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PacWastePlus
PACIFIC WASTE MANAGEMENT

This initiative is supported by **PacWastePlus**-a 85-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.**

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# Tuvalu National Waste Audit Analysis Report

June 2025

This 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).

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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

**www.pacwasteplus.org**

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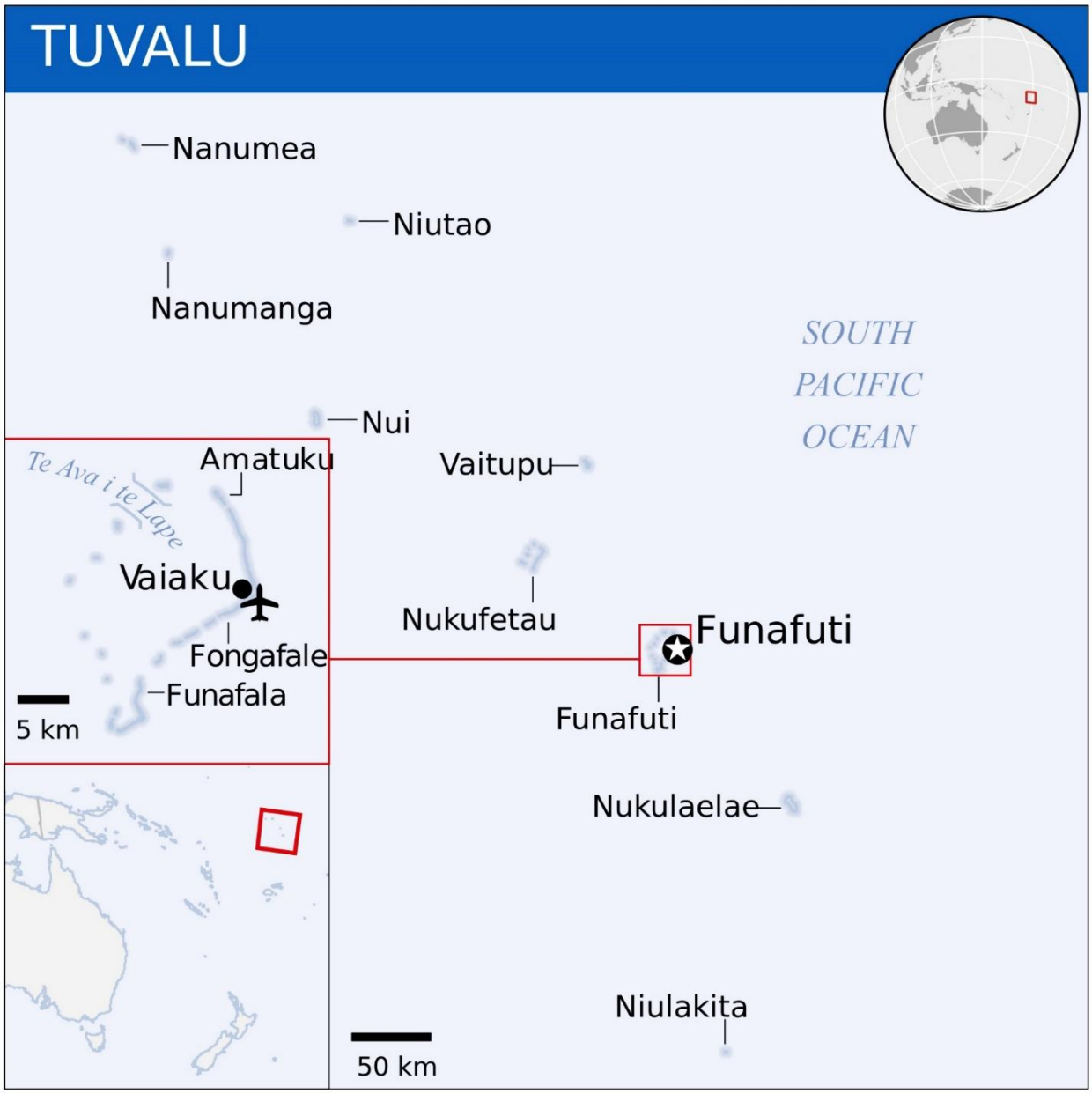
# Map of Tuvalu




*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 ($/tonne) | 62.33 |
| **2.** Count / capacity of unregulated waste facilities | 10 / Capacity unknown | 2. Weight of waste disposed (tpa) | 730 |
| **3.** National recovery rate (%) | 22.48 | 3. Weight of waste recovered (tpa) | 82.5 |
| **4.** Per capita waste generation rate (kg/capita/year) | 30.61 | 4. Volume of stockpiled hazardous waste ($m^3$) | Asbestos:33.00<br>E-waste:30.00<br>Healthcare and pharmaceutical:0.00<br>Used oil 2.00<br>Used tyres:4.00<br>Obsolete chemicals:0.00<br>Other 0.00 |
| **5.** Municipal Solid Waste (MSW) Composition (%) | Figure (a) | 5. Marine plastic pollution potential (tpa) | 9.59 |
| **6.** Household waste capture rate (%) | 91% | 6. Awareness and support of waste management services (%) | 72% |
| **7.** Household collection service coverage (%) | 91% | 7. Proportion of strategic waste management initiatives implemented (%) | 86% |
| 8. Fulfillment of MEA reporting requirements (%) | 40% | 8. Commercial waste capture rate (%) | 95% |
| | | 9. Commercial collection service coverage (%) | 84% |
| | | 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.***

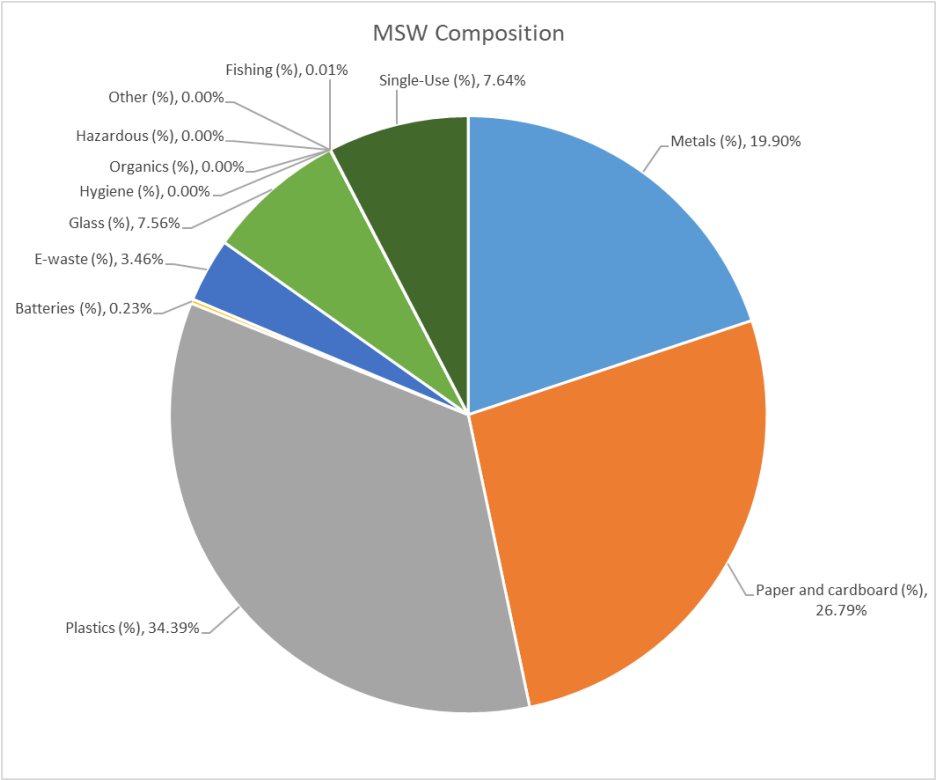



*Figure (a) Tonga Municipal Solid Waste (MSW) Composition (% by weight)*

# 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;
- Collect additional data to address gaps of the 2023 Waste Analysis Report; 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 by Asia Pacific Waste Consultants (APWC) 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.
- 2019 Waste Audit
- 2023 National Waste Audit Analysis Report
- 2025 Additional data & Consulting Waste Facility Register
- Other relevant documents

## 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 | Year | Location/s | Sample Size/s | Method for Data Collection | Reported Data | Notes |
|---|---|---|---|---|---|---|
| **Tuvalu Waste Audit PRIF[1]** | 2019 | Vaitupu, Funafuti | 195 | Household audit | Per capita generation, waste composition, total household waste generated | |
| **Tuvalu Waste Audit PRIF** | 2019 | Vaitupu, Funafuti | 140 | Household survey | Waste collection coverage, Awareness of waste services | |
| **Tuvalu Waste Audit PRIF** | 2019 | Funafuti | 15 | Commercial audit | Per employee waste generation | |
| **Tuvalu Waste Audit PRIF** | 2019 | Funafuti | 21 | Commercial survey | Waste collection coverage | |
| **Tuvalu National Waste Audit Analysis Report MRA Consulting Group** | 2023 | Nationwide | The National Waste Audit Analysis Report uses data from the Waste Audit Report outlined above. | | | |
| **Waste Facility Register Eunomia Research & Consulting** | 2025 | Funafuti, Niutao, Nanumanga, Nukulaelae, Vaitupu, Nui, Nukufetau | 183 | Updated household survey | Waste collection coverage, Awareness of waste services | |
| **Waste Facility Register** | 2025 | Funafuti, Nanumaga, | 38 | Updated commercial | Waste collection | |

| Data Source | Year | Location/s | Sample Size/s | Method for Data Collection | Reported Data | Notes |
|---|---|---|---|---|---|---|
| **Eunomia Research & Consulting** | | Niutao, Nui, Nukufetau | | survey | coverage | |
| **Waste Facility Register Eunomia Research & Consulting** | 2025 | Tuvalu | | Facility registers | Number and capacity of facilities, waste disposed, waste recovered, cost of landfill operation, hazardous waste stockpiled, disaster waste | |

## 2.2 Data Analysis

The datasets listed in the table above were analysed for relevant information to be collated into PICT specific databases. The extracted data was then used to calculate the 18 KPIs according to the calculation methodologies as detailed in the DCMR Framework. The main assumptions made and challenges met 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 the corresponding KPI in section 3.0 Analysis.

### 2.2.1 Main Assumptions

- The main assumption is that the previously collected data is representative of the goals of the current project. Previous audit was conducted on a large and geographically dispersed sample of households and businesses, but the method of sampling was cross-sectional, i.e., multiple samples were collected at one point in time. Therefore, for these results to be representative, we need to make two key assumptions:
    1. Seasonal variation in waste generation and composition is non-existent or low,
    2. Large time-frame variation (several years) in waste generation and composition is non-existent or low.
- While there are solid grounds for these assumptions, there are no empirical records to support them.
- Specific assumptions for each KPI calculations are also discussed in Section 3.2 KPI Reporting Results. For calculation of national averages involving different geographical locations, weighting is done to ensure a more representative value at the national level. This applies to both household/commercial audits and community surveys.

### 2.2.2 Main Challenges

The collection and analysis of data to measure the KPIs can be quite challenging in the Pacific Region due to the following:

1. Oftentimes, facilities do not carry licenses and as such, capacity to accept waste is not always known. In most cases, operation exceeds capacity due to lack of foresight on the remaining capacity. In addition, planning for new waste facilities can be daunting due to limited options to locate a site. The reasons could be land tenure, site suitability especially for atoll islands, and community approval for potential sites within human settlements.

2. Most of the waste facilities did not undergo Environmental Impact Assessment and as such are operating without necessary environmental controls. This could have been addressed in the licensing process but is not happening due to limited options available to site the facilities.
3. Data collection relies on guess estimates due to lack of proper recording system of waste material flow and receipt of these materials in the facilities. The measurement of capture rate could be very challenging with the lack of data on wastes received in the facilities.
4. It is hard to determine recovery of materials to calculate national recovery rate since most of the materials remain stockpiled and not processed or exported and as such cannot be considered a return to economy. In the case of green waste diversion, Tuvalu has a good system of recovery and processing of these materials producing compost or mulch.
5. Request for information from the countries is very challenging given the very limited time to deliver this project. Based on Consultants' experience working in the Pacific, requested data may be likely provided within four months at a minimum.
6. Most disposal sites are unregulated and are operating sub-standardly and cost may not reflect what should have been spent. Also, most disposal sites operate on a fixed budget and do not consider changing disposal pattern and as such performance improvement cannot be monitored through disposal costs.
7. There is difficulty in locating stockpiles since some of these are stored in backyards with no proper storage facility. Most of the stockpiles are unreported.
8. There seems to be ambiguity in measuring success of initiatives since there is no established M & E framework in national implementation of projects unless the project is regional in scope with donor funding
9. The disposal sites are not recording incoming disaster waste since these are emergency actions which are not closely monitored. There may have been disaster wastes dumped anywhere close to the affected areas and remain there for a long time. Demolition may take years.
10. While the introduction of Kobo Toolbox may be helpful in recording data on the spot, there is some degree of reluctance on its use with more preference still given to the paper record. An intensive training on its use as part of a separate data recording training would promote its wider use.

## 2.3 Key Performance Indicators

The DCMR Framework introduces a series of KPIs (see **Table 2**). 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 2 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***

| Calculated with additional data | Calculated in Previous Report | No data |
|---|---|---|

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

## 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**<br>• It has been confirmed during the country visit that 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.<br>• There is a newly built transfer station in Funafuti but awaiting further information on material flow in the facility.<br>**Capacity of modern waste facilities (tonnes per annum): Not Applicable** |
| **Assumptions** | None |
| **Data gaps** | • Only two of the dumpsites/landfills were examined over the course of the audit (Funafuti and Vaitupu) although the existence of a dumpsite in each of the islands is known.<br>• No information received regarding the staffing, equipment access, or use of daily cover at any of the other 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. |

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

| | |
|---|---|
| **Result** | Count of unregulated waste facilities: 10<br>• Each of the 9 islands in Tuvalu has a dedicated area for a dump site and there is a newly built transfer station in Funafuti.<br>• 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'.<br>• 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 in Tuvalu utilise regular staff. There are, however, designated waste officers in each of the islands.<br>• Funafuti landfill is staffed, fenced and has access to dedicated equipment.<br>• 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.<br>**Capacity of unregulated waste facilities (tonnes per annum): No data**<br>• 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. The landfill was rehabilitated in the same year and additional capacity was obtained. |
| **Assumptions** | None |
| **Data gaps** | • No processing or storage capacities of the unregulated facilities in Tuvalu were identified.<br>• The audit only examined two landfill/dumpsites (Funafuti and Vaitupu).<br>• No facility registers returned |
| **Key considerations** | • Lack of leachate management at all the waste facilities is putting the environment and community at risk of hazards due to contamination and material flow.<br>• 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.<br>• 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.<br>• 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 3: National recovery rate**

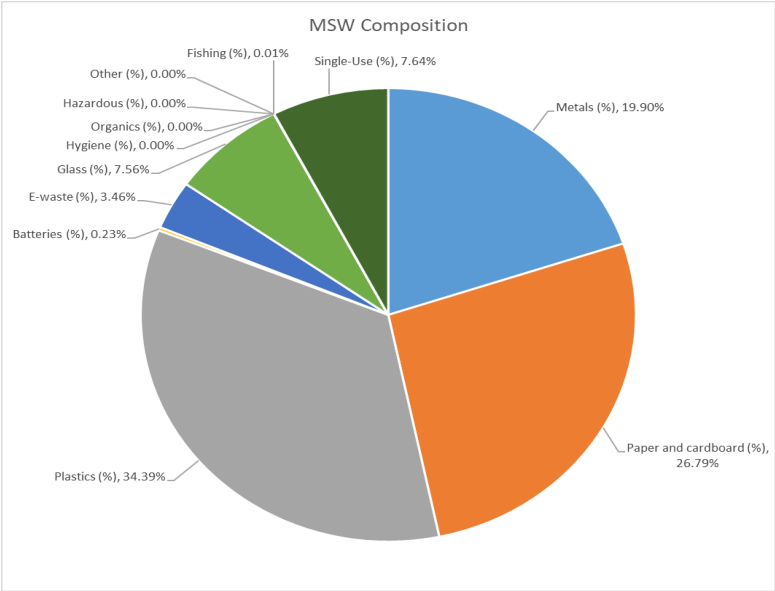
| | |
|---|---|
| **Results** | **National recovery rate (%): Insufficient data (Funafuti green waste: 22.48**<br>• In Tuvalu, green is waste is collected, shredded, and composted before being used as organic fertiliser for vegetable planting. Recycling green waste through mulching is a common practice across the islands.<br>• Approximately 206 tonnes of green waste (primarily consisting of pandanus, breadfruit, and other trees) is generated on Funafuti per annum.<br>• Of the 206 tonnes generated, approximately 72 tonnes are collected and mulched per annum.<br>• The waste levy or advanced recovery fee and deposit scheme allows redemption of used Al cans and PET bottles. A total of 10.5 tpa of these items were recovered through this scheme. |
| **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)".<br>• One redeemed item in the ARFD scheme is estimated to weigh 15 g/item. The total redeemed number of items (699,370) was converted to tpa<br>• The quantity of AL cans and PET bottles were estimated using the MSW composition data of 20% and 34% of calculated annual waste generation, respectively. |
| **Data gaps** | • Green waste recovery estimates provided for Funafuti only, no other of the islands of Tuvalu.<br>• 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.<br>• No information on the total mass of material diverted from landfill (tpa).<br>• Available data is not current. Redemption data was obtained in 2021. |
| **Key considerations** | • There are no records of waste diverted from landfill or recovery facility. The full operation of the Material Recovery Facilities with proper recording system will allow this KPI to be measured.<br>• 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.<br>• The ARFD scheme worked well during its infancy years in 2020 and 2021. It should be sustained.<br>• 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): 30.61**<br>– kg/capita/day: 0.084<br>– kg/household/day: 0.49 |
| **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.<br>• 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.<br>• 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** | Plastics is the most prevalent waste category for household waste in Tuvalu. This is followed by paper and cardboard, metals, single-use plastics, and glass, detailed below:<br>Plastics – 34.39%<br>Paper and cardboard – 26.79%<br>Metals – 19.90%<br>Single-use plastics – 7.64%<br>Glass – 7.56% |




| | |
|---|---|
| **Assumptions** | None |
| **Data gaps** | • Household MSW compositions were only examined in Funafuti and Vaitupu as part of the Tuvalu audit. |
| **Key considerations** | • The prevalence of plastics in Tuvalu's waste stream prompted the development of policies targeted for this category.<br>• Organics, hygiene and hazardous waste are absent in the waste stream of Tuvalu reflecting diversion of these materials from the landfill through dedicated collection of each waste type.<br>• Periodic updating of waste composition is valuable to determine changing consumption and disposal patterns as well as impacts of the pandemic and climate change or weather events which may have changed the proportions of waste types sourced from households.<br>• 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 (%): 91.44**<br>– Total weight of household waste generated = 140 tpa<br>– Total weight of household waste captured responsibly = 128 tpa<br>– 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.<br>$$Household\ waste\ capture\ rate\ (\%) = \frac{weight\ of\ managed\ waste\ (tpa)}{total\ household\ waste\ generated\ (tpa)}$$<br>Total weight of managed waste is calculated as the product of:<br>$$weight\ of\ managed\ waste\ (tpa) = \frac{household\ collection\ coverage\ (\%)}{total\ household\ waste\ generated\ (tpa)}$$<br>Collection service coverage (%) is the product of:<br>$$household\ collection\ coverage\ (\%) = \frac{number\ of\ households\ with\ some\ form\ of\ collection\ service}{total\ number\ of\ households}$$<br>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:<br>$$total\ household\ waste\ generated\ (tpa) = average\ waste\ generation\ rate\ of\ location\left(\frac{\frac{kg}{capita}}{year}\right) \times location\ population$$ |
| **Data gaps** | No information on the weight of waste captured by waste management services or received in the facilities which reflects why the collection coverage and capture rate values are quite similar. |
| **Key considerations** | • The vast majority of household waste generated in Tuvalu is captured by waste management services.<br>• 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 (%): 91.44**<br>• Based on reviews examined in the audit report, household collection coverage is as follows:<br>– Funafuti: 100%<br>– Other islands: 80%<br>• General waste, green waste, bulky and hazardous waste, and nappies all have their own dedicated collections services on Funafuti Island.<br>• 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 2022 census data:<br>• Number of households<br>• Household coverages were not reported for each island in Tuvalu. The household collection service coverages provided above were extrapolated using census data from 2022. |
| **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.<br>• A smaller proportion of the populations on the outer islands do not receive collections.<br>• 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.<br>• 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.<br>• Tuvalu is a recent member party to the Basel convention (signing in 2020). It has yet to deliver an annual report.<br>• 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): 62.33** |
| **Assumptions** | An annual cost of 45,500 USD was estimated based on annual budget (personal communication) for Funafuti Dumpsite. This has to be validated with actual records and still awaiting confirmation. |
| **Data gaps** | • The calculation only considered Funafuti Dumpsite due to lack of information on the other facilities.<br>• Lacking information to calculate the annual quantity of waste disposed in the rest of the facilities (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.<br>• Governments and private industry would also be more able to accurately budget for estimated future costs.<br>• 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): 730** |
| **Assumptions** | • The quantity was only estimated for Funafuti due to lack of information for the rest of the islands. This is based on an estimate of 10 m3 of household waste entering the landfill daily as per the audit report.<br>• A density of 0.2 tonnes/m3 was used to convert volume to tonnage1. |
| **Data gaps** | • Annual tonnages were only reported for 7 out of 9 of Tuvalu's dumpsites. |
| **Key considerations** | • The disposal record in 7 out of 9 dumpsites is a good representative of national figure but would be more reliable if data from all sites are presented. |

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

| | |
|---|---|
| **Results** | **Total weight of waste recovered (tonnes per annum): 82.50**<br>• Of the 206 tonnes of green waste generated, approximately 72 tonnes are collected and composted per annum.<br>• Of the 160.92 tonnes of Al cans and PET bottles generated, approximately 10.5 tonnes are recovered through the ARFD |
| **Assumptions** | • Green waste recovery estimates only provided for Funafuti, and not for any other of the islands of Tuvalu.<br>• 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.<br>• The quantity of AL cans and PET bottles were estimated using the MSW composition data of 20% and 34% of calculated annual waste generation, respectively. |
| **Data gaps** | • No information presented on recorded weights of any waste recovered at any disposal site in Tuvalu in examined audit reports.<br>• The audit reports presented no estimates for e-waste and used oils collected for export to Fiji.<br>• Only green wastes are recorded as waste recovered. |
| **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.<br>• 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 ($m^3$):<br>– Asbestos: 33<br>– E-waste: 30<br>– Healthcare and pharmaceutical waste: No data<br>– Used oil: 2<br>– Used tyres: 4<br>– 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.<br>• 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): 959** |
| **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** | • The relatively low potential of marine plastic pollution despite higher plastic composition may have been attributed to higher collection coverage.<br>• 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 (%): 72.13** |
| **Assumptions** | • A new household survey was conducted covering more islands, i.e., Funafuti, Niutao, Nanumanga, Nukulaelae, Vaitupu, Nui, and Nukufetau. The updated raw data was used to calculate this KPI.<br>• The survey question assessed the collection service as a whole, and was not directed to all possible waste services. Therefore, a value of 1 was assigned as number of available services in the formula to calculate awareness. |
| **Data gaps** | – None |
| **Key considerations** | • A high percentage of awareness of waste services is recorded owing to focus given to educational campaigns. There is a dedicated person to undertake this task.<br>• 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%**<br>– Number of successfully implemented waste initiatives = 18 out of 21<br>– Number of pipeline/planned waste initiatives = 3<br>• Implemented initiatives include:<br>– National Strategy for Sustainable Development 2016 – 2020<br>– Sustainable and Integrated Water and Sanitation Policy 2012 – 2021<br>– National Strategic Action Plan for Climate Change and Disaster Risk Management 2012 - 2016<br>• Pipeline initiatives include:<br>– Accession to the Basel Convention<br>– Container Deposit Scheme<br>– 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.<br>• 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 (%): 95.21**<br>• Theoretically, this is measured as the fraction of the total waste captured through formal waste management services over the total waste generated by businesses. |
| **Assumptions** | The number of registered businesses was used to calculate a weighted average of daily generation per business from the audit, and assumed that each country has 250 workdays a year. |
| **Data gaps** | • Commercial waste generation rates were presented for Funafuti and Vaitupu, but not for the outer islands.<br>• 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.<br>• No estimate for the total amount of commercial waste successfully captured by management services was identified in the audit report. |
| **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.<br>• 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 (%): 84.21**<br>• 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.<br>• No information on the specific commercial collection service coverages by island.<br>• 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.<br>• 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**<br>• 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.<br>• 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.<br>• 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.<br>• 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. |

# 4 Conclusion

From this exercise, the following findings and recommendations are drawn:

- There could be a big opportunity to promote the DCMR framework at the national level to enable the availability of more reliable regional data for strategic planning by SPREP through this project. However, this would entail more intensive training at the country level to ensure uptake of knowledge and sustained compliance to the framework. In addition, there should be a pilot year set-up for data collection before new annual KPI calculations are made.
- Tuvalu which is one of the countries whose audit was conducted prior to the development of a common approach in audit was not able have sufficient data to calculate the KPIs in the DCMR Framework. With further investigation of the raw data, calculations of most of the KPIs were done in this study.
- With the EU support to waste management in Tuvalu through the EDF 11 funding, it could be possible that waste management in Tuvalu has improved. However, this has not been captured yet in the 2019 audit. It is compelling to have another audit to capture these improvements.
- The improved waste management system in Tuvalu should be sustained and further support is needed for areas with limited data availability. There is a strong need to encourage continuous recording system to be in place for most of the facilities in the countries.
- The online recording system can potentially contribute to the collection and storage of data. This can facilitate easy access to the data and reduces risk of data loss.
- While the previous 2023 analysis presented KPI calculations based on sufficient data in Tuvalu, some of these KPIs were recalculated based on raw data from waste auditors who did the actual audit. There were differences (some are slight) owing to the weighting approach done in the calculation of national averages. There were also KPIs with no data reported in the previous report which are actually available from the raw data of the actual waste audit. The common methodology approach which was agreed prior to the recent audits should be strictly used to allow lateral comparison among the countries and enable more reliable regional data.
- There is still a huge gap in the data received from countries owing to the limited recording system available to monitor waste material flow. If recording is done regularly and data stored properly and made available for any legitimate request from external customers, there may be lower probability of obtaining guess estimates of material flow. The confidence level of available data could be higher.

# 5 Appendix

## 5.1 Collection Methods

The KPIs are calculated from a range of data sources. They are listed in the below table with information about what KPIs they inform, how they work, and how often they need to be collated.

| Collection Method | What the Collection Method Informs | About the Collection Method | Frequency of Reporting |
|---|---|---|---|
| **Waste Facility Register** | **KPI 1** Count and capacity of modern waste facilities<br>**KPI 2** Count and capacity of unregulated waste facilities<br>**KPI 3** National recovery rate<br>**SKPI 1** Cost of disposal to landfill<br>**SKPI 2** Weight of waste disposed<br>**SKPI 3** Weight of waste recovered<br>**SKPI 4** Volume and type of stockpiled hazardous waste<br>**SKPI 10** Weight of disaster waste disposed. | The Waste Facility Register is a written survey that can be completed on Word, Excel, Kobo Toolbox, or something similar. It should be completed by or on behalf of waste facility operators. | Annual submission of monthly report (all KPIs and SKPIs).<br><br>As and when disaster events occur (SKPI 10). |
| **Household Community Survey** | **KPI 4** Per capita waste generation rate<br>**KPI 6** Household waste capture rate<br>**KPI 7** Household collection coverage<br>**SKPI 5** Marine plastic pollution potential<br>**SKPI 6** Awareness and support of waste management services. | The Household Community Survey is a written survey that can be completed on Word, Excel, Kobo Toolbox, or something similar. It should be completed by or on behalf of households in Tuvalu. Sample size: 183; Locations: Funafuti, Niutao, Nanumanga, Nukulaelae, Vaitupu, Nui, Nukufetau | Every five years. |
| **Household Compositional Waste Audit** | **KPI 4** Per capita waste generation rate<br>**KPI 5** Municipal solid waste (MSW) composition<br>**KPI 6** Household waste capture rate<br>**SKPI 5** Marine plastic pollution potential. | The Household Compositional Waste Audit is a sort and weigh audit undertaken according to the Waste Audit Methodology: A Common Approach.[1] Sample size: 195; Locations: Vaitupu and Funafuti | Every five years. |
| **Commercial Community Survey** | **SKPI 6** Awareness and support of waste management services<br>**SKPI 8** Commercial collection service coverage<br>**SKPI 9** Commercial collection service | The Commercial Community Survey is a written survey that can be completed on Word, Excel, Kobo Toolbox, or something similar. It should be completed by or on behalf | Every five years. |

[1] https://www.sprep.org/sites/default/files/documents/publications/waste-audit-methodology-common-approach.pdf

| Collection Method | What the Collection Method Informs | About the Collection Method | Frequency of Reporting |
|---|---|---|---|
| | coverage. | of households in Tuvalu. Sample size: 38; Locations: Funafuti, Nanumaga, Niutao, Nui, Nukufetau | |
| **Commercial Compositional Audit** | **KPI 4** Per capita waste generation rate<br>**KPI 5** Municipal solid waste (MSW) composition<br>**SKPI 5** Marine plastic pollution potential. | The Commercial Compositional Waste Audit is a sort and weigh audit undertaken according to the Waste Audit Methodology: A Common Approach. Sample size: 15; Locations: Funafuti | Every five years. |
| **Landfill Activity Audit** | Landfill Activity Audits can help to validate incomplete Waste Facility Register surveys. | | Every five years if Waste Facility Register is incomplete. |
| **Hazardous Stockpile Audit** | Hazardous Stockpile Audits can help to validate Waste Facility Register surveys that have incomplete data on stockpiled hazardous waste. The audits are typically visual and estimate volumes of the following hazardous waste categories:<br>• Asbestos<br>• E-waste<br>• Healthcare and pharmaceutical waste<br>• Used oil<br>• Used tyres<br>• Obsolete chemicals. | | Every five years if Waste Facility Register is incomplete. |
| **Policy Survey** | **KPI 8** Fulfilment of MEA reporting requirements<br><br>**SKPI 7** Proportion of strategic waste management initiatives implemented. | The Policy Survey is a written survey that can be completed on Word, Excel, Kobo Toolbox, or something similar. It quantifies the number of planned national and regional strategic initiatives over time. | Biennial. |
| **Disaster waste** | **SKPI 10** Weight of disaster waste disposed | Data on waste generated from disaster events is captured via the Waste Facility Register. | Annual/after disaster events. |
| **Census data** | **KPI 4** Per capita waste generation rate<br>**SKPI 5** Marine plastic pollution potential. | Population data to inform the per capita waste generation rate and marine plastic pollution potential. | N/A |
| **Customs Import and Export Data** | Can be used to inform KPIs on waste generation, recovery rate, and capture rates. | | N/A |

| Collection Method | What the Collection Method Informs | About the Collection Method | Frequency of Reporting |
|---|---|---|---|
| **Commercial Data** | Number of total businesses and type to allow data to be used for national extrapolation. | | N/A |

**5.2**

## 5.3 KPI Calculations

### 5.3.1 Calculations for Core KPIs

| KPI | Data Source/s | Formula and Notes | Definitions |
|---|---|---|---|
| **1. Count / capacity of modern waste facilities** | **Waste Facility Register** | **Count of modern facilities**<br>The number of modern waste facilities, including incinerators.<br><br>**Capacity of modern facilities**<br>The theoretical maximum facility capacity based on the facility license in tonnes per annum for each modern waste facility, including incinerators. | **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 waste 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.<br><br>**Waste facilities** – '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 |

| KPI | Data Source/s | Formula and Notes | Definitions |
|---|---|---|---|
| | | | controlled manner), recycling / recovery facilities for dry recyclables (and e-waste), organics recovery facilities, and waste-to-energy facilities. |
| **2. Count / capacity of unregulated waste facilities** | **Waste Facility Register** | **Count of unregulated facilities**<br>The number of unregulated waste facilities.<br><br>**Capacity of unregulated facilities**<br>The theoretical maximum facility capacity based on the facility license in tonnes per annum for each unregulated waste facility. | **Unregulated** – typically unlicensed waste facilities which do not follow international frameworks, rules, and guidelines to protect the health of the environment and community.<br><br>**Waste facilities** – refer to **KPI 1** definitions above. |
| **3. National recovery rate (%)** | **Waste Facility Register** | **National recovery rate**<br>Calculated using the below formula:<br>$\frac{Tonnes\ per\ annum\ of\ waste\ diverted\ from\ landfill}{Tonnes\ per\ annum\ of\ waste\ received\ by\ all\ waste\ facilities}$<br><br>This excludes informal and small-scale recovery activities that take place outside of waste facilities. However they can be calculated separately using the following formula where waste generated is the sum of what is recovered and disposed of:<br><br>$\frac{Tonnes\ per\ annum\ of\ target\ waste\ stream\ recovered}{Tonnes\ per\ annum\ of\ target\ waste\ stream\ generated}$<br><br>• Where facilities do not have weighbridges conversion factors can be applied to convert volume ($m^3$) to tonnage (t). | **Recovery** – any activity that diverts waste material from landfill, including:<br>• Dry recycling – the separation and reprocessing of dry recyclables including paper, cardboard, metal, and certain plastics.<br>• Organics recovery – the mulching or composting of mixed organics to produce new products.<br>• Energy recovery – waste |

| KPI | Data Source/s | Formula and Notes | Definitions |
|---|---|---|---|
| | | | processing that allows for the capture and reuse of energy. |
| **4. Per capita waste generation rate (kg/capita/year)** | **Household waste audit**<br><br>**Household Community Survey**<br><br>**Census data** (population distribution, socio-economic conditions) | **Per capita waste generation rate**<br>Calculated using the below formula:<br><br>$$\frac{Tonnes\ per\ annum\ of\ waste\ generated}{National\ population}$$<br><br>This KPI considers household waste only.<br><br>This calculation needs to consider the locations where compositional waste audits and surveys were undertaken to apply the audit results appropriately over the PICT. Waste generation varies between settlement types (urban/rural, main island/outer islands, etc.) and as these settlements are distributed uniquely in each PICT it needs to be considered in the calculation. This will be addressed in Section 3.0 Analysis of KPI Results to provide more detail about how the calculation was addressed for each PICT. | **Per capita** – units measured in a per capita (i.e., per person) basis to allow for extrapolation over a national population.<br><br>**Waste generation rate** – waste generation measured at the point of origin and includes all disposal pathways (formal collection, dumping, burning, burying or other means). |
| **5. Municipal Solid Waste (MSW) composition (%)** | **Household waste audit**<br><br>**Household Community Survey** | **MSW composition**<br>The breakdown of the following waste materials by percentage:<br>• Batteries<br>• E-waste<br>• Fishing<br>• Glass<br>• Hazardous<br>• Hygiene<br>• Metals<br>• Organics<br>• Other<br>• Paper and cardboard<br>• Plastics<br>• Single-use<br>This calculation needs to consider the locations where compositional waste audits were undertaken to apply the audit results appropriately over the PICT. Waste generation varies between settlement types (urban/rural, main island/outer islands, etc.) and as these settlements are distributed uniquely in | **Municipal Solid Waste** (MSW) – waste originating from the public (typically managed by local government entities) and excludes commercial waste. |

| KPI | Data Source/s | Formula and Notes | Definitions |
|---|---|---|---|
| | | each PICT it needs to be considered in the calculation. This will be addressed in Section 3.0 Analysis of KPI Results to provide more detail about how the calculation was addressed for each PICT. | |
| **6. Household waste capture rate (%)** | **Household waste audit**<br><br>**Household Community Survey**<br><br>**Census data** | **Household waste capture rate**<br>Calculated using the below formula:<br><br>$$\frac{\textit{Tonnes per annum of waste captured responsibly}}{\textit{Tonnes per annum of waste generated}}$$<br><br>This calculation needs to consider the locations where compositional waste audits and surveys were undertaken to apply the audit results appropriately over the PICT. Waste generation and access to formal waste management services vary between settlement types (urban/rural, main island/outer islands, etc.) and as these settlements are distributed uniquely in each PICT it needs to be considered in the calculation. This will be addressed in Section 3.0 Analysis of KPI Results to provide more detail about how the calculation was addressed for each PICT. | **Capture rate** – the proportion of total waste generated that is successfully captured and disposed of or recovered in an environmentally responsible manner. Waste capture can include:<br>• Waste collected by a household collection service.<br>• Waste that is self-hauled to a licensed waste disposal facility.<br>• Materials that are source separated and diverted to a recovery facility. |
| **7. Household collection service coverage (%)** | **Household Community Survey**<br><br>**Census data**<br><br>**Waste department records** (for validation) | **Household collection service coverage**<br>Calculated using the below formula:<br><br>$$\frac{\textit{Number of people surveyed with access to a service}}{\textit{Total number of people surveyed}}$$<br><br>This calculation needs to consider the locations where compositional surveys were undertaken to apply the results appropriately over the PICT. Access to waste services varies between settlement types (urban/rural, main island/outer islands, etc.) and as these settlements are distributed uniquely in each PICT it needs to be considered in the calculation. This will be addressed in Section 3.0 Analysis of KPI Results to provide more detail about how the calculation was addressed for each PICT. | • **Collection service** – a waste collection, transportation, and disposal service for household waste. Collection services can be either a house-to-house kerbside collection or community |

| KPI | Data Source/s | Formula and Notes | Definitions |
|---|---|---|---|
| | | | drop-off point. It is a requirement that the collection service be:<br>• Regular – services are provided consistently in a way the does not lead to negative environmental impacts or disrupted engagement.<br>• Accessible – drop-off points should be close to households included in the service.<br>• Affordable – if the service is user-pay, then it should be priced in a manner that is affordable to the target population.<br><br>**Coverage** – the proportion of the total households that have access to a regular waste collection service. |
| **8. Fulfilment of MEA reporting requirements (%)** | **Policy Survey** | **Fulfilment of MEA reporting requirements**<br>Calculated using the below formula:<br><br>$\frac{Number\ of\ satisfactorily\ completed\ reports}{Total\ number\ of\ reports\ required}$ | **Fulfilment** – to satisfy the condition of a reporting requirement to be fulfilled, it must:<br>• Delivered on time (whether by a specific deadline or at |

| KPI | Data Source/s | Formula and Notes | Definitions |
|---|---|---|---|
| | | | a regular reporting interval)<br>• Presented in the required format and units of measurement.<br>• Utilise the correct information portal or platform for reporting.<br>• Be based on accurate data collection methods.<br><br>**Multilateral environmental agreement** (MEA) – agreements between countries, usually taking the form of international conventions that strive to protect the environment through the implementation of actions to meet specific environmental goals. Some MEAs have obligations which are legally binding.<br><br>**Reporting requirements** – MEAs often require member nations to regularly report implementation plans, progress reports, and other information to the authoritative body of the MEA. |

### 5.3.2 Calculations for Supplementary KPIs

| KPI | Data Source/s | Formula | Relevant Definitions and Notes |
|---|---|---|---|
| **1. Cost of disposal to landfill ($/tonne)** | **Waste Facility Register** | **Cost of disposal to landfill**<br>Calculated in two steps, first using the below formula for each separate landfill:<br>$$\frac{\textit{Annual facility operating cost}}{\textit{Tonnes per annum of waste disposed to landfill}}$$<br>Secondly, calculating the national weighted average according to their proportional contribution to the total weight of waste disposed nationally. This will be addressed in Section 3.0 Analysis of KPI Results to provide more detail about how the calculation was addressed for each PICT. | **Cost of disposal** – a measure of a facility operating cost incurred for the disposal of every tonne of material that is sent to landfill. This does not measure the 'gate fee' charged by landfill facilities, which may include additional profit margins charged to customers.<br><br>**Landfill** – a waste disposal facility that primarily relies on burying of waste (includes both licensed and unlicensed facilities above the minimum processing threshold). |
| **2. Weight of waste disposed (tonnes per annum)** | **Waste Facility Register**<br><br>**Conversion factors** | **Weight of waste disposed**<br>The total weight in tonnes of waste that is disposed in all landfills across the PICT. Where facilities do not have a weighbridge conversion factors can be used. Where the Waste Facility Register is incomplete landfill audit activities can be used for validation. | **Disposed** - waste that is appropriately collected and landfilled, as opposed to waste which gets dumped, burned, buried, littered, or otherwise. |
| **3. Weight of waste recovered (tonnes per annum)** | **Waste Facility Register** | **Weight of waste recovered**<br>The total weight in tonnes of waste that is disposed in all recovery facilities across the PICT. Where facilities do not have a weighbridge conversion factors can be used.<br><br>Excludes informal waste recovery activities that take place outside of waste facilities, such as small-scale organics recovery or specialty recycling. | **Recovered** - waste that is appropriately collected and diverted from landfill through:<br>• Dry recycling – the separation and reprocessing of dry recyclables including paper, cardboard, metal, and certain plastics.<br>• Organics recovery – the mulching or composting of mixed organics to produce new products. |

| KPI | Data Source/s | Formula | Relevant Definitions and Notes |
|---|---|---|---|
| | | | • Energy recovery – waste processing that allows for the capture and reuse of energy. |
| **4. Volume and type of stockpiled hazardous waste ($m^3$)** | **Waste Facility Register**<br><br>**Alternative: Drones** to identify unreported stockpiles | **Volume and type of stockpiled hazardous waste**<br>The volume in cubic metres ($m^3$) for each hazardous waste stream:<br>• Asbestos<br>• E-waste<br>• Healthcare and pharmaceutical waste<br>• Used oil<br>• Used tyres<br>• Obsolete chemicals. | **Stockpile** – an accumulation of materials over a specified quantity and time, held in reserve or storage, that typically occurs during:<br>• Temporary storage until enough material is accumulated to treat or dispose of it efficiently.<br>• Temporary storage while commodity prices are low, until the value of the recovered materials rises.<br>• Inappropriate and permanent waste disposal.<br><br>**Type of Hazardous waste** – waste or waste products that present a risk to environmental or human health, either now or in the future. |
| **5. Marine plastic pollution potential (tonnes per annum)** | **Household waste audit**<br><br>**Household Community Survey**<br><br>**Census data** | **Marine plastic pollution potential**<br>Calculated in two steps, first quantify the weight of waste in tonnes per annum that is mismanaged using **KPI 4 Rate of household waste generation** and **KPI 6 Household waste capture rate:**<br><br>Mismanaged waste = $\boldsymbol{KPI\ 4} \times population \times (1 - \boldsymbol{KPI\ 6})$<br><br>Secondly, estimating the amount of plastic that has the potential to become marine pollution using the composition of plastic as a percentage (%) identified in **KPI 5 MSW Composition:**<br><br>Marine plastic pollution potential = | **Marine plastic pollution** – Waste plastics which are not managed in an environmentally sound manner, hence have a risk of polluting oceans and estuarine waterways. The KPI scope only considers macroscopic plastic waste (i.e., plastic that can be identified visually through compositional audits) originating from household sources. |

| KPI | Data Source/s | Formula | Relevant Definitions and Notes |
|---|---|---|---|
| | | $Mismanaged\ waste \times plastic\ composition\ (\%)$ | **Potential** – a theoretical estimate of the potential weight of plastic that ends up in the ocean annually. |
| **6. Awareness and support of waste management services (%)** | **Household Community Survey** | **Awareness and support of waste management services**<br><br>Calculated using the below formula:<br><br>$$\frac{Number\ of\ positive\ responses}{Number\ of\ available\ services\ \times Number\ of\ participants}$$ | **Awareness** – based on responses from the community awareness survey, the extent to which knowledge of waste management services is common in a community or on the country level.<br><br>**Waste management services** – Services available to the public for waste management, including:<br><br>• Access to waste collection services.<br><br>• Access to waste drop-off points.<br><br>• Availability of local recycling services.<br><br>• Availability of local composting services. |
| **7. Proportion of strategic waste management initiatives implemented (%)** | **Policy Survey** | **Proportion of strategic waste management initiatives implemented**<br>Calculated using the below formula:<br><br>$$\frac{Number\ of\ initiatives\ implemented\ nationally}{Number\ of\ planned\ initiatives\ national\ +\ regional}$$ | **Strategic waste management initiatives** – Actions (usually in the form of projects, policy interventions or new regulation) that are established by national and regional waste strategies.<br><br>**Implemented** – successfully executed actions that are delivered during the reporting |

| KPI | Data Source/s | Formula | Relevant Definitions and Notes |
|---|---|---|---|
| | | | period. |
| **8. Commercial waste capture rate (%)** | **Commercial waste audit**<br><br>**Commercial Community Survey**<br><br>**National commercial information** (i.e. number, types, and geographic distribution of businesses across the PICT) | **Commercial waste capture rate**<br>Calculated using the below formula:<br><br>$$\frac{\textit{Tonnes per annum of waste captured responsibly}}{\textit{Tonnes per annum of waste generated}}$$<br><br>This calculation needs to consider the locations where compositional waste audits and surveys were undertaken to apply the audit results appropriately over the PICT. Waste generation and access to formal waste management services vary between settlement types (urban/rural, main island/outer islands, etc.) and as these settlements are distributed uniquely in each PICT it needs to be considered in the calculation. This will be addressed in Section 3.0 Analysis of KPI Results to provide more detail about how the calculation was addressed for each PICT. | **Capture rate** – the proportion of total commercial waste generated that is successfully captured and disposed of or recovered in an environmentally responsible manner. Waste capture can include: - Waste collected by a commercial collection service or that is self-hauled to a licensed waste disposal facility. - Materials that are source separated and diverted to a recovery facility |
| **9. Commercial collection service coverage (%)** | **Commercial Community Survey**<br><br>**National commercial information** (i.e. number, types, and geographic distribution of businesses across the PICT) | **Commercial collection service coverage**<br>Calculated using the below formula:<br><br>$$\frac{\textit{Number of people surveyed with access to a service}}{\textit{Total number of people surveyed}}$$<br><br>This calculation needs to consider the locations where compositional surveys were undertaken to apply the results appropriately over the PICT. Access to waste services varies between settlement types (urban/rural, main island/outer islands, etc.) and as these settlements are distributed uniquely in each PICT it needs to be considered in the calculation. This will be addressed in Section 3.0 Analysis of KPI Results to provide more detail about how the calculation was addressed for each PICT. | **Collection service** – a waste collection, transportation, and disposal service for commercial waste. Collection services can be either a provided as a kerbside collection or as a designated drop-off point. It is a requirement that the collection service be:<br>• Regular – services are provided consistently in a way the does not lead to negative environmental impacts or disrupted engagement.<br>• Accessible – drop-off points should be close to businesses included in the service. –<br>• Affordable – if the service is user-pay, then it |

| KPI | Data Source/s | Formula | Relevant Definitions and Notes |
|---|---|---|---|
| | | | should be priced in a manner that is affordable to the target businesses.<br><br>**Coverage** – the proportion of the total businesses that have access to a regular waste collection service. |
| **10. Total weight of disaster waste disposed (tpa)** | **Waste Facility Register**<br><br>**Alternative: Datasets** collected not yet reported to the Waste Facility Register<br><br>**Alternative: Drones** to identify unreported stockpiles | **Total weight of disaster waste disposed**<br><br>Calculated as the sum of weight of disaster waste (tonnes) landfilled or received at a waste disposal facility in a country following disaster events. | **Weight** – measured as a weight-based summation of all waste facilities.<br><br>**Disaster Waste** – Large quantities of waste caused by disasters.<br><br>**Disposed** - waste that is appropriately collected and landfilled, as opposed to waste which gets dumped, burned, buried, littered, or otherwise. |

# 6 References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