

URBAN SECTOR ASSESSMENT (SUMMARY): WATER SUPPLY AND OTHER MUNICIPAL INFRASTRUCTURE AND SERVICES

Sector Road Map

1. Sector Performance, Problems, and Opportunities

1. **Urban growth.** Nuku'alofa, Tonga's capital has a population of 34,058 (34% of the national population) and is forecast to grow to 45,000 (or about 45% of Tonga's population) by 2030.¹ Migration to Nuku'alofa from Tonga's outer islands is significant.² Urban growth in Tonga is a relatively recent phenomenon and has not been matched by the provision of, or improvement in the delivery of, urban services. Living conditions for many of Nuku'alofa's residents are deteriorating, and demand for improved urban infrastructure is increasing.

2. **Urban development pressure.** Development pressure in Nuku'alofa is increasing as a result of population growth. The existing urban infrastructure is barely capable of meeting the demands from the current urban population. Upgrading of existing infrastructure is being undertaken through the Nuku'alofa Reconstruction Project and the Integrated Urban Development Sector Project (IUDSP). However, the scope of these projects is limited, and they will not meet all immediate infrastructure needs. Further investment in urban infrastructure is urgently required. Land for urban expansion of Nuku'alofa is limited to peripheral agricultural and ecologically sensitive areas.

3. **Urban planning.** The Planning and Urban Management Agency (PUMA) of the Ministry of Transport is responsible for planning and coordination of urban development. However, the lack of spatial planning legislation and limited experienced staff and resources has constrained PUMA from providing effective and efficient urban planning and management services. Legislation providing a framework for the planning, use, development, and protection of land (i.e., spatial planning) is expected to be approved by the Parliament by the end of 2011.³ Capacity development will be required within PUMA to implement and enforce the spatial planning legislation.

4. **Roads.** Traffic growth in Nuku'alofa has resulted in congestion of the main approach roads to the urban area and roads in the town center.⁴ Limited traffic management at strategic locations within the road network, particularly poor parking controls, contributes to traffic congestion. The absence of adequate road drainage and the poor maintenance of existing drains result in frequent flooding of roads. The surfaces of most local residential access roads are gravel, which can be impassable during wet weather. Limited provisions for pedestrians (i.e., footpaths) result in pedestrian-vehicular traffic conflicts, particularly after heavy rainfall when roadside flooding forces pedestrians onto the main roadways. No mechanisms are currently operational for the funding of road maintenance.

¹ The population figure for Nuku'alofa is based on data gathered during the 2006 census.

² The Tonga Department of Statistics has projected Tonga's population to reach about 115,300 by 2030. Based on a high scenario projection, by 2030, Nuku'alofa will have about 45,000 people, or nearly 40% of the country's total population.

³ Prepared under ADB's TA for Urban Planning and Management System (TA 7082-TON) attached to ADB. 2008. *Report and Recommendation of the President to the Board of Directors: Proposed Asian Development Fund Grant and Technical Assistance Grant to the Kingdom of Tonga for the Integrated Urban Development Sector Project.* Manila.

⁴ Traffic growth on the major approach roads to the Nuku'alofa central business area, Taufua'ahau Road and Vuna Road, has doubled during the period 1999 to 2009 based on traffic surveys conducted in 1999 and August 2009.

5. **Drainage.** The topography of Tongatapu is flat and low-lying, the highest elevation on Tongatapu being 70 meters above mean sea level. Most of the urban area of Nuku'alofa is only 1–2 meters above sea level and is subject to flooding during heavy rain. Most floodwater eventually infiltrates into the limestone substrata, but extensive low-lying sections within the urban area are frequently flooded and provide ideal conditions for mosquitoes and the transmission of waterborne diseases. Nuku'alofa has a number of open drainage channels with few culvert interconnections. Development of residential subdivisions on the fringes of Nuku'alofa is constrained by large areas of undrained surface water, requiring substantial filling of properties and raising of roads. The piecemeal raising of road levels and filling of residential land has altered the natural drainage patterns and created additional swamps and open water bodies. These result in flood damage to property, perpetual standing water, and a loss of access to unfilled properties. Mechanisms for funding drainage maintenance have not been established.

6. **Water supply.** About 98% of households in Nuku'alofa have access to the piped water supply provided by the Tonga Water Board (TWB). Water for the TWB water supply is abstracted from the Mataki'eua Tongamai well field and is chlorinated prior to distribution. Currently, only 32 of the 40 production wells are operating. Consequently, a number of wells are currently operating beyond the recommended abstraction rate of 2.5 liters per second.⁵ Water quality monitoring data indicate increasing salinity of the Mataki'eua Tongamai aquifer, particularly in the wells closest to Faga'uta Lagoon.⁶ The monitoring data show that the aquifer is under stress, and careful management is necessary to ensure that salinity within the aquifer does not increase. The construction of additional production wells to the west of the existing production wells will reduce the risk of further saline intrusion, thereby reducing the pumping stress on the Mataki'eua Tongamai aquifer system, and extending its operational life as well as providing greater production security.

7. Water pumps at 23 wells were electrified in 2009 under the European Union-funded Disaster Risk Reduction Project, implemented by South Pacific Applied Geoscience Commission to improve water security in the Marshall Islands, Nauru, Tonga and Tuvalu. The remaining 17 wells use diesel-powered pumps, creating an ongoing source of soil contamination and potential water contamination. If the wellhead surface protection is breached, this hydrocarbon spillage has the potential to quickly contaminate the freshwater aquifer around the well and render the production well unusable. Replacement of the diesel pumps with electric pumps will eliminate the potential for hydrocarbon spillage as well as reducing the operation and maintenance (O&M) costs of the pumps.

8. The age of the TWB network in Nuku'alofa is generally less than 8 years as the distribution system was replaced in 2002 under a Japan International Cooperation Agency-financed water supply renewal program. Despite the relatively young age of the TWB's networks, unaccounted for water (UFW) is estimated to be in the range of 30%–50%. Collector pipes from the wells at the Mataki'eua Tongamai well field were not replaced under the 2002 water supply renewal program and account for a substantial portion of UFW. Unmetered usage from fire hydrants and leakage from consumer service connections are considered to be substantial. Current average daily production, estimated at 7,000 cubic meters (m³) per day, is inadequate to meet demand and system losses. Demand is projected to increase from the current level of 4,800 m³ per day to 6,600 m³ per day by 2016. Reduction of UFW is essential to

⁵ I. White, T. Falkland, and T. Fatai. 2009. *Vulnerability of Groundwater in Tongatapu*, Kingdom of Tonga - Groundwater Evaluation and Monitoring Assessment. Canberra: Australian National University.

⁶ SOPAC. 2007. Tongatapu Groundwater Evaluation and Monitoring Assessment. Nuku'alofa Workshop.

reduce the required production rates at the Mataki'eua Tongamai wellfield and to cut production costs. It can be achieved through the replacement of the collector pipe system at Mataki'eua Tongamai well field and the implementation of a detection program, as hydrants and leakage from consumer service connections is substantial.

9. **Sanitation.** Most households in Nuku'alofa rely on individual septic tank systems for wastewater disposal. Many septic tanks are undersized, improperly constructed, and serviced only when full or overflowing. Septic tanks are likely to be the main source of contaminants in aquifers within the Nuku'alofa area. Contaminated groundwater discharging to the coastal fringe and lagoon areas is thought to be the cause of excessive algal growth, and there are concerns about impacts on the aquatic ecosystems. Monitoring wells to assess groundwater quality have been constructed, and a water quality monitoring program commenced in June 2010.⁷ Septic tank sludge treatment facilities on Tongatapu do not have sufficient capacity to treat septic tank waste generated in Nuku'alofa and need to be augmented.

10. **Solid waste management.** In 2007, a new, engineered landfill was commissioned at Tapuhia; a weekly household 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. WAL is also responsible for disposal of septic tank sludge at the Tapuhia facility. 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 billing and revenue collection are not proving effective,⁸ resulting in very low levels of payment from household and commercial customers. Hence, WAL is not financially viable and, despite the availability of an Australian Agency for International Development sustainability fund for the purpose, it has been unable to fund adequate maintenance and repairs, and has a growing maintenance backlog that threatens the continued provision of its essential services. Capacity development within WAL is urgently required to: (i) provide a robust financial management, billing, revenue collection, and accounting system; (ii) provide a sustainable asset management system; and (iii) address poor governance and management skills within WAL.

11. **Asset management.** Management of existing and new urban infrastructure is a high priority. Government policy is that, wherever possible, the cost of O&M of economic infrastructure should be funded from user charges. The 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, to achieve self-funding of sustainable O&M by the government and public enterprises. All public enterprises have yet to develop and implement an asset management framework and asset management plans.

2. Government's Sector Policy and Strategy

12. The government's development aims and program are presented in the Tonga Strategic Development Framework (TSDF), 2011–2014.⁹ The TSDF specifically targets infrastructure and has four priority themes for economic infrastructure development: (i) renewable energy and stable electricity prices, (ii) improved access to markets, (iii) improved management of the water and waste cycle, and (iv) improved asset management. Until recently, Nuku'alofa's expansion was driven by ad hoc projects in response to immediate development priorities. Limited planning

⁷ Constructed under ADB. 2008. *Report and Recommendation of the President to the Board of Directors: Proposed Grant to the Integrated Urban Development Sector Project*. Manila (G0108-TON).

⁸ Revenue collection for FY2011 was assessed to be 27% (TA 7631-TON: Preparing the Integrated Urban Development Sector Project).

⁹ Kingdom of Tonga. 2011. *National Strategic Development Framework 2011–2014*. Nuku'alofa.

has resulted in the development of residential areas on unsuitable land on Nuku'alofa's periphery, and public infrastructure with limited capacity for future urban growth.

13. The government has prepared a costed urban infrastructure development plan (UIDP) for Nuku'alofa covering water supply, sanitation, drainage, solid waste, roads and traffic, transport, electricity, telecommunications, site development, and environmental management.¹⁰ The UIDP will guide urban infrastructure development for Nuku'alofa in the short term (FY2011–FY2013), medium term (FY2014–FY2016), and long term (FY2017–2031). The infrastructure investments identified in the UIDP are generally aligned with urban infrastructure investments identified in Tonga's National Infrastructure Investment Plan.¹¹ The estimated investment cost to implement the UIDP is \$186 million.

3. ADB Sector Experience and Assistance Program

14. The 2007–2012 country partnership strategy of the Asian Development Bank (ADB)¹² focuses on poverty reduction by means of three intervention pillars—pro-poor, environmentally sustainable integrated urban infrastructure development; financing of pro-poor policies through effective, prudent macroeconomic and fiscal management; and private sector development. The country partnership strategy supports the implementation of the TSDF, including urban development.¹³

15. ADB is supporting urban infrastructure development through the IUDSP and has provided capacity development for spatial planning and urban management through the Urban Planning and Management System (UPMS) technical assistance (TA).¹⁴ The IUDSP focuses on upgrading of roads and drainage systems and has established a groundwater quality monitoring program to assess the impacts on-site sanitation facilities on the water quality of Nuku'alofa's aquifers, Faga'uta Lagoon, and the Nuku'alofa coastal foreshore.¹⁵ The IUDSP is scheduled to be completed by 31 December 2013. Major outputs of the UPMS included a comprehensive urban sector analysis, a spatial planning framework and preparation of legislation to support urban planning, the Nuku'alofa Traffic Management Plan, and the Urban Infrastructure Development Plan. The UPMS was completed in July 2010.

16. A number of other donors are providing assistance to develop urban infrastructure in Tonga. The People's Republic of China has provided a loan of CNY440 million for the Nuku'alofa Reconstruction Project to rebuild buildings and associated infrastructure destroyed during civil unrest on 16 November 2006. The European Union is providing TA to prepare an integrated spatial plan for Nuku'alofa to guide urban development to 2030. The World Bank is assisting the development of Tonga's transportation sector through the Transport Sector Consolidation Project, including urban roads.

¹⁰ ADB. 2008. *Technical Assistance to the Kingdom of Tonga for Urban Planning and Management System* (TA 7082-TON). Manila.

¹¹ The government endorse the National Infrastructure Investment Plan in October 2010.

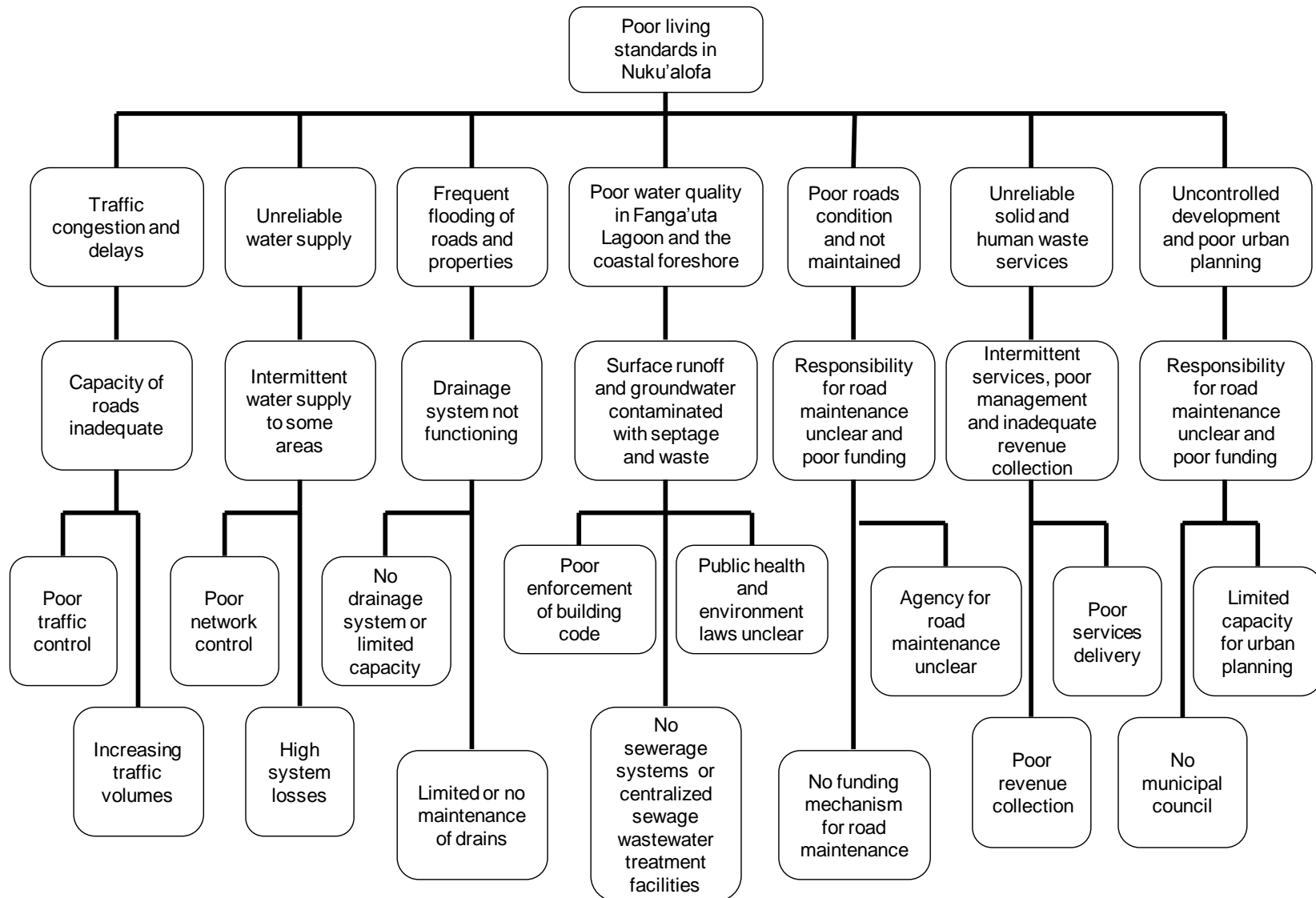
¹² ADB. 2007. *Country Partnership Strategy: Tonga, 2007–2012*. Manila.

¹³ Kingdom of Tonga. 2011. *Tonga Strategic Development Framework 2011/2014*. Nuku'alofa.

¹⁴ ADB. 2008. *Technical Assistance to the Kingdom of Tonga for Urban Planning and Management System* (TA 7082-TON). Manila.

¹⁵ Core subprojects for the IUDSP were selected from a long list of candidate projects identified under ADB. 2005. *Technical Assistance to the Kingdom of Tonga for Preparing the Integrated Urban Development Project*. Manila by the project steering committee. Candidate subprojects will be selected from the UIDP.

Problem Tree for water supply and other municipal infrastructure and Services



Sector Results Framework (water supply and other municipal infrastructure and services, 2011–2018)

Country Sector Outcomes		Country Sector Outputs		ADB Sector Operations	
Sector Outcomes with ADB Contribution	Indicators with Targets and Baselines	Sector Outputs with ADB Contribution	Indicators with Incremental Targets	Planned and Ongoing ADB Interventions	Main Outputs Expected from ADB Interventions
Improved standards of environmental quality and public health in Nuku'alofa	The reliability of Nuku'alofa water supply (availability) at all locations increases from less than 50.0% to 99.9% by 2015 (baseline year 2011)	The Government of Tonga coordinates and implements the UIDP.	Urban infrastructure development is guided by the UIDP and fully coordinated by 2013 (baseline 2011 – limited coordination of urban infrastructure development)	Planned key activity areas Urban infrastructure (89% of funds) Institutional strengthening and capacity development for municipal service delivery (11% of funds) Pipeline projects with estimated amounts Nuku'alofa Urban Development Sector Project (\$14.59 million) Ongoing projects with approved amounts Integrated Urban Development Sector Project (\$11.3 million)	Planned key activity areas Rehabilitation and construction of about 25 km of urban roads Construction of 12 new water supply wells and rehabilitation of 17 existing water supply wells Construction of second cell at the Tapuhia landfill Pipeline projects Construction of 12 new water supply wells and rehabilitation of 17 existing water supply wells Nuku'alofa water supply loss reduction program implemented Construction of second cell at the Tapuhia landfill Ongoing projects 20 km of primary urban roads rehabilitated 4 km of urban access roads constructed Rehabilitation and cleaning of about 4 km of urban drains
	Consumer access to solid waste management services increases from less than 40% to 80% by 2015 and the collection rate of solid waste charges increases from less than 30% to 75% by 2015. (baseline year 2011)	Municipal infrastructure is upgraded and well maintained.	At least 5 high priority components of the UIDP are implemented by 2015 (baseline 2011: 0%) Maintenance programs for urban services are prepared and implemented by 2015 (baseline 2011: no asset management frameworks or plans) Financing mechanisms for operation and maintenance of all urban infrastructure are established by 2015 (baseline 2011: 80% – no mechanism for roads, drainage, and sanitation)		
	Urbanization and growth management task force established by December 2011	Urban planning and management of Nuku'alofa improves	An urban management institution for Nuku'alofa is established by 2015 (baseline 2011: no institution established)		

ADB = Asian Development Bank, km = kilometer, UIDP = Urban Infrastructure Development Plan.

Source: ADB.