Tuvalu National Waste Audit Analysis Report

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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

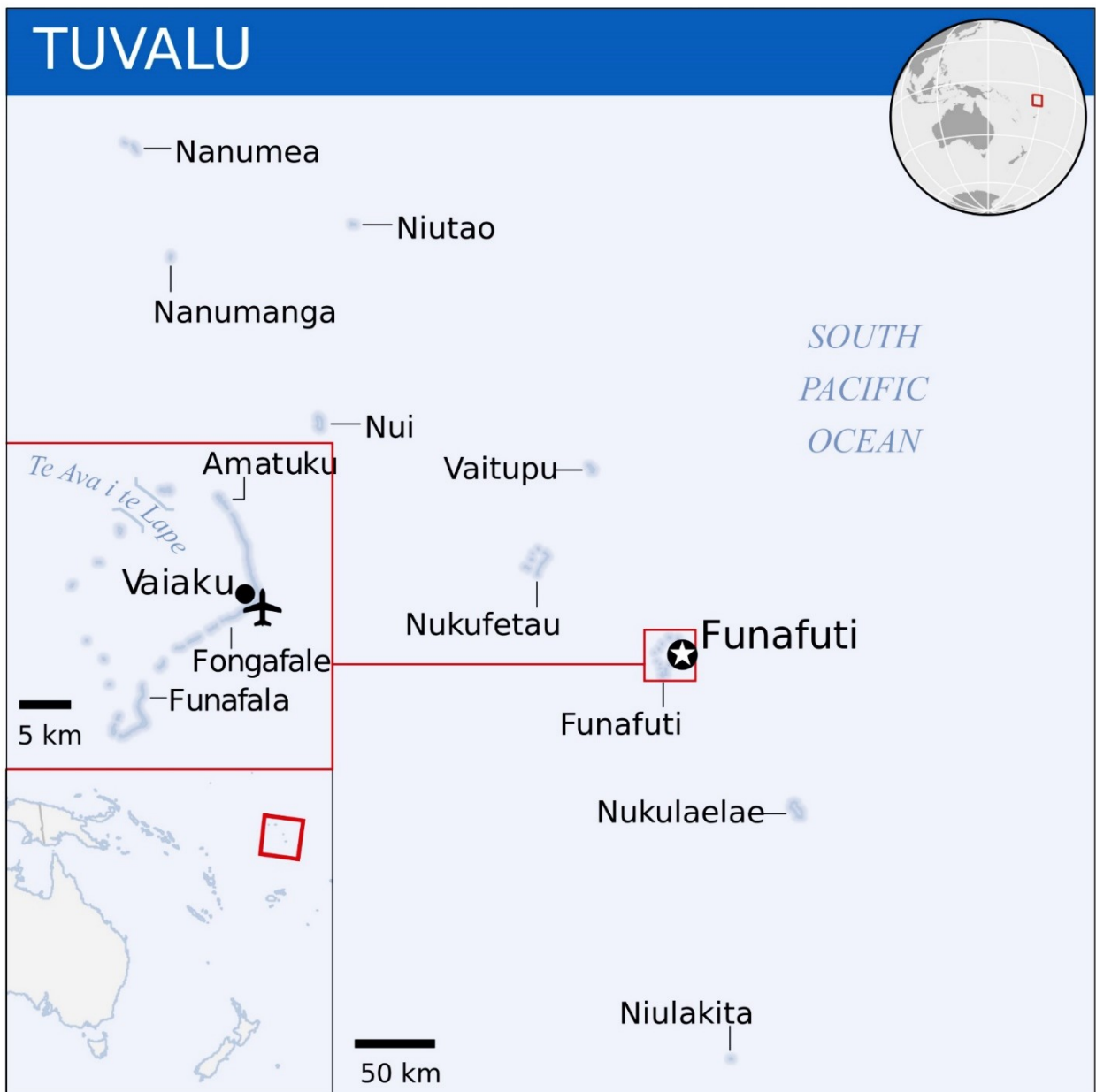**Learn more about the PacWaste Plus programme by visiting**

www.pacwasteplus.org

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Map of Tuvalu

Source: UN Office for the Coordination of Humanitarian Affairs, 2013

Glossary

Acronym	Definition
C&D	Construction and Demolition (Waste)
C&I	Commercial and Industrial (Waste)
DCMR	Data Strategy & Collection, Monitoring, and Reporting (Framework)
DSW	Solid Waste Agency of Tuvalu
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)
NGO	Non-Governmental Organisation
PICT	Pacific Island Countries & Territories
PRIF	Pacific Region Infrastructure Facility
NEMS	National Environmental Management Strategies
SPREP	Secretariat of The Pacific Regional 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, 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.
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 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 Tuvalu 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 in a consistent and reliable way across the Pacific.

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

Core KPIs	Result	Supplementary KPIs	Result
1. Count / capacity of modern waste facilities	0 / 0	1. Cost of disposal to landfill ($/tonne)	No data
2. Count / capacity of unregulated waste facilities	10 / Capacity unknown	2. Weight of waste disposed (tpa)	1,149
3. National recovery rate (%)	(Garden Waste: 34.79%) See **Section 3.2**	3. Weight of waste recovered (tpa)	71.7
4. Per capita waste generation rate (kg/capita/year)	56.8	4. Volume of stockpiled hazardous waste (m^3)	See **Section 3.2**
5. Municipal Solid Waste (MSW) Composition (%)	No data	5. Marine plastic pollution potential (tpa)	No data
6. Household waste capture rate (%)	94.69%	6. Awareness and support of waste management services (%)	No data
7. Household collection service coverage (%)	90.36%	7. Proportion of strategic waste management initiatives implemented (%)	85.71%
8. Fulfillment of MEA reporting requirements (%)	40.00%	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

1 Introduction

1.1 Background

Tuvalu 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. PacWastePlus 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.

Tuvalu's waste management practices primarily rely on burying, burning, dumping, and landfilling. There is limited access to proper waste collection and disposal facilities, leading to environmental degradation and health hazards. Waste recovery is primarily carried out by the Solid Waste Agency of Tuvalu (DSW). Bulky waste, e-waste, green waste, used oils, and other materials are collected and stored at Tuvalu's transfer station.

Green waste is partially segregated and collected by DSW separately from general waste. This green waste is then deposited at a central location for processing through a shredder at the transfer station. Shredded green waste is used as bedding for vegetable planting. The composting of green waste continues in Funafuti, local agriculture using all mulched material as organic fertiliser. Informal composting and mulching green waste are also widespread across all of Tuvalu's islands.

The country requires investment in infrastructure, implementation of data-guided decision making, and increased general waste management education to improve the current situation.

1.2 Purpose and Aim

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

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

- **Tuvalu waste audit report 2019**: The audit was undertaken in September 2019 and provided an evaluation of household and business waste generated in Tuvalu. Audit data and information was obtained via interviews and waste collections from 197 households and 25 businesses, followed by sorting and weighing. The audit report also provided an assessment of the state of Tuvalu'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

Tuvalu, formerly known as the Ellice Islands, is midway between Hawaii and Australia in the South Pacific Ocean. It is one of the smallest and least populated countries in the world, with a population of around 11,000 people. Tuvalu is made up of nine islands (four reef islands and five coral atolls), include Niulakita, Nukulaelae, Funafuti, Nukufetau, Vaitupu, Nui, Niutao, Nanumaga and Nanumea. The total land area is only 27 square kilometres, and all of the islands are less than five meters above sea level. Tuvalu's economy is heavily dependent on foreign aid, remittances from Tuvaluans living abroad, and fishing licenses. The capital of Tuvalu is Funafuti, which is located on the largest atoll in the country. Funafuti is home to around 7,000 people and is the centre of government, commerce, and transportation in Tuvalu.

The Government of Tuvalu launched their *National Environmental Management Strategies (NEMS) 2022-2026* in June 2022. Solid waste management is one of the key priorities under NEMS. The strategy recognises the pressing need to improve waste management practices in Tuvalu to reduce the environmental and health risks associated with improper disposal of solid waste.

The NEMS identifies several objectives, targets, and actions for improving solid waste management in Tuvalu. The responsibility for managing solid waste is divided among various institutions in Tuvalu, which include:

- National government: Ministry of Home Affairs and Rural Development is the governing body for the waste management. The national government is responsible for creating national legislation, strategies, and policy frameworks for waste management, as well as fulfilling obligations under international conventions. Provides financial support for waste management activities through governments annual budget.

- Subordinated agencies: Agencies such as the Solid Waste Agency of Tuvalu oversee and manage the handling of all of Tuvalu's waste. These agencies and departments sit under the Ministry of Home Affairs and Rural Development and are responsible for carrying out the management and operation of Tuvalu's waste facilities, development of landfills, education and awareness on waste, and the storage and disposal of bulky and hazardous wastes.

- Local government: Establish, maintain and carry out series for the removal and destruction of, or otherwise dealing with, all kinds of rubbish, refuse or excreta and by bylaws to require householders to contribute to such services. Preparation of reports and maintenance of statistical records relating to its waste management activities submitted to Solid Waste Agency of Tuvalu.

The NEMS also recognises the importance of partnerships and collaboration with other stakeholders, including the private sector, civil society organisations, and development partners, in achieving the objectives of the solid waste management strategy.

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
Tuvalu waste audit 2019	• Household waste audits • Commercial waste audits • Household and business interviews • Landfill audit • Stockpile audit	• Household generation rates • Waste generation by weight • Recovery rate for materials • Stockpile volumes and weights • Landfill life assessments
2017 National census	• National census	• Population data • Household data

2.1.1 Tuvalu Waste Audit 2019

The Tuvalu waste audit was undertaken in September 2019 and utilised a methodology that was developed before the publication of the Pacific Regional Infrastructure Facility (PRIF) waste audit guidelines (in 2020). This has resulted in differences in material sorting categories and audit methodology compared to more recent country audits undertaken within the region.

Waste audits were conducted to inform the feasibility of a recycling network, as well as an assessment of the institutional capacity of the PICs to play an effective role in this network. The Tuvalu project was a pilot exercise, whereby the waste audit methodology developed by the consultants was being used to ascertain if it could serve as an appropriate model for all future waste audits across the other PICs to ensure comparable data.

In addition, a data collection system was employed to incorporate external agency requirements to help facilitate data sharing between all stakeholders and PICs. All data is uploaded to SPREP's INFORM database.

Audit data and information was obtained via interviews and waste collections from 197 households and 25 businesses, followed by sorting and weighing. The audit report also provided an assessment of the state of Tuvalu's landfills including landfill audits and stockpile assessments.

Table 2 Sample locations for audits

Sample Location	Population (2017)	Classification
Funafuti	6,716	Urban
Vaitupu	1,190	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 (Funafuti) is assumed to represent all urban areas in Tuvalu, while audit data provided for 'rural' Vaitupu is assumed to be representative of all rural areas (see **Table 2**).

- All population estimates used to calculate performance indicators are based on national census data from 2017, which predates the Tuvalu audit (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 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:

- There was adequate data provided within the audit report to sufficiently calculate Core KPIs 4, 6 to 8, and Supplementary KPIs 2, 3, and 7.
- Limited data was provided within the audit report to calculate Core KPIs 1 to 3, and Supplementary KPIs 4, 8, and 9.
  - No information as to the maximum processing capacities of the waste facilities (tpa) was provided. There was information on equipment, staffing, and leachate management controls present at the site.
  - The audit found stockpiles of all hazardous waste categories targeted in the DCMR framework except for healthcare and pharmaceutical wastes, and obsolete chemicals.
  - Waste facility data (landfill and dumpsite) has been assumed to be representative of all Tuvaluan waste facilities as only two sites were audited and reported on. No maximum capacities were provided for the facilities.
  - Estimates for green waste recovery was provided for Funafuti but not for the other islands. The audit report mentions e-waste and used oil collections and export but gives no estimate for the amount of either waste type diverted from landfill.
  - Limited information on the collection service coverage and waste capture rate for commercials presented in the audit report.
- No data was available in the report to calculate Core KPI 5, and Supplementary KPIs 1, 5, 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 Tuvalu.

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 Tuvalu 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: 0
	
	• The audit examined two waste facilities; Funafuti landfill and Vaitupu dumpsite.
	   – Funafuti landfill is staffed and has access to dedicated equipment.
	   – For the rest of the islands of Tuvalu, the audit found there was little to no control over the types of waste dumped at site.
	   – All dumpsites were non-engineered and have no pollution control measures in place.
	   – As such, Tuvalu has no waste facilities which can be classified as 'modern' per DCMR framework definitions.
	• A newly built transfer station was mentioned in the audit report, but no further information was provided as to the capacity or controls present at the facility.
	
	Capacity of modern waste facilities (tonnes per annum): 0
	
	• No quantitative processing or storage capacities were reported for the audited waste facilities in Tuvalu. However, it was noted that a 2017 study examined by the auditing team found that the Funafuti landfill was due to reach full capacity within one year of the study. It is likely that the Funafuti landfill site has since reached and may be exceeding maximum capacity.

Assumptions	• None
Data gaps	• Quantitative processing and storage capacities (tpa) for Tuvalu's waste facilities. • Only two of the dumpsites/landfills were examined over the course of the audit (Funafuti and Vaitupu). • No information regarding the staffing, equipment access, or use of daily cover at any of the facilities in Tuvalu.
Key considerations	• None of the facilities qualify as 'modern'. Waste management facilities in Tuvalu lack sufficient staff resources, equipment, pollution control and space. • There was inadequate data to calculate the capacity for any waste facility. • Only two of the 10 dumpsites/landfills were examined over the course of the audit (Funafuti and Vaitupu). There are dumpsites on each of Tuvalu's 9 islands. • It is recommended that the number, location, name, and operations of all landfills/dumpsites and recovery facilities are collated for future reporting to this performance indicator.

Core KPI 2: Count / capacity of unregulated waste facilities

Result	Count of unregulated waste facilities: 10 • The audit examined two landfill/dumpsites out of a total of 9 dumpsites and 1 transfer station. Every island in Tuvalu has a dumpsite and there are 9 islands. • The audit report notes that all dumpsites in Tuvalu were non-engineered, have no pollution control measures in place, and that all facilities are 'unregulated'. • The count of 9 unregulated waste facilities includes each island's dumpsite, and the transfer station. • According to the audit report, only the Funafuti landfill is staffed. It is assumed that the transfer station is also staffed to some degree, meaning only 2 out of 10 facilities on Tuvalu utilise regular staff. Capacity of unregulated waste facilities (tonnes per annum): No data
Assumptions	• None
Data gaps	• No processing or storage capacities of the unregulated facilities in Tuvalu were identified.
Key considerations	• All 10 facilities are 'unregulated'. • 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. • 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. • The identified unregulated facilities present investment opportunities to upgrade existing sites to align with best practice. Reducing the number of unregulated facilities will lead to better outcomes for the local environmental and community health.

Core KPI 3: National recovery rate

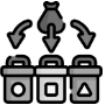|	

Results	National recovery rate (%): Insufficient data (Funafuti green waste: 34.79%)
	
	• In Tuvalu, green is waste is collected, shredded, and composted before being used for vegetable planting and as organic fertiliser. Recycling green waste through mulching is a common practice across the islands.
	
	    – Approximately 206 tonnes of green waste (primarily consisting of pandanus, breadfruit, and other trees) is generated on Funafuti per annum.
	
	    – Of the 206 tonnes generated, approximately 72 tonnes are collected and mulched per annum.
	
	• E-waste and used oils are collected and stored before transport to Fiji.
	
	• The audit mentioned one private recycling operator collecting scrap metals across Funafuti. However, the business was on hold indefinitely.
	
	• No formal plastic recycling is or has previously been in place.

Assumptions	• Volumetric estimates for green waste generation and recovery provided in the audit report were converted to tonnes using density conversion factors provided by the New South Wales Environment Protection Authority's "Disposal-based audit - Commercial and industrial waste stream in the regulated areas of New South Wales, Appendix D - Material Density Conversion Factors (2014)".
Data gaps	• Green waste recovery estimates provided for Funafuti only, no other of the islands of Tuvalu. • The audit reports presented no estimates for e-waste and used oils collected for export to Fiji. • No dedicated recovery facilities mentioned in audit reports. • No information on the total mass of material diverted from landfill (tpa).
Key considerations	• There was insufficient data to calculate a national rate of recovery. Additionally, no weights of waste diverted from landfill or recovery facility data was recorded during the audits. • While there is mention of used oil and e-waste recovery in Tuvalu, and further green waste recovery on islands aside from Funafuti, no correlating estimates were presented in the audit report. • Of the green waste generated on Funafuti annually approximately 35% is collected and used for composting. The composting of green waste is commonplace across Tuvalu, and thus the result of this indicator is expected to change significantly as data becomes more available in the future. • Due to challenges with available landfill space in Tuvalu, diversion of waste from landfill via recycling is a viable consideration to alleviate pressure on waste disposal sites.

 Core KPI 4: Per capita waste generation rate

Results	Per capita waste generation rate (kg/capita/year): 56.8 — kg/capita/day: 0.155 — kg/household/day: 0.937
Assumptions	• 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 then extrapolated using census data of the national population. • For islands in Tuvalu not included as part of the audit (i.e., all other islands except for Funafuti and Vaitupu), an assumed 'rural' average waste generation rate was used based on data from household audits from Vaitupu. • The population estimate used to calculate per capita information was based on 2017 census results.
Data gaps	• The audit did not capture household generation rates for 7 out of 9 islands in Tuvalu.
Key considerations	• Future per capita waste generation rates will provide insight into waste management trends and changes for Tuvalu.

 Core KPI 5: Municipal Solid Waste (MSW) composition

Results	Municipal Solid Waste (MSW) composition: No data • Household MSW compositions were not examined as part of the Tuvalu audit.
Assumptions	• None
Data gaps	• Household MSW compositions were not examined as part of the Tuvalu audit.
Key considerations	• It is recommended that compositional data is updated data on a regular basis. • 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 (%): 94.69 — Total weight of household waste generated = 604 tpa — Total weight of household waste captured responsibly = 572 tpa • The majority of household waste is captured on all islands in Tuvalu as all islands have access to a regular general or mixed waste collection service.
Assumptions	• The samples collected during survey and audits did not capture each household's disposal method, or the weight of waste captured by management services, so census data was used and extrapolated across household audit results. $$Household\ waste\ capture\ rate\ (\%) = \frac{weight\ of\ managed\ waste\ (tpa)}{total\ household\ waste\ generated\ (tpa)}$$ Total weight of managed waste is calculated as the product of: $$weight\ of\ managed\ waste\ (tpa) = \frac{household\ collection\ coverage\ (\%)}{total\ household\ waste\ generated\ (tpa)}$$ Collection service coverage (%) is the product of: $$household\ collection\ coverage\ (\%) = \frac{number\ of\ households\ with\ some\ form\ of\ collection\ service}{total\ number\ of\ households}$$ 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: $$total\ household\ waste\ generated\ (tpa)$$ $$= average\ waste\ generation\ rate\ of\ location\ \left(\frac{\frac{kg}{capita}}{year}\right)$$ $$\times location\ population$$
Data gaps	• None
Key considerations	• The vast majority of household waste generated in Tuvalu is captured by waste management services. • The audit reported that for some of the outer islands, Nukuefetau and Nulaelae Islands, an estimated 95% to 100% household collection coverage had been achieved.

Core KPI 7: Household collection service coverage

Results	Household collection service coverage (%): 90.36
	
	• Based on reviews examined in the audit report, household collection coverage is as follows:
	    – Funafuti: 100%
	    – Other islands: 80%
	
	• General waste, green waste, bulky and hazardous waste, and nappies all have their own dedicated collections services on Funafuti Island.
	
	• There is one service that covers the collection of bulky waste, green waste and nappies on the outer islands.

Assumptions	• The performance indicator result has been calculated based on information from 2021 census data: – Number of households • Household coverages were not reported for each island in Tuvalu. The household collection service coverages provided above were extrapolated using census data from 2017.
Data gaps	• Household coverage was not reported for all islands individually.
Key considerations	• Most Tuvaluan households have access to a waste collection service. Full coverage was reported for households on Funafuti. • A smaller proportion of the populations on the outer islands do not receive collections. • Communities without collection services are more likely to manage waste via burning, dumping, burying, or littering. Expanding outer island household coverage would increase the waste capture rate and reduce the quantity of waste that is mismanaged.

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

Results	Fulfillment of MEA reporting requirements (%): 40.00%			
	Convention	**Status**	**Reporting requirements**	**Reports delivered**
	Basel Convention	Accession	Annual reports (2)	0
	Minamata Convention	Accession	First national reports due 2021 (1)	1
	Stockholm Convention	Accession	5 reporting cycles (5)	1
Assumptions	• None			
Data gaps	• Only MEA's with mandatory reporting requirements were included in the calculation of this KPI. • For conventions like the Waigani convention or Rotterdam convention, strict reporting requirements are not enforced and so are not included in the calculation.			
Key considerations	• Tuvalu is up to date with required reports to the Minamata convention on mercury. • Tuvalu is a recent member party to the Basel convention (signing in 2020). It has yet to deliver an annual report. • Tuvalu has been a member party to the Stockholm convention since 2004. It has not recently delivered a national report during reporting cycles.			

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. • Lacking 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. • Governments and private industry would also be more able to accurately budget for estimated future costs. • Combined with accurate measurements of the total waste disposed per annum, the total national cost of landfilling in Tuvalu will be able to be determined.

Supplementary KPI 2: Total weight of waste disposed

Results	Total weight of waste disposed (tonnes per annum): 1,150
Assumptions	• None
Data gaps	• Limited to no information available to calculate the annual quantity of waste disposed (tpa), as tonnages were only reported for 2 out of 9 of Tuvalu's dumpsites/landfills.
Key considerations	• Current weight of waste disposed is not representative of all waste sent to landfill in Tuvalu due to data gaps. • This KPI is expected to increase considerably once data is collected from other facilities in the future using the waste facility register suggested in the DCMR Framework.

Supplementary KPI 3: Total weight of waste recovered

Results	Total weight of waste recovered (tonnes per annum): 71.7
	
	• In Tuvalu, green is waste is collected, shredded, and composted before being used for vegetable planting and as organic fertiliser. Recycling green waste through mulching is a common practice across the islands.
	
	   – Approximately 206 tonnes of green waste (primarily consisting of pandanus, breadfruit, and other trees) is generated on Funafuti per annum.
	
	   – Of the 206 tonnes generated, approximately 72 tonnes are collected and composted per annum.

Assumptions	• Green waste recovery estimates only provided for Funafuti, and not for any other of the islands of Tuvalu. • Volumetric estimates for green waste generation and recovery provided in the audit report were converted to tonnes using density conversion factors provided by the NSW EPA.
Data gaps	• No information presented on recorded weights of any waste recovered at any disposal site in Tuvalu in examined audit reports. • The audit reports presented no estimates for e-waste and used oils collected for export to Fiji.
Key considerations	• According to the information provided by the audit report, composting of green waste is the most practiced method of resource recovery in Tuvalu. The result of this indicator is expected to change significantly as data becomes more available in the future. • Calculation requires the completion of the waste facility register with the inclusion of data for any recovery facilities operating in Tuvalu. Reporting on this performance indicator will provide an indication of the effectiveness of a country's waste management systems, and a comparative data point for other countries and time periods.

Supplementary KPI 4: Volumes of stockpiled hazardous waste

Results	Volumes of stockpiled hazardous wastes (m^3): — Asbestos: 33 — E-waste: 30 — Healthcare and pharmaceutical waste: No data — Used oil: 2 — Used tyres: 4 — Obsolete chemicals: No data
Assumptions	• None
Data gaps	• Missing information for healthcare and pharmaceutical, and obsolete chemical waste stockpiles.
Key considerations	• The volume of other hazardous waste stockpiles in Tuvalu remains unknown. • Landfill audits, and the completion of the waste facility register as proposed by the DCMR Framework, will provide the information required to calculate this indicator in the future.

Supplementary KPI 5: Marine plastic pollution potential

Results	Marine plastic pollution potential (tonnes per annum): No data
Assumptions	• None
Data gaps	• This performance indicator relies on household waste composition data for its calculation. Household MSW compositions were not examined as part of the Tuvalu audit. Therefore, the weight of mismanaged plastic was not able to be calculated.
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 the 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 (%): 85.71%**
	  — Number of successfully implemented waste initiatives = 18 out of 21
	  — Number of pipeline/planned waste initiatives = 3
	• Implemented initiatives include:
	  — National Strategy for Sustainable Development 2016 – 2020
	  — Sustainable and Integrated Water and Sanitation Policy 2012 – 2021
	  — National Strategic Action Plan for Climate Change and Disaster Risk Management 2012 - 2016
	• Pipeline initiatives include:
	  — Accession to the Basel Convention
	  — Container Deposit Scheme
	  — Waste taxation

Assumptions	• None
Data gaps	• None
Key considerations	• Tuvalu's Government is prioritising environmental protection by implementing policies which deal with waste management, most notably the Environment Act 2007 and the Waste Management and Services Act 2009. • Tuvalu has taken significant steps in waste management policy by enacting the Waste Management (Ban on Single-Use Plastic Imports) Regulation 2019 and a waste management regulation, alongside the litter Waste Management (Littering and Disposal) Regulation 2018.

Supplementary KPI 8: Commercial waste capture rate

Results	**Commercial waste capture rate (%): Insufficient data** • Measured as the fraction of the total waste captured through formal waste management services over the total waste generated by businesses. • Without further estimates of commercial waste generation rates and the number of businesses, this indicator cannot be calculated.
Assumptions	• None
Data gaps	• Commercial waste generation rates were presented for Funafuti and Vaitupu, but not for the outer islands. • The estimated number of workers (in Funafuti and elsewhere in Tuvalu) that were used to determine commercial waste generation rates were not provided in the audit reports. • No estimate for the total amount of commercial waste successfully captured by management services was identified in the audit report. • No information on the number of businesses in Tuvalu provided by the audit report. • No information as to the total amount of waste generated by businesses.
Key considerations	• 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. • 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.

 Supplementary KPI 9: Commercial collection service coverage

Results	**Commercial collection service coverage (%): Insufficient data** • Commercial collection services are available to all the islands of Tuvalu. Commercial collections are charged between AUD$110 and $410. It is likely that a significant proportion of businesses in Tuvalu could access collection service, but there is insufficient data available in the audit report to confirm this.
Assumptions	• None
Data gaps	• No information on the total number of businesses participating in collection services nationally. • No information on the specific commercial collection service coverages by region. • No information provided on the access that businesses have to alternative collection services (e.g., waste disposal-points or self-haul).
Key considerations	• Accurate calculation relies on understanding the total number of businesses participating nationally, and specific collection service coverages for businesses. • 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 the load of any 'disaster waste' carrying vehicles entering the facility will help reconcile waste amounts disposed if these wastes are not managed separately.