua'amotu, \$4 million for Vava'u, \$7 million for Ha'apai, but economies of scale may be possible if combined with similar activities, such as road resurfacing).

There are several complementary initiatives in the airports sector that support these investments. Long term planning for Tonga airports is currently underway (supported by the TSCP) and is expected to be completed by late 2010. This will define the future roles of each of the airports and the investment needs of the major airports over the next 10-20 years.

It is also important to update the policy environment for the domestic aviation market. Over recent years, inter-island air services have been unreliable and the market unstable with several operators entering and leaving the market. This has adversely affected tourism and access to markets for the outer islands. Studies underway as part of the TSCP will examine the domestic aviation market and provide recommendations on issues such as market entry and regulation, for consideration by Government. The aim is to create a market environment in which stable and reliable inter-island air transport can be assured.

The third complementary initiative is to further develop post harvest facilities (handling, storage and processing) so that fishing and agricultural produce can be prepared, processed and stored for export and domestic markets. Support for post harvest facilities is being provided under the EU assistance program.

The priority program for the Air Transport sector is:



Multi-Sector

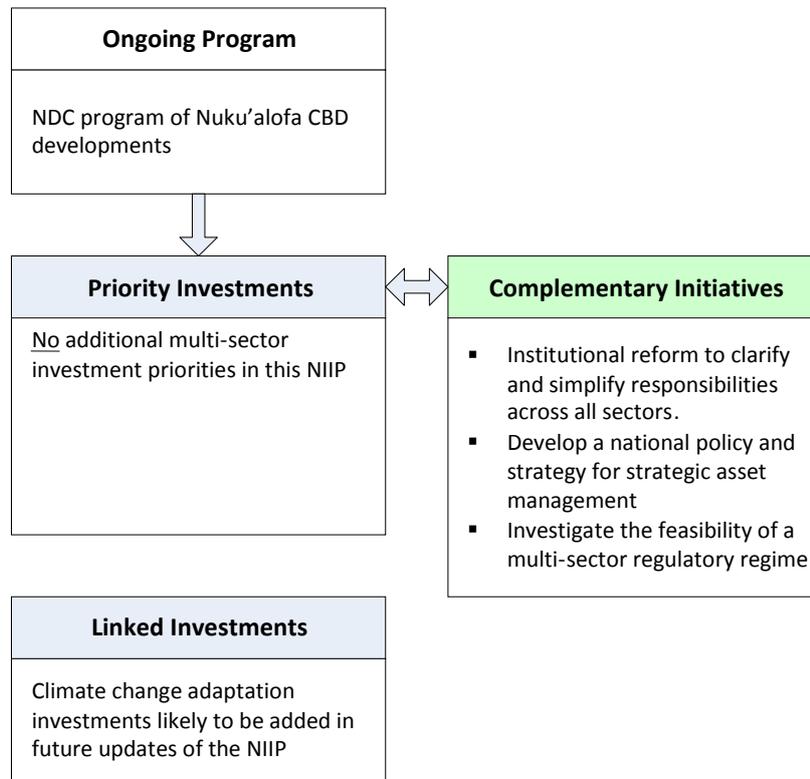
No new multi-sector investment priorities are identified in this Plan. However it is expected that future updates of the NIIP will include a multi-sector investment program that will emerge from the *Joint Action Plan on Climate Change Adaptation and Disaster Risk Management 2010-2015*.

Although no high priority multi-sector investments are planned for this NIIP, a range of important complementary measures have been identified as high priorities for improving the performance of the economic infrastructure sector as a whole. The Government priorities in this respect are the following complementary initiatives:

- review the functional responsibilities in the economic infrastructure sector and institutional reform to clarify and simplify institutional responsibilities. Reforms could be implemented as part of overall restructuring of Government associated with political reforms to occur in late 2010. This also provides an opportunity to identify and apply reforms that streamline the infrastructure planning, approvals and delivery process;
- promote the principles of strategic asset management and a life-cycle view of infrastructure, as a framework for an improved approach to infrastructure management by Ministries and Public Enterprises; and
- examine the potential for establishing a multi-sector regulatory regime that reviews and make recommendations regarding pricing of common-user services (power, water, waste and telecom wholesaling).

The purpose of the first initiative is to clarify and simplify responsibilities and streamline processes, with the aim of ensuring that lines of responsibility are clearly drawn (with no gaps or overlaps in coverage of responsibility for economic infrastructure sub-sectors) and that there is a single coordinating agency for each sub-sector. The purpose of the second initiative is to promote asset management as a core function of agencies and incorporate a longer-term view into infrastructure planning and management. The purpose of the third initiative is to ensure that

pricing of public utilities providing monopoly services is consistent with sustainable and efficient delivery of the service. These and other cross-sectoral complementary initiatives are discussed in more detail in the following chapters. In summary, the priority multi-sector program is:



4.4 Priorities by strategic theme

When viewed as a whole, there are several cross-sectoral themes that flow through the priority investments and their associated complementary initiatives. These themes reflect the NSPF infrastructure priorities outlined in Chapter 1 (quality of life, improved access to business and social opportunities, sustainability and maintenance); and align with the key priorities to emerge from consultation with the private sector (access to markets and energy cost and security). For this NIIP, the economic infrastructure priorities can be integrated under four strategic themes:

1. Greener Energy and more Stable Prices
2. Better Access to Markets
3. Better Management of the Water and Waste Cycle
4. Better Asset Management

These themes and their rationale are defined in Table 4.2¹³ and the overall structure of the Plan and alignment of themes and initiatives is summarised in Table 4.3. Together, these priority themes and the associated projects and initiatives provide strategic direction to guide development of the economic infrastructure sector.

¹³ An additional theme that is likely to figure more prominently in future updates of the NIIP is

5. Climate Change Adaptation and Disaster Management

A multi-sector response to these issues is being developed by Government as part of the *Joint Action Plan on Climate Change Adaptation and Disaster Risk Management 2010-2015*, but at this stage, the associated investment needs are not sufficiently well defined to be part of this NIIP.

Table 4.3 Priority themes for economic infrastructure

Theme	Rationale
1. Greener Energy and more Stable Prices	These are initiatives that implement the <i>Energy Road Map</i> . They are aimed at reducing emissions; improving national energy security; reducing the vulnerability of the country to future oil price shocks; and helping to stabilise energy costs for the community and business. This theme aligns with NSPF priorities; Government targets for conversion to renewable energy sources; and the directions outlined in the <i>Energy Road Map</i> .
2. Better Access to Markets	The aim of this theme is to improve access to domestic and international markets for Tongan businesses, especially in the agriculture, fisheries and tourism sectors; and at the same time, improve quality of life by providing improved access to social, educational and health-related activities, especially for residents of outer islands. This theme strongly aligns with NPSF objectives to improve access to markets (especially for outer islands) and facilitate private sector development.
3. Better Management of the Water and Waste Cycle	Water and waste are sectors where investment is urgently needed to improve effectiveness and current institutional arrangements are not working as well as expected. This theme is a mix of infrastructure and non-infrastructure measures aimed at revitalising these sectors. This theme reflects NSPF sustainability priorities, and the urgent need to address problems in these sectors.
4. Better Asset Management	The aim of this theme is to improve the management of infrastructure. This involves better planning, making better use of existing infrastructure, and looking after it better through improved maintenance. This theme reflects the importance placed by Government on improving maintenance performance and the overall need to make the most of existing and new infrastructure. This theme aligns with Government commitments in the NSPF to ensure the maintenance of infrastructure in the Kingdom.

Table 4.4 Summary of priority projects and complementary initiatives by theme

Theme	Sector	Priority Investment Projects	Complementary Initiatives
Greener Energy and more Stable Prices	Energy	<p>Energy Roadmap implementation</p> <ul style="list-style-type: none"> Renewable energy installations (solar \$14m) and pilot plants (biogas, coconut \$3m) Infrastructure components of the Energy Roadmap demand-side management program Tonga Green Incentive Fund (infrastructure components) 	<p>Energy Roadmap implementation</p> <ul style="list-style-type: none"> Technical assistance for policy, legal, regulatory adjustments DSM and other non-infrastructure aspects of the Energy Roadmap Tonga Green Incentive Fund (other components) Improved fuel supply chain and price stability (e.g. hedging, upgrade tank farm, etc)
	Telecoms	<ul style="list-style-type: none"> Under-sea optic fibre cable linking Tonga with international networks (\$60m) Upgrading of TBC AM radio transmitter (\$1.4m) 	<ul style="list-style-type: none"> Local reticulation of high speed internet by appropriate technology (such as cabling) Private sector and Government initiatives that take advantage of opportunities emerging from improved internet access (such as the E-Government Initiative)
	Ports	<ul style="list-style-type: none"> Rehabilitate outer island ports to improve safety/reliability/ efficiency and support economic development (follow-up to immediate works to reconfigure ports for the new ferry) (\$10m) 	<ul style="list-style-type: none"> Develop post harvest facilities (handling, storage, processing) in conjunction with inter-island and international ports so that fishing and agricultural produce can be prepared, processed and stored for export and domestic markets. (initial support by EU)
Better Access to Markets	Airports	<ul style="list-style-type: none"> Resurface airport runways (Tongatapu \$28m, Ha'apai \$4m, Vava'u \$7m) 	<ul style="list-style-type: none"> Update the policy environment for domestic aviation (study supported under the TSCP program). Government's response to the TSCP recommendations may require the support of specialist technical assistance. Develop post harvest facilities (handling, storage, processing) in conjunction with airports (initial support by EU)

Theme	Sector	Priority Investment Projects	Complementary Initiatives
Better Management of the Water and Waste Cycle	Water	<ul style="list-style-type: none"> Accelerate the existing program to rehabilitate and upgrade water supply systems (especially Nuku'alofa) to increase efficiency, reduce losses etc. (\$6.5m) 	<ul style="list-style-type: none"> Prepare a roadmap for the Water Sector that examines the full water cycle, including waste water and drainage. The roadmap should address <ol style="list-style-type: none"> institutional responsibilities in the water and waste sectors, including an organisational and business model for managing urban drainage the TWB financial and pricing model and revenue collection; drainage plan for Nuku'alofa; a water and drainage investment plan for the next 10 years.
	Solid Waste	<ul style="list-style-type: none"> <u>Delay</u> new infrastructure investments, pending the results of the proposed sector roadmap New semi-aerobic landfill at Vava'u, depending on the outcome of the sector roadmap (\$4m) Other recommendations of sector roadmap 	<ul style="list-style-type: none"> Prepare a sector roadmap that addresses current issues and required improvements to the institutional, financial and operational model for the sector and provides a 5-10 year investment plan.
Better Asset Management	All Sectors		<ul style="list-style-type: none"> Institutional reform to clarify and simplify institutional responsibilities across all sectors. Develop a national policy for strategic asset management, that promotes asset management as a core function of agencies and incorporates a longer-term view of infrastructure needs and asset management. Investigate the potential for establishing a multi-sector regulatory regime that reviews and make recommendations regarding pricing of common-user services (power, water, waste, telecom wholesaling)
	Roads	No <u>additional</u> priority projects over the next five years. The priority is to complete the projects already underway or committed.	<ul style="list-style-type: none"> Implement new arrangements for sustainable road maintenance funding and delivery (study supported under the TSCP program). Government's response to the TSCP recommendations may require the advisory support of specialist technical assistance.
	Domestic Ports		<ul style="list-style-type: none"> Implement new institutional/financial arrangements for sustainable management and maintenance of domestic ports.

5. Accounting for life cycle costs

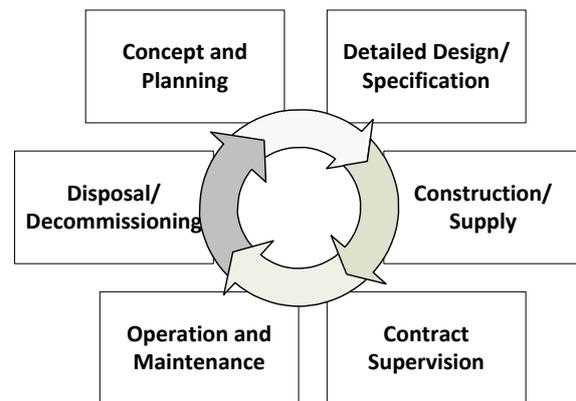
The purchase or construction of an infrastructure asset is not an end, or even a beginning. It is one step in the life cycle of an asset that extends from the initial identification of needs through to disposal of the asset at the end of its useful life. This part of the NIIP examines the life cycle costs of infrastructure and the current situation in Tonga regarding the balance between maintenance needs and maintenance spending. It also examines the maintenance implications of the NIIP infrastructure investment program.

5.1 The asset life cycle

The life cycle of an infrastructure asset (Figure 5.1) involves a sequence of steps that extend from the initial identification of needs through to disposal of the asset at the end of its useful life. All of these steps require planning and coordination and involve costs and time:

- the cost and time involved in planning investigations, development of the design concept, and associated studies such as environmental impact assessment;
- the cost and time required for preparing detailed designs and/or specifications and the cost of preparing contract documentation;
- the construction/supply cost of the infrastructure, plus allowance for contingencies and cost escalation over the supply period. For a major infrastructure project, the combined duration of planning, detailed design/specification, contracting and delivery can amount to several years;
- the cost of supervising the contract (technical, financial, legal) to ensure that the work is done to the required standard and in compliance with contract requirements;
- the cost of operating the infrastructure over its useful life (such as labour, energy costs and consumables);
- the cost of maintaining the infrastructure over its entire operating life to keep it in good condition. This includes routine maintenance (small-scale activities undertaken regularly as general upkeep against normal wear and tear) and periodic maintenance (larger scale activities carried out at longer intervals to sustain the infrastructure condition or operational status). The economic life over which infrastructure is operated and maintained can range from around 5-10 years for some equipment and up to 100 years for major civil works; and
- the cost of disposal which can include the cost of decommissioning the asset, demolishing/removing it from the current location, and disposing of the waste. This can involve a range of environmental costs associated with disposal. The unused infrastructure should not be just left in place to decay and potentially pollute its surroundings.

Figure 5.1 The asset life cycle



This means that the total cost of owning an infrastructure asset is the sum of all of these life cycle costs and will generally be much higher than the initial construction/purchase cost. The typical breakdown of life cycle costs of infrastructure is summarised in Table 5.1 along with some

benchmarks for the typical contribution of each cost component. The figures demonstrate that up-front costs (planning, design/specification, contract management) can add 10-20% to the cost of infrastructure projects before operation commences, and when combined with ongoing maintenance and contingencies for cost escalation, the total 20 year life cycle cost of major infrastructure can be up to double the initial construction/purchase cost. On the other hand, in some cases lower operating costs can offset a higher initial purchase price and produce a lower life-cycle cost. This emphasises the need to consider full life cycle costing in infrastructure decision making.

Table 5.1 Indicative analysis of life cycle costs

Stage	Rate ^a	Construct/ Supply Only	+ Other Up-front	20 year Maintenance
Concept Development and Planning	2-5%		\$2-5	
Detailed Design and Documentation	5-10%		\$5-10	
Infrastructure Construction/Supply		\$100	\$100	
Contingency/Escalation	10%		\$10	
Contract Supervision	2-5%		\$2-5	
Operating Cost	variable			
Maintenance – Routine ^b	0-5%			\$0-100
Maintenance – Periodic ^c	5-10%			\$10-20
Disposal/Decommissioning	variable			
TOTAL		\$100	\$120-130	\$10-120

Notes: a. Based on typical infrastructure costing parameters
 b. Varies from minimal routine/periodic maintenance for buried infrastructure (such as water pipes) up to 5% per year for routine and 10% periodic maintenance for gravel roads.
 c. Based on 20 year asset life with periodic maintenance every 7 years.

Government understands the need to consider life cycle costs more fully in project planning and budgeting and intends to introduce a new standardised format for all project proposals submitted for its funding or support, which includes an estimate of life cycle costs for infrastructure projects. This initiative is discussed in Chapter 7 in the context of managing and delivering infrastructure.

To further illustrate the importance of life-cycle costing, Table 5.2 provides an indicative breakdown of the life cycle costs of owning the infrastructure associated with NIIP priority projects, using the cost categories and rules-of-thumb shown in Table 5.1. The analysis shows that when full life cycle costs are included, the total up-front costs of delivering the NIIP priority infrastructure projects (including concept development, detailed design, construction/purchase, allowance for cost contingency/escalation, contract supervision) can increase from \$146 million to an estimated \$178 million. Note that these are conservative estimates and that the concept planning and detailed design of all of these projects is already well underway. In total, the 20-year life cycle cost of NIIP priority projects is estimated at around \$240 million.

Table 5.2 Estimated life cycle costs of NIIP priority projects (\$'000)

Sector	Projects	Concept Planning & Detailed Design	Capital Cost	Supervision & Contingency/ Escalation	Annual Maintenance	Total 20-year Life cycle
Energy	E11 Solar generation (Tongatapu - Additional 1MW)	\$0.7	\$14.0	\$1.7	\$0.02	\$24.8
	E12 Renewable energy pilots (Coconut Oil/land fill gas)	\$0.9	\$3.0	\$0.5	\$0.09	\$5.6
	E13 Energy Roadmap TGIF Projects	-	-	-	-	
Telecoms	T5 Upgrading of TBC Radio Towers	\$0.1	\$1.4	\$0.2	\$0.04	\$2.5
	T6 International Fibre-Optic Cable	\$4.2	\$60.0	\$9.0	\$1.20	\$97.2
	T7 Local Reticulation of High Speed Internet	\$0.6	\$8.0	\$1.2	\$0.20	\$13.8
Water	W2 Upgrade Tongatapu (wells, storage, distribution)	\$0.5	\$6.5	\$1.0	\$0.16	\$11.2
Solid Waste	S3 Vava'u Semi-Aerobic Landfill Facility	\$0.6	\$4.0	\$0.6	\$0.12	\$7.6
Roads	No projects, priority is to complete committed projects.					
Ports	P9 Inter-island port and terminal upgrades	\$1.2	\$10.0	\$1.5	\$0.20	\$16.7
Airports	A8 Resurfacing of Fua'amotu runway, apron, taxiway	\$2.0	\$28.0	\$4.2	\$0.60	\$45.4
	A10 Resurfacing of Vava'u runway, apron, taxiway	\$0.3	\$4.0	\$0.6	\$0.08	\$6.5
	A11 Resurfacing Ha'apai runway, apron, taxiway	\$0.5	\$7.0	\$1.0	\$0.14	\$11.3
Total		\$10.9	\$145.9	\$21.4	\$2.9	\$242.5

Notes: a Maintenance estimates from project pre-feasibility studies where available (Energy Roadmap, Fibre-Optic Cable link study), otherwise based on typical costs.

5.2 Maintenance implications of the NIIP priority program

In addition to the priority proposed projects, the projects that are already underway or committed also have potential to add significantly to ongoing maintenance commitments. In total, the infrastructure program that is already underway and committed, plus the 12 priority investment projects, involves projected investment of some \$480 million over the next five years. Table 5.3 shows an analysis of estimated annual maintenance costs after the projects are fully implemented, using rules of thumb for maintenance requirements of different types of infrastructure as shown in Table 5.1. The results are broken down by sector, agency and whether the infrastructure is new, an upgrade to existing infrastructure, or addresses a deferred maintenance issue¹⁴.

Table 5.3 Estimated annual maintenance requirements of NIIP projects at 2015 (\$'000)

Sector	Agency	New Infrastructure	Upgrades	Deferred Maintenance	Total
Energy	Tonga Power	900	1,200	500	2,600
	Government		50	0	50
Telecoms	Public Enterprises ^a – TCC, TCB, TCL ^b , Tonga Power	1,500	250	50	1,800
Water	Tonga Water Board	0	300	0	300
Waste	Waste Authority	100	0	0	100
Transport	Roads – Ministry of Works	0	2,300	700	3,000
	Airports – Tonga Airports Ltd	50	150	800	1,000
	Ports – Ports Authority Tonga	650	1,100	50	1,800
	– Ministry of Transport	0	250	0	250
Multi	Nuku'alofa Development Corp.	0	500	0	500
TOTAL		3,200	6,100	2,100	11,400

Notes: a Several Public Enterprises are planning investment in the telecommunications sector and ultimate responsibility for some infrastructure items (such as local distribution of high speed internet) is unclear. All maintenance requirements have been combined.

b TCL (Tonga Cable Ltd) is a new Public Enterprise established to manage the proposed international fibre-optic cable and provide common carrier access.

If all of these projects go ahead, the total annual recurrent cost of sustainable maintenance of the infrastructure would be around \$11.4 million. About 75% (\$8.5 million) of this is for projects that

¹⁴ The categories are defined as follows. Deferred maintenance involves repair or replacement on a largely like-for-like basis. Upgrades involve replacing existing infrastructure with newer technology/design which may reduce operating costs, improve reliability/safety, or add new service features. New infrastructure provides additional capacity or access to services that did not exist before.

are already underway or committed, and about 25% (\$2.9 million) for proposed priority projects (12 projects). Around \$3 million of this annual maintenance liability relates to road maintenance, but most of the balance of maintenance cost would be incurred by Public Enterprises.

However not all is “new” maintenance. Most of this recurrent maintenance cost (50%) relates to projects that upgrade existing infrastructure and a further 20% to projects that could be considered to be deferred maintenance. These are projects that repair/replace/upgrade existing infrastructure and may lead to a short-term decrease in required maintenance spending (assuming that the maintenance of the old infrastructure was funded). This means that if sustainable maintenance funding arrangements are put in place in conjunction with all planned projects, the net effect of implementing all projects that are underway and committed is to add an estimated \$1.4 million to the national annual maintenance bill, or if the 12 NIIP priority projects are also implemented, this rises to \$3.2 million per year. Note that all of this cost for maintenance of new infrastructure would accrue to Public Enterprises, and the largest share is associated with the fibre-optic cable project and associated local high speed internet distribution.

5.3 Recent maintenance and investment record

These future requirements for maintenance can be placed in the context of the recent record of maintenance spending by Public Enterprises and Government. The overall picture is mixed:

- several Public Enterprises (TPL, TCC, PAT, TAL) have effective maintenance programs in place and can fully fund routine maintenance and small to medium asset renewal from their own resources. Several of these enterprises (TPL, PAT and TAL) are currently engaged in programs to clear a backlog of maintenance using a combination of self funding and assistance from development partners;
- TBC and TWB are struggling to keep pace with maintenance requirements, resulting in gradually deteriorating infrastructure condition. Both can partially fund required maintenance and small infrastructure projects, but do not have the financial strength to keep pace with demand. In the case of Tonga Water, this is reflected in the proposed complementary initiative to prepare a road map to address sector issues;
- WAL cannot fully fund the cost of operations and maintenance from its own resources and requires a Government subsidy to remain financially viable. This further highlights that the financial and operational model for WAL is not working well, and the need for the proposed sector roadmap to find sustainable sector management solutions before further capital investment; and
- Government spending on maintenance and rehabilitation of roads and outer island ports has been patchy and below sustainable levels. In the case of outer island ports, revenue from user fees is very small and it is estimated that spending on maintenance and infrastructure renewal has mostly been at around 20% of the sustainable level. Development partner supported programs are underway or commencing in 2010/11 to rehabilitate roads and ports, but for the longer term, a more systematic approach to asset management and a more reliable stream of funding for maintenance is required to break out of the boom-bust cycle. Recommendations regarding a sustainable road maintenance funding mechanism will be prepared for Government consideration as part of the TSCP program, but for outer islands ports, funding for ongoing maintenance is uncertain. New long-term arrangements need to be considered for sustainable funding of outer island port infrastructure maintenance and renewal. Development of these new arrangements is a high priority complementary initiative of this NIIP.

The implications of this situation in terms of the likely capacity of responsible agencies to self-fund maintenance requirements associated with NIIP priority projects under current arrangements is shown in Table 5.4.

Table 5.4 Estimated Maintenance requirements of NIIP priority projects at 2015 (\$m)

Sector	Projects	Capital Cost \$m	Est. Annual Mtnce \$m	Capacity to Self-Fund Mtnce
Energy	E11 Solar generation (Tongatapu - Additional 1MW)	\$14.0	\$0.02	High
	E12 Renewable energy pilots (Coconut Oil/land fill gas)	\$3.0	\$0.09	High
	E13 Energy Roadmap TGIF Projects	-	-	High
Telecoms	T5 Upgrading of TBC Radio Towers	\$1.4	\$0.04	Medium
	T6 International Fibre-Optic Cable	\$60.0	\$1.20	High
	T7 Local Reticulation of High Speed Internet	\$8.0	\$0.20	High
Water	W2 Upgrade Tongatapu (wells, storage, distribution)	\$6.5	\$0.16	Medium
Solid Waste	S3 Vava'u Semi-Aerobic Landfill Facility	\$4.0	\$0.12	Low
Roads	No projects, priority is to complete committed projects.			
Ports	P9 Inter-island port and terminal upgrades	\$10.0	\$0.20	Low
Airports	A8 Resurfacing of Fua'amotu runway, apron, taxiway	\$28.0	\$0.60	High
	A10 Resurfacing of Vava'u runway, apron, taxiway	\$4.0	\$0.08	High
	A11 Resurfacing Ha'apai runway, apron, taxiway	\$7.0	\$0.14	High
Total		\$145.9	\$2.85	

Again, the picture is mixed. For the Public Enterprises with strong maintenance programs (TPL, TCC, PAT, TAL), the outlook for sustainably maintaining the proposed new investments is good, but for projects in the water, solid waste and outer islands ports sub-sectors, reform of existing financial arrangements would be required to develop capacity for sustainable long-term maintenance. Issues regarding the capacity of Public Enterprises and Government to fund future maintenance and investment requirements and the implications for a funding strategy for economic infrastructure are discussed further in Chapter 6.

5.4 Summary and future directions

Investments in the economic infrastructure sector that are underway, committed or part of the NIIP priority program will add around \$11 million to annual maintenance liabilities, but not all of this is “new” maintenance. Projects that repair/replace/upgrade existing infrastructure may lead to a short-term decrease in required maintenance spending (assuming that the maintenance of the old infrastructure was funded). This means that the net effect of implementing all projects that are underway and committed is to add an estimated \$1.4 million to the national annual maintenance bill, or if the 12 NIIP priority projects are also implemented, this figure rises to around \$3 million per year.

Based on recent spending patterns, the outlook for meeting these maintenance requirements and life cycle costs is mixed. Some Public Enterprises have a good and improving maintenance record, while others are struggling to keep pace with maintenance requirements and have a growing maintenance backlog. This highlights the critical importance of NIIP complementary initiatives (Chapter 4) aimed at improving asset management, developing new maintenance arrangements, and improving the financial performance of Public Enterprises. Analysis undertaken for the NIIP has confirmed the link between financial strength and maintenance record. It is often observed that when money is tight, maintenance is one of the first corporate functions that suffers. The Waste Authority Ltd is an example of where problems with its profitability are adversely affecting its ability to adequately fund maintenance. The Government intends to work closely with Public Enterprises and development partners to accelerate progress in improving the financial performance of Public Enterprises as a way of developing capacity to meet maintenance needs and fund infrastructure renewal.

Government also recognises that, in the past, it has not made sufficient budget allowance for maintenance and some Government-owned assets have deteriorated. This is changing. In the roads sector, the upcoming National Roads Improvement Project, Integrated Urban Development Sector Program, Nuku’alofa Redevelopment Program and Agricultural Road Program will help to clear much of the maintenance backlog; and the Transport Sector Consolidation Project (TSCP) will trial a new approach to road maintenance and develop a sustainable mechanism for road maintenance funding for consideration by Government. In the ports sector, improvements underway to prepare for the new inter-island ferry will address some of the most urgent maintenance needs, and a possible follow-up project will further rehabilitate outer-island port infrastructure.

In the future, Government intends to back up its own infrastructure investments with an ongoing commitment to fund maintenance and expects Public Enterprises to do the same. Some Public Enterprises are already complying with this requirement. The level of Government’s commitment to funding recurrent annual maintenance will be matched to the type of infrastructure and Budget conditions, and where possible, based on a user pays principle. A study currently underway in the road sector as part of the TSCP and an upcoming study of outer island port investment needs (supported by AusAID) will provide Government with better information on which to base decisions about maintenance funding levels. In the meantime, Government is expecting to increase spending on capital and maintenance significantly over the next three years, from 1.7% of total Government funds in 2009/10 to more than 7% by 2012/13. Much of this increased expenditure is budgeted for road maintenance. A commitment to maintenance funding by both Government and Public Enterprises will help maintain infrastructure condition and performance levels, and in the longer term, can delay the need for major infrastructure investment by prolonging infrastructure life.

6. Funding Strategy

Issues related to funding of infrastructure investment and life cycle costs and possible responses are developed further in the Chapter. It sets out the projected demand for infrastructure related finance; the financial capacity of Government and Public Enterprises to address infrastructure costs; the interventions that government can make to improve the infrastructure financing environment; and what this all means in terms of an overall strategy for how limited financial resources can best be deployed.

6.1 Demand For Infrastructure Finance

The overall demand for infrastructure finance is divided between maintaining assets, complementary activities aimed at improving overall asset and sector performance, and the financing of priority projects. Table 6.1 shows the total projected demand for infrastructure financing over the next 5 years, covering investment projects that are underway or committed, and priority investments and complementary initiatives of the NIIP priority program. Total demand for finance over the next five years is some \$530 million, of which 8% is for maintenance, 2% is for complementary initiatives, and 90% for capital investment.

Table 6.1 Projected expenditure by activity (\$m)

Activity	Total	10/11	11/12	12/13	13/14	14/15
Maintenance	43	4	7	10	11	11
Complementary Initiatives	10	2	2	2	2	2
Capital Expenditure	479	160	135	136	25	23
Total	532	166	144	148	38	36

Maintenance

Maintenance and broader issues of asset management and sustainability are critically important issues for Government and a key focus of this NIIP. There is a history of under-maintaining assets in Tonga that appears to arise for the following reasons:

- infrastructure operators not having a policy to fund all operating and maintenance expenses from revenues based on cost-reflective user tariffs;
- service prices not including adequate provision for maintenance;
- operational inefficiencies that in combination with inadequate pricing lead to insufficient cash being left to finance maintenance;
- investment decisions being made on the supply cost rather than a whole-of-life cost, which leads to cheap equipment and expensive servicing or early replacement; and
- a culture of carrying out breakdown maintenance rather than preventive maintenance, the latter of which is cheaper and reduces outages and lost revenues.

This means that changes are required in the way that maintenance is funded and managed. For a start, Government considers that the full cost of operations and maintenance of economic infrastructure should be funded from annual operating income and recovered through user charges, wherever possible. This will involve strengthening the financial performance of Public Enterprises and Ministries, and could involve money being set aside into a reserve account for periodic major maintenance. In addition, the following seven point plan is proposed as a possible

basis for improved maintenance performance to be adopted by all owners of economic infrastructure in Tonga:

- each owner should conduct (with expert assistance) a review of their operations, investment plans and tariffs to ensure, amongst other things that adequate service prices are planned;
- submission and review of those plans by an independent regulator who makes a determination of appropriate tariffs;
- establishment of maintenance reserve account for periodic major maintenance. Controls should be put in place to ensure that drawings are applied to approved and budgeted major maintenance only;
- assistance with planning and implementing improvements in operational efficiency, for example with loss reduction plans and targets to implement and achieve;
- application of a whole-of-life investment planning principles;
- development of asset management plans that provide for preventive maintenance and the implementation of those plans, including training; and
- conversion of existing accounting standards to International Financial Reporting Standards (IFRS) to help maintenance expenditure to be recorded properly.

These measures form part of the NIIP complementary initiatives, and it is expected that the total budget for these activities will be approximately \$2 million. These activities require overall leadership from Government, and in the short- to medium-term, their financing and delivery will require assistance from development partners, ideally in the form of technical assistance grants, until the Government has a more significant budget surplus after the 2012/13 fiscal year.

Complementary initiatives

Complementary initiatives are a key component of the NIIP, as outlined in Chapter 4. The total budget to finance these activities, which mostly will involve consulting services, is estimated to cost around \$10 million. This includes the \$2 million budget for maintenance related complementary activities, and a further \$8 million required for:

- implementing the non-infrastructure aspects of the energy roadmap, and improving fuel supply chain logistics;
- developing a long-term investment plan for the airports, and updating the policy environment for domestic aviation;
- development of post harvest facilities, where required, at ports and airports;
- developing an access and regulatory regime to support the submarine optical fibre cable;
- preparing a roadmap for the water sector;
- institutional reform clarifying and simplifying responsibilities across all sectors;
- assistance to enable the government to be an informed purchaser through improved analytical capabilities; and
- updating the NIIP.

Again, financing these activities is expected to rely largely on discussions with development partners until the budget is in a stronger position.

Capital Expenditure

Tonga's economic infrastructure capital expenditure requirements are set out in Chapters 3 and 4. This expenditure is divided between projects that are underway or committed, and NIIP priority projects. Table 6.2 shows projected capital expenditure by project category over the next five years. Some \$330 million of expenditure has already been programmed for projects for which funding decisions had been made. However, financing of the NIIP priority projects is much less certain because the country's capacity to raise finance for those projects has been affected by the very substantial recent borrowings and the global financial crisis.

Table 6.2 Total potential capital expenditure (million pa'anga)

Project	Total	10/11	11/12	12/13	13/14	14/15
Projects that are underway	221	99	52	40	15	15
Projects that are committed	112	55	38	11	4	4
Priority projects	146	6	45	85	6	4
Total potential capital expenditure	479	160	135	136	25	23

Although funding for most of the priority projects is uncertain, arrangements that are already being contemplated for four of the projects are:

- During February 2010 a memorandum of understanding was entered into between the Governments of Tonga and the United Arab Emirates. Under a recently announced fund called the Pacific Partnership Program, which will have a size of US\$50 million. This is a potential source of financing for a solar generation facility;
- The International Renewable Energy Agency (IRENA) that is now headquartered in the UAE is a possible source of financing for the coconut oil pilot plant;
- The submarine fibre optic cable project has tentative financing that is yet to be committed. Indicatively, the finance plan for the project is (in pa'anga): \$20 million from the ADB in the form of a grant; \$20 million from the World Bank as a grant; \$13 million as a concessional loan from the ADB/World Bank; and \$13 million from TCC. The challenges of the Government borrowing even on concessional terms are discussed below; and
- JICA is in discussion with the Ministry of Environment on possible financing of the \$4 million Vava'u Semi-Aerobic Landfill Facility and has already funded some preparatory investigations.

While some of the priority projects have potential funding from identified sources, at the time of preparing the NIIP, finance has yet to be secured from those providers. Therefore, these projects are not yet considered to be "committed". The following section examines the overall capacity for funding these investments from local or other sources.

6.2 Current capacity of capital markets

National Situation

Tonga experienced difficult economic conditions in the years ended June 2009 and 2010 when the economy shrank by 0.4% and 1.2% respectively. This is expected to reverse in the medium term with average growth of 1.5% p.a. A budget deficit is forecasted for 2010/11 and estimates for the 2011/12 and 2012/13 fiscal years indicate small surpluses of \$5.3 million and \$15.3 million respectively. Dividends from Public Enterprises to strengthen the budget are not significant nor are they likely to be so in the medium term.

As a result, Government has very limited capacity for financing economic infrastructure activities either from its Budget or through borrowings. As of 31 March 2010, the Government carried \$300 million of indebtedness by way of direct borrowings from various sources and loan guarantees. The level of debt and impending principal and interest repayments pose significant challenges. Tonga's total debt as a percentage of revenues is currently sitting at 236%, which is above the government's target of 200%. In addition, the country's present value of debt to GDP and present value of debt to exports, which are both key debt sustainability indicators¹⁵, are expected to exceed their debt sustainability thresholds of 100% and 30% respectively, until at least 2018.

This means that as far as possible, new borrowing should be avoided and for the time being, Tonga will remain dependent on its external relationships with its development partners. Ideally, appropriate support from these partners would be in the form of grants and technical assistance facilities, which would be best directed towards financing of complementary activities and those priority projects that are financially feasible.

Public Enterprises

With the exception of roads and outer island ports, Public Enterprises manage all economic infrastructure in Tonga. However the capacity of Public Enterprises to self-fund infrastructure activities is mixed. Table 6.3 summarises the results of an analysis of the capacity of Public Enterprises to self-fund infrastructure maintenance and renewal.

The analysis indicates that several Public Enterprises (TPL, TCC, PAT, TAL) have effective maintenance and investment programs in place and can fully fund routine maintenance and small-medium asset renewal from their own resources. However these Public Enterprises would struggle to self-fund investments to replace or rehabilitate the largest item of infrastructure that the Public Enterprise already owns (such as the airport runway) or is required in order to transform the sector (such as an undersea fibre-optic cable). TBC and TWB are struggling to keep pace with maintenance requirements, resulting in a gradually deteriorating infrastructure condition. Both can partially fund required maintenance and small infrastructure projects, but do not have the financial strength to keep pace with demand. WAL cannot fully fund the cost of operations and maintenance from its own resources and requires a Government subsidy to remain financially viable.

In addition, Public Enterprises (with the possible exception of TPL and TCC) have limited capacity for additional borrowings based on an analysis of their debt carrying capacity, and most Public Enterprises already have commitments to self-funded future capital investment programs. This further reduces the capacity for additional capital investment. Improving the financial performance of Public Enterprises is a key priority of the NIIP, and Government will continue to reform and strengthen Public Enterprises to ensure they operate commercially; are accountable to the

¹⁵ Refer to <http://www.imf.org/external/np/exr/facts/jdsf.htm> for further information about debt sustainability thresholds.

Government as shareholder; and produce dividends that reflect the investment that Government has made.

Table 6.3 Analysis of capacity for Public Enterprises to self-fund infrastructure costs

Sector	Agency	Operations	Mainten- ance	Small CAPEX	Medium CAPEX	Large CAPEX
Energy	Tonga Power					
		High	High	High	High	Medium
Telecoms	Tonga Communications Corp (TCC)					
		High	High	High	High	Medium
	Tonga Broadcasting (TBC)	High	Medium	Medium	Low	Low
Water	Tonga Water Board (TWB)					
		High	Medium	Medium	Low	Low
Waste	Waste Authority Ltd					
		Medium	Low	Low	Low	Low
Transport	Tonga Airports Ltd (TAL)					
		High	High	High	Medium	Low
	Ports Authority Tonga (PAT)	High	High	High	High	Low

In terms of funding requirements, Public Enterprises will be responsible for most of the projected maintenance expenditure of \$43 million over the next five years, and if the proposed complementary initiatives are carried out, then they should be able to finance maintenance from internal cash flows. With regard to proposed capital expenditure, TPL, TAL and TCL have major capital raising obligations in front of them to finance priority projects while TPL and TCC have borrowing capacity. The general outlook for other Public Enterprises to finance their priority investment projects is poor.

Overall, Public Enterprises have limited capacity to borrow based on the debt carrying capacity analysis. In addition, Government has very little additional debt carrying capacity for itself, which limits its ability to (a) borrow on commercial (and arguably concessional) terms and on-lend to Public Enterprises; and (b) guarantee new debt obligations of Public Enterprises. Government will therefore need to look to its external relationships to assist with the financing of priority investment projects on terms that do not compromise its debt sustainability. Considerable value for money can be derived from the complementary activities if these are provided through technical assistance programs and with some limited allocation from future Budgets.

6.3 Future directions to improve funding

Government policy is toward economic infrastructure being managed commercially with minimal Government support. To do so requires substantial improvements to be made in the financing environment by:

- improving international perceptions of Tonga “country risk”;
- ensuring that public enterprises are financially robust; and

- at the individual project level, ensuring projects are procured and developed such that financiers are assured that a project will be completed on time, to budget, specification and will earn as projected.

Complementary initiatives and project prioritisation deal with the last two of these issues, which leaves improving perceptions of country risk to be explored.

Commercial lender interest in lending to Tonga is limited by perceptions of country risk. Lenders are guided by credit ratings but Tonga does not have one yet. If it were to obtain a rating, it is possible that it would be in the S&P “B” range, which is not usually strong enough for international commercial lenders to lend to the Government or any entity in Tonga without some form of credit enhancement. Nonetheless, having a credit rating establishes a benchmark signals to the international financial community that the country is looking to engage; creates a robust analytical framework for assessing the country’s economic position; and increases the pool of potential sources of finance. Therefore Tonga can improve its financing environment by obtaining a credit rating; encouraging growth in the private capital market; fostering strong infrastructure companies that are commercially viable; and continually improving the Government infrastructure framework of policy, institutions, legislation and regulation so that the policy of greater engagement with the private sector can be realised.

6.4 Potential for increased private sector involvement

One of the strategic priorities of Government and a key theme of the NSPF is to increase the involvement of the private sector in all aspects of the economy. In the economic infrastructure sector, private sector involvement can take several forms:

- providing advice and information to Government about the infrastructure needs of industry and bottlenecks to economic development. To facilitate this dialogue, Government has established the National Economic Development Council (NEDC) to provide advice on private sector priorities and help guide investment and policy decisions for a private sector led economy. NEDC is chaired by the Prime Minister and includes eight private sector representatives;
- in the construction of infrastructure and supply of equipment. At this stage, Government has no plans to privatise any of its own activities in the economic infrastructure sector or those of Public Enterprises operating in the sector. However in terms of infrastructure construction and supply of equipment, the Government expects the private sector to take the lead role in providing these services; and
- as an infrastructure service operator or contractor. Contracting infrastructure-related services to the private sector is already happening in many areas of the economic infrastructure sector and Government encourages further involvement. In particular, there are opportunities for further outsourcing of maintenance activities, and the development of post-harvest storage and processing facilities (such as cool stores and the high temperature treatment facility) is a particular area where the private sector and Government, through NEDC, can work together to facilitate export of agricultural and fisheries products.

An analysis was undertaken as part of the NIIP process of the scope for increased private sector delivery of basic services (power, water, sanitation, transport infrastructure). The review found that the priority at this stage is to “get the house in order” to create a more conducive environment for increased private sector participation in economic infrastructure sector. This will involve:

- strengthening the overall commercial performance of the sector as a way of creating private sector opportunities. The priority program described in Chapter 4 includes complementary initiatives to review the business model and pricing structure of several sub-sectors;
- outsourcing certain infrastructure activities, such as maintenance, and helping to build capacity in the private sector so that these activities can be outsourced on a competitive basis. For example, the road maintenance component of the TSCP program will trial these measures; and
- continuing the process of strengthening the underpinning policy, regulatory and legal framework for the economic infrastructure sector.

6.5 Overall Funding Strategy

Tonga does not currently have the capacity to finance substantially more infrastructure assets without assistance from development partners, even if those investments are high priorities. As already noted:

- Government Budget position is weak and projections of future surpluses are fragile based on recent experience;
- Government capacity for further borrowing and loan guarantees is very limited; and
- capacity of Public Enterprises to finance infrastructure from internal sources varies, but generally is not sufficient to replace/rehabilitate major infrastructure items, or introduce significant new innovations to transform the sector.

In addition, Tonga has a small local capital market, which means that offshore sources of finance remain important but options are limited because Tonga does not have a credit rating. This means that the immediate funding strategy needs to reflect what is cost effective and achievable.

Funding is required for three basic infrastructure activities: maintenance, complementary initiatives and priority investments. The funding of NIIP priority investment projects is uncertain but tentative plans are already in place for the larger of these projects (including the submarine fibre optic cable, and elements of the Energy Road Map implementation). Bringing these investment projects to fruition in a way that the Government's debt sustainability plans are not compromised will be important.

Maintenance of existing and new infrastructure is a high priority. Government policy is that the cost of operations and maintenance of economic infrastructure should be funded from user charges wherever possible. Government intends to work closely with Public Enterprises, the private sector, and development partners to lift the overall performance of the economic infrastructure sector, and as a minimum, achieve self-funding of operations and sustainable maintenance by Government and Public Enterprises. In particular, appropriate maintenance expenditure levels need to be established, which means having effective asset management plans in place and then ensuring that service prices include provision for maintenance. The establishment of reserve accounts is one way that maintenance funding can be protected and only be used for approved maintenance.

In the short- to medium -term, Government considers that despite current financial constraints, substantial progress can be made towards optimising the use of existing infrastructure assets, through improved asset management and operating efficiencies ("making better use of existing infrastructure"). These complementary activities are less visible than new assets but are nonetheless crucially important. In particular, much progress can be made with relatively modest budgets and development partner support for complementary initiatives (mostly technical assistance) aimed at:

- improving the financial and operational performance of infrastructure management;
- improving asset management and maintenance; and
- creating an improved environment for infrastructure development and financing.

Overall, Tonga will need to adopt a partnership approach to infrastructure delivery with Government, Public Enterprises and the private sector working closely together with the support of development partners; and consider a range of financing options for the proposed infrastructure investment, maintenance and complementary activities. These options include Internal Finance (funding by Public Enterprises or Ministries from normal operating cashflow); Budget (special allocation from the Government Budget); Development Partners (as grant, concessional loan or funding for Technical Assistance); and Commercial Finance. Bearing in mind current economic and budgetary conditions in Tonga, Table 6.4 provides an indication of the current suitability of different financing sources for priority investment projects, maintenance, and complementary initiatives.

For its part, Government will continue to invest in the economic infrastructure sector, but as outlined above, its capacity to fund additional infrastructure, beyond what is already committed, is limited. A key role that Government will continue to play is to facilitate a partnership approach to infrastructure delivery by brokering arrangements for funding infrastructure. This will involve:

- identifying and building awareness of traditional, new and innovative financing sources and mechanisms (the Tonga Green Incentive Fund proposed under the *Tonga Energy Road Map* is an example of an innovative financing mechanism);
- helping to coordinate the dialogue between sources of funding and infrastructure managers; and
- working with infrastructure managers to design and implement financing packages for major projects (for example this may involve a combination of one or more sources such as Public Enterprise resources, development partner loan or grant, commercial loan, and in some cases Government budget and private equity). The MFNP has a key role to play in this area and Government is strengthening its capability to coordinate infrastructure financing.

Finally, engaging further with the private sector through continuing the reform processes already started by the Government has an important role to play in infrastructure delivery. In the short-to medium-term, private sector involvement is most likely to involve further outsourcing of infrastructure activities, but in the longer term, Government supports the concept of the private sector taking on more significant roles in infrastructure. To do so will depend on building private sector capacity (in some cases through complementary initiatives of the NIIP); and in part on building a framework for engaging with the private sector and a financing environment that is conducive to commercial capital-raising. In this respect, obtaining a credit rating would help Tonga progress towards a more robust capital market that will benefit not only the capital-intensive economic infrastructure sector, but other economic activities as well.

Table 6.4 Suitable sources of finance by activity

Project	Internal Finance	Budget	CAPEX Grant	Concessional Loan	TA & Other	Commercial Finance
1. Maintenance	●	○	○	○	○	○
2. Complementary Initiatives	◐	◑	○	○	●	○
3. Priority Projects						
Solar generation (Tongatapu - Additional 1MW)	◑	○	●	◑	○	◑
Coconut Oil/waste Pilot Plant	◐	○	●	◑	◐	○
Implementation of Energy Roadmap (TGIF)	○	○	◑	◐	◑	○
Upgrading of TBC Radio Towers	◐	○	◑	◐	○	○
International Fibre-Optic Cable	◐	○	●	◑	◐	◐
Local reticulation of high speed internet	◐	○	◑	◐	◐	◐
Upgrade Tongatapu (wells, storage, distribution)	○	○	◑	◐	◑	○
Vava'u Semi-Aerobic Landfill Facility	◐	○	●	◑	◑	○
Outer-island Port Upgrades	◐	○	◑	◐	◑	○
Resurfacing of Fua'amotu runway, apron, taxiway	◐	○	◑	◐	○	○
Resurfacing of Vava'u runway, apron, taxiway	◐	○	◑	◐	○	○
Resurfacing Ha'apai runway, apron, taxiway	◐	○	◑	◐	○	○

- Not a realistic option or not applicable ○
- Low likelihood of financing interest ◐
- Average likelihood of financing interest ◑
- Strong likelihood of financing interest ◒
- Very Strong likelihood of financing interest ●

7. Managing and Delivering the Infrastructure

Infrastructure investment projects are important, but they are only part of the story. They go hand in hand with improved management of existing and new infrastructure. The need for an integrated approach involving investment projects and supporting complementary initiatives is a major theme of this Plan. Consequently, this part of the NIIP focuses further attention on the broader issues of asset management and delivery, and what Government can do to facilitate better outcomes from the economic infrastructure sector. In particular, this involves initiatives that can lead to better management and use of infrastructure, and in the longer term, reduced need for future capital investment in infrastructure. This includes factors such as better planning and coordination of infrastructure development, efficiency and conservation, greater emphasis on maintenance, and improved methods for delivery of infrastructure.

7.1 Strategic asset management

At present, there is no consistent framework for asset management across Government and Public Enterprises. The concept of *strategic asset management* encompasses a life cycle approach and provides a framework for guiding the process of “acquisition, use and disposal of assets to make the most of their service delivery potential and manage the related risks and costs over their entire life”¹⁶. Strategic asset management involves:

- achieving greater value for money through a rigorous project planning and evaluation process which takes into account life cycle costing and potential for private sector involvement;
- focusing attention on results by clearly assigning responsibility, accountability and reporting requirements in relation to asset management;
- reducing the demand for new assets through demand management techniques, improved efficiency of service delivery, and consideration of alternative service delivery options;
- maximising the performance of existing assets by ensuring that they are appropriately used and maintained; and
- eliminating unnecessary acquisition and holding of assets by ensuring agencies are aware of (and required to pay for) the full costs of holding and using assets.

The principles of strategic asset management and the infrastructure asset life cycle provide a strong foundation for better management of infrastructure in Tonga. Government intends to promote these principles as a framework for an improved approach to infrastructure management by Ministries and Public Enterprises. They also provide a framework for addressing some of the broader issues associated with infrastructure management and guiding Government responses.

7.2 Better planning and coordination

The first step in the infrastructure management cycle is project planning and coordination. Most sectors/agencies have well-defined investment plans for the next 3 years; for 3-5 years the picture is less certain; and beyond 5 years, only the major Public Enterprises have well-developed investment plans. In part, this is a reflection of the current status of overall long-term planning in the economic infrastructure sector. Table 7.1 shows that the situation is mixed. The

¹⁶ DTF (2004) *Developing Strategic Asset Management Plans*, Department of Treasury and Finance, Government of Tasmania.

energy sector has a current roadmap and TPL has a 10 year investment plan, but for most other sectors, long-term infrastructure strategies are either still under development or not up-to-date.

Table 7.1 Status of sector strategic and master planning

Sector	Master Plan/ Roadmap	Notes
Energy	Yes	<i>Tonga Energy Road Map 2010-2020</i> , June 2010; Tonga Power 10 year investment plan
Telecommunications	Partial	Elements (TCC corporate plan, Undersea Cable proposal, <i>National IT Policy 2009</i>) but no sector roadmap
Water and sanitation	Outdated	No up-to-date sector strategy; latest Masterplan for Water Supply 1991
Solid Waste	Draft	<i>(Draft) National Integrated Waste Management Strategy for Tonga</i> , July 2010, but no roadmap for how to implement the strategy
Transport		
Airports	Planned	Aviation sector strategy and airport master plans to be prepared under TSCP; expected to be completed by early 2011
Roads	Planned	Roads sector strategy and maintenance plan to be developed under TSCP; plan expected early 2011
Sea Ports	Planned	Ports sector strategy plan to be prepared under TSCP; expected to be completed by early 2011
QSW Nuku'alofa	Partial	Outdated QSW Master Plan is under review, but not a formal master planning process
Other Islands	Planned	Investment plan to be prepared under TSCP; expected to be completed by early 2011
Multi-Sector Climate Change	Draft	<i>(Draft) Joint Action Plan on Climate Change Adaptation and Disaster Risk Management 2010-2015</i> , July 2010

Government intends to strengthen forward planning requirements by requiring that all economic infrastructure sectors have a 10-year infrastructure strategy and a 3-year investment plan. Some Public Enterprises, such as TPL, are already complying with these requirements.

Along with better planning is the need for a more rigorous approach to project evaluation and prioritisation. Unfortunately there are many examples of infrastructure projects that have been implemented without prior preparation of a proper business case to confirm the long-term viability of the project. The Government is working with Ministries and Public Enterprise Boards to strengthen project evaluation and ensure that major infrastructure investments are backed up by a positive project evaluation and clear business case. This is expected to be a staged process. As a first step, Government will require that all projects submitted for its funding or support are

presented in a new standardised format that includes a project profile summary table. This summary table will include:

- a description of the project, the problem it addresses, how it aligns with national and corporate planning priorities, and the options that were considered;
- an overview and qualitative/quantitative assessment of project impacts and benefits (financial, economic, social, environmental, readiness);
- a rating of the overall project viability and priority (high, medium, low); and
- an estimate of life-cycle costs for the project.

This is expected to produce a more systematic approach to project preparation and allow better comparisons to be made between proposed projects. In the longer term, Government will work towards greater use of quantitative tools for detailed appraisal of projects at the business case stage.

The preparation of the NIIP has also highlighted gaps and overlaps in the coordination of infrastructure planning and responsibility¹⁷. For example, there are currently five projects underway to rehabilitate the roads system but with responsibility split across several agencies; while for waste water disposal and drainage there is a gap, with several agencies having roles but no clear management responsibility. Infrastructure projects can also cut across sectors and have interacting effects. The lack of clarity and coordination in responsibility for planning, management and delivery of infrastructure can lead to inefficient delivery of infrastructure and services, unnecessary delays, and wasteful duplication, especially when related projects are planned and delivered in isolation from each other. As another step towards better infrastructure management, Government intends to review the institutional structure of the economic infrastructure sector to clarify and simplify responsibilities, with the aim of ensuring that:

- lines of responsibility are clearly drawn, with no gaps or overlaps in coverage of responsibility for economic infrastructure sub-sectors; and
- there is a single coordinating agency or “one stop shop” for each sub-sector.

The political reforms scheduled for November 2010 will reduce the number of Ministries and this provides an opportunity to re-examine the allocation of functional responsibilities in the economic infrastructure sector. A clearer and simpler structure should produce greater efficiency in project planning and delivery, and simplify the infrastructure dialogue with development partners and the private sector. Expected changes to the institutional structure of Government also provides an opportunity to identify and apply reforms that streamline the infrastructure planning, approvals and delivery process.

7.3 Opportunities for streamlining infrastructure processes

Government is committed to streamlining the infrastructure delivery process. This is critical to ensuring that the NIIP priority program for the economic infrastructure is delivered as quickly and effectively as possible. In particular, it is important that the outcome of expected changes in Government structure is a simpler and more streamlined process; not more complication. After the new arrangements in place in 2011, Government will require that all new agencies undertake a comprehensive review of their infrastructure planning, approvals and delivery procedures with the aim of streamlining infrastructure development.

¹⁷ Further discussion of governance, financial and maintenance aspects of strategic asset management is available in ADB (2007) *Improving the Delivery of Infrastructure Services in the Pacific*.

Government is already working to clarify and simplify procedures for processing proposals for Government funding or support for infrastructure projects. MFNP is the central agency for managing proposals for funding support and the dialogue with development partners about support for economic infrastructure projects. MFNP has established clear procedures for the project proposal and evaluation process and Government is working to ensure that these procedures are followed. As described above, this process will be streamlined by introducing a new standardised format for project proposals.

In the past, procurement procedures have also been a problem. To address this, the Government established a Procurement Unit within the MFNP in 2007 to ensure that public funds are spent in an economic, efficient and transparent manner. The Procurement Bill and associated Regulations, Manual and Standard Documentation, which are expected to be enacted in 2010, back up this initiative. It will be a major step forward in streamlining and standardising Government procurement activities. In addition, Government has established a high-level Procurement Committee to oversee the contracting of Budget-funded projects. Together the aim of these initiatives is to smooth and clarify the procurement process so that infrastructure can be delivered quicker and with reduced overhead costs and without compromising procurement outcomes. In time, the scope of the Procurement Unit will extend to procurement of private sector partners under public-private partnership arrangements. Work towards this objective will help the Government realise its policy of greater private sector involvement in economic infrastructure.

A further initiative that Government is taking to streamline the development of economic infrastructure is to provide clear direction and information about its infrastructure development priorities. The preparation of this NIIP is a significant step forward in facilitating the infrastructure dialogue. The Government expects Ministries and Public Enterprises to take the priority directions and initiatives of the NIIP into account when framing their Corporate and Annual Management Plans, and Statements of Corporate Intent. Further, by providing greater certainty about the nature and timing of infrastructure projects, the NIIP improves the investment environment for the private sector. It also provides development partners with clear information about Government priorities and plans for infrastructure development, and the areas where assistance is most needed. As a result, NIIP itself has an important role in streamlining the infrastructure management process.

7.4 Making better use of existing infrastructure

As well as facilitating better processes for acquiring new infrastructure, a strategic approach to asset management also places a greater emphasis on reducing the demand for new assets through measures such as demand management techniques, improved efficiency of service delivery, and consideration of alternative service delivery options. In the long-term, this can reduce or delay the need for major infrastructure investment.

The infrastructure system involves users and suppliers, both of whom have a role to play in making better use of existing infrastructure. Supply-side initiatives involve measures to improve the efficiency of service delivery, that is, doing the job better with less resources. Examples include reducing system losses and replacing out-dated and inefficient equipment with efficient alternatives. The *Energy Roadmap* estimates that measures to maximise electricity generation efficiency, reduce distribution network losses and optimise network operations, have the potential to reduce diesel fuel use by 7-8%. There is also substantial scope for supply-side efficiencies in the water sector where losses in the water supply and distribution system currently exceed 60% in some areas. If these losses can be reduced substantially then there is the potential to reduce the volume of water extracted from existing well fields and delay the need for new wells and preserve this valuable resource. Ministries and Public Enterprises are already well aware of the

need to increase efficiency and reduce losses, but Government will continue to push for further gains to be made.

Demand-side management (DSM) initiatives aim to reduce demand for infrastructure services (such as power, water, and travel) by influencing consumer behaviour and encouraging the use of more efficient equipment and appliances (such as energy efficient lights, low water use plumbing fittings and fuel efficient vehicles). The 3R's campaign (reduce, reuse, recycle) is an example of a conservation program already underway, and DSM measures are proposed under the *Energy Roadmap* as a way of mitigating growth in electricity consumption. These measures may include replacing household incandescent bulbs with compact fluorescent lights, upgrading streetlights to use either LED or dimming, and reducing the demand in large Government buildings with more energy efficient cooling, ventilation and lighting systems. According to the *Energy Roadmap*, these three measures alone have the potential to reduce energy consumption by up to 4.5%.

In the past, infrastructure managers in Tonga have tended to focus on supply-side issues and given less attention to demand-side measures. In the future, Government will require that DSM is considered as an integral part of long-term strategic and corporate planning for all economic infrastructure sectors.

The third aspect of making better use of existing infrastructure is consideration of alternative service delivery options and non-infrastructure solutions. The standard response to an infrastructure problem is an infrastructure solution. But in many cases, the core issues adversely affecting service delivery are institutional, planning, regulatory or financial rather than technical. For example, improved urban planning can reduce the need for expensive expansion of utilities (power, water, telecoms, waste collection). In addition, there may be alternative ways of delivering services or optimising the use of existing infrastructure through technology and infrastructure management. For instance, improved traffic management can reduce demand for road widening; and the construction of a submarine fibre-optic cable could enable internet-based applications that can provide an alternative to expanding conventional infrastructure.

Government will encourage Ministries and Public Enterprises to consider innovative approaches and non-infrastructure solutions, as an alternative to build/buy responses. This will be included in the new project proposal template where Ministries and Public Enterprises will be required to demonstrate that alternative solutions have been considered.

7.5 Summary

Infrastructure investment and improved management of existing and new assets go hand-in-hand as parts of an integrated response to improved performance in the economic infrastructure sector. Government can facilitate better outcomes from the economic infrastructure sector and intends to strengthen its role in coordinating infrastructure management and place a greater emphasis on asset management. In particular, the preparation of the NIIP has highlighted a range of specific measures that the Government can take and is taking to achieve better outcomes. These measures include:

- setting the ground rules appropriately because infrastructure relies on having effective public policies, institutions and legislation;
- promoting the principles of strategic asset management as a framework for an improved approach to infrastructure management by Ministries and Public Enterprises, and increasing the focus on maintenance as just as (or more) important than investing in new infrastructure;
- strengthening forward planning by requiring that all economic infrastructure sectors have a 10-year infrastructure strategy and a 3-year investment plan, since *failure to plan is really*

planning to fail. Since most infrastructure is part of a system, this planning should take a system-wide approach, rather than addressing specific problems in isolation;

- establishing infrastructure planning and management procedures and sticking to them. Government intends to introduce a new standardised format for all project proposals submitted for its funding or support, which includes an estimate of full life-cycle costs for infrastructure projects. This goes hand-in-hand with progressively strengthening the capacity of Government and infrastructure managers to prepare and evaluate the business case for proposed infrastructure investments;
- adopting a commercial focus. Wherever possible, Government considers that infrastructure services should be delivered through a commercial model that fully recovers the cost of operation;
- reviewing the overall institutional structure of the economic infrastructure sector to clarify and simplify responsibilities and streamline procedures, so that lines of responsibility are clearly drawn and there is a single coordinating agency for each sub-sector;
- requiring that demand-side management is considered as an integral part of long-term strategic planning by Ministries and Public Enterprises for all economic infrastructure sectors, and innovative approaches and non-infrastructure solutions are considered as an alternative to build/buy responses;
- engaging further with the private sector and continuing the reform processes already started by the Government, especially encouraging further outsourcing of selected functions to the private sector and progressively expanding to more significant roles in infrastructure delivery. This will involve maximising competition and regulating where necessary; and
- working towards obtaining a credit rating that would help Tonga progress towards a more robust capital market. This will benefit not only the capital-intensive economic infrastructure sector, but other economic activities as well. It will also help to improve the investment climate, raise the number of financing options available, and increase the likelihood of private sector participation in infrastructure.

8. Updating the Plan

The NIIP is an integral part of the Government's national planning and budgeting process. Starting with this report, the NIIP will be updated on a regular basis to align with the latest planning and budget priorities, and reflect progress on implementation. There are several sector development plans currently under preparation (Table 7.1), with most expected to be finalised by mid-2011. Building on the outputs of these sector plans, it is proposed that the NIIP will be updated in the second half of 2011. The updating process will then be reviewed and recommendations made on how often updates would be required in the future.

Each year, Government agencies and Public Enterprises will be required to report on progress with projects contained in the NIIP and provide information about proposed new projects. This information, together with consultation with community representatives, the private sector, NEDC and development partners, will help to shape future updates of the NIIP. As a way of further integrating the NIIP into sector planning, Government is considering the option of holding an Infrastructure Forum on a regular basis to help ensure that a wide range of views are incorporated into framing the NIIP.

When projects and activities are identified between each update of the NIIP, these projects should be analysed by the Government using the same prioritisation methodology as used for the NIIP. In this way, the chances of developing projects that are not consistent with good planning principles used in this NIIP will be reduced significantly.