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This initiative is supported by **PacWastePlus**-a 72 month project funded by the European Union (EU) and implemented by the Secretariat of the Pacific Regional Environment Programme (SPREP) to sustainably and cost effectively improve regional management of waste and pollution.

# Tonga National Waste Audit Analysis Report

August 2023



This Waste data collation, analysis and reporting for the Tonga National Waste Audit Analysis Report was guided by the overarching Regional Waste Data Collection, Monitoring, and Reporting (DCMR) Framework for the Pacific Island Countries and Territories (PICT).

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Our vision: A resilient Pacific environment sustaining our livelihoods and natural heritage in harmony with our cultures.

# PacWaste Plus Programme

The Pacific – European Union (EU) Waste Management Programme, PacWaste Plus, is a 72-month programme funded by the EU and implemented by the Secretariat of the Pacific Regional Environment Programme (SPREP) to improve regional management of waste and pollution sustainably and cost-effectively.

## About PacWaste Plus

The impact of waste and pollution is taking its toll on the health of communities, degrading natural ecosystems, threatening food security, impeding resilience to climate change, and adversely impacting social and economic development of countries in the region.

The PacWaste Plus programme is generating improved economic, social, health, and environmental benefits by enhancing existing activities and building capacity and sustainability into waste management practices for all participating countries.

Countries participating in the PacWaste Plus programme are: *Cook Islands, Democratic Republic of Timor-Leste, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu.*

## Key Objectives

### Outcomes & Key Result Areas

The overall objective of PacWastePlus is *“to generate improved economic, social, health and environmental benefits arising from stronger regional economic integration and the sustainable management of natural resources and the environment”*.

The specific objective is *“to ensure the safe and sustainable management of waste with due regard for the conservation of biodiversity, health and wellbeing of Pacific Island communities and climate change mitigation and adaptation requirements”*.

### Key Result Areas

- **Improved** data collection, information sharing, and education awareness
- **Policy & Regulation** - Policies and regulatory frameworks developed and implemented.
- **Best Practices** - Enhanced private sector engagement and infrastructure development implemented
- **Human Capacity** - Enhanced human capacity

Learn more about the PacWaste Plus programme by visiting



[www.pacwasteplus.org](http://www.pacwasteplus.org)

# Table of Contents

Map of Tonga .....	5
Glossary .....	6
Executive Summary .....	7
1 Introduction .....	9
1.1 Background .....	9
1.2 Purpose and aim .....	9
1.3 Scope .....	9
1.4 Country overview .....	10
2 Methodology .....	11
2.1 Data sources .....	11
2.2 Data analysis .....	12
2.3 Key performance indicators .....	13
3 Audit analysis results .....	14
3.1 Summary of data availability .....	14
3.2 KPI reporting results .....	15



# Map of Tonga



## Tonga

NIUA GROUP  
 GROUPE NIUA  
 Niuu Foafoa • Niuu Toputapu

VAVAU GROUP  
 GROUPE VAVAU  
 Late • Kapinga • Maninika • Vavau

HAAPAI GROUP  
 GROUPE HAAPAI  
 Kao • Haano • Tofua • Uliha • Lolonei • Nomuka • Fonuafoou • Hunga Tonga • Tongatapu Group  
 GROUPE NOMUKA  
 GROUPE TONGATAPU  
 Tongatapu • Eua

• Ata

0 Kilometres 300



Source: Communauté du Pacifique (CPS)

## Glossary

Acronym	Definition
<b>C&amp;D</b>	Construction and Demolition (Waste)
<b>C&amp;I</b>	Commercial and Industrial (Waste)
<b>DCMR</b>	Data Strategy & Collection, Monitoring, and Reporting (Framework)
<b>GRC</b>	Gio Recycling Company
<b>KPI</b>	Key Performance Indicator
<b>MEA</b>	Multilateral Environmental Agreement
<b>MSW</b>	Municipal Solid Waste (i.e., waste originating from the general public that is typically managed by local government entities, excludes commercial / business waste)
<b>NGO</b>	Non-Governmental Organisation
<b>PICT</b>	Pacific Island Countries & Territories
<b>SPREP</b>	Secretariat of The Pacific Regional Environment Programme
<b>SRM</b>	Sustainable Resource Recovery Company
<b>WAL</b>	Waste Authority Limited

Terminology	Definition
<b>Capacity</b>	The total maximum waste storage and processing that can take place at a facility (as capped by license conditions).
<b>Capture rate</b>	The proportion of total waste generated that is successfully captured and disposed or recovered in an environmentally responsible manner (e.g., by a formal collection service or self-hauled to a licensed facility)
<b>Coverage</b>	The proportion of total households that have access to a regular waste collection service.
<b>Modern</b>	A 'modern' facility employs 'sound waste management practices' (as defined by the UNEP) and results in minimal adverse impacts on the environment. A 'modern' facility must be licensed, staffed, have access to equipment and machinery such as a bulldozer, employ a leachate management system and implement a daily cover routine at a landfill, and must not be exceeding their maximum storage capacity.
<b>Per capita</b>	Units measured on a per person basis (i.e., to allow for extrapolation over a national population).
<b>Recovery</b>	Any activity that diverts waste material from landfill, including processing of dry recyclables (such as paper, cardboard, metal and plastics such as PET and HDPE), organics recovery, and energy recovery.
<b>Unregulated</b>	Typically, unlicensed waste facilities which do not follow international frameworks, rules, and guidelines to protect the health of the environment and community.
<b>Waste facility</b>	'Waste facilities' involved in the handling, disposal, or recovery of waste streams above a minimum processing threshold determined on country basis (i.e., tonnes of waste received per year). Can include landfills or dumpsites (that primarily rely on burying waste in a controlled manner), recycling facilities for dry recyclables, organics recovery facilities, and waste-to-energy facilities. Incinerators are not included in this analysis.

# Executive Summary

Waste data collation, analysis and reporting for the Tonga National Waste Audit Analysis Report was guided by the overarching Regional Waste Data Collection, Monitoring, and Reporting (DCMR) Framework for the Pacific Island Countries and Territories (PICT). The implementation of the DCMR Framework ensures that waste data is collected, analysed, and reported consistently and reliably across the Pacific.

Table (a) Summary of Key Performance Indicators (KPIs) for Tonga

Core KPIs	Result	Supplementary KPIs	Result
1. Count / capacity of modern waste facilities	2 / Capacity unknown	1. Cost of disposal to landfill (\$/tonne)	AU \$20.91 (US \$13.94)
2. Count / Capacity of unregulated waste facilities	2 / Capacity unknown	2. Weight of waste disposed (tpa)	18,553
3. National recovery rate (%)	8.57%	3. Weight of waste recovered (tpa)	1,590
4. Per capita waste generation rate (kg/capita/year)	90.5	4. Volume and type of stockpiled hazardous waste (m <sup>3</sup> )	See <b>Section 3.2</b>
5. Municipal Solid Waste (MSW) composition (%)	Figure (a)	5. Marine plastic pollution potential (tpa)	96.7
6. Household waste capture rate (%)	90.29%	6. Awareness and support of waste management services (%)	No data
7. Household collection service coverage (%)	93.20%	7. Proportion of strategic waste management initiatives implemented (%)	81.82%
8. Fulfillment of MEA reporting requirements (%)	44.44%	8. Commercial waste capture rate (%)	See <b>Section 3.2</b>
		9. Commercial collection service coverage (%)	80.00%
		10. Total weight of disaster waste disposed (tpa)	No data

Note: 'No data' indicates that the audit did not capture the parameters/measurements necessary to calculate the KPI.

### Legend

Sufficient data	Limited data	No data
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## Tonga MSW Composition

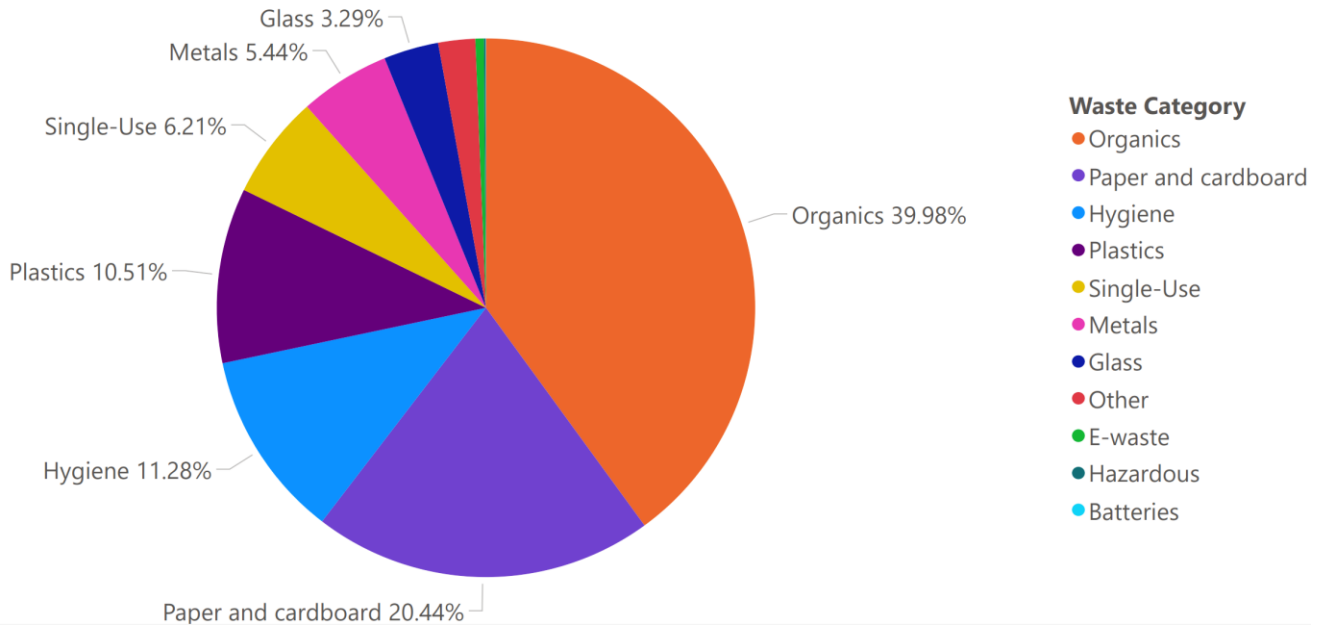


Figure (a) Tonga Municipal Solid Waste (MSW) Composition (% by weight)





# Introduction

## 1.1 Background

Tonga is one of fifteen Pacific Island Nations which took part in the PacWaste Plus Programme implemented through SPREP and funded by the European Union Delegation of the Pacific. The PacWaste Plus Programme aims to improve waste management activities across the islands and strengthen the capacity of Governments, industries, and communities to manage waste to protect human health and the environment. Tonga's waste management practices are reliable and diversified. There is a range of collection services and disposal measures in place for different types of waste (e.g., commercial waste, household waste, hazardous waste). Organic waste is often composted by households and or mulched for reuse by the community. In Tonga, recycling efforts are primarily driven by the private sector. Recycling companies collect materials such as used lead-acid batteries (ULABs) and scrap metal, which have maintained their market value in recent years.

Tonga had several projects in the pipeline (at the time the audit report) to enhance waste management and recycling in the country, including:

- Introduction of an Advance Recycling and Disposal Fee, supported by the Pacific Waste and Pollution Prevention (PWP) program.
- Provision of waste bins to all households in Tonga and expansion of collection services to the rest of Tonga.
- Upgrading of the Ha'apai and 'Eua Waste Disposal Sites under the Global Environment Facility Islands funding.
- Establishment of a composting facility at Tapuhia Waste Landfill for efficient management of green waste.

However, although adequately managed, landfills on each of the three islands lack appropriate equipment and are reaching capacity. In addition, plastics pose a major problem to waste management and are generally not separated, stockpiled, or recycled. Investment in infrastructure, implementation of data-guided decision making, and increased general waste management education will improve the current situation.

## 1.2 Purpose and Aim

The purpose of this audit analysis and report is to establish a baseline position for Tonga's waste data and waste management systems.

The aim of this report is to:

- Validate pre-existing national waste audit data; and
- Build national waste insights based on new key performance indicators (KPIs) to understand waste management trends.

The results of this report, and the other fourteen SPREP country audit analysis reports, will be collated together to inform a broader Pacific Regional Data and Audit Analysis Report.

## 1.3 Scope

The scope of this waste audit analysis report is limited to the following waste data collected in Tonga:

- **Waste audit report 2021:** The audit was undertaken between March and April 2021 and provided an evaluation of household and business waste generated in Tonga. Audit data and information was obtained via interviews and collections from 207 households and 49 businesses. The audit report also provided an assessment of the state of Tonga's landfills including landfill audits and stockpile assessments.

This national report examines the MSW, commercial and industrial (C&I), and landfill waste streams. Landfills may receive a broad array of waste types including construction and demolition (C&D) waste, hazardous waste and disaster waste, in addition to MSW and C&I waste. As such, landfill waste is considered a separate waste stream.

The potential for marine plastic pollution is considered for macroscopic plastic waste (i.e., plastics that can be identified through compositional audits) originating from household sources. Accurate data on the amount and management of macroscopic plastic waste in the region is limited.

## 1.4 Country Overview

Tonga, officially known as the Kingdom of Tonga, is located in the South Pacific Ocean. It consists of 171 islands, of which 40 are permanently inhabited, and is divided into five administrative island divisions: Tongatapu, Ha'apai, Vava'u, 'Eua, and Ongo Niua. The capital city of Tonga is Nuku'alofa, located on the island of Tongatapu. Tonga has a population of approximately 100,000 and a total land area of 749 square kilometres.

Tonga does not have a comprehensive and integrated waste management strategy to guide overall resource recovery and waste management challenges. Instead, waste management falls under the umbrella of general environmental legislation, regulation and strategy. The Government developed *Waste Management Act Cap 14.06 (as at 2020)*, including *Waste Management (Plastic Levy) Regulations Cap 14.06.01*, which provides for the development of the waste management sector, with wide-ranging powers and responsibilities for the Waste Authority Limited (WAL).

The responsibility for managing solid waste is divided among various institutions in Tonga, which include:

- National government: The national government is responsible for creating national legislation, strategies, and policy frameworks for waste management, as well as fulfilling obligations under international conventions, primarily through the Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications.
- Local councils: Led by district and town officers to coordinate meetings and promote government developments and activities, including waste management.

Government public enterprises and other waste collection contractors and private recyclers also play a role in the waste management and resource recovery sector.



## 2 Methodology

Waste data collation, analysis and reporting were guided by the overarching Regional Waste Data Collection, Monitoring, and Reporting (DCMR) Framework for the Pacific Island Countries and Territories (PICT). The implementation of the DCMR Framework ensures that waste data is collected, analysed, and reported consistently and reliably across the Pacific.

### 2.1 Data Sources

Data collated and examined in this audit analysis report was sourced from the data sources listed in **Table 1**.

Table 1 Data sources examined and available data

Data Source	Methods for data collation	Reported data
<b>Waste audit 2021</b>	<ul style="list-style-type: none"> <li>• Sample collection from households and businesses</li> <li>• Sort and weigh household/business waste</li> <li>• Household and business interviews</li> <li>• Landfill audit</li> <li>• Stockpile assessment</li> </ul>	<ul style="list-style-type: none"> <li>• Access to general waste collection service</li> <li>• Household and business waste composition</li> <li>• Recyclable collection and composition</li> <li>• Stockpile types and quantities</li> <li>• Landfilled waste composition and weight</li> <li>• Landfill life</li> </ul>
<b>2021 Tonga National census</b>	<ul style="list-style-type: none"> <li>• National census</li> </ul>	<ul style="list-style-type: none"> <li>• Population data</li> <li>• Household data (size, number)</li> </ul>

#### 2.1.1 Tonga Waste Audit 2021

The audit was undertaken between March and April 2021 and utilised the Waste Audit Methodology produced by the Pacific Region Infrastructure Facility (PRIF).

The audit took over around one month to complete and consisted of landfill and material stockpile audits. Data was collected from households in urban and rural areas as well as commercial premises. A total of 206 household samples and 49 commercial samples were gathered, out of which 206 had matching household interviews. 107 samples were taken from Tongatapu, 51 from Vava'u and 48 from Ha'apai.

The waste composition, recycling potential, hazardous waste status and potential for future treatment options were audited for Tapuhia Landfill (Tongatapu) over 14 days and for Kalaka Landfill (Vava'u) over 7 days.

Table 2 Sample locations for audits

Sample Location	Population (2021)	Classification
<b>Tongatapu</b>	74,320	Urban
<b>Vava'u</b>	14,182	Rural

## 2.2 Data Analysis

Each country's audit reports, audit data, and other relevant data sources were inspected for relevant information which was subsequently collated into country-specific databases. These databases were then used to calculate the DCMR Framework KPIs. KPI reporting followed the calculation methodologies as detailed in the DCMR Framework.

The main assumptions made during the analysis are discussed below.

When it was necessary to modify calculation methodologies or assumptions (e.g., in cases of missing data or when certain parameters had to be calculated using assumptions derived from external data sources like census data), details of the changes are provided under their corresponding KPI in **Section 3.2**.

### 2.2.1 Main Assumptions

- The data from 'urban' areas (in Tongatapu) and 'rural' areas (in Vava'u) sampled during the audits (see Table 2) is assumed to be representative of the rest of the country.
- All population estimates used to calculate performance indicators are based on national census data from 2021.
- All waste plastics which are not managed in an environmentally sound manner are assumed to have the potential risk of polluting oceans and estuarine waterways.
- Commercial waste service coverage reporting has relied primarily on survey information conducted during audits of commercial business waste.



## 2.3 Key Performance Indicators

The DCMR Framework introduces a series of KPIs (see **Table 3**). The KPIs were developed to guide data analysis to improve the efficiency of data collection activities by building on pre-existing data collection practices across the region.

Each of the KPIs were designed to be reported to using corresponding data collection methodologies. These comprise of:

- a waste facility register
- household waste audits and community surveys
- business waste audits and surveys
- a policy survey
- landfill and stockpile audits

**Table 3** Key Performance Indicators (KPIs) from the DCMR Framework

Core KPIs	Supplementary KPIs
1. Count / capacity of modern waste facilities	1. Cost of disposal to landfill
2. Count / capacity of unregulated waste facilities	2. Weight of waste disposed
3. National recovery rate	3. Weight of waste recovered
4. Per capita waste generation rate	4. Volume and type of stockpiled hazardous waste
5. Municipal Solid Waste (MSW) composition	5. Marine plastic pollution potential
6. Household waste capture rate	6. Awareness and support of waste management services
7. Household collection service coverage	7. Proportion of strategic waste management initiatives implemented
8. Fulfillment of Multilateral Environmental Agreement (MEA) reporting requirements	8. Commercial waste capture rate
	9. Commercial collection service coverage
	10. Total weight of disaster waste disposed

### 3 Audit Analysis Results

#### 3.1 Summary of Data Availability

The waste audits provided varying levels of data and information to calculate performance via the indicators introduced in the DCMR Framework. The extent to which there was adequate data and information to calculate the KPIs is represented below in **Table 4**.

Table 4 Summary of data availability for reporting against DCMR Framework KPIs

Core KPIs	Supplementary KPIs
1. Count / capacity of modern waste facilities	1. Cost of disposal to landfill
2. Count / capacity of unregulated waste facilities	2. Weight of waste disposed
3. National recovery rate	3. Weight of waste recovered
4. Per capita waste generation rate	4. Volume and type of stockpiled hazardous waste
5. Municipal Solid Waste (MSW) composition	5. Marine plastic pollution potential
6. Household waste capture rate	6. Awareness and support of waste management services
7. Household collection service coverage	7. Proportion of strategic waste management initiatives implemented
8. Fulfillment of MEA reporting requirements	8. Commercial waste capture rate
	9. Commercial collection service coverage
	10. Total weight of disaster waste disposed

Legend		
Sufficient data	Limited data	No data

**Note:** ‘No data’ indicates that the audit did not capture the parameters/measurements necessary to calculate the KPI.

In summary:

- The audit reports provided adequate information for Core KPIs 3 to 8, and Supplementary KPIs 1 to 3, 5, and 7.
- There was limited data available to calculate Core KPIs 1 and 2, and Supplementary KPIs 4, 8 and 9.
  - Storage and processing capacities for waste facilities were not identified in the audit report.
  - There were some measurements of stockpile volumes for some hazardous waste categories, but not all.
  - There was some information pertaining to the collection service coverage for commercials presented in the audit report, however it is difficult to confidently extrapolate the results of the indicator to the national level due to data insufficiency.
- No data were available to inform Supplementary KPI 6 and 10.

In the future, improved data capture and data quality will benefit performance assessment by reducing the extent to which assumptions and substitutions are necessary. In turn, the KPIs will reflect a more accurate depiction of the status of waste management in Tonga.

## 3.2 KPI Reporting Results

The following sections present the results of the collated and analysed waste audit data for each of the eight core and ten supplementary KPIs introduced in the DCMR Framework. The results of the analysis will serve as a baseline position for Tonga to compare future data to guide subsequent waste management or waste data-related activities.



### Core KPI 1: Count / capacity of modern waste facilities

<b>Result</b>	<p><b>Count of modern waste facilities: 2</b></p> <ul style="list-style-type: none"> <li>• Waste management in Tonga primarily comprises of disposal to landfill on islands with waste management services. There is one officially designated disposal site on each of the islands of Tongatapu, Vava’u, Ha,apai, and ‘Eua.</li> <li>• The Tapuhia landfill on Tongatapu, and the Kalaka landfill on Vava’u can be classified as ‘modern’ facilities under the definition set in the DCMR Framework. <ul style="list-style-type: none"> <li>– Sites are staffed, have dedicated equipment, leachate management in place and practice an incremental cover system.</li> <li>– Tapuhia landfill has an estimated lifespan of 30 years remaining, and daily soil cover is implemented on site.</li> <li>– Kalaka landfill implements soil cover when needed, but as of the time of the audit report, had reached capacity.</li> </ul> </li> </ul> <p><b>Capacity of modern waste facilities (tonnes per annum): No data</b></p> <ul style="list-style-type: none"> <li>– Tapuhia landfill is 50% full</li> <li>– Kalaka landfill is already full</li> </ul>
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Data gaps</b>	<ul style="list-style-type: none"> <li>• No estimates or parameters were used to calculate the maximum annual processing capacity (tpa) of Tapuhia and Kalaka disposal sites.</li> </ul>
<b>Key considerations</b>	<ul style="list-style-type: none"> <li>• Two waste facilities in Tonga are classified as ‘modern’ facilities. However, disposal sites on other islands do not classify as ‘modern’.</li> <li>• The number, location, name and operations of all landfills and dumpsites should be collated for future reporting purposes.</li> </ul>



## Core KPI 2: Count / capacity of unregulated waste facilities

<b>Result</b>	<p><b>Count of unregulated waste facilities: 2</b></p> <ul style="list-style-type: none"> <li>• The Faleloa disposal site in Ha’apai, and the Angaha disposal site on ‘Eua island, cannot be classified as ‘modern’ waste facilities due to:             <ul style="list-style-type: none"> <li>– No leachate management: and</li> <li>– No cover systems.</li> </ul> </li> <li>• Both sites are open disposal sites, and while recognised as the designated waste facilities for their respective islands, pose a risk to the community and environmental health due to the potential for pollution impacts.</li> <li>• The report also mentions that sewerage and sludge are disposed of via open ditches on Vava’u, Ha’apai, and ‘Eua.</li> </ul> <p><b>Capacity of unregulated waste facilities (tonnes per annum): No data</b></p> <ul style="list-style-type: none"> <li>• Ha’apai landfill is estimated to reach capacity around 2023.</li> </ul>
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Data gaps</b>	<ul style="list-style-type: none"> <li>• No estimates or parameters were used to calculate the maximum annual processing capacity (tpa) for the unregulated facilities.</li> </ul>
<b>Key considerations</b>	<ul style="list-style-type: none"> <li>• Two of four officially designated landfills or dumpsites in Tonga are not up to ‘modern’ standards and as such are classified as ‘unregulated’.</li> <li>• The lack of leachate management at these facilities means that both the environment and community are at risk of hazards due to contamination and material flow.</li> <li>• No daily cover usage at the dumpsites means that these sites are very susceptible to material flow during climate-related weather events such as cyclones.</li> <li>• Investment to upgrade existing landfills in Tonga to meet ‘modern’ standards/best practices will lead to better outcomes for the local environment and community health.</li> </ul>





### Core KPI 3: National recovery rate

<b>Results</b>	<p><b>National recovery rate (%): 8.57%</b></p> <ul style="list-style-type: none"> <li>Recycling in Tonga is performed by the private sector, through two companies that operate in Tongatapu, Vava'u and Ha'apai. At the time of the audit, these companies were Gio Recycling Company (GRC) and the Sustainable Resource Recovery Company (SRM).</li> <li>Recycled materials include: <ul style="list-style-type: none"> <li>Metals (aluminium, iron, steel, copper, brass, and lead);</li> <li>E-waste, batteries, car batteries, and vehicular parts such as engines, alternators, chassis, and radiators;</li> <li>PVC; and,</li> <li>Some white goods, power tools, generators, catalytic converters and transformers.</li> </ul> </li> <li>This waste is collected and exported to other countries.</li> </ul>
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>Estimates obtained through interviews were provided in the 2021 waste audit report for annual tonnages of recycled materials collected and exported by GRC and SRM. The combined tonnages of waste collected were used to calculate the total weight of waste diverted from the landfill, which was then subtracted from the total amount of waste received at the landfill.</li> <li>Assumes an annual 18,553 tonnes of waste disposed in Tonga, and 1,590 tonnes of waste recovered.</li> </ul>
<b>Data gaps</b>	<ul style="list-style-type: none"> <li>The estimates obtained on recyclable material per year may not accurately reflect the actual quantity of waste materials recovered. Maintaining records of the weight of recyclables collected and exported will provide more accuracy when reporting to this KPI in the future.</li> </ul>
<b>Key considerations</b>	<ul style="list-style-type: none"> <li>Tonga is one of the few PICTs with access to dedicated waste recovery infrastructure via the private sector. At the time of the audit, there was no official recycling service/system. Kerbside recycling collections have now since become available.</li> <li>Comparison of landfill audit data and the recycler interview estimates suggests that virtually all used-lead acid batteries, lead, brass, copper, and ferrous metals disposed of are recovered by the private recycling operations.</li> </ul>



### Core KPI 4: Per capita waste generation rate

<b>Results</b>	<p><b>Per capita waste generation rate (kg/capita/year): 90.5</b></p> <ul style="list-style-type: none"> <li>kg/capita/day: 0.248</li> <li>kg/household/day: 1.23</li> </ul>
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>Household waste audit data was converted from a per household basis to a per capita basis, then grouped and averaged based on geographic position (i.e. rural, semi-urban or urban), and extrapolated using census data of the national population.</li> <li>Where provinces had no data available (i.e. 'Eua and Ongo Niua), an assumed 'rural average waste generation rate was used based on data from household audits performed in Vava'u and Ha'apai.</li> <li>Population data used in the calculation was sourced from the 2015 national census.</li> </ul>
<b>Data gaps</b>	<ul style="list-style-type: none"> <li>No household audit information was recorded on the islands of 'Eua and Ongo Niua.</li> <li>Not all towns and villages represented in audits have corresponding data represented in the 2021 census.</li> </ul>
<b>Key considerations</b>	<ul style="list-style-type: none"> <li>Future per capita waste generation rates will provide insight into waste management trends and changes for Tonga and allow for comparison within Tonga and across the region.</li> </ul>



Core KPI 5: Municipal Solid Waste (MSW) composition

**Results**

Organics is the most prevalent waste category for household waste in Tonga. This is followed by paper & cardboard, and then plastics, and hygiene waste.

- Organics: 39.98%
- Paper & Cardboard: 20.44%
- Plastics: 11.28%
- Hygiene: 11.28%

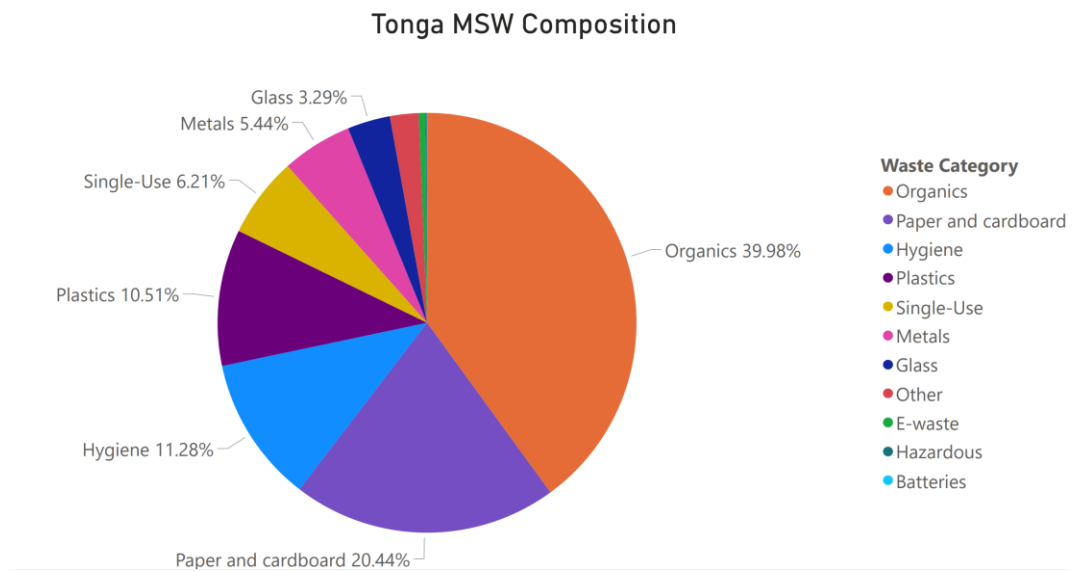


Figure 1 Tonga Municipal Solid Waste (MSW) composition (% by weight)

**Assumptions**

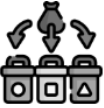
- None

**Data gaps**

- No household waste samples were collected on 'Eua and Ongo Niua.

**Key considerations**

- The prevalence of organics in the household waste stream is likely due to reliance on local subsistence agriculture, as rural communities often have fewer options for food and goods, which can result in a greater reliance on locally grown or produced items.
- Organics recovery systems, such as a local or national composting service could help support local farmers and reduce the amount of organic waste destined for landfill.
- It is recommended that compositional data is updated data on a regular basis. Impacts of the pandemic and climate change or weather events will have changed the proportions of waste types sourced from households.
- Household waste compositions provide an insight into the types of waste contained inside the MSW stream. Knowledge of the waste types and proportion of these wastes present within the household waste stream allows for targeted decision making and prioritisation of problem waste types.



**Core KPI 6: Household waste capture rate**

<b>Results</b>	<p><b>Household waste capture rate (%): 90.54%</b></p> <ul style="list-style-type: none"> <li>– Total weight of household waste generated = 9,476 tpa</li> <li>– Total weight of household waste captured responsibly = 8,556 tpa</li> </ul>
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>• The survey and audits did not capture each household’s disposal method, nor the weight of waste captured by management services, so census data was used and extrapolated across household audit results.</li> </ul> <p style="text-align: center;"><i>Household waste capture rate (%) = <math>\frac{\text{weight of managed waste (tpa)}}{\text{total household waste generated (tpa)}}</math></i></p> <p>Total weight of managed waste is calculated as the product of:</p> <p style="text-align: center;"><i>weight of managed waste (tpa) = <math>\frac{\text{household collection coverage (%)}}{\text{total household waste generated (tpa)}}</math></i></p> <p>Collection service coverage (%) is the product of:</p> <p style="text-align: center;"><i>household collection coverage (%) = <math>\frac{\text{number of households with some form of collection service}}{\text{total number of households}}</math></i></p> <p>Total household waste generated is the summation of waste generation tonnages for all sampling locations. Waste generation rates for individual sampling locations are calculated by:</p> <p style="text-align: center;"><i>total household waste generated (tpa)</i></p> <p style="text-align: center;"><i>= average waste generation rate of location <math>\left(\frac{\text{kg}}{\text{capita}}\right)</math></i></p> <p style="text-align: center;"><i>× location population</i></p>
<b>Data gaps</b>	<ul style="list-style-type: none"> <li>• The audit and conducted survey did not capture: <ul style="list-style-type: none"> <li>– Information to quantify each household’s disposal method; and</li> <li>– The weight of waste captured by management services.</li> </ul> </li> </ul>
<b>Key considerations</b>	<ul style="list-style-type: none"> <li>• The vast majority of the waste generated in Tonga is captured by formal collection services. This includes waste drop-off to collection points by residents.</li> <li>• A high capture rate reflects a high participation in collection programs.</li> </ul>



### Core KPI 7: Household collection service coverage

Results	
	<b>Household collection service coverage (%): 93.2</b>
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>Calculated using information based on 2021 census data, namely the number of households per sampled area.</li> <li>No collection service coverages were identified in the report for Ongo Niua. This was assigned an average collection service coverage based on percentages for Va'vau, 'Eua, and Ha'apai.</li> </ul>
<b>Data gaps</b>	<ul style="list-style-type: none"> <li>The audit did not include a survey including questions on service options and coverage. Therefore, the KPI could not be calculated using the DCMR Framework methodology.</li> </ul>
<b>Key considerations</b>	<ul style="list-style-type: none"> <li>It is estimated that the majority of households have access to collection services.</li> <li>The report noted that new services had commenced in Ha'apai and Va'vau, leading to increased collection service coverage in recent years.</li> </ul>



### Core KPI 8: Fulfillment of Multilateral Environmental Agreement (MEA) reporting requirements

Results																	
	<b>Fulfilment of MEA reporting requirements (%): 44.44%</b>																
	<table border="1"> <thead> <tr> <th>Convention</th> <th>Status</th> <th>Reporting requirements</th> <th>Reports delivered</th> </tr> </thead> <tbody> <tr> <td><b>Basel Convention</b></td> <td>Accession</td> <td>Annual reports (12)</td> <td>1</td> </tr> <tr> <td><b>Minamata Convention</b></td> <td>Accession</td> <td>First national report due in 2019 (1)</td> <td>1</td> </tr> <tr> <td><b>Stockholm Convention</b></td> <td>Ratification</td> <td>5 reporting cycles (4)</td> <td>1</td> </tr> </tbody> </table>	Convention	Status	Reporting requirements	Reports delivered	<b>Basel Convention</b>	Accession	Annual reports (12)	1	<b>Minamata Convention</b>	Accession	First national report due in 2019 (1)	1	<b>Stockholm Convention</b>	Ratification	5 reporting cycles (4)	1
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<b>Stockholm Convention</b>	Ratification	5 reporting cycles (4)	1														
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>None</li> </ul>																
<b>Data gaps</b>	<ul style="list-style-type: none"> <li>Only MEA's with mandatory reporting requirements were included in the calculation of this KPI.</li> <li>For conventions like the Waigani Convention, strict reporting requirements are not enforced and so are not included in the calculation.</li> </ul>																
<b>Key considerations</b>	<ul style="list-style-type: none"> <li>Tonga has satisfied the reporting requirements for the Minamata Convention on Mercury.</li> <li>Tonga is behind on national reports for the Basel and Stockholm Conventions.</li> </ul>																



### Supplementary KPI 1: Cost of disposal to landfill

Supplementary KPI 1: Cost of disposal to landfill	
<b>Results</b>	<b>Cost of disposal to landfill (\$/tonne): AUD \$20.91</b> <ul style="list-style-type: none"><li>The audit report provided expenditures on waste disposal site operation and management from 2019 to 2022.</li></ul>
<b>Assumptions</b>	<ul style="list-style-type: none"><li>Operational costs for 2022 were used to represent the cost of disposal for all facilities in Tonga.<ul style="list-style-type: none"><li>The cost in 2022 was AUD \$445,107.</li><li>This cost was divided by the estimated mass of material disposed of per annum to give a total of 18,553 tonnes per annum (see also Supplementary KPI 2).</li></ul></li></ul>
<b>Data gaps</b>	<ul style="list-style-type: none"><li>No disposal costs for specific facilities were provided, only the total expenditure for site operations and management.</li></ul>
<b>Key considerations</b>	<ul style="list-style-type: none"><li>The cost of disposal to landfill is estimated to be AUD \$20.91.</li><li>Completion of the waste facility register suggested by the DCMR Framework will provide greater accuracy in reporting to this performance indicator in the future supporting governments and private industry in their budgeting for future costs.</li></ul>



### Supplementary KPI 2: Total weight of waste disposed

Supplementary KPI 2: Total weight of waste disposed	
<b>Results</b>	<b>Total weight of waste disposed (tonnes per annum): 18,553</b>
<b>Assumptions</b>	<ul style="list-style-type: none"><li>None</li></ul>
<b>Data gaps</b>	<ul style="list-style-type: none"><li>Estimates for annual tonnages at waste facilities were only identified in the audit report for the audited sites, and no other dumpsites on the outer islands.</li></ul>
<b>Key considerations</b>	<ul style="list-style-type: none"><li>This KPI indicates the effectiveness of a country's waste management system in diverting waste from the environment via landfill. It allows for comparison against past and future results across Tonga and the region.</li></ul>



### Supplementary KPI 3: Total weight of waste recovered

<b>Results</b>	<p><b>Total weight of waste recovered (tonnes per annum): 1,590</b></p> <ul style="list-style-type: none"><li>• Recycling in Tonga is performed by the private sector, via two companies who operate on Tongatapu, Vava'u and Ha'apai. At the time of the audit, these companies were Gio Recycling Company (GRC) and the Sustainable Resource Recovery Company (SRM).</li><li>• Recycled materials include:<ul style="list-style-type: none"><li>– Metals (aluminium, iron, steel, copper, brass, and lead);</li><li>– E-waste, batteries, car batteries, and vehicular parts such as engines, alternators, chassis, and radiators;</li><li>– PVC; and,</li><li>– Some white goods, power tools, generators, catalytic converters and transformers.</li></ul></li><li>• This waste is collected and exported to other countries.</li></ul>
<b>Assumptions</b>	<ul style="list-style-type: none"><li>• The auditors obtained estimates for the annual tonnages of recycled materials collected and exported by GRC and SRM through interviews. The combined tonnages of waste collected were used to calculate the total weight of waste recovered.</li></ul>
<b>Data gaps</b>	<ul style="list-style-type: none"><li>• The collected data may not accurately reflect the actual quantity of waste materials recovered. To obtain a more precise measure, it is recommended that specific records of weight collected and exported are collected and available during audits.</li></ul>
<b>Key considerations</b>	<ul style="list-style-type: none"><li>• Tonga is one of the few PICTs with access to dedicated waste recovery infrastructure, via the private sector. At the time of the audit, there was no official recycling service/system in place. Kerbside recycling collections have since become available.</li></ul>





#### Supplementary KPI 4: Volumes of stockpiled hazardous waste

Results	
<b>Results</b>	<p><b>Volumes of stockpiled hazardous wastes (m<sup>3</sup>):</b></p> <ul style="list-style-type: none"> <li>– Asbestos: 32.5 m<sup>3</sup></li> <li>– E-waste: 0</li> <li>– Healthcare and pharmaceutical waste: No data</li> <li>– Used oil: No data</li> <li>– Used tyres: 4 m<sup>3</sup></li> <li>– Obsolete chemicals: 1 m<sup>3</sup></li> </ul>
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>• The obsolete chemical stockpile comprises of acetylene gas bottles located at a GRC facility.</li> <li>• Asbestos is represented by roofing iron stockpiles.</li> </ul>
<b>Data gaps</b>	<ul style="list-style-type: none"> <li>• This data is taken to be representative of the total volume of material stockpiled, as additional sites are assumed to exist.</li> <li>• No information on healthcare and pharmaceutical waste and used oil stockpiles were observed in the audit report.               <ul style="list-style-type: none"> <li>– While no data was found relating to stockpiles for these materials, there may exist no stockpiles of these hazardous waste types in Tonga, but further information is necessary to confirm this.</li> </ul> </li> </ul>
<b>Key considerations</b>	<ul style="list-style-type: none"> <li>• According to the information available in the audit report, there are stockpiles of asbestos, used tyres, and obsolete chemicals in Tonga.</li> <li>• The volume of other hazardous waste stockpiles in Tonga remains unknown which makes it difficult to assess the potential risk posed to the community and environment.</li> <li>• Landfill audits, stockpile assessments, and the completion of the waste facility register proposed by the DCMR Framework will provide the information required to calculate this performance indicator.</li> </ul>



#### Supplementary KPI 5: Marine plastic pollution potential

Results	
<b>Results</b>	<p><b>Marine plastic pollution potential (tonnes per annum): 96.7</b></p>
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>• Assumes a national weight of mismanaged waste, based on household audit samples.               <ul style="list-style-type: none"> <li>– This calculation uses the total weight of waste generated, subtracted by the weight of waste captured by collection services. The difference is the estimate for mismanaged waste used in this calculation.</li> <li>– Mismanaged waste is defined as all waste which is not captured in collection services, and ends up buried/burned/littered etc.</li> </ul> </li> <li>• Uses a proportion of plastics captured in MSW composition.</li> </ul>
<b>Data gaps</b>	<ul style="list-style-type: none"> <li>• Requires a more reliable metric for mismanaged waste.</li> </ul>
	<ul style="list-style-type: none"> <li>• Waste plastics which are not managed in an environmentally sound manner are assumed to pose a significant risk of polluting oceans and estuarine waterways.</li> </ul>



### Supplementary KPI 6: Awareness of waste management services

<b>Results</b>	<b>Awareness of waste services (%): No data</b>
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Data gaps</b>	<ul style="list-style-type: none"> <li>• Unable to calculate based on audit reports as this performance indicator requires completion of a community survey, specifically gathering responses on:             <ul style="list-style-type: none"> <li>– Number of positive responses indicating awareness;</li> <li>– Number of available services; and,</li> <li>– Number of survey participants.</li> </ul> </li> </ul>
<b>Key considerations</b>	<ul style="list-style-type: none"> <li>• Completion of a community survey in the future is required to report to this KPI. Monitoring the community's awareness provides an indication of the success of education initiatives and the effective use of existing waste management services.</li> </ul>



### Supplementary KPI 7: Proportion of strategic waste management initiatives implemented

<b>Results</b>	<p><b>Proportion of waste management initiatives implemented (%): 81.82%</b></p> <ul style="list-style-type: none"> <li>– Number of successfully implemented waste initiatives = 9 out of 11</li> <li>– Number of planned/pipeline initiatives = 2</li> <li>• Implemented initiatives include:             <ul style="list-style-type: none"> <li>– Tonga National Infrastructure Investment Plan (2013–2023)</li> <li>– Tonga National Strategic Development Framework 2015–2025</li> <li>– Hazardous Wastes and Chemicals Act Cap 47.08 (as at 2016)</li> </ul> </li> <li>• Pipeline initiatives include:             <ul style="list-style-type: none"> <li>– Building Control Act</li> <li>– Local single-use plastics campaigns</li> </ul> </li> </ul>
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Data gaps</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Key considerations</b>	<ul style="list-style-type: none"> <li>• Tonga has specific legislation for waste management. Following a significant reform program in the mid-2000s, Waste Authority Limited (WAL) was established as the central administration point for waste management in the country.</li> <li>• The <i>Waste Management Act</i> and the <i>Environment Management Act</i> are the two most relevant legislations addressing solid waste management, pollution control, and waste minimisation.</li> <li>• Pipeline initiatives include a community awareness campaign advocating for alternatives to single-use plastics.</li> <li>• There is currently no integrated waste management strategy to guide overall resource recovery.</li> </ul>





### Supplementary KPI 8: Commercial waste capture rate

<b>Results</b>	<p><b>Commercial waste capture rate (%): Insufficient data</b></p> <ul style="list-style-type: none"> <li>• Measured as the fraction of the total waste captured through formal waste management services over the total waste generated by businesses.</li> <li>• Without estimates of commercial waste generation rates and the number of businesses, this indicator cannot be calculated.</li> </ul>
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Data gaps</b>	<ul style="list-style-type: none"> <li>• No estimate for the number of businesses in Tonga was provided in the audit report.</li> <li>• No information on the total amount of waste generated by businesses.</li> <li>• No information on the waste generation rates of businesses was provided.</li> </ul>
<b>Key considerations</b>	<ul style="list-style-type: none"> <li>• Accurate calculation relies on an estimate of total numbers of businesses in the country categorised by business type, and an estimate of the commercial waste generation rates for each business type.</li> <li>• Completion of business surveys suggested in the DCMR Framework will provide an indication of how many businesses are using collection services, and other forms of waste management, and to what extent these businesses access the service.</li> </ul>



### Supplementary KPI 9: Commercial collection service coverage

<b>Results</b>	<p><b>Commercial collection service coverage (%): 80.00%</b></p> <ul style="list-style-type: none"> <li>• Tonga has a user-pay collection service for commercial waste on the islands of Tongatapu, Vava'u, Ha'apai, and 'Eua.</li> <li>• Tonga's outer islands do not have official collection services.</li> </ul>
<b>Assumptions</b>	<ul style="list-style-type: none"> <li>• Assumes that the presented service coverage identified in the audit report is adequately representative of their corresponding locations.</li> <li>• The report presents an estimated 70 to 80% collection service coverage for both businesses and households, the median of this range is used as the result of this indicator.</li> </ul>
<b>Data gaps</b>	<ul style="list-style-type: none"> <li>• The estimated 70 to 80% service coverage is provided in the audit report without reference to a specific audit or data source.</li> <li>• The audit report did not quantify access to alternative collection services used by businesses (e.g., waste disposal points or self-haul).</li> <li>• The total number of businesses participating nationally, and specific collection service coverages for businesses, categorised by business type, and if possible, by region/state/province.</li> </ul>
<b>Key considerations</b>	<ul style="list-style-type: none"> <li>• Approximately 80% of businesses in Tonga have access to collection services. <ul style="list-style-type: none"> <li>– The audit report states that collections are available to 70–90% of households and businesses in Tonga. A separate collection service coverage estimate for businesses only was not identified within the audit report.</li> </ul> </li> <li>• Completion of business surveys suggested in the DCMR Framework would provide an indication of how regular, accessible, and affordable collection services are for businesses.</li> </ul>



## Supplementary KPI 10: Weight of disaster waste disposed

<b>Results</b>	<b>Weight of disaster waste disposed (tpa): No data</b> <ul style="list-style-type: none"><li>• Measured as a sum of the recorded weight of disaster waste disposed to a landfill or received and stockpiled at the waste facility following a disaster event.</li><li>• No disaster waste data was recorded during the examined audits.</li></ul>
<b>Assumptions</b>	<ul style="list-style-type: none"><li>• Only captures disaster waste which ends up disposed of or stored at waste facilities, including landfills, disposal sites and recovery facilities.</li><li>• Assumes that the waste facility register has been completed to capture disaster waste information separately of other waste loads received post-event (i.e., information on disaster waste categorised separately to other waste types/streams).</li></ul>
<b>Data gaps</b>	<ul style="list-style-type: none"><li>• The calculation of this performance indicator relies on estimations of the weight of disaster waste (tonnes) landfilled or received at a waste disposal facility following disaster events.</li></ul>
<b>Key considerations</b>	<ul style="list-style-type: none"><li>• Calculation of this performance indicator provides an estimate of the amount of disaster waste being effectively managed and the total amount of disaster waste generated in a year.</li><li>• Calculating this KPI can be undertaken by regularly updating the waste facility register. Tracking the vehicle capacity and percentage fullness of the load of any 'disaster waste' carrying vehicles entering the facility will help reconcile waste amounts disposed of if these wastes are not managed separately.</li></ul>





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