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Secretariat of the Pacific Regional Environment Programme

PacWastePlus
PACIFIC WASTE MANAGEMENT

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.**

Palau National Waste Audit Analysis Report

August 2023

This Waste data collation, analysis and reporting for the Palau 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

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PacWastePlus PACIFIC WASTE MANAGEMENT

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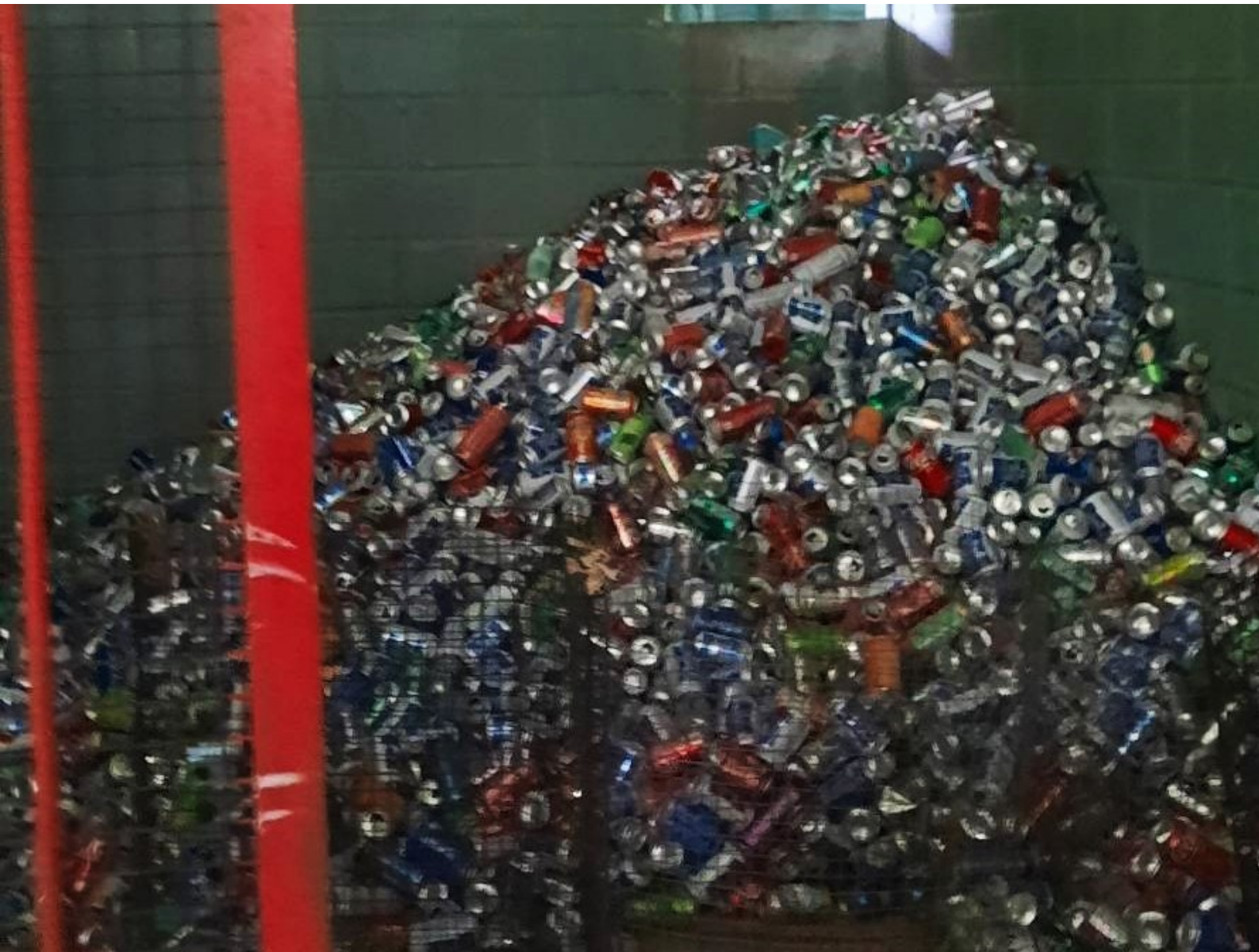


Map of Palau

Source: https://ontheworldmap.com/palau

Glossary

Acronym	Definition
C&D	Construction and Demolition (Waste)
C&I	Commercial and Industrial (Waste)
DCMR	Data Strategy & Collection, Monitoring, and Reporting (Framework)
KPI	Key Performance Indicator
MEA	Multilateral Environmental Agreement
MSW	Municipal Solid Waste (i.e., waste originating from the general public that is typically managed by local government entities, excludes commercial / business waste)
NS Strategy	Palau's National Solid Waste Management Strategy (2017-2026)
PICT	Pacific Island Countries & Territories
PRIF	Pacific Regional Infrastructure Facility
SPREP	Secretariat of The Pacific Regional Environment Programme
UNEP	United Nations Environment Programme

Terminology	Definition
Capacity	The total maximum waste storage and processing that can take place at a facility (as capped by license conditions).
Capture rate	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)
Coverage	The proportion of total households that have access to a regular waste collection service.
Modern	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, and have access to equipment and machinery such as a bulldozer. A landfill or dumpsite must employ a leachate management system and a daily cover routine. A recovery facility should have fire prevention and control measures in place, and appropriate stormwater runoff controls. Facilities must not be exceeding their maximum storage capacity.
Per capita	Units measured on a per person basis (i.e., to allow for extrapolation over a national population).
Recovery	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.
Unregulated	Typically, unlicensed waste facilities which do not follow international frameworks, rules, and guidelines to protect the health of the environment and community.
Waste facility	'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 / recovery facilities for dry recyclables (and e-waste), 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 Palau National Waste Audit Analysis Report was guided by the overarching Regional Waste Data Collection, Monitoring, and Reporting (DCMR) Framework for Pacific Island Countries and Territories (PICT). The implementation of the DCMR Framework ensures that waste data is collected, analysed, and reported in a consistent and reliable way across the Pacific.

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

Core KPIs	Result	Supplementary KPIs	Result
1. Count / capacity of modern waste facilities	1 / Capacity unknown	1. Cost of disposal to landfill ($/annum)	No data
2. Count / capacity of unregulated waste facilities	10 / Capacity unknown	2. Weight of waste disposed (tpa)	26,100
3. National recovery rate (%)	12.50%	3. Weight of waste recovered (tpa)	2,443
4. Per capita waste generation rate (kg/capita/year)	129	4. Volume and type of stockpiled hazardous waste (m^3)	See Section 3.2
5. Municipal Solid Waste (MSW) composition (%)	See Figure (a)	5. Marine plastic pollution potential (tpa)	78
6. Household waste capture rate (%)	77.78%	6. Awareness and support of waste management services (%)	No data
7. Household collection service coverage (%)	77.78%	7. Proportion of strategic waste management initiatives implemented (%)	73.33%
8. Fulfillment of MEA reporting requirements (%)	43.03%	8. Commercial waste capture rate (%)	See Section 3.2
		9. Commercial collection service coverage (%)	See Section 3.2
		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

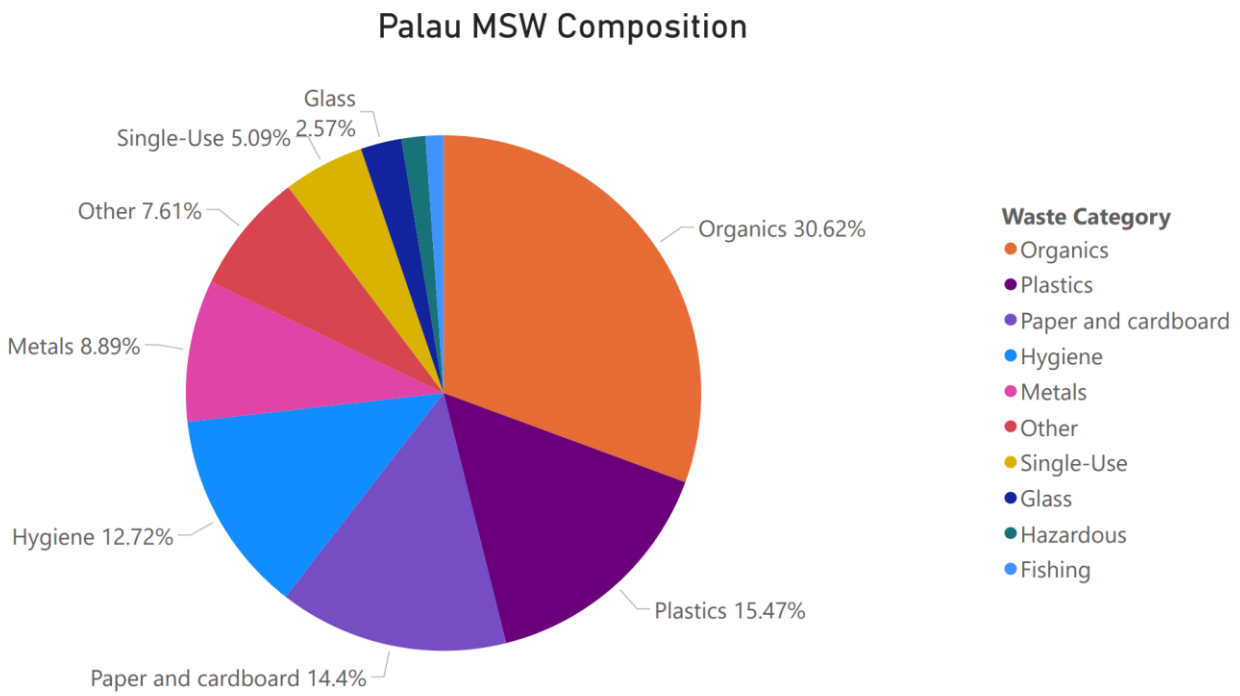


Figure (a) Palau Municipal Solid Waste (MSW) Composition (% by weight)

1 Introduction

1.1 Background

Palau is one of fifteen Pacific Island Nations taking part in the PacWaste Plus Programme implemented through SPREP and funded by the European Union Delegation of the Pacific. PacWaste Plus aims to improve waste management activities across the islands and strengthen the capacity of Governments, industries, and communities to manage wastes to protect human health and the environment.

Palau has implemented several waste management practices aimed at reducing waste generation, increasing, and promoting recycling, as well as minimising the environmental impact of the country's landfilling of wastes. From 2011 to 2019, Palau imported over 140,000,000 beverage containers via its Container Deposit Scheme (CDS), of which more than 123,000,000 containers were recovered, achieving an 85-90% recovery rate. Recovery rates for other recyclables, such as motor vehicles, scrap iron, ferrous metal, and aluminium cans, have also been encouraging.

Additionally, the Koror State Recycling Centre houses various recycling facilities, including the National Redemption Centre, an energy recovery facility, a composting facility, and a glass blowing facility. Established and operated by the Koror State Government, the centre achieved a 12% recycling rate for the waste generated in Koror and Babeldaob in 2017. Recyclables are segregated and processed at the centre, with residual waste sent to landfill. The National Redemption Centre, which began operating in 2011, receives and processes beverage containers. The state government also runs 42 segregation stations across the state. The recycling fund from the CDS generates sufficient income to support national landfills and awareness campaigns, with residents of Koror State not required to pay for waste collection and disposal services.

Despite the above achievements in resource recovery, the majority of waste generated in the nation still ends up in landfills and dumpsites across the country. Palau's 2019 State of the Environment report revealed that the total amount of waste produced in the country is increasing in correlation to its GDP (Gross Domestic Product). The report also indicates that the increase in total waste generation is outpacing the efforts to reduce, reuse or recycle waste through Palau's waste recovery programs.

1.2 Purpose and Aim

The purpose of this audit analysis and report is to establish a baseline position for Palau waste 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 Palau:

- **Palau Waste Audit Report 2019**: The audit was undertaken November 2019 and provided an evaluation of household and business waste generated in Palau. Audit data and information was obtained via interviews and waste collections from 207 households of which 177 participated in interviews, and 39 businesses, followed by sorting and weighing. The audit report also provided an assessment of the state of Palau's landfills including landfill audits and stockpile assessments.

This national report examines the MSW, commercial and industrial (C&I), disaster waste and landfill waste streams. Landfills may receive a broad array of waste types, including construction and demolition (C&D) waste, hazardous waste, and other types of 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

The Republic of Palau is a group of 340 coral and volcanic islands, eight of which are inhabited, located in Southwest Micronesia (a map is provided on page 4). Palau has a land area of 459 square kilometres and a coastline stretching over 1,519 kilometres. The country is home to over 17,000 people, with 78% of the population residing in urban areas, and 22% of the population in rural areas. Palau's total population is declining at a rate of about -0.05% annually. Around 70% of the population of Palau resides in the state of Koror, which is the most urbanised state amongst all of Palau.

Palau has developed significant environmental legislation and strategies for solid waste management, most notably the *Solid Waste Management Plan (2006-2016)* and *National Solid Waste Management Strategy (2017-2026)* (NSWMS). There is no overarching Solid Waste Act, but rather a combination of various laws and regulations.

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

- National government: The Palauan national government has the responsibility of creating legislation, strategies, and policy frameworks for waste management. It is also responsible for solid waste management through the Bureau of Public Works, which includes infrastructure planning, managing the national landfill, and raising public awareness about solid waste management issues. Additionally, the government coordinates with state governments to address solid waste issues and implement the NSWMS.
- State government: The state governments of Palau are responsible for household waste collection, the management of recycling facilities and projects, dumpsite management, composting programs, and waste education programs.

Beyond this, private recycling companies have a contractual arrangement with public entities to provide waste management and pollution control services.

2 Methodology

Waste data collation, analysis and reporting 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 in a consistent and reliable way 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
Palau waste audit 2019	• Household waste audits • Commercial waste audits • Landfill waste audits • Household and business interviews	• Waste generation rates • Waste composition • Estimation of waste to landfill • Leakage rates • Recovery rates • Stockpile sizes and types • Landfill life assessments
2020 National census	• National census	• Population data • Household data (size, number)

2.1.1 Palau Waste Audit 2019

The November 2019 audit utilised a methodology that was previously used for a Tuvalu waste audit commissioned by PRIF in 2019.

The purpose of the audit was to assess the feasibility of a recycling network in the region and evaluate the institutional capacity of PICTs while providing private sector initiatives. Palau's waste audit was the second audit to use this approach; its purpose was to determine whether the methodology was suitable for future PICTs waste audits, and if it could provide comparable data.

Data was collected from households in urban, semi-urban, and rural areas as well as commercial premises. A total of 207 household samples were gathered, out of which 177 also participated in interviews, followed by 39 commercial samples and interviews. The samples were obtained from different locations, with 76 samples from Koror, 81 from Babeldaob, 15 from Kayangel, and five from Angaur. In addition, a visual audit was conducted at nine disposal sites, and an in-depth quantitative audit was carried out at Koror State Landfill (M-Dock landfill), Palau's largest and most modern landfill, over a two-week period.

Table 2 Sample locations for audits

Sample Location	Population (2020)	Classification
Koror (State)	11,400	Urban
Badeldaob (Island of 10 states)	5,497	Rural, semi-urban
Kayangel (State)	41	Rural
Angaur (State)	114	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. The extracted audit data was 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.

Where 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 audit data provided for 'urban' areas (Koror), 'semi-urban' areas (Badeldaob), and 'rural' areas (Badeldaob, Kayangel, Angaur) (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 2020, while the waste audit was completed in 2019.
- 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 with the aim of improving 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 for the purposes of calculating 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

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
Legend	10. Total weight of disaster waste disposed
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:

- There was adequate data provided within the audit report to sufficiently calculate Core KPIs 4, 5 and 8, and Supplementary KPIs 2, 3, 5, and 7.
- Limited data was provided within the audit report to calculate Core KPIS 1, 2, 3, 6, and 7, and Supplementary KPIs 4, 8, and 9.
  - There was no information on the use of daily cover in Palau landfills and dumpsites.
  - No information was provided on maximum processing capacities of Palau waste facilities.
  - Stockpile volume estimates were not given for all suggested hazardous waste categories.
  - There was some information pertaining to the collection service coverage waste capture rate 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 was available in the report to calculate Supplementary KPIs 1, 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 Palau.

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 Palau to compare future data to, and to guide subsequent waste management or waste data related activities.

Core KPI 1: Count / capacity of modern waste facilities

Result	**Count of modern waste facilities: 1** • Palau's National Recycling Centre at Koror includes a composting facility, a redemption centre for cans, glass, and bottles, a pyrolysis facility, and a glass blowing facility. – The site is staffed, operated by the Koror State Government, and has access to a variety of equipment. • The most advanced landfill, M-Dock landfill, is staffed, licensed, has access to equipment and has some form of leachate management system. However, it is assumed that the landfill does not incorporate the use of daily cover (based on review of audit reports). As such, this facility can not be classified as 'modern'. (Note: At the time of reporting, M-Dock landfill has been closed. A new semi-aerobic landfill utilising the Fukuoka method, located in Aimeliik, has commenced operations.) **Capacity of modern waste facilities (tonnes per annum): No data** • No information on the maximum capacities of any of the 9 landfills in Palau were found in the audit report.
Assumptions	• None
Data gaps	• Use of daily cover at landfills & dumpsites. • The maximum capacities of all Palau waste facilities (tonnes per annum). • No mention of leachate management for any other facility besides M-Dock.
Key considerations	• Koror's National Recycling Centre meets the requirements for being a 'modern' waste facility. • Palau has only one licensed landfill, M-Dock, operated by the government on Koror, which at the time of the audit had already reached maximum storage capacity. (This facility has since been closed.) • A new national landfill in Aimeliik has commenced operations to receive waste from all of Palau, following the closure of M-Dock landfill. • The rest of the official waste facilities are dumpsites, located on 9 of the islands on Palau. • No daily cover usage at the landfill sites means that these sites are very susceptible to material flow during climate-related weather events such as cyclones.

Core KPI 2: Count / capacity of unregulated waste facilities

Result	**Count of unregulated waste facilities: 10** • M-Dock landfill and the 9 dumpsites across Palau do not meet the criteria for being a 'modern' facility. (Note: At the time of reporting, M-Dock landfill has been closed.) • None of the 9 dumpsites feature any form of leachate management. • The dumpsites on Ngeremiengui, Melekeok, Ngiwal, and Ngaraard are not staffed. – Melekeok dumpsite has no equipment access. **Capacity of unregulated waste facilities (tonnes per annum): No data** • No landfill capacities were mentioned in the audit report. • Other dumpsites across Palau were at capacity but were not specifically identified in the audit report.
Assumptions	• None.
Data gaps	• Storage capacities of unregulated waste facilities (tonnes per annum). • Although it was mentioned in the report that some of the dumpsites in Palau were at capacity, the specific dumpsites were not identified in the report.
Key considerations	• There is limited information available for majority of the 9 dumpsites in Palau. • There is no information on the total storage capacity of the sites, although some dumpsites and M-Dock landfill were noted to be at capacity. • There are no landfills or dumpsites in Palau that meet with 'modern' standards. • Lack of leachate management at the dumpsites facilities means that both the environment and community are at risk of hazards due to contamination and material flow. • No daily cover usage at the landfill sites means that these sites are very susceptible to material flow during climate-related weather events such as cyclones.

Core KPI 3: National recovery rate

Results	**National recovery rate (%): 12.50 %** • Around 10% to 15% of waste generated in Palau goes through the National Recycling Centre on Koror. • This metric was identified directly from the literature and was not calculated via framework methodology. The presented result is given as a proportion of the total waste generated in Palau in a year which is recovered at the centre in Koror. • The centre offers four main recovery services: – Palau's CDS allows residents to bring cans, plastic bottles and glass bottles to the recycling centre for redemption, – Yard waste, cardboard and paper are composted, – Plastics are converted to fuel via pyrolysis, – A glass blowing facility allows for glass to be repurposed into artisan products. • The centre is the only recovery facility in Palau identified in the report.
Assumptions	• None
Data gaps	• The total quantity of waste received by all waste facilities (tpa) was not identified in the audit report. • The total quantity of waste diverted from landfill (tpa) was not identified in the report. – Because these parameters were unavailable, it was not possible to calculate the performance indicator using framework methodology. Therefore, a reported national recovery rate from the audit report itself was implemented.
Key considerations	• Palau is one of the few Pacific Island Nations with a dedicated waste recovery system and infrastructure.

Core KPI 4: Per capita waste generation rate

Results	**Per capita waste generation rate (kg/capita/year): 129** – kg/capita/day: 0.353 – kg/household/day: 1.24
Assumptions	• Household waste audit data was converted from a per household basis to a per capita basis, then grouped and averaged based on geographic zoning (i.e., rural, or urban), and extrapolated using census data of the national population. • States that had no audit data were given an assumed 'rural' average waste generation rate based on data from household audits from other areas of similar geographic zoning. • Per capita information based on 2020 census results.
Data gaps	• 7 out of 16 states in Palau were sampled. No data is available for remaining states. The sampled states represent about 85% of the population.
Key considerations	• Data was sufficient to calculate this performance indicator. • Future per capita waste generation rates will provide insight into waste management trends and changes for Palau.

Core KPI 5: Municipal Solid Waste (MSW) Composition

Organics is the most prevalent waste type for household waste in Palau. This is followed by plastics and then paper and cardboard.

- Organics: 30.62%
- Plastics: 15.47%
- Paper and cardboard: 14.40%

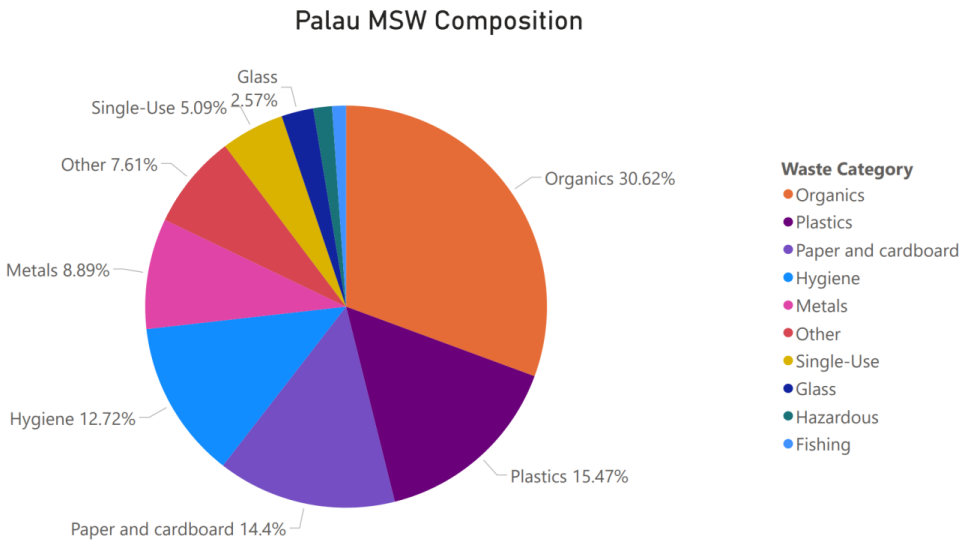
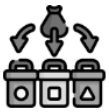


Figure 1 Palau Municipal Solid Waste (MSW) composition (% by weight)

- States with no audit data were assigned an assumed average household waste composition based on data from other areas of similar geographic zoning (i.e.. rural, semi-urban, urban).

- Categories presented are based the PRIF waste audit guidelines. Past audits may record different categories.

- 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

Results	**Household waste capture rate (%): 77.78%** – Total weight of household waste generated = 2269 tpa – Total weight of household waste captured responsibly = 1765 tpa
Assumptions	• The audit report states that waste collection services are provided to approximately 77% of the national population in Palau. No measurements or estimates for individual states were given.
Data gaps	• The audit did not quantify household disposal methods or include a survey, therefore the KPI could not be calculated using the DCMR framework methodology.
Key considerations	• The audit did not quantify household disposal methods and did not provide a breakdown of waste capture by state. Therefore, the presented performance indicator is not a true measurement of household waste capture rate in Palau.

Core KPI 7: Household collection service coverage

Results	**Household collection service coverage (%): 77.78%** • The audit report states that waste collection services are provided to approximately 77% of the national population in Palau. No measurements or estimates for individual states were given.
Assumptions	• The 77% statistic from the report is the only mention of collection service coverage and is the only information that can be presented for this performance indicator. • The figure presented for collection service coverage in the audit report combines household and businesses but is assumed to represent the household collection service coverage. • Calculated based on information from 2020 census data: – Number of households
Data gaps	• The audit did not include a survey, therefore the KPI could not be calculated using the DCMR framework methodology.
Key considerations	• This KPI is expected to change significantly in the future as relevant data is collected to calculate the household waste capture rate more accurately.

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

Results	**Fulfillment of MEA reporting requirements (%): 43.03%**

Convention	Status	Reporting requirements	Reports delivered
Basel Convention	Accession	Annual reports (11)	1
Minamata Convention	Ratified	First national reports due 2021 (1)	1
Stockholm Convention	Ratified	5 reporting cycles (5)	1

Assumptions	• Only MEA's with mandatory reporting requirements were included in the calculation of this KPI. • MEA's without strict reporting requirements are not included in the calculation.
Data gaps	• None
Key considerations	• Palau has satisfied the reporting requirements for the Minamata convention on Mercury. However, Palau is behind on national reports for the Basel and Stockholm conventions.

Supplementary KPI 1: Cost of disposal to landfill

Results	**Cost of disposal to landfill ($/tonne): No data**
Assumptions	• None
Data gaps	• No information presented in audit reports on the annual facility operating cost for any facilities. • Insufficient information to calculate the annual quantity of waste disposed (tpa).
Key considerations	• Completion of the waste facility register suggested by the DCMR Framework will provide sufficient data to accurately calculate this indicator and a benchmark for comparing disposal costs against previous periods, other countries, and the region.

Supplementary KPI 2: Total weight of waste disposed

Results	**Total weight of waste disposed (tonnes per annum): 26,100**
Assumptions	• The audit report states that a total of 30,183 tpa of waste is generated in Palau, and that 85% to 88% of waste generated in Palau ends up in landfill. – This calculation assumed that 86.5% of the total waste generated in Palau ends up in landfill.
Data gaps	• The presentation of this indicator relies on figures taken directly from the audit report. Measured data is required in the future to calculate this KPI.
Key considerations	• This measurement is expected to change once data is collected from Palau's landfills and dumpsites using the waste facility register suggested by the DCMR Framework.

Supplementary KPI 3: Total weight of waste recovered

Results	**Total weight of waste recovered (tonnes per annum): 2,440** • This metric is pulled directly from the report.
Assumptions	• None
Data gaps	• The presentation of this indicator relies on figures taken directly from the audit report. Measured data is required in the future to calculate this KPI.
Key considerations	• Palau has successfully established a waste recovery system. • The National Recycling Centre is Palau's only dedicated recovery facility.

Supplementary KPI 4: Volumes of stockpiled hazardous waste

Results	**Volumes of stockpiled hazardous wastes (m^3):** – Asbestos: No data – E-waste: 415 – Healthcare and pharmaceutical waste: No data – Used oil: 1,135 – Used tyres: 13,839 – Obsolete chemicals: No data
Assumptions	• None
Data gaps	• Missing information for asbestos, healthcare and pharmaceutical waste, and obsolete chemicals.
Key considerations	• The volume of other hazardous waste stockpiles in Palau remains unknown. • 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.

Supplementary KPI 5: Marine plastic pollution potential

Results	**Marine plastic pollution potential (tonnes per annum): 78**
Assumptions	• Assumes a national weight of mismanaged waste, based on household audit samples. – 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. – Mismanaged waste is defined as all waste which is not captured in collection services, and ends up buried / burned / littered etc. – Uses proportion of plastics captured in MSW composition.
Data gaps	• Requires a more reliable metric for mismanaged waste.
Key considerations	• Waste plastics which are not managed in an environmentally sound manner are assumed to pose a significant risk of polluting oceans and estuarine waterways.

Supplementary KPI 6: Awareness of waste management services

Results	**Awareness of waste services (%): No data**
Assumptions	• None
Data gaps	• Unable to calculate based on audit reports as this performance indicator requires completion of community survey, specifically gathering responses on: – Number of positive responses indicating awareness – Number of available services – Number of survey participants
Key considerations	• Completion of 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 effective use of existing waste management services.

Supplementary KPI 7: Proportion of strategic waste management initiatives implemented

Results	**Proportion of waste management initiatives implemented (%): 73.33%** – Number of successfully implemented waste initiatives = 11 out of 15 – Number of planned/pipeline initiatives = 4 • Implemented initiatives include: – National Solid Waste Management Strategy: The Roadmap towards a Clean and Safe Palau 2017 to 2026 – Palau Responsible Tourism Policy Framework 2017–2021 – Plastic Bag Use Reduction Act, RPPL No. 10-14 2017 • Pipeline initiatives include: – Review of National Solid Waste Management Strategy 2017 to 2026 – Chemical Waste Management System – CDS Expansions
Assumptions	• None
Data gaps	• None
Key considerations	• Palau's foremost waste initiative is the *National Solid Waste Management Strategy: The Roadmap towards a Clean and Safe Palau 2017 to 2026*.

Supplementary KPI 8: Commercial waste capture rate

Results	**Commercial waste capture rate (%): Insufficient data**
Assumptions	• None
Data gaps	• The report does not provide separate measurements for household and commercial collection service coverages. • No estimate for the number of businesses in Palau in the audit report. • No information on the total amount of waste generated by businesses. • No information on the waste generation of businesses in the audit report.
Key considerations	• Accurate calculation relies on an estimate of total businesses in country, total commercial waste generated, and commercial waste generation rates. • Completion of community surveys will provide an indication of how many businesses are using collection services, and other forms of waste management, and to what extent businesses use the service.

Supplementary KPI 9: Commercial collection service coverage

Results	**Commercial collection service coverage (%): Insufficient data** • A total of 39 businesses were interviewed during the Palau audit. The figure presented for collection service coverage in the audit report combines household and businesses and does not differentiate between two categories, so a combined collection service coverage is presented. • The report identifies that 88% of survey respondents had access to a collection service, and 4% hauled their own waste to landfill, resulting in a 92% total collection service coverage. The geographic distribution of the businesses was not identified in the audit report.
Assumptions	• None
Data gaps	• No specific commercial collection service coverage was provided in the audit report. • No information on the total number of businesses participating nationally.
Key considerations	• The audit report notes that survey responses indicated commercial collection coverages were generally high across all states surveyed. • Completion of business surveys suggested in the DCMR framework, would provide an indication of how regular, accessible, and affordable collection services are for businesses.

Supplementary KPI 10: Weight of disaster waste disposed

Results	**Weight of disaster waste disposed (tpa): No data** • Measured as a sum of the recorded weight of disaster waste disposed to landfill or received and stockpiled at waste facility following a disaster event. • No disaster waste data was recorded during the examined audits.
Assumptions	• Only captures disaster waste which ends up disposed of or stored at waste facilities, including landfills, disposal sites and recovery facilities. • 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).
Data gaps	• 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.
Key considerations	• 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. • Calculating this KPI can be undertaken by regularly updating the waste facility register. Tracking the vehicle capacity and percentage fullness of a load of any 'disaster waste' carrying vehicles entering the facility will help reconcile waste amounts disposed if these wastes are not managed separately.

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