



Diagnostics of Pacific Water and Wastewater Association Water Utilities

SDG-6 PROFILE FOR PALAU
AND PALAU PUBLIC UTILITIES CORPORATION



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The currency of Palau is the US dollar. Palau does not have its own currency and uses the US dollar as its official currency.

The currency used in this report is US dollars unless specified otherwise.



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LIST OF ABBREVIATIONS

CSO	Civil Society Organization
FTE	Full-time equivalent
GESI	Gender Equality and Social Inclusion
GNI	Gross national income
HRM	Human resources management
JICA	Japan International Cooperation Agency
NGO	Non-Government Organization
NRW	Non-revenue water
O&M	Operation and maintenance
PPUC	Palau Public Utilities Corporation
PRIF	Pacific Region Infrastructure Facility
PWWA	Pacific Water and Wastewater Association
SDG	Sustainable Development Goal
SOE	State-owned enterprise
PPUC	Palau Public Utilities Corporation
SWOT	Strength, Weakness, Opportunity, and Threat
TA	Technical assistance
ToR	Terms of reference
WaSH	Water, Sanitation and Hygiene
WHO	World Health Organization
WSS	Water Supply and Sanitation

1 INTRODUCTION

1.1 Introduction

This report is part of a study called “Diagnostics of Pacific Water and Wastewater Association Water Utilities” and has the objective to assess progress, formulate recommendations, propose measures, and develop tools to assist Pacific Island Countries, water utilities, and Pacific Water and Wastewater Association (PWWA) in achieving United Nations Sustainable Development Goal 6 (SDG-6), i.e., universal access to safe water and sanitation.

To assess progress and evaluate the contribution of water utilities in achieving SDG-6, a diagnostic framework has been developed, which is described in section 1.2 below. The framework has been applied and tested in five countries and five PWWA member utilities with the following purpose:

- i) assess the status of SDG-6 achievement in the countries concerned;
- ii) assess the current contribution and potential of water utilities in realizing universal access to safe Water Supply and Sanitation (WSS) in their country; and
- iii) formulate strategies and plans for enhancing the contribution of water utilities toward achieving SDG-6.

In the current report, the diagnostic framework is applied for Palau and the Palau Public Utilities Corporation (PPUC). Based on the outcome of the diagnostic analysis, a Strategic Action Plan has been formulated in collaboration with PPUC to enhance its contribution to achieving SDG-6.

1.2 SDG–6 Diagnostic Analysis of PWWA Utilities

The diagnostic framework assumes that the contribution of a utility to universal access to safe WSS in a country is determined by various internal factors, including its performance, available resources, and level of service delivery, and by external factors such as the topography, demography, natural environment, socioeconomic conditions, sector policies and the institutional and regulatory environment. Also, the performance of other WSS organizations in a country will play a role. A schematic presentation of the internal and external factors is presented in Figure 1.1.

Step 1 – Carry out the diagnostic analysis

For each factor in the framework, indicators have been developed that help understand the key issues and constraints. Where possible, the indicators have been quantified and data have been collected from available reports and databases, including the IBNET/PWWA Benchmarking database, the Joint Monitoring Program (JMP) of UNICEF/WHO, and data available from the utilities and governments. A list of indicators is attached as Annex 1 to this report. The diagnostic analysis is presented in chapters 2 and 3 of this report.

Figure 1.1: Diagnostic Framework for SDG-6 Achievement



SDG = United Nations Sustainable Development Goal, WSS = water supply and sanitation.
Note: Light blue circles refer to so-called “internal” factors, and dark blue circles refer to “external” factors.
Source: Authors.

Step 2 - SWOT Analysis

To obtain a better understanding of the potential contribution of a utility to increasing universal access to safe WSS, a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis has been carried out. The SWOT analysis is often used by organizations entering new markets or starting new activities. Likewise, the SWOT analysis in this case is used to assess how Pacific Water Utilities can enhance their contribution to universal access to safe WSS in their country.

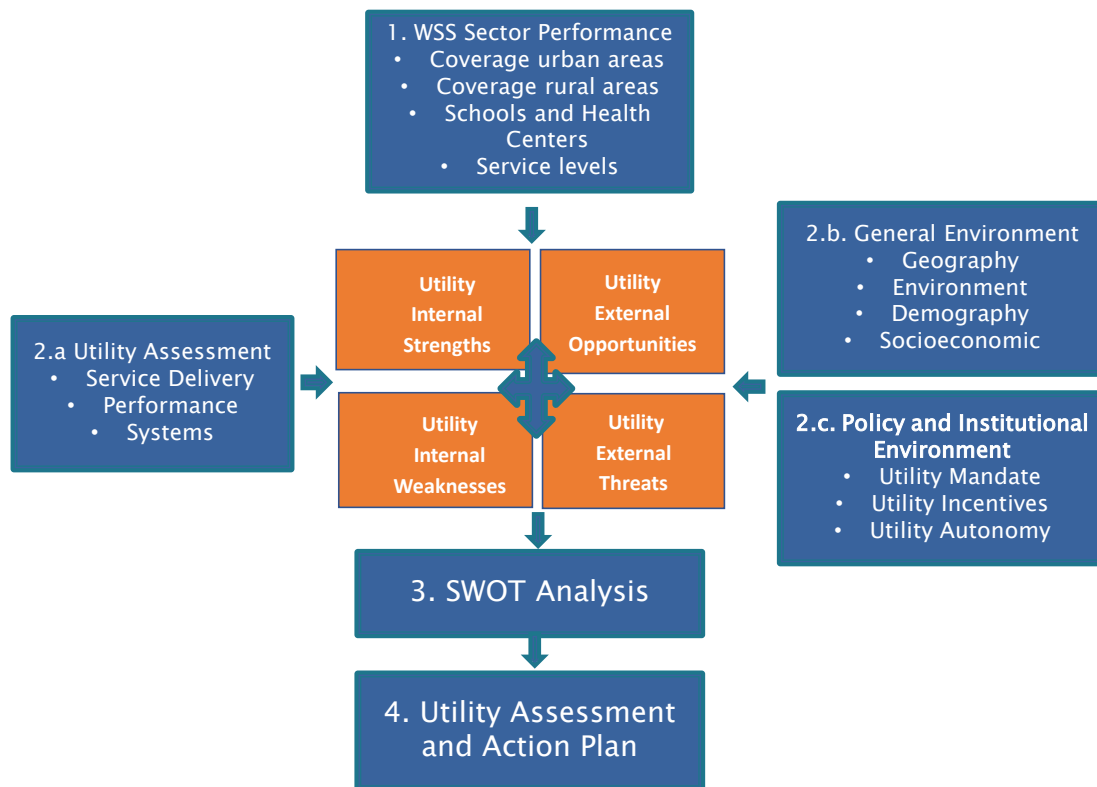
The SWOT analysis for PPUC is described in Chapter 4 of this report. In the SWOT analysis, the internal strengths and weaknesses of the utility are identified to assess its potential to (contribute to) achieving universal access to safe WSS as well as the external opportunities and threats.

Step 3 – Prepare an SDG-6 Action Plan

Following the SWOT Analysis, a Working Group within PPUC and the consultants have conducted various remote meetings to formulate a strategic action plan, as presented in Chapter 5.

The various steps in the Diagnostic Framework are schematically presented in Figure 1.2.

Figure 1.2: Flow Diagram of SDG-6 Diagnostic Analysis for PWWA Utilities



PWWA = Pacific Water and Wastewater Association, WSS = water supply and sanitation.
Source: Authors.

The methodology of the diagnostic analysis, as presented above, has been applied to Palau and the PPUC. Data and information were collected from available reports and databases, including the PWWA/IBNET database, the JMP, and data available from PPUC and the government. The data in the report were collected and validated by consultants in close collaboration with a PPUC Working Group, consisting of

- Frank Kyota, CEO Palau Public Utilities Corporation
- Marson Aderiano, Outlying States Water System Supervisor, Water Operations
- David Dengokl, Manager, Water Operations
- Clarence Masayos, Manager, Wastewater Operations (Retired)
- Naveen Kumar, Wastewater Operations Engineer
- Anthony Rudimch, Manager, Project Planning and Implementation Department
- Donna JM Titimel, Administrative Officer, Water Operations
- Albert Philip, Acting Manager, Wastewater Operations

2 COUNTRY AND UTILITY CHARACTERISTICS

2.1 Palau

Palau is an archipelago of approximately 340 coral and volcanic islands, part of the Micronesia region in the western Pacific Ocean, perched on the Kyushu-Palau Ridge. Koror Island is home to the former capital, also named Koror, and is the islands' commercial center, with about 80% of the population. The larger Babeldaob island has the present capital, Ngerulmud, plus mountains and sandy beaches on its east coast. Palau's current population is about 18,200.

Figure 2.1: Map of Palau



Source: Google Maps.

2.2 The Palau Public Utilities Corporation

PPUC is a public corporation established in 2013 to manage and operate the electrical power and the water and wastewater systems of the Republic of Palau. PPUC is the sole provider of water and sewerage services in Palau; in addition to several water supply systems, it operates sewerage systems in Koror and in the capital area Ngerulmud.

PPUC uses surface water (15 intakes diverted from rivers) and groundwater in Ngiwal and Peleliu and Angaur extracted from groundwater wells. Water is treated in 17 water treatment plants as shown in Figure 2.2.

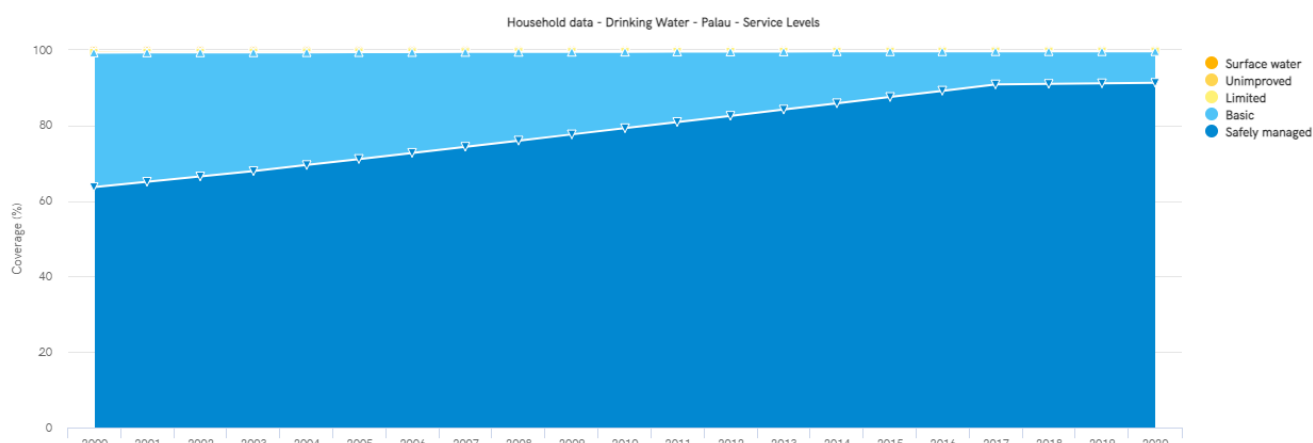
Table 2.1: Palau Access to Water and Sanitation (% of total population)

Palau	Drinking water			Sanitation		
	National 2020	Rural 2020	Urban 2020	National* 2020	Rural* 2020	Urban* 2020
Safely managed	91	70	96	-	-	-
Basic service	8	29	3	100	99	100
Limited service	0	0	0	0	0	0
Unimproved	0	0	0	0	1	0
No service	0	0	0	0	0	0

Source: WHO/UNICEF JMP (2021).

Palau scores very well on universal access to safe WSS services. Based on the latest JMP report of 2021, about 99% of the population has access to safely managed or basic WSS services. In urban areas, there is 99% access to safe water supply and 100% access to safe sanitation. In rural areas, there is 99% access to safe water supply and 99% access to safe sanitation. Only a small number of households, most likely living in remote areas or on outer islands, do not have access to safe WSS.

Figure 2.3: Access to Safe Water Supply (% of total population)



Source: WHO/UNICEF Joint Monitoring Program (<https://washdata.org>).

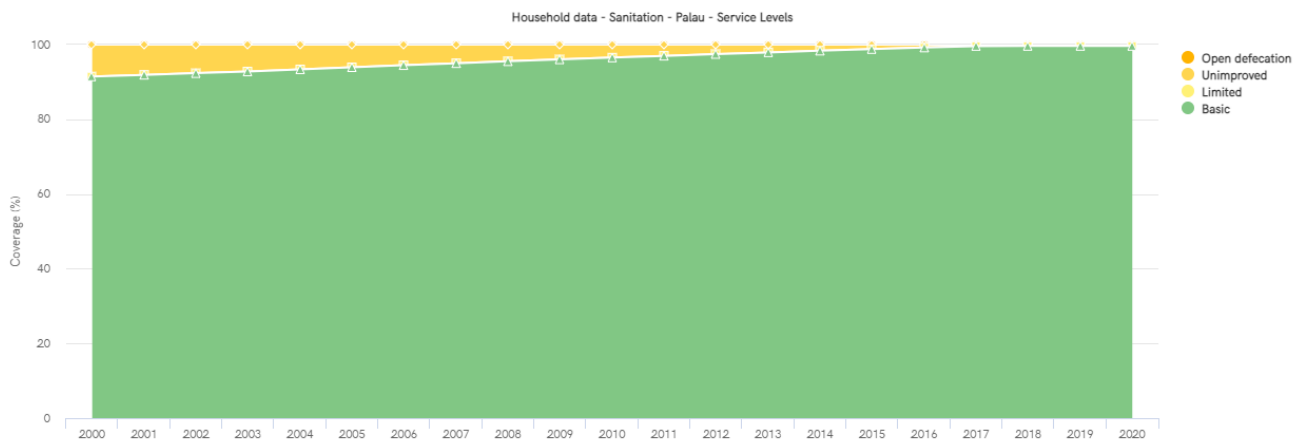
The trend over the past 20 years in access to safe water supply is presented in Figure 2.3 and access shows a 0.3% increase over the past 20 years from about 99.31% in the year 2000 to about 99.66% in 2020. Most improvement is seen with the gradual increase of “safely managed” water from 63% to 91%.

Every household in Palau has access to water; 97% have access to public water systems; the remaining households rely on rainwater catchments. Those households lacking access to public water are mostly located on the sparsely populated, remote atolls of Kayangel, Sonsorol, and Hatohobei.¹

Further, access to safe sanitation has been steadily increasing from about 91% in the year 2000 to its current level of about 99%. This trend is presented in Figure 2.4.

¹ Palau Voluntary Review of Sustainable Development Goals 2019.

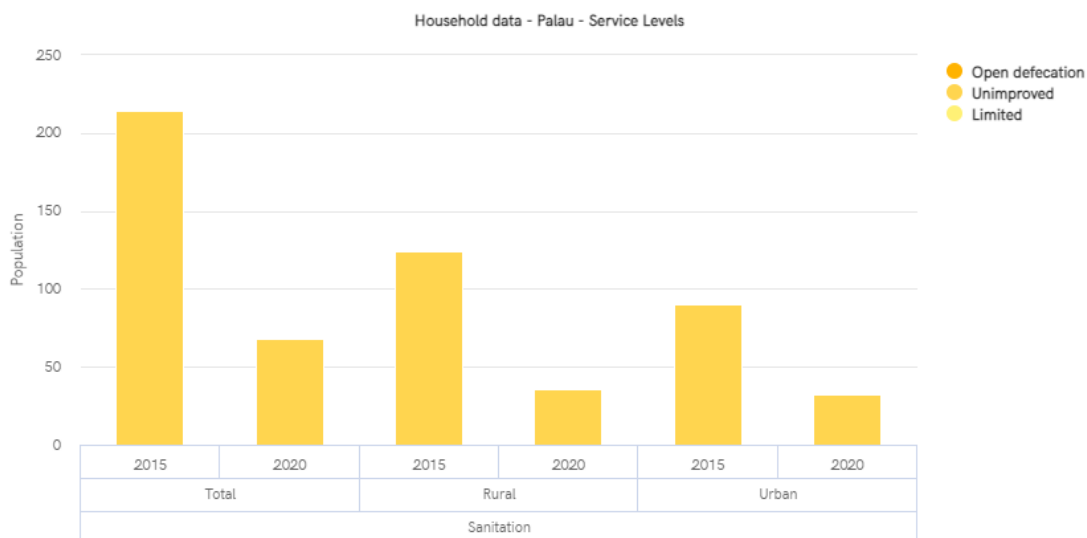
Figure 2.4: Palau – Access to Safe Sanitation (% of total population)



Source: WHO/UNICEF Joint Monitoring Program (<https://washdata.org>).

The trend for sanitation is confirmed by data about the number of households that lack access to safe sanitation services, as shown in Figure 2.5. This number has slightly decreased over the past 5 years, both in rural and urban areas, from about 214 persons in 2015 to about 68 persons in 2020.

Figure 2.5: Palau – Number of Households Lacking Access to Safe Sanitation Services



Source: WHO/UNICEF Joint Monitoring Program (<https://washdata.org>).

According to Palau’s first Voluntary National Review on the SDGs of 2019, all households have a toilet facility of some type; 91.8% use flush toilets and 7.8% use “benjos” (or Type III toilets). The environmental authorities want to replace all type III toilets with flush toilets. Public sewer systems are available in Koror and the capital area Melekeok.

3 UTILITY ASSESSMENT

PPUC was created on 6 July of 1994. It was mandated by law to plan, develop, and execute an electrification plan for the entire Republic of Palau. On 6 June 2013 the Republic of Palau Law, RPPL No 9-04, was signed and joined two independent public corporations, the Palau Water and Sewer Corporation and PPUC. The reason for this union was to generate cost efficiencies through unifying the management, administration, and other operational support functions of the separate corporations. Water and wastewater operations are treated as separate business units with their own organizational chart and financial accounts.

3.1 Level of Service Delivery

PPUC, within its current mandate and service area, significantly contributes to realizing access to safe WSS services. To assess whether there is scope to extend or improve its services, it is important to first assess PPUC's current performance.

Table 3.1: PPUC Key Data on Service Delivery

Performance Area	Key Performance Indicators	Unit	2016	2019	2020
Inclusiveness	Drinking Water Coverage in service area	%	99	99	99
	Sewerage Service Coverage in service area ^a	%	80%	80%	80%
Water Supply	Continuity of service	hours/day	24	24	24
	Customers with discontinuous supply	%	0.29	0	0
	Average total water consumption	l/p/d	436	400	404
	Residential Water Consumption	l/p/d	246	245	256
	% of annual required number of microbiological tests taken	%	100	100	100
	Compliance of tests	%		100	79
Wastewater	Availability of on-site sanitation services	Most households use septic tanks, and all households have a toilet facility; 91.8% use flush toilets and 7.8% use Type III toilets. Maintenance of septic tanks is the responsibility of the individual household. No information is available on providers of maintenance of septic tanks.			
	Wastewater and Fecal Sludge Quality passing primary and secondary level of treatment	%	100	n.a.	n.a.
Responsiveness to customers	Is there a customer charter and has the charter been made known?	Descriptive	No information is available.		
	Nr. of complaints /1,000 connections	Number	n.a.	n.a.	n.a.

Note:

^A Consultant's estimate.

Source: Palau's first Voluntary National Review on the SDGs of 2019.

Water Supply Services

- PPUC reports 100% water supply coverage within its service area, which is excellent. Overall, about 97% of all households in Palau are connected to the public water supply system and therefore PPUC is to a large extent responsible for achieving this SDG-6 target.

- In all its service area, PPUC maintains sufficient pressure in its distribution system and ensures continuity of service for all its customers.
- Average total water consumption amounts to 577 liters per capita per day (lcd).² This is very high and is partly caused by high levels of NRW.
- Average residential water consumption is about 250 l/c/d, which is high as compared to the Pacific Benchmark set by PWWA (150 l/c/d). It appears that there are two reasons for this: i) water tariffs are very low, which encourages high water consumption, and ii) the high number of tourists visiting Palau, who stay in hotels and use high volumes of water. A review of the tariff system and education to tourists and customers to avoid wasting water appears to be useful.
- Regarding water quality, according to 2019 study funded by the US Department of Interior³, there is insufficient monitoring of water quality parameters to fully evaluate regulatory compliance and evaluate treatment technology alternatives. According to the PWWA Benchmarking System, in 2020, only 79% of tests were compliant, which is too low. According to PPUC, most water treatment plants need significant improvements. The most common issue that PPUC currently faces is turbidity. Infrastructure needs improvement with additional treatment and dam extensions. There are a few ongoing improvement projects such as pump replacements and pump station renovations however the major improvement projects are still in pending. Lack of funding is one of the biggest constraints in this respect.

Wastewater Services

- More than 80% of Palau’s population live in Koror, which is serviced by a PPUC operated sewer system. About 95% of the population of Koror is serviced by this system. The Koror-Airai Sanitation Project, funded by an ADB loan of \$28 million, is ongoing but only covers the Koror area. The Melekeok area, in which Palau’s capital is situated, also has a small sewer system operated by PPUC.
- Onsite sanitation systems are prevalent in the outlying states. Most properties in Palau outside of these areas are serviced by a septic tank, pit latrine, or similar system, and possibly limited open defecation. It is likely that many of the septic tanks are poorly constructed and only infrequently desludged, resulting in groundwater contamination and community health issues.
- Wastewater primary and secondary treatment: No recent data on wastewater treatment processes are available. Over the past years, the ADB-funded Koror-Airai Sanitation Project has constructed 2.2 km of gravity sewers and 3.1 km of force mains, upgraded two sewage pump stations, constructed two new sewage pumping stations, and constructed a new tertiary sewage treatment plant at Malakal through a design–build–manage contract.

3.2 Utility Performance

Key data on performance of PPUC are available from the PWWA benchmarking system and are presented in Table 3.2.

Table 3.2: PPUC Performance Indicators

Performance Area	Key Performance Indicators	Score	2016	2019	2020
Commercial	Collection Rate	%	81	88	96
	Water sold that is metered	%	100	100	100
Technical	Non-Revenue Water	%	59	34 ^a	34

² IBNET/PWWA Benchmarking Database: www.ib-net.org

³ Republic of Palau Water Treatment Plants – Preliminary Assessment U.S. Department of the Interior Bureau of Reclamation Office of Insular Affairs, July 2020

Performance Area	Key Performance Indicators	Score	2016	2019	2020
	Energy costs as % of operational costs	%	30	38	31
Financial	Operating Cost Recovery Ratio	%	90	85	76
HRM	Staff per 1,000 connections	FTE	n.a.	16.4	19.8
Organization and Strategy	Aggregate Performance Ratio (AGPAR)	AGPAR score	6	7	7

FTE = full-time equivalent, HRM = human resource management, PPUC = Palau Public Utilities Corporation.

Note:

^a = According to PPUC, this number only applies to the Koror Arai area.

Source: IBNET/PWWA Benchmarking Database.

- Collection ratio: The 96% collection ratio has a somewhat erratic history. Measures are implemented to collect long-term water debts with weekly special disconnections involving all PPUC staff aside from the normal daily disconnection program. Obviously, this campaign has had a positive impact on the collection ratio, which has improved considerably over the past years.
- Water meter coverage is 100%, which is excellent.
- Non-revenue water: NRW has reportedly come down from 59% in 2016 to 34% in 2020, which is a very good result. This was achieved with the help of a Japan International Cooperation Agency (JICA)-supported NRW reduction program and replacement of parts of the water mains in the distribution system. The NRW indicator is now approaching the PWWA standard of 25%, which would be good to aim for over the coming years.
- Energy efficiency: For 2020, the amount of energy needed for water production is 1.08 kW/m³ and wastewater production is 231 kW/m³.
- The operating cost recovery ratio of PPUC has been decreasing over the past years and a ratio of 76% is too low to allow for sustainable operation. This is partly caused by the fact that PPUC is not fully complying with Palau's water quality standards and therefore it is legally not allowed to increase tariffs. In recent years, it appears that the increase in operational costs has been higher than the increase in revenues, which makes things worse. The PWWA standard for this indicator is 120% and PPUC should aim at achieving that standard by either reducing costs or increasing revenue. Unless PPUC charges an adequate rate to cover its expenses, this gap will continue to increase, which can lead to deteriorating quality of services.
- The staff-connection ratio of PPUC is about 20 FTE staff per 1,000 connections. This is very high as compared to the PWWA standards, which is eight FTE staff per 1,000 connections for utilities of a similar size. The cause may be that the number of staff used in the calculation is not correct, because PPUC also supplies power in addition to water and sewerage. It is recommended that PPUC check this figure.
- The AGPAR score is an indicator of the overall performance of a water utility, considering WSS coverage, NRW, commercial and financial performance. The score ranges on a scale of 1–10 and a score of 7 for PPUC is relatively high, which is mainly based on high service levels.

3.3 Maturity of Utility Systems

In addition to service delivery and performance, it is also important to assess the maturity of utility systems and available resources to cope with possible extension of services. Important indicators are


- Capacity utilization of production and distribution systems and the state of utility assets.
- The resilience of systems against natural disasters and the effects of climate change.
- The existence of a transparent financial accounting, management and reporting system and the borrowing capacity of a utility.
- The level of innovation as reflected in the use of advanced technology and billing systems.
- The ability of a utility to recruit and train capable staff and its relations with customers.

- Progress in gender policies and the percentage of female employees working in the utility.

Indicators and data for these are available from the IBNET/PWWA benchmarking reports (www.ib-net.org), as well as from water utility reports, and are presented in Table 3.3.

Table 3.3: System Maturity Indicators

Performance Area	Key Performance Indicators	Unit	2017	2019	2020
Technical Systems	% Water production capacity used	%	100%	98.89%	98.89% ^a
	% Sewerage capacity used	%	68.92%	100%	100%
	Power Supply Reliability	descriptive	Power supply is also managed by PPUC. PWWA benchmarking reports continuity of service of 24 hours/day for 2011 through to 2020.		
	Monitoring of pressure and quantities in networks	descriptive	JICA new water pipeline project in 2018 helped to reduce NRW by 9% from FY2018 to FY2019, it was reported JICA also provided proper equipment and training for water leak investigations		
Financial	Borrowing Capacity: debt to equity ratio	descriptive	Current and long-term debt and payment obligations exceed current assets with a factor of 2.5 and PPUC will not normally be able to borrow from third parties.		
Transparency	Timely and accurate financial reporting available and accessible for public	descriptive	Financial Statements for 2018 and 2019 are available and have been audited. The financial statements show that since 2013, PPUC revenues have not been sufficient to cover its expenses.		
HRM	Training policy and implementation : number of employees undergoing training disaggregated per category and gender	descriptive	PPUC's Corporate Plan 2020-2022 includes training needs analysis and implementation of a training plan. To what extent this training is being realized is unknown.		
	Gender equality and social inclusivity policies in place. ^b	descriptive	PPUC's workforce consists of 83.5% male and 16.5% female staff (2020) and the HRM department actively encourages women to apply for new job opportunities within the company.		
Organization & Strategy	Strategy Document	descriptive	PPUC has produced a Corporate Plan 2020-2022 which, among others, outlines the Strategy for Water Services.		

Performance Area	Key Performance Indicators	Unit	2017	2019	2020
	Organization Charts	descriptive	<p>Chart 1. Current Organizational Chart</p>  <p>Organization chart extracted from PPUC FY2019</p>		
Innovation	Use of advanced technology	descriptive	PPUC is gradually introducing the use of SCADA to manage and monitor its water supply system.		
	Use of advanced billing systems	descriptive	PPUC has introduced an e-billing system, which allows customers to pay their bills online.		
Resilience	Technical resilience	descriptive	An ADB Technical Assistance program supported the development of emergency procedures and standard operating procedures for sewerage operations in PPUC, which were developed in collaboration with the operational managers. However, equipment needed to implement (part of) the procedures has not been procured.		
	Organizational resilience	descriptive	<p>PPUC is overseen by a Board of Directors with seven members appointed by the President of the Republic of Palau with advice and consent of the Palau National Senate. The Board is entrusted to exercise the corporate powers of PPUC vested in them under RPPL No 9-04, including the hiring of a Chief Executive Officer with demonstrated experience and skills. The Chief Executive Officer is responsible for taking charge and controlling the operations of PPUC, enforcing its rules and regulations, and acting in line with the directions of the Board.</p> <p>The Palau Public Utilities Corporation does not have a Drought and Typhoon contingency and business continuity plan.</p>		

JICA = Japan International Cooperation Agency, PWWA = Pacific Water and Wastewater Association, HRM = human resource management, PPUC = Palau Public Utilities Corporation, NRW = non-revenue water, RPPL = , SCADA = .

Notes:

^a = PPUC is currently conducting additional groundwater assessment studies to increase production to meet future demand for water.

^b = The types of policies in place for flexible work arrangements; maternity/paternity leave, family leave, etc.

Source: PPUC Annual Statements 2018-2019.

Based on PPUC's Corporate Plan 2020–2022, PPUC's financial position is very weak. Even though the water rates of PPUC have recently been increased, they do not allow for recovery of operation and maintenance costs, and therefore it is relying on subsidies of the government and support of development partners to continue operations and make the necessary investments. Correcting this situation calls for implementation of strategies to:

- Review water tariffs at least annually with tariffs structured to deliver a surplus for reinvestment and encourage conservation of both water and power.
- Devise a scheme of arrangement to restructure water related debts.

- Improve cost controls and improved expenditure monitoring and processing of payments.
- Periodic inspections of meters to reduce unbilled water and power and prevent theft.

Restoring the financial health of PPUC is dependent on implementation of these strategies. The regular review of tariffs for water, sanitation and power is crucial to achieving financial sustainability.

3.4 General Environment

3.4.1 Geographic and Environmental Conditions

The climate of Palau is equatorial; heat, humidity, and rainfall are plentiful throughout the year, giving rise to a reliable supply of water from rivers and good sources of groundwater in many parts of the country. Temperature is stable throughout the year as well.

Between April and December, Palau can be hit by typhoons, but since the sea is always warm, they sometimes also occur from January to March but with less strength (Table 3.4).

Table 3.4: Environmental Conditions in Palau

Performance Area	Indicators	Assessment																		
Geographic conditions	Type of landscape	Made up of four main types: volcanic, high limestone, low platforms, and atolls. Babeldaob, Arakabesan, and Malakal are volcanic. Peleliu, Angaur, and other islands of the southwest are either raised or low coral platform, while Koror is a combination.																		
Water Resources	Availability Type	<p>Palau’s water supply relies primarily on surface sources, including the Koror-Airai water supply system that depends on the Ngerikill and Ngerimel rivers. Water sources on Angaur, Peleliu, and Kayangel are groundwater and desalination.</p> <p>PPUC operates 17 water supply systems: 15 with surface water from rivers, and two shallow groundwater systems from wells. PPUC water tanks with capacity listed below (Source PPUC).</p> <table border="1"> <thead> <tr> <th>Water Storage Tanks</th> <th>Capacity</th> <th>Coverage</th> </tr> </thead> <tbody> <tr> <td>Airai</td> <td>1M gallons</td> <td>Whole state of Airai from Ordomei, Ngetkib to KB Bridge Airai side, Ochelechei</td> </tr> <tr> <td>Ngermid</td> <td>1M gallons</td> <td>Ngesaol, Ngermid, Ngerias, Ngerbodel, Ngerchemai, and Iyebukei</td> </tr> <tr> <td>Ngerkesaol</td> <td>1M gallons</td> <td>Ngerkesaol, Ikelau, Idid, Meketii, Dngeronger, Ngerbeched, M-Dock, Medalai, including causeway store, Dr. Kuartei, WCTC Building, National Hospital, PNCC and all the houses nearby all the way to CIP Office, PC Club, Ellilai</td> </tr> <tr> <td>Ngerkebesang</td> <td>.5M gallons</td> <td>Ngerkebesang, PPR, Echang, Echol all the way to Meyuns elementary school area</td> </tr> <tr> <td>Malakal</td> <td>.25M gallons</td> <td>all Malakal area to Minatobashi Bridge</td> </tr> </tbody> </table>	Water Storage Tanks	Capacity	Coverage	Airai	1M gallons	Whole state of Airai from Ordomei, Ngetkib to KB Bridge Airai side, Ochelechei	Ngermid	1M gallons	Ngesaol, Ngermid, Ngerias, Ngerbodel, Ngerchemai, and Iyebukei	Ngerkesaol	1M gallons	Ngerkesaol, Ikelau, Idid, Meketii, Dngeronger, Ngerbeched, M-Dock, Medalai, including causeway store, Dr. Kuartei, WCTC Building, National Hospital, PNCC and all the houses nearby all the way to CIP Office, PC Club, Ellilai	Ngerkebesang	.5M gallons	Ngerkebesang, PPR, Echang, Echol all the way to Meyuns elementary school area	Malakal	.25M gallons	all Malakal area to Minatobashi Bridge
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Ngerkebesang	.5M gallons	Ngerkebesang, PPR, Echang, Echol all the way to Meyuns elementary school area																		
Malakal	.25M gallons	all Malakal area to Minatobashi Bridge																		
Extreme weather events	Occurrence Severity	<p>Droughts (January–May) and typhoons (April–December) Occur at least once every 7–10 years. In 2016, Palau declared a state of emergency because of the severe drought conditions affecting the country, leading to the introduction of water rationing.</p> <p>Palau is situated just south of the Pacific Ocean “typhoon belt” (between 10°N and 40°N). It does experience typhoons and recent examples took place in December 2012 and November 2013 and December 2021, with significant wind damage to trees, homes and structures, saltwater water intrusion to agriculture, alterations to lagoon patterns and storm surge flooding to coastal areas.</p>																		

PPUC = Palau Public Utilities Corporation.

Sources: World Bank Group/ADB, 2021: Climate Risk Profile of Palau; ADB Review of Opportunities in the Pacific WaSH Sector, Dec. 2021.

3.4.2 Socioeconomic and Demographic Conditions

The level of economic development and issues like income distribution will determine the ability of the population to pay for safe WSS services and will determine the financial resources available to the government, the utility and/or private sector institutions for financing WSS infrastructure, and its dependence on external resources (Table 3.5).

Table 3.5: Socioeconomic and Demographic Indicators

Performance Area	Indicators	Assessment
Economic Development	Per capita GDP	\$14,243 in 2020
Socioeconomic development	Per capita GNI	\$14,390 in 2020
Affordability of 6 m ³ water	% of per capita GNI	0.09% in 2019
Urban population	% Population in urban areas	Increased from 70.4% to 81% between 2000 to 2020
Rural Population	% Population in rural areas	Decreased from 29.6% to 19% between 2000 to 2020
Outer Island Population	% Population in outer islands	Only a small number of Palau's 340 islands are inhabited.
Population density	Nr of persons/km ²	Reduction from 41.5 to 39.3 people per km ² from 2000 to 2020

GDP = gross domestic product, GNI = gross national income.

Source: World Bank: <https://data.worldbank.org>

Palau is a small country and 80% of the population lives in the urban Koror/Airai area, which facilitates distribution and operations.

The data show that, in Palau, water tariffs are very low and only a fraction of per capita gross national income (GNI) is spent on water. There is plenty of room to increase water tariffs and herewith improve the financial sustainability of PPUC and encourage the efficient use of water.

3.5 The Policy and Institutional Environment

3.5.1 Government WSS Policies

Government policies and strategies have a profound effect on the functioning of the WSS sector (Table 3.6).

Table 3.6: Government Policies

Performance Area	Indicators	Assessment
Policy/Strategy	Approved Water Sector Policy in place	The Palau Public Utilities Consolidation Act (RRPL09-04) provides guidance on the functioning of PPUC. PPUC has a detailed Corporate Plan 2020–2022.
Gender issues	Specific Policy for women and underprivileged groups	PPUC’s HRM department actively encourages women to apply for new job opportunities within the company.
Funding (gap)	Utility access to financial resources	Over the past decade, PPUC has implemented several capital investment projects, which are financed by development partners, such as ADB and JICA. PPUC fully relies on the government for access to financial resources. This situation is not expected to change, unless PPUC is able to implement adequate tariffs to recoup its operational cost and capital expenses. See also next section on sector regulation.
Human Resources	Availability and use of WSS training facilities	Historically, PPUC staff management is based on Public Service staff management guidelines. This has included recruitment, training, conditions of employment, remuneration, and leave. The Corporate Plan 2020-2022 includes strategies to move PPUC closer to a private sector model of staff management. Introducing this approach entails a change of organizational culture to focus on performance. Notwithstanding the very high staffing ratio, there appears to be a strong need to recruit qualified local staff within the water section as well as a way to retain such specialized talent.
Monitoring	Monitoring System in place and producing regular and reliable reporting	All connections are metered. The extent of water quality monitoring does not appear to be sufficient to ensure regulatory compliance throughout the various reaches of the distribution system.

ADB = Asian Development Bank, JICA = Japan International Cooperation Agency, HRM = human resource management, PPUC = Palau Public Utilities Corporation.

Source: US Dept. of Interior 2020: Palau Water Treatment Plants Preliminary Assessment.

3.5.2 Institutional and Regulatory Framework

The institutional and regulatory framework of the WSS sector will determine the functions and mandate of water utilities and other water sector organizations, their respective service areas, and the level of autonomy of water utilities. The assessment therefore includes data about the existence, responsiveness, and predictability of adequate service standards for the WSS sector and review if these standards are enforced (Table 3.7).

Table 3.7: WaSH Institutional Framework and Regulations

Performance Area	Indicators	Assessment
Service Standards	Existence, responsiveness, and predictability of service standards	<ul style="list-style-type: none"> The Environmental Quality Protection Act created the Environmental Quality Protection Board, which is a semiautonomous agency that enforces regulations on drinking water and wastewater quality, solid waste management, and environmental quality. The Sewer Use Act of 1984 sets the regulation of wastewater disposal and establishes minimum standards for planning, design, and construction.

Service area of the Utility	Mandate for water supply Mandate for sanitation	<ul style="list-style-type: none"> PPUC has a mandate to supply water and wastewater services throughout the Republic of Palau. 																																																						
Sector Regulation	Existence, responsiveness, and predictability of regulatory system	<ul style="list-style-type: none"> RPPL 9-04 The Utilities Consolidation Act. Effective on 6 June 2013. 																																																						
Tariff Setting	Reliability, transparency, and effectiveness of tariff setting system	<table border="1" data-bbox="911 465 1378 792"> <thead> <tr> <th colspan="3">Effective February 1, 2017 WATER RATES</th> </tr> <tr> <th colspan="3">KOROR/AIRAI- WATER & SEWER RATES</th> </tr> <tr> <th colspan="3">Residential Rate</th> </tr> </thead> <tbody> <tr> <td>WATER RATES TIER1</td> <td><5000/GALS</td> <td>\$1.59/1000gals</td> </tr> <tr> <td>WATER RATES TIER2</td> <td>>5001</td> <td>\$6.49/1000gals</td> </tr> <tr> <td>SEWER RATES</td> <td><5000/GALS</td> <td>\$0.39/1000gals</td> </tr> <tr> <td>SEWER RATES</td> <td>>5001</td> <td>\$5.94/1000gals</td> </tr> <tr> <th colspan="3">Commercial, Rop. and Government</th> </tr> <tr> <td>WATER RATES</td> <td>0 & ABOVE</td> <td>\$6.49/1000gals</td> </tr> <tr> <td>SEWER RATES</td> <td>0 & ABOVE</td> <td>\$5.94/1000gals</td> </tr> <tr> <th colspan="3">BABELDAOB & YOULDAOB</th> </tr> <tr> <th colspan="3">Residential Rate</th> </tr> <tr> <td>WATER RATES TIER1</td> <td><5000/GALS</td> <td>\$1.06/1000gals</td> </tr> <tr> <td>WATER RATES TIER2</td> <td>>5001</td> <td>\$1.28/1000gals</td> </tr> <tr> <td>SEWER RATES</td> <td>0 & ABOVE</td> <td>\$0.30/1000gals</td> </tr> <tr> <th colspan="3">Commercial, Rop. and Government</th> </tr> <tr> <td>WATER RATES</td> <td>0 & ABOVE</td> <td>\$1.28/1000gals</td> </tr> <tr> <td>SEWER RATES</td> <td>0 & ABOVE</td> <td>\$1.28/1000gals</td> </tr> </tbody> </table> <ul style="list-style-type: none"> PPUC is required by law to achieve full cost recovery; in 2015, the above tariff structure was designed and set to take effect to ensure that PPUC will meet full cost recovery. Unfortunately, this objective could not be met due to RRPL 10-19 and RRPL 10-26, which prohibit any increase in tariff unless Palau water quality standards are met. The above tariff (\$0.42/m³) has been effective from 2017 onwards. Based on this tariff, PPUC water has not been able to recover its operation and maintenance costs. 	Effective February 1, 2017 WATER RATES			KOROR/AIRAI- WATER & SEWER RATES			Residential Rate			WATER RATES TIER1	<5000/GALS	\$1.59/1000gals	WATER RATES TIER2	>5001	\$6.49/1000gals	SEWER RATES	<5000/GALS	\$0.39/1000gals	SEWER RATES	>5001	\$5.94/1000gals	Commercial, Rop. and Government			WATER RATES	0 & ABOVE	\$6.49/1000gals	SEWER RATES	0 & ABOVE	\$5.94/1000gals	BABELDAOB & YOULDAOB			Residential Rate			WATER RATES TIER1	<5000/GALS	\$1.06/1000gals	WATER RATES TIER2	>5001	\$1.28/1000gals	SEWER RATES	0 & ABOVE	\$0.30/1000gals	Commercial, Rop. and Government			WATER RATES	0 & ABOVE	\$1.28/1000gals	SEWER RATES	0 & ABOVE	\$1.28/1000gals
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SEWER RATES	0 & ABOVE	\$1.28/1000gals																																																						
Institutional Framework	Clarity of responsibilities and level of overlap	<ul style="list-style-type: none"> PPUC is responsible for providing piped water and wastewater services and has a monopoly for these services. The Ministry of Environment and the Ministry of Health oversee monitoring raw water and drinking water quality, respectively. 																																																						
Level of Utility Autonomy	Formal and actual level of autonomy of utility management	<ul style="list-style-type: none"> PPUC is to a large extent depending on government subsidies for its operations and capital investments. Also, the members of the Board are appointed by the government and therefore PPUC's autonomy in practice is limited. 																																																						

PPUC = Palau Public Utilities Corporation, RPPL = Republic of Palau Public Law, WaSH = Water, Sanitation and Hygiene.

3.6 Summary of the Diagnostic Analysis

A spider diagram,⁴ which depicts the scores of the various factors which jointly determine PPUC's contribution to achieving SDG-6, summarizes the results of the diagnostic analysis. The spider diagram is based on scores for each of the internal and external factors as presented in Table 3.8.

⁴ The use of a spider diagram for this purpose was suggested by officials of Department of Foreign Affairs and Trade (Australia) in the review of the draft Interim Report of the project.

Table 3.8: Summary of Diagnostic Analysis

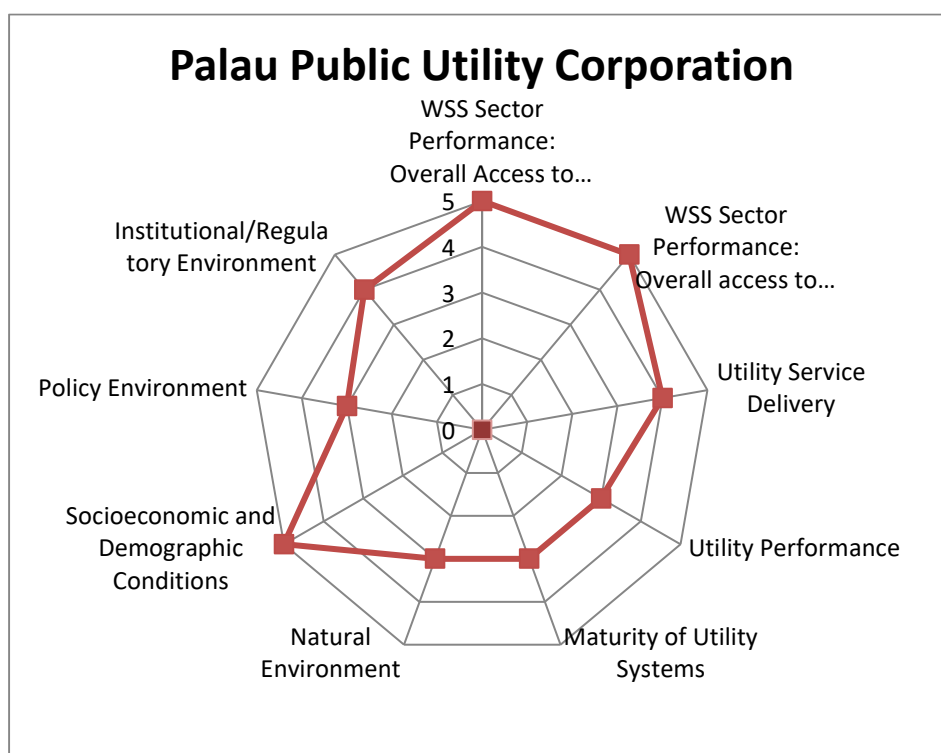
1	WSS Sector Performance: Overall Access to safe Water Supply	5	JMP
2	WSS Sector Performance: Overall access to adequate sanitation	5	JMP
3	Utility Service Delivery	4	Service Level : average of Continuity 5, Water Quality 3, water consumption 3, Water Coverage 5, Sewerage Coverage 3
4	Utility Performance	3	SDG 6 Assessment: average of NRW 3, Staff ratio 1, operational cost ratio 2, metering ratio 5 and collection ratio 5
5	Maturity of Utility Systems	3	Technical Systems 4, Financial Systems 3, Organization, 3, Innovation 3, Resilience 3
6	Natural Environment	3	Topography 5, water resources 4, Extreme weather events 2
7	Socioeconomic and Demographic Conditions	5	GNI 5, Demography 5
8	Policy Environment	3	Policy 3, Access to finance 3, Access to training 3
9	Institutional/Regulatory Environment	4	Service Area 5, Tariff system 3

GNI = gross national income, SDG = Sustainable Development Goal, JMP = Joint Monitoring Program, WSS = water supply and sanitation.

Source: Authors.

The scores vary between 1 and 5 for each of the factors, where 1 is a very poor or low score and 5 is a very good or high score. The results are presented in the spider diagram in Figure 3.1 and the ranking table of the scores is attached as Annex 2 to this report.

Figure 3.1: Summary of Diagnostic Assessment



WSS = water supply and sanitation.

Source: Authors.

Access to safe Water Supply:	Very good (5) with 99% access to basic or safely managed water supply in Palau (countrywide)
Access to safe Sanitation:	Very good (5) with 100% access to basic or safely managed Sanitation in Palau (countrywide)
PPUC Service Level:	Good (4): high coverage for water supply in service area and moderate coverage on sewerage, excellent continuity in supply, but very high water consumption and issues in some places on water quality.
PPUC Performance	Moderate (3): Improving performance on NRW, poor performance on operational cost recovery; poor staffing ratio, 100% metering, and strongly improved performance in collection of bills.
PPUC System Maturity	Moderate (3): systems operate at full capacity; not very strong in organizational and HRM systems and financial transparency, weak debt to equity ratio, average resilience, and innovation
Natural Environment	Good (4): Topography easy to manage, good water resources but Palau is vulnerable for extreme weather events.
Demography and Economy	Very good (5): Larger part of the population lives in urban areas, with high population density and relatively cheap to supply; Incomes and GNI are high and water rates are very affordable.
Policy Environment	Moderate (3): Clear policies but not consistently applied; limited access for PPUC to financial resources (apart from development partners) and average access to training institutions.
Regulatory environment	Good (4): Regulatory environment is clear but not fully applied; PPUC's service area covers all of Palau. Water tariffs are supposed to cover costs, but PPUC is not allowed to charge such tariffs. The result is very affordable tariffs for customers in combination with very poor cost recovery for PPUC.

4 SWOT ANALYSIS

After having analyzed the various factors, the key internal Strengths and Weaknesses and the key external Opportunities and Threats in relation with enhancing access to safe water and sanitation services of PPUC are presented in Table 4.1.

Table 4.1: SWOT Analysis PPUC

<p>Strengths (internal)</p> <ul style="list-style-type: none"> • PPUC maintains 100% water coverage and some 80% sewerage coverage and relatively high service standards • Almost 100% of the population has access to safe sanitation • Plentiful rain throughout the year and good water resources 	<p>Weaknesses/constraints (internal)</p> <ul style="list-style-type: none"> • Continued inability of PPUC to increase water rates and meet costs. • No borrowing capacity • Poor water quality in small water supply systems
<p>Opportunities (external)</p> <ul style="list-style-type: none"> • Improved water quality to meet regulatory standards has been put as condition to raise water rates and revenue. • Normally there is a lot of tourism in Palau, which may be an attractive market segment with a high demand for water. • Merger of Power and Water Utilities in 2013 to improve efficiency but keeping them financially separate. 	<p>Threats (external)</p> <ul style="list-style-type: none"> • Occasional lack of water supply due to droughts • Poor quality of private septic tanks may cause pollution to (shallow) groundwater in some areas

SWOT = Strengths, Weaknesses, Opportunities and Threats, PPUC = Palau Public Utilities Corporation.

Source: Authors.

Conclusions from SWOT Analysis

Water Supply: In general, PPUC has been able to maintain high service levels, although water quality (turbidity) remains an issue in several the smaller water supply systems. These issues need to be resolved and PPUC should continue to work on further reducing its NRW and herewith reduce costs. It is also necessary to prepare disaster recovery and business continuity plans for dealing with extreme weather events and water quality issues.

Sanitation: Coverage of PPUC's sewerage system is high in urban areas. In rural areas, PPUC could work with other stakeholders to improve the quality of septic tanks and their maintenance.

Finance: PPUC water tariffs should be increased and the additional revenues could be used to improve the quality of its water and pay for the necessary upgrading of the smaller systems. The tourist market is an attractive market segment and PPUC might consider charging higher tariffs for this category of customers to discourage excessive use and increase revenues.

5 PREPARATION OF A UTILITY STRATEGY AND ACTION PLAN

5.1 Introduction

After having completed the SWOT analysis, the PPUC working group, with support of consultants, have formulated recommendations and measures to accelerate universal access to safe WSS as follows:

- improve services by making use of opportunities and strengths;
- defend itself against threats by making use of its strengths;
- improve on its weaknesses and in this way make use of external opportunities; and
- withdraw where external threats match with the internal weaknesses.

Carrying out the SWOT analysis has helped PPUC to identify the key strengths and weaknesses that need to be addressed in the Action Plan.

5.2 Action Plan

Regarding the achievement of SDG-6 goals for universal access to water and sanitation, PPUC is one of the best-performing utilities in the Pacific Region. PPUC has achieved almost 100% water coverage within its supply area and about 80% of the population has access to its sewerage system. Houses outside the reach of PPUC's sewerage systems still have access to adequate sanitation facilities in the form of septic tanks in most cases in combination with flush toilets. The proposed Action Plan therefore focuses on addressing qualitative improvements in performance and service delivery rather than extending access to water and sanitation services.

5.3 Water Supply

In this Action plan, PPUC addresses some of the Water Supply issues that it currently faces. Some of these recommended actions are already in the early stages of implementation by PPUC.

5.3.1 Mitigation against droughts

Of the 17 treatment plants used by PPUC, 15 treat surface water diverted from nearby rivers. The rivers are supplied by abundant rainfall in a tropical climate, about 150 inches per year on average. Some of the plant operators reported that during droughts or periods of below average rainfall, there is insufficient river water supply to meet the needs of the PPUC customers. When this occurred, water is transported to the impacted areas from other plant locations that are less impacted by reduced rainfall.⁵

Based on this, PPUC intends to carry out a hydrological study of the affected raw water sources to determine minimum safe yields for these water sources. Based on the findings of the study, suitable source augmentation or alternative water sources must be identified. At present, PPUC is carrying out a preliminary study with support of the US Department of the Interior, although works have currently been suspended due to COVID-19.

⁵ US Department of Interior 2020: Palau: Preliminary Analysis of Water Treatment Plants.

5.3.2 Improve treated water quality

The major Koror/Airai water treatment plant services the large proportion of the population and consists of a conventional treatment plant system. The conventional treatment plant can accommodate varying quality fluctuations in its two raw water sources, the Ngerikill River and Ngerimel Dam. The treated water quality from this plant reportedly meets the treated water quality standards.

Outside of Koror, other water treatment systems consist of either sand filtration followed by disinfection or desalination plants also followed by disinfection. In some areas on Babledaob Island, after heavy rainfall, the raw water turbidity rises dramatically and causes treated water quality failures as the simple filtration systems are unable to cope with high turbidity incoming raw water. In such cases, conventional treatment systems (or alternative raw water sources) may be necessary.

As part of this Action Plan, PPUC intends to undertake audits and assessment for treatment plants that are failing to meet treated water quality standards. The audit and assessment shall then recommend appropriate rectification works for implementation. At present, PPUC is being supported by the US Department of the Interior in such works although works have currently been suspended due to COVID-19. Such works should be recommenced when possible.

5.3.3 Further reduce non-revenue water

Between 2016 and 2019, PPUC significantly reduced its NRW from 59% to 34%, which is an impressive achievement. The dramatic reduction in NRW was to a large extent due to the replacement of several leaking mains with modern pipe materials, with the support of JICA. The 2020 NRW remains at 34%. The PWWA NRW target is 25% and there is scope for PPUC to further improve on its significant gains to date.

At present, it appears that all bulk water meters are mechanical, and are less accurate than electromagnetic flowmeters. In measuring and managing NRW more accurately, there is a need for accurate flow measurements especially at the water treatment plants. It is also possible that there are additional leaking mains that are known to PPUC but were not part of the JICA project where mains were replaced. As such, replacement of these mains also represents an opportunity to further reduce NRW.

As part of this Action Plan, PPUC intends to make use of electromagnetic flowmeters on bulk mains and particularly at water treatment plants so that accurate water production figures can be obtained to use in NRW calculations. The use of system-wide bulk mains electromagnetic flowmeters will also enable PPUC to measure NRW on a zonal basis within the network and this will help in understanding and locating areas of high NRW for targeting. Where mains are known to have ongoing or regular leaks, these should be identified for replacement.

5.3.4 Additional water treatment plant capacity (reserve capacity)

PPUC reports that the percentage water production capacity used is 99.9% in 2019 and 2020. Depending on the accuracy of the data, this could be interpreted that the water treatment plant(s) are currently running at their maximum design capacity and are unable to accommodate future water demand increases unless they are upgraded.

PPUC wants to confirm each water treatment plant's design capacity against the treatment plant water production figures to determine if treatment plants are being used at their maximum treatment capacities. If treatment plants are operating at their maximum capacities, upgrades of the plants should be planned to cater for future population/or commercial/tourism and other projected water demands.

5.4 Sewerage

PPUC currently covers approximately 80% of the population with sewerage. Areas outside of the service area are reportedly served by septic tanks. The Department of the Environment is responsible for inspection of septic tank installations and PPUC reports that there has recently been improved regulation and management of septic tanks as part of this process which is reducing environmental impacts.

5.4.1 Alternative sewer systems

PPUC would like to investigate the effectiveness of the current sanitation systems and determine whether some areas are better served by conventional sewerage systems than septic tanks. Especially in areas with high water tables, this may cause problems. For that reason, PPUC plans to investigate these areas and, where appropriate, consider specific system upgrades.

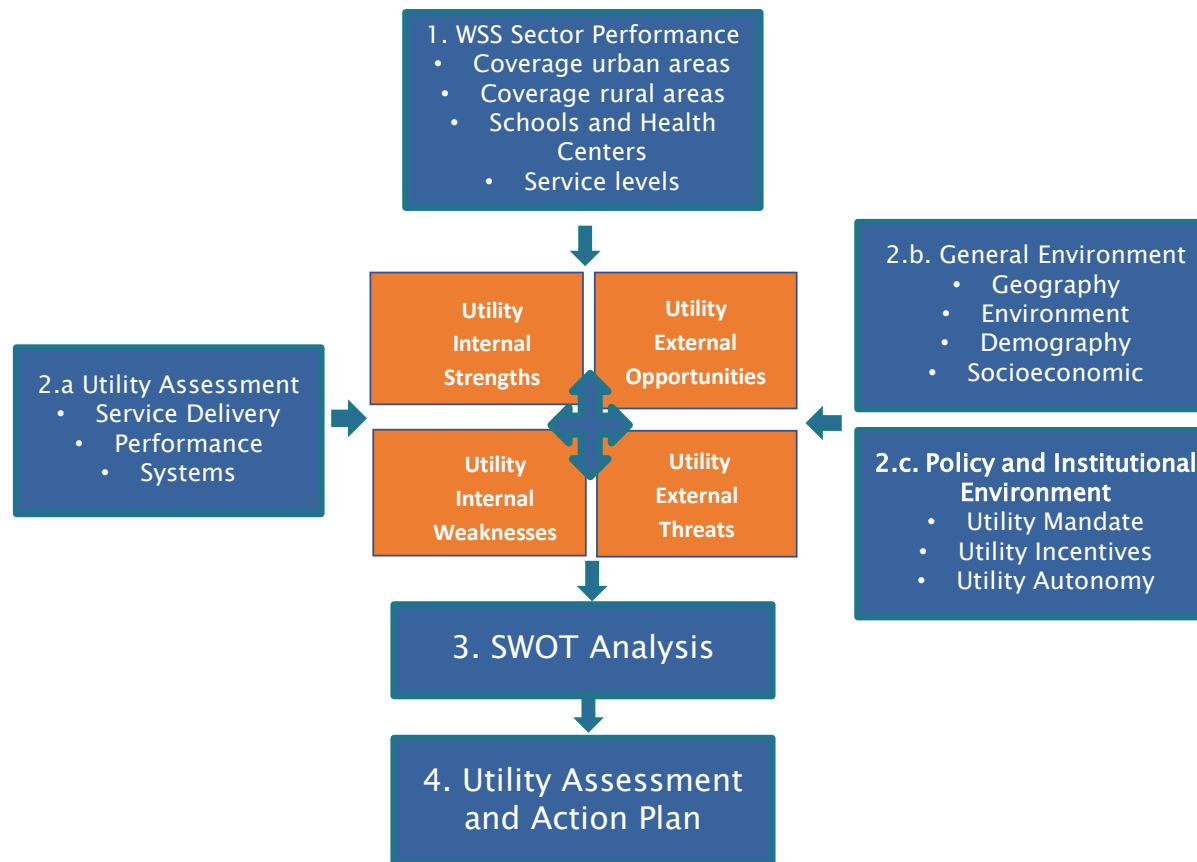
5.4.2 Sewage treatment plant capacity

PPUC reports that the percentage capacity of the Melekeok Wastewater Treatment Plant is 100% in 2019 and 2020. Depending on the accuracy of the data, this means that the small sewer system operated by PPUC in the Melekeok area, in which Palau's capital is situated, currently operates at maximum capacity and would be unable to cater for any additional increases in sewage flows.

As part of this Action Plan, PPUC intends to confirm the treatment plant's design capacity against the treatment flows and determine if the plant has any reserve capacity available. In the event that the treatment plant is at its maximum capacity, upgrade of the plant will be considered to cater for future population/or commercial/tourism and other projected sewage flows.

Appendix 1: Diagnostic Framework Key Indicators

Diagnostic Framework



Diagnostic Framework - List of Indicators^a

Performance Area	Key Performance Indicators ^b	Data Source	Score
Overall WSS Sector Performance			
Water Supply	Overall Coverage (urban/rural) *	JMP	%
	Contribution Water Utilities	Utility/JMP	%
	Contribution Other Sector Organizations	Govt/JMP	%
	Service Levels*	Utility/JMP	1 safely managed 2 basic level 2 limited 4 unimproved 5 no
Sanitation	Overall Coverage (urban/rural) *	JMP	%
	Contribution Water Utilities	Utility/JMP	%
	Contribution Other Sector Organizations	Govt/JMP	%
	Service Levels*	Utility/JMP	1 safely managed 2 basic level 2 limited 4 unimproved 5 no
	Proportion of household wastewater safely treated	UN/Habitat monitoring data	%
	Coverage and Service Levels in Schools and Health Facilities	JMP	1 safely managed 2 basic level 2 limited 4 unimproved 5 no
Gender Equality and Social Inclusion (GESI)	Minimum standards for mainstreaming GESI	JMP, Government	Descriptive
Utility Service Level			
Inclusiveness	Drinking Water Coverage in service area*	Benchmarking	%
	Sanitation Service Coverage in service area*	Benchmarking	%
Water Supply	Continuity of service*	Benchmarking	hours/day
	Continuity (customers with discontinuous supply)	Benchmarking	%
	Quantity of water supply (residential consumption) *	Benchmarking	l/p/d
	Nr of microbiological tests taken per year	Benchmarking	No

Performance Area	Key Performance Indicators ^b	Data Source	Score
	Percentage of non-compliant tests*	Benchmarking	%
Wastewater	Availability of on-site sanitation services	Utility	descriptive
	Wastewater and Faecal Sludge Quality passing primary and secondary level of treatment		%
Responsiveness to customers	Is there a customer charter and has the charter been made known?	Benchmarking	Descriptive
	Nr. of complaints /1,000 connections	Benchmarking	Number
Utility Performance			
Technical	Non-Revenue Water *	Benchmarking	%
	Energy Efficiency (Energy costs as % of operational costs)	Benchmarking/ Utility	%
Financial	EBITDA Margin (% of Revenues)	Benchmarking	%
	Operating Cost Recovery Ratio*	Benchmarking	%
HRM	Staff per 1,000 connections*	Benchmarking	Number FTE
Organization & Strategy	Aggregate Performance Ratio (AGPAR)	Benchmarking	AGPAR score
Commercial	Metering Ratio*	Benchmarking	%
	Collection Ratio*	Benchmarking	%
Maturity of Utility Systems			
Technical Systems	% Water production capacity used *	Utility	%
	% Sewerage capacity used *	Utility	%
	Power Supply Reliability *	Utility	descriptive
	Monitoring of pressure and quantities in networks *	Utility	descriptive
Financial Systems	Borrowing Capacity: debt to equity ratio *	Benchmarking System, Utility	%
	Timely and accurate financial reporting available and accessible for public *	Utility/Govt	descriptive
Organization	Training policy and implementation: number of employees undergoing training disaggregated per category and gender	Utility	descriptive
	Gender equality and social inclusivity policies in place* ^c	PWWA Benchmarking Report 2020/Utility	descriptive
	Strategy Document *	Utility	descriptive
	Organization Charts *	Utility	descriptive

Performance Area	Key Performance Indicators ^b	Data Source	Score
Innovation	Use of advanced technology *	Use of electromagnetic flowmeters, smart meters, SCADA and GIS	descriptive
	Use of advanced billing systems *	Payment by bank, automatic transfer, annual meter readings, etc.	descriptive
(Climate) Resilience	Technical resilience *	Construction, spare storage capacity, backup generators, IT backup systems.	descriptive
	Organizational resilience *	Use of emergency plans, data, emergency drills, design standards, etc.	descriptive
Natural Environment			
Topographic conditions	Type of landscape *	Utility/Govt	Accessibility
Water Resources	Availability and type *	Utility	Descriptive
Extreme weather events	Occurrence and severity *		Descriptive
Socioeconomic Conditions and Demography			
Socioeconomic development	Per capita GNI *	ADB/WB	GNI/capita
Affordability of 6m ³ water	% of per capita GNI	Benchmarking	%
Urban population	% Population in urban areas *	UN population data	%
Rural Population	% Population in rural areas *	UN population data	%
Outer Island Population	% Population in outer islands	UN population data	%
Population density	Nr of persons/km ²	UN population data	Number
WSS Policy Environment			
Policy/Strategy	Approved Water Sector Policy in place *	Utility/Govt	Descriptive
Gender issues	Specific Policy for women and underprivileged groups	Govt/Utility	Descriptive
Funding (gap)	Utility access to financial resources *	Utility/Govt	Descriptive
Human Resources	Availability and use of WSS training facilities *	Utility/Govt	Descriptive
Monitoring	Monitoring System in place and producing regular and reliable reporting *	Utility/Govt	Descriptive

Performance Area	Key Performance Indicators ^b	Data Source	Score
Institutional and Regulatory Environment			
Service area of the Utility	% of total population within Utility mandate*	Utility/Govt	%
	% of urban population within Utility mandate*	Utility/Govt	%
	% of rural population within utility mandate*	Utility/Govt	%
Sector Regulation (including quality standards)	Existence, responsiveness, and predictability of regulatory system	Utility/Govt/Regulator	descriptive
Tariff Setting	Reliability, transparency, and effectiveness of tariff setting system *	Utility/Govt/Regulator	descriptive
Institutional Framework	Clarity of responsibilities and level of overlap	Utility/Govt	descriptive
Level of Utility Autonomy	Formal and actual level of autonomy of utility management	Utility/Govt	descriptive

Notes:

^a The table in Appendix 2 presents the key indicators that have been identified to assess the status of the various performance areas. During the study, data have been collected on a number of these indicators to assess progress on SDG-6 in the various countries. However, it has not been possible to find data for all indicators. The results of the assessments are presented in the spider diagrams in Figure 3.5. The indicators for which no data were available have not been used in the spider diagrams.

^b Those indicators marked with an (*) have been used in developing the spider diagrams in chapter 3 of this report. Indicators with a source “benchmarking” are defined according to the World Bank operated IBNET Benchmarking System (www.ib-net.org). Indicators with a source JMP are defined in accordance with the WHO/UNICEF Joint Monitoring Program (<https://washdata.org>). Other indicators are defined in Appendix 2 below.

^c The types of policies in place for flexible work arrangements; maternity/paternity leave, medical leave, family leave, part-time employment, flexible core hours, rules and/or regulations to prevent sexual harassment, gender targets for share of female employees, separate toilets for men/women/gender neutral/unisex at all sites, menstrual hygiene management facilities, childcare facilities, lactation rooms, etc.

Source: Authors.

Appendix 2: Ranking Table of Key Performance Indicators for Spider Graph^a

Remarks	Scores				
	Strong-5	4	3	2	1 – Weak
Overall WSS Sector Performance					
Country wide access to safe water (safely managed and basic service level)	100–95%	95%–85%	85%–75%	75%–50%	50%–0%
Country wide access to safe Sanitation (safely managed and basic service level)	100–95%	95%–85%	85%–75%	75%–50%	50%–0%
Utility Service Levels					
Water Coverage Service Area	100–95%	95%–85%	85%–75%	75%–50%	50%–0%
Sewerage Coverage Service Area	100–95%	95%–85%	85%–75%	75%–50%	50%–0%
Continuity of service	24 hours	23 hours	22 hours	21 hours	≤20 hours
Drinking Water Quality	100%	95%–100%	90%–95%	85%–90%	≤80%
Drinking Water consumption	175–150lcd	125–150 lcd	100–125 lcd	75–100 lcd	<75 lcd
Utility Performance					
Non-Revenue Water	<25%	25%–35%	35%–45%	45%–55%	>55%
Staff Ratio	<5	5–7	7–9	9–11	>11
Operational Cost Ratio	>150%	125%–150%	100%–125%	75%–100%	<75%
Metering Ratio	100–95%	95%–85%	85%–75%	75%–50%	50%–0%
Collection Ratio	100–95%	95%–85%	85%–75%	75%–50%	50%–0%
Maturity of Utility Systems					
Technical Systems	Ample excess capacity in water/sewage capacity available, reliable power and adequate monitoring in place	Some excess capacity in water and sewerage systems, reliable power most of the time and most of system monitored.	Water/sewage systems operate at full capacity, regular power outages and about 75% of system is monitored.	Water/sewage systems lack capacity during peak hours, regular power outages and about 50% of system is monitored.	Water/sewage systems lack capacity to meet demand, power outages do occur often and about 50% of system is monitored.

Remarks	Scores				
	Strong-5	4	3	2	1 – Weak
Financial Systems	Regular and timely Annual Reports with the audited financial statements are prepared and accessible for the public. Debt to equity ratio < 1	Annual Reports with the audited financial statements are prepared with 1–2 years delay and accessible for the public. Debt to equity ratio 1–1.5	Annual Reports with the audited financial statements are prepared with > 2 years delay and not accessible for the public. Debt to equity ratio 1.5–2	Annual Reports with financial statements are prepared but audits are >2 years delayed and not accessible for the public. Debt to equity ratio 2 or more.	Annual Reports are not regularly prepared and not accessible to the public. Debt to equity ratio >2
Organization	Strategy document, organization structure, training policy and gender policy all available, implemented and monitored.	Strategy, organization structure, training policy and gender policy available, but only partly implemented and monitored.	Strategy, organization structure, training policy and gender policy all available, but no clear implementation or monitoring	Strategy, organization structure, training and gender policy only partly available, without clear implementation or monitoring	Strategy, organization structure, training and gender policy are mostly lacking.
Innovation	SCADA system fully implemented throughout WSS systems; Smart meters installed for all customers, various payment methods in place	SCADA only partly implemented; smart meters partly installed, various payment methods in place	SCADA installed but not yet operational; Smart meters being piloted, some payment methods in place	Plans for SCADA and smart meters but not yet implemented, limited payment methods in place	SCADA not implemented; no smart meters installed, only cash payment methods in place
Resilience	Utility infrastructure is resilient against extreme events. Resilience plan in place and being implemented.	Utility infrastructure is being made resilient against extreme events. Resilience plan in place but not implemented.	Utility infrastructure is only partly resilient against extreme events. Resilience plan in place but not implemented.	Utility infrastructure is not resilient against extreme events. Resilience plan in place but not implemented.	Utility infrastructure is not resilient against extreme events. No resilience plan in place.
Natural Environment					
Topography	Easy access to towns and villages	Ease of access to towns and villages is moderate	100 to 200 islands. Ease of access to towns and villages is moderate to difficult	200 to 1,000 islands. Access to towns and villages is difficult	Above 1,000 islands. Access to towns and villages is very difficult
Water Resources	good water resources available for all of the	good water resources available for ALL of the	good water resources available for SOME of the	good water resources available for SOME of the	poor water resources available for most of the country.

Remarks	Scores				
	Strong-5	4	3	2	1 – Weak
	country with excess to meet demand	country but does not meet the demand	country and these areas exceeds the demand	country but does not meet the demand	
Exposure to extreme weather events	Extreme weather events do not normally occur	Extreme weather events only in rare cases, less than once every 10 years	Extreme weather events do occasionally occur: less than once every 5 years	Extreme weather events occur regularly, once every 1–5 years.	Extreme weather events occur often, at least once every year
Socio Economic Conditions and Demography					
Average Gross National Income (GNI) per capita	>\$10,000	\$10,000–\$5,000	\$5,000–\$2,000	USD 2,000– USD 1,000	< USD 1,000
Urban Population	> 80%	60%–80%	40%–60%	20–40%	< 20%
WSS Policy Environment					
Water and Sanitation Policy	Clear WaSH policy in place, implemented and monitored	WaSH policy in place but only partly implemented and monitored due to lack of resources	WaSH Policy in place but not implemented nor monitored	Only parts of a WaSH Policy in place and only partial implementation and monitoring	No WaSH Policy in place
Access to Finance	Policies allow utility to independently generate sufficient revenues and/or borrow sufficient funds for investments	Policies allows utility to generate revenues for most investments and government assists with remaining funding and/or provides access to third party funding	Policies restrict utility in generating sufficient revenues, but government assists with sufficient funding and/or provides access to third party funding	Policies restrict utility in generating sufficient revenues and only partial support for funding from government and development partners	Policies restrict utility in generating sufficient revenues and there is limited support from government and development partners
Access to Training	Wide access to national and regional training programs for training of staff	Wide access to national training programs, moderate access to regional training programs	moderate access to national and regional training programs	moderate access to national training programs and limited access to regional programs	limited access to national and regional training programs
Institutional and Regulatory Environment					
Service Area	Utility has mandate for 85%–100% of the population	Utility has mandate for 70%–85% of the population	Utility has mandate for 55%–70% of the population	Utility has mandate for 40%–55% of the population	Utility has mandate for > 40% of the population

Remarks	Scores				
	Strong-5	4	3	2	1 – Weak
Tariff System	Tariff system well regulated, transparent, and implemented with good balance between financial sustainability for the utility and affordability for the public.	Tariff system well regulated, but only partly implemented, but with reasonable outcomes for financial sustainability for the utility and affordability for the public.	Tariff system well regulated, but not implemented with political interference and poor outcomes for either financial sustainability or affordability.	Tariff system not well regulated and implemented without balance between financial sustainability for the utility and affordability for the public.	No regulated tariff system and poor outcomes for either financial sustainability or affordability.

Note:

^a In developing the spider diagrams, use has been made of the list of Indicators presented in Appendix 2. However, as it has not been possible to find sufficient data, not all indicators listed in Appendix 2 have been used in developing the spider diagrams and only those indicators for which data for all countries and utilities were available, have been used.

Source: Authors.

SCADA System = Supervisory Control and Data Acquisition System



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