EUROPEAN UNION

SPREP
Secretariat of the Pacific Regional Environment Programme

PacWastePlus
PACIFIC WASTE MANAGEMENT

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

Niue National Waste Audit Analysis Report

August 2023

This Waste data collation, analysis and reporting for the Niue 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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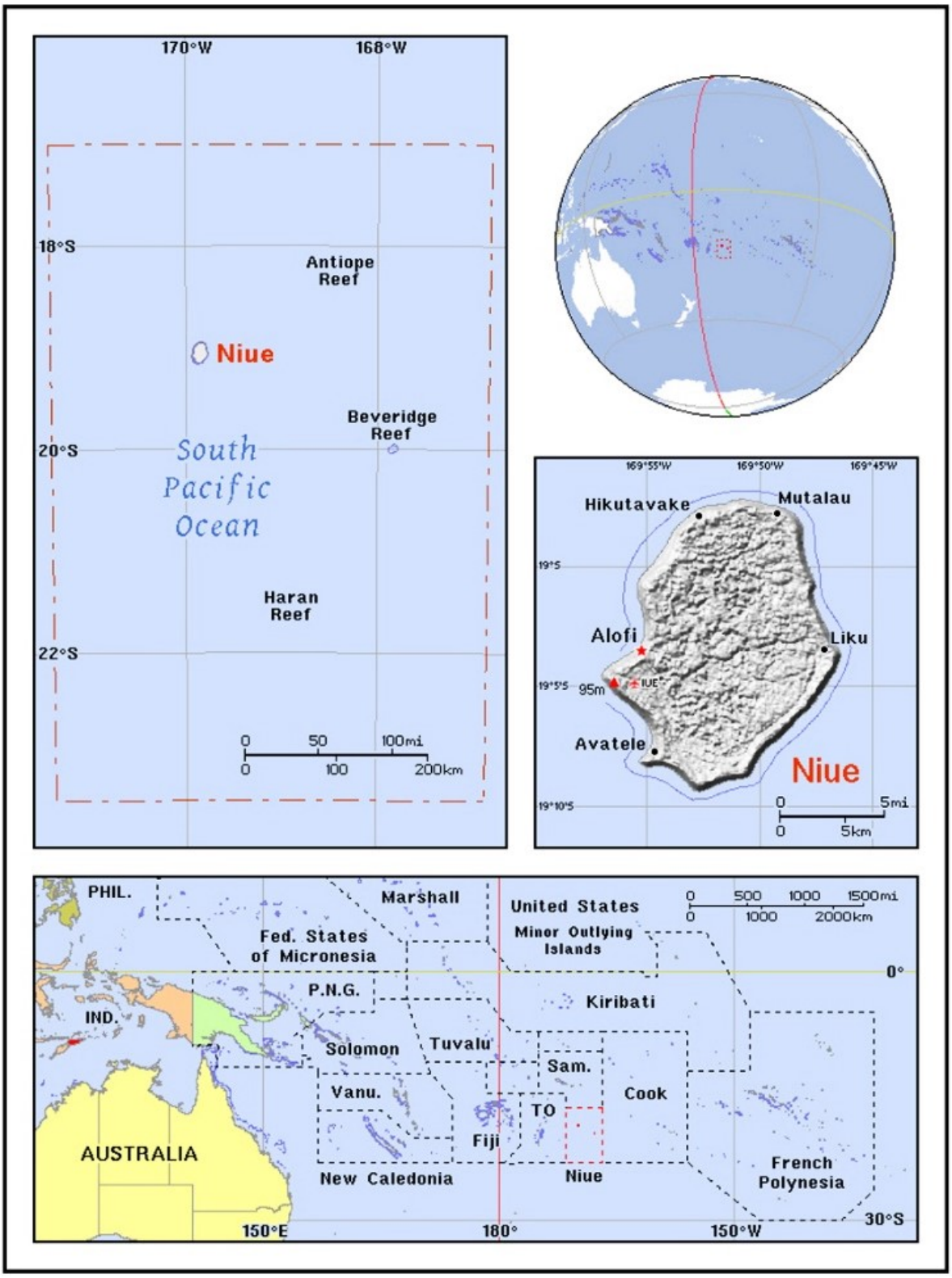
Map of Niue



Source: www.mapsland.com/oceania/niue

Glossary

Acronym	Definition
C&D	Construction and Demolition (Waste)
C&I	Commercial and Industrial (Waste)
CCM	Niue Catholic Church Mission
DCMR	Data Strategy & Collection, Monitoring, and Reporting (Framework)
DoE	Niue Department of Environment
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 Regional Infrastructure Facility
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, and have access to equipment and machinery such as a bulldozer. A landfill or dumpsite must employ a leachate management system and a daily cover routine. A recovery facility should have fire prevention and control measures in place, and appropriate stormwater runoff controls. Facilities must not be exceeding their maximum storage capacity.
Per capita	Units measured on a per person basis (i.e. to allow for extrapolation over a national population).
Recovery	Any activity that diverts waste material from landfill, including processing of dry recyclables (such as paper, cardboard, metal and plastics such as PET and HDPE), organics recovery, and energy recovery.
Unregulated	Typically, unlicensed waste facilities which do not follow international frameworks, rules, and guidelines to protect the health of the environment and community.
Waste facility	'Waste facilities' involved in the handling, disposal, or recovery of waste streams above a minimum processing threshold determined on country basis (i.e. tonnes of waste received per year). Can include landfills or dumpsites (that primarily rely on burying waste in a controlled manner), recycling/recovery facilities for dry recyclables (and e-waste), organics recovery facilities, and waste-to-energy facilities.

Executive Summary

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

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

Core KPIs	Result	Supplementary KPIs	Result
1. Count / capacity of modern waste facilities	0 / 0	1. Cost of disposal to landfill ($/annum)	NZ $92.59 (US $57.51)
2. Count / capacity of unregulated waste facilities	4 / Capacity unknown	2. Weight of waste disposed (tpa)	1,088
3. National recovery rate (%)	See Section 3.2	3. Weight of waste recovered (tpa)	See Section 3.2
4. Per capita waste generation rate (kg/capita/year)	88.5	4. Volume and type of stockpiled hazardous waste (m^3)	See Section 3.2
5. Municipal Solid Waste (MSW) composition (%)	Figure (a)	5. Marine plastic pollution potential (tpa)	0.222
6. Household waste capture rate (%)	98.99%	6. Awareness and support of waste management services (%)	No data
7. Household collection service coverage (%)	98.99%	7. Proportion of strategic waste management initiatives implemented (%)	85.00%
8. Fulfillment of MEA reporting requirements (%)	20.0%	8. Commercial waste capture rate (%)	40.00%
		9. Commercial collection service coverage (%)	40.00%
		10. Total weight of disaster waste disposed (tpa)	No data

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

Legend		
Sufficient data	Limited data	No data

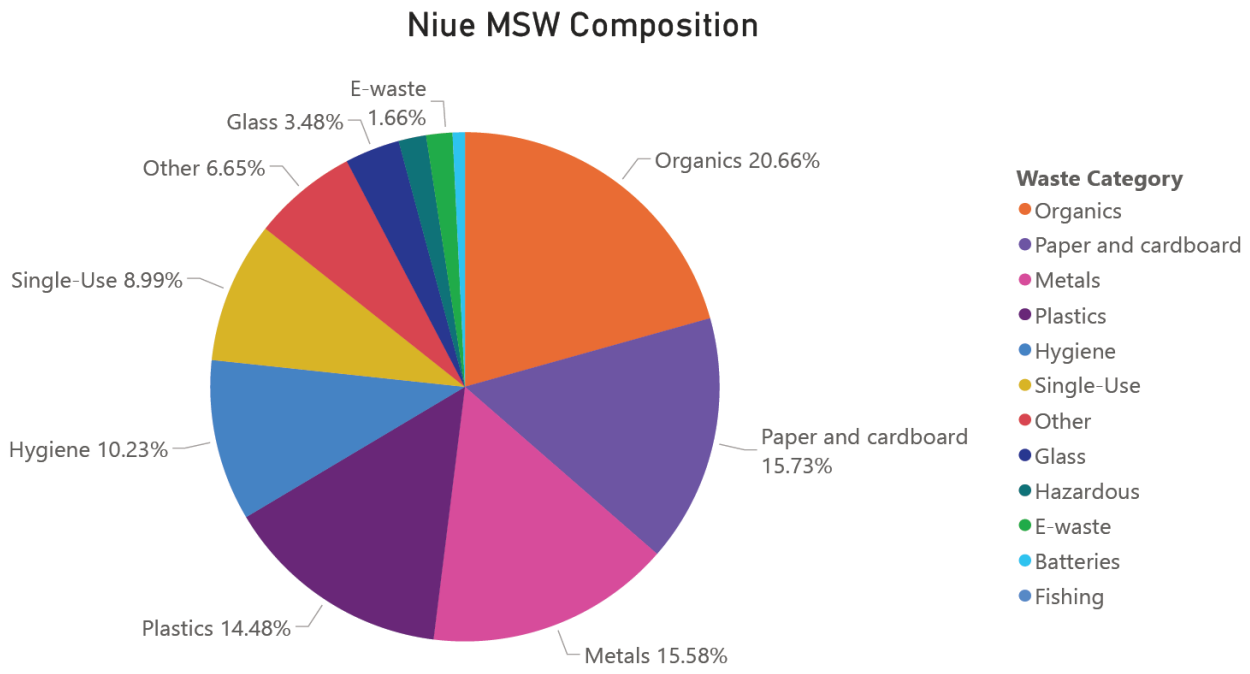


Figure (a) Niue Municipal Solid Waste (MSW) Composition (% by weight)

1 Introduction

1.1 Background

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

Niue has a dedicated recycling collection program for residents and small commercial businesses. Collected materials are stockpiled or stored in cages at designated storage sites or at landfill for future sorting and processing at Niue's (planned) recycling facility. Collections of e-waste (including white goods and batteries) was being undertaken on a scheduled basis but is subject to funding availability and storage space is becoming limited. Additionally, a successful recycling program for aluminium cans is run by the Catholic Church Mission, incentivising community members to recycle by offering a buyback program. Niue otherwise relies on landfilling or burying, burning and dumping of wastes. Investment in infrastructure, implementation of data-guided decision making, and increased general waste management education will improve the current situation.

1.2 Purpose and aim

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

The aim of this report is to:

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

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

1.3 Scope

The scope of this report is limited to the following waste data collected in Niue:

- **Niue waste audit 2021**: The audit was undertaken between February and April 2021 and provided an evaluation of household and business waste generated in Niue. Audit data and information was obtained via interviews and waste collections from 104 households and 11 businesses, followed by sorting and weighing. The audit report also provided an assessment of the state of Niue'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 waste types in addition to MSW and C&I waste. As such, landfill waste is considered a separate waste stream.

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

1.4 Country Overview

The Republic of Niue is a small island nation located in the South Pacific (a map is provided on page 4). The population of the island was last assessed in the 2017 Census to be 1,719 people. Niue's land area is about 261 square kilometres, and it is located in a triangle between Tonga, Samoa, and the Cook Islands. The languages spoken include Vagahau (Niuean) and English.

There is no specific waste management legislation in place for Niue, but there are a combination of laws and waste management protocols. For example, the *Environment Act 2015* sets out several waste-related activities that require development consent including landfills, recycling or collection stations, drainage or disposal systems, wastewater and sanitation schemes, and human waste disposal systems.

The Niue government developed the *National Integrated Waste Management Strategy 2010 – 2015* which provides analysis and context for local waste management. The strategy provides a framework for waste management in the country and aims to improve waste reduction, recycling, and disposal practices across the islands.

Implementation of the National Integrated Waste Management Strategy and accompanying Action Plan are now coordinated by the Niue Department of Environment (DoE).

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

- DoE: Responsible for designing and implementing programmes for waste management and pollution control, in collaboration with other departments. Their role also covers regulation and policy development, monitoring and enforcement, and operation (collection and disposal) for solid, liquid (including sludge) and hazardous wastes. In addition, the DoE are also responsible for monitoring and enforcement of medical waste management and recycling of solid waste.
- Department of Agriculture, Forestry and Fisheries: Responsible for regulation and policy development, monitoring and enforcement, and operation (collection and disposal) for quarantine wastes. Responsible for Stockholm Convention and Waigani Convention implementation.
- Department of Health: Responsible for medical waste regulation and policy development on the island.

Niue Catholic Church Mission (CCM) currently operates a recycling programme collecting aluminium cans for exporting to New Zealand. Niue Fo'ou Hospital is responsible for the collection and disposal of medical waste on the island.

2 Methodology

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

2.1 Data Sources

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

Table 1 Data sources examined and available data

Data Source	Methods for data collation	Reported data
Niue waste audit 2021	• Sample collection from households and businesses • Sort and weigh household/business waste • Household and business interviews • Landfill audit • Stockpile assessment	• Access to household and business waste collection services • Household and business waste composition • Potentially recyclable materials from household waste • Stockpile types and quantities • Landfilled waste composition and weight • Assessment of landfill operational costs • Customs data
2017 Niue National census	• National census	• Population data • Household data (size, number)

2.1.1 Niue Waste Audit 2021

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

Audit activities took place over six weeks across Niue. The audit plan was developed based on the most recent household and commercial statistics from the Niue Statistics Office and used to determine target sample sizes and areas. A total of 104 household samples and 11 commercial samples were gathered, out of which 99 had matching household interviews. Sampling methodologies differed by the type of collection service available to the sampled area. In addition, 43 landfill audits and 12 stockpile assessments were conducted. The waste composition, hazardous waste status and operational costs were audited for the island's two primary landfills at Makato and Vaiea over two weeks.

2.1.2 Sample Locations

Table 2 Sample locations for audits

Sample Location	Population (2017)	Classification
Niue	1,719	Peri-urban

2.2 Data Analysis

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

The main assumptions made during the analysis are discussed below.

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

- Since the nation of Niue consists of one island with a relatively small population, all samples were assumed to be directly representative of the country.
- The population estimates used to calculate performance indicators are based on national census data from 2017, which predates the audit (completed in 2021).
- All waste plastics which are not managed in an environmentally sound manner are assumed to have the potential risk of polluting oceans and estuarine waterways.
- Commercial waste service coverage reporting has relied primarily on survey information conducted during audits of commercial business waste.

2.3 Key Performance Indicators

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

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

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

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

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

3 Audit Analysis Results

3.1 Summary of Data Availability

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

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

Core KPIs	Supplementary KPIs
1. Count / capacity of modern waste facilities	1. Cost of disposal to landfill
2. Count / capacity of unregulated waste facilities	2. Weight of waste disposed
3. National recovery rate	3. Weight of waste recovered
4. Per capita waste generation rate	4. Volume and type of stockpiled hazardous waste
5. Municipal Solid Waste (MSW) composition	5. Marine plastic pollution potential
6. Household waste capture rate	6. Awareness and support of waste management services
7. Household collection service coverage	7. Proportion of strategic waste management initiatives implemented
8. Fulfillment of MEA reporting requirements	8. Commercial waste capture rate
	9. Commercial collection service coverage
Legend: Sufficient data / Limited data / No data	10. Total weight of disaster waste disposed

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 to 8, and Supplementary KPIs 1, 2, 5 and 7.
- Limited data was provided within the audit report to calculate Core KPIs 1 to 3, and Supplementary KPI 3, 4, 8 and 9.
  - There was no data regarding the maximum processing capacity of Niue's waste facilities (tonnes per annum), however, there was information regarding the equipment, staffing, leachate management and cover systems.
  - There was insufficient data to determine the national recovery rate. Recycling is collected from residents and small businesses across all 14 villages on the island and stored for future processing. There are other small scale reuse and recycling programmes operational on the island.
  - The audit found stockpiles of all hazardous waste categories targeted in the DCMR Framework except for healthcare and pharmaceutical waste, used tyres and obsolete chemicals. Stockpiles assessments were recorded in weight (kilograms) and did not provide enough information for volumetric conversion.
- No data was available in the report to calculate Supplementary KPIs 6 and 10. See Section 3.2.

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 Niue.

3.2 KPI Reporting Results

The following section presents 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 Niue to compare future data 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**
	• Niue's primary disposal facilities are Vaiea and Makato landfills. There is a temporary storage site at Huihui and the Mutalau dumpsite.
	• Vaiea landfill is not lined but according to the audit report, there was no evidence of leachate at the time of the audit. Waste is placed into landfill cells loose and is compacted via bulldozer once a month. The site has uncontrolled access and is open 24 hours a day.
	  – Collection workers and a bulldozer operator work on-site, so Vaiea can be considered staffed and as having access to equipment. However, there is no leachate control or evidence of a landfill cover system so it cannot be classified as a 'modern' facility under the definitions of the DCMR Framework.
	• Makato landfill has no leachate management. Workers on site utilise an excavator and tractor owned by the DoE. However, the 2021 audit report noted that the tractor was not functioning, and repair costs outweighed the operational costs of pushing back waste when required. Makato landfill spans two hectares and waste has extended beyond the original perimeter of the site in recent years. Efforts are being made to rehabilitate the area and tidy up overflowing waste where overextension has occurred.
	  – Due to these factors, the Makato landfill cannot be classified as a 'modern' waste facility under the definitions set by the DCMR Framework.
	• The Huihui storage site was (at the time of the audit) a temporary disposal site for the island's planned recycling facility (still under construction). There are plans to rehabilitate the site if funding becomes available. Only recyclables, e-waste and hazardous wastes are accepted on site. E-waste is stockpiled. Hazardous wastes, consisting of chemicals and bagged asbestos, are stored in a shipping container on site. There are no management plans available for hazardous waste stored at the site. Illegal dumping of waste occurs at the site.
	• Mutalau dumpsite has been closed to the public since 2016 and there is no infrastructure on site. Dumping still occurs, particularly following disaster events and from nearby villages. Waste at the landfill is scattered over a wide area. Controlled fires are undertaken to reduce the hazard of flies within the landfill area.
	  – Due to these factors, the above facilities cannot be categorised as 'modern' waste facilities under the definitions set by the DCMR Framework.
	Capacity of modern waste facilities (tonnes per annum): 0
	• Since none of the disposal facilities in RMI meet 'modern' requirements, the capacity of 'modern' facilities is 0.

Assumptions	• None
Data gaps	• No estimates or parameters were used to calculate the maximum annual processing capacity (tpa) of any of the four Niue disposal sites. • No information was reported on the total storage capacity of the sites and if they are exceeding storage capacity.

Key considerations	• There are no landfills or dumpsites in Niue which are up to 'modern' standards. • The lack of leachate management at these facilities means that both the environment and community are at risk of hazards due to contamination and material flow. • No daily cover usage at the main landfill sites, and limited rehabilitation of the closed landfill site, means that these sites are very susceptible to material flow during climate-related weather events such as cyclones. Makato is at particular risk of pollution impact due to cyclones due to its higher elevation and waste is deposited in open piles. • It is recommended that the number, location, name, 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**: **4** • Niue has four waste facilities comprising Vaiea and Makato landfills, the Huihui temporary storage site, and the closed Mutalau dumpsite. • None of these facilities can be classified as 'modern', and thus are considered 'unregulated'. – Primary Niue landfill sites suffer from a lack of leachate management, equipment reliability, and lack of cover systems. All sites on the island are 'unregulated'. – The other disposal sites are prone to uncontrolled waste dumping. **Capacity of unregulated waste facilities (tonnes per annum): No data**
Assumptions	• None
Data gaps	• No estimates or parameters were used to calculate the maximum annual processing capacity (tpa) of any of the four Niue disposal sites. • No information was reported on the total storage capacity of the sites and if they are exceeding storage capacity.
Key considerations	• All waste facilities at Niue are classified as 'unregulated'. • The lack of leachate management at these facilities means that both the environment and community are at risk of hazards due to contamination and material flow. • No daily cover usage at the main landfill sites, and limited rehabilitation of the closed landfill site, means that these sites are very susceptible to material flow during climate-related weather events such as cyclones. Makato is at particular risk of pollution impact due to cyclones due to its higher elevation and waste is deposited in open piles. • Investment to upgrade operational landfills and rehabilitate temporary and closed sites in Niue to meet 'modern' standards / best practices will lead to better outcomes for the local environment and community health.

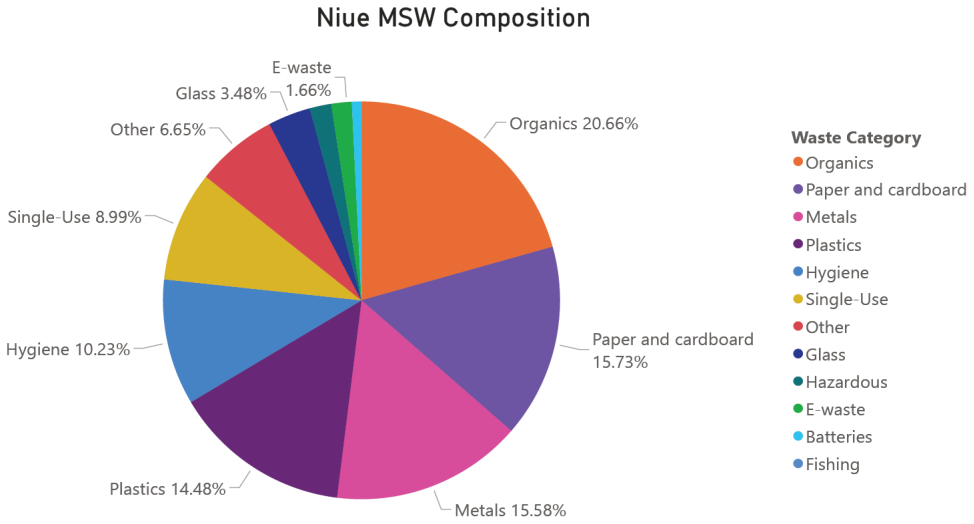
Core KPI 3: National recovery rate

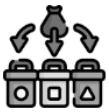
Results	**National recovery rate (%): Insufficient data** • A recycling programme for aluminium cans is run by the CCM. The CCM buys cans from the public at NZ $0.10 which are then sold to the Government for NZ $0.12 per can. These cans are stored in shipping containers for export to New Zealand. It can take up to 6 months to fill one container for export. Despite the availability of this recycling program, aluminium cans remain common in household waste collections in Niue. • At the time of the audit, a recycling facility was under development. The site will be situated by the airport outside of Alofi. After it becomes operational, the recycling facility will replace the Huihui storage site processing of recoverable materials, and recyclables will also be extracted from Makato and Vaiea landfills. • The DoE has provided Niuean residents and small businesses with 450 x 20-litre recycling crates for glass, aluminium and steel cans, and plastics for fortnightly collections. These materials are collected, stored, and await processing once the recovery facility is operational. • E-wastes were collected on a scheduled basis but this is now on hold.
Assumptions	• Assumes the shipping container is 20 ft, with a volume of 33.2 m3 for one shipping container. Assumes two full shipping containers per year. • Assumes a density of 139 kg/m3 for aluminium cans (based on material density conversions provided by the Australian NSW EPA).
Data gaps	• No dimensions are available for shipping containers sent to NZ.
Key considerations	• An estimated 9 tonnes of aluminium cans are shipped to NZ annually. • Taking into account fortnightly collections of recycling, and assuming all crates are full when collected, an additional 36 tonnes per annum is estimated to be collected for recycling. • Niue recovers about 50 tonnes per annum of recycling. This result is expected to change significantly following the completion of the planned recycling centre. • Completion of the waste facility register suggested in the DCMR Framework should capture the necessary information required to report to this performance indicator in the future.

Core KPI 4: Per capita waste generation rate

Results	**Per capita waste generation rate (kg/capita/year): 88.5** – kg/capita/day: 0.242 – kg/household/day: 0.800
Assumptions	• Household waste audit data was converted from a per household basis to a per capita basis and extrapolated using census data of the national population. • A total of 104 households were sampled during the household waste audits. • Relies on census data from the Niuean national census of 2017: – Population data; – Number of households; and – Household size.
Data gaps	• None
Key considerations	• Future per capita waste generation rates will provide insight into waste management trends and changes for Niue and allow for comparison within Niue and the region.

Core KPI 5: Municipal Solid Waste (MSW) composition

Results	Organic waste is the most prevalent waste type for household waste in Niue. This is followed by paper and cardboard, and metals. • Organics: 20.66.% • Paper and Cardboard: 15.73% • Metals: 15.58%  Figure 1 Niue Municipal Solid Waste (MSW) composition (% by weight)
Assumptions	• None
Data gaps	• The categories presented are based on the PRIF waste audit guidelines. Past audits may record different categories.
Key considerations	• The prevalence of organics in the household waste stream is likely due to reliance on local subsistence agriculture, as rural communities often have fewer options for food and goods, which can result in a greater reliance on locally grown or produced items. • Organics recovery systems, such as a local or national composting service could help support local farmers and reduce the amount of organic waste destined for landfill. • It is recommended that compositional data is updated data on a regular basis. Impacts of the pandemic and climate change or weather events will have changed the proportions of waste types sourced from households. • Household waste compositions provide an insight into the types of waste contained inside the MSW stream. Knowledge of the waste types and proportion of these wastes present within the household waste stream allows for targeted decision making and prioritisation of problem waste types.



Core KPI 6: Household waste capture rate

Results	**Household waste capture rate (%): 98.99%** – Total weight of household waste generated = 152 tpa – Total weight of household waste captured responsibly = 151 tpa
Assumptions	• The 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	• The audit and conducted survey did not capture: – Information to quantify each household's disposal method; and – The weight of waste captured by management services.
Key considerations	• It is estimated that the majority of household waste generated in Niue is captured by waste management services. This includes landfill drop-off. • Interview responses during the 2021 audit indicated that illegal dumping is still practiced in Niue.

Core KPI 7: Household collection service coverage

Results	**Household collection service coverage (%): 98.99%** • Based on interviews conducted during the audit, the household collection coverage for Niue was 98.99%. • This takes into account both the government's free collection service and independent drop off of household wastes to landfill. • During interviews, residents conveyed a desire for a bulky waste collection service and a desire for larger recycling bins(current bins are 20-litre).
Assumptions	• This performance indicator has been calculated based on information from 2017 census data: – Number of households
Data gaps	• None
Key considerations	• It is estimated that the majority of households in Niue have access to collection services. This includes kerbside and independent drop off to landfill by residents.

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

Results	**Fulfillment of MEA reporting requirements (%): 20.0%**

Convention	Status	Reporting requirements	Reports delivered
Stockholm Convention	Ratified	5 reporting cycles (5)	1

	• Niue is party to the Stockholm Convention, achieving ratification status in 2005. It has only delivered its national implementation plan.
Assumptions	• Conventions without mandatory reporting requirements were not included in the calculation of this KPI.
Data gaps	• None
Key considerations	• Niue is behind on the required MEA reports for the agreements of which it is party to.

Supplementary KPI 1: Cost of disposal to landfill

Results	**Cost of disposal to landfill ($/tonne): NZ $92.59** • The 2021 audit report quotes an operational cost of NZ $50,000 to $60,000 per year, including fuel and machinery maintenance for Makato landfill. • DoE reports state that Makato landfill operates at a loss, the cost being absorbed by the DoE.
Assumptions	• Only operational costs for Makato were available in the 2021 audit report. Makato landfill's operational cost was therefore assumed to be representative of the rest of Niue's disposal facilities. • Assumes an annual operating cost of NZ $ 55,000.
Data gaps	• Costs for operation and contracts associated with Vaiea landfill were not provided.
Key considerations	• Completion of the waste facility register suggested by the DCMR Framework will provide sufficient data to accurately calculate this indicator to work as a benchmark for comparing disposal costs against previous periods, other countries, and the region.

Supplementary KPI 2: Total weight of waste disposed

	Total weight of waste disposed (tonnes per annum): 1,088
	• Only Vaiea and Makato landfill waste disposal estimates were used to report for this performance indicator. The amount of waste entering Huihui and Mutalau is not expected to change this KPI result to a significant extent.
	• No data was provided on the weight of waste disposed of or stored at the Huihui and Mutalau disposal sites.
	• The total amount of waste is expected to show an increase once data is collected from other sites in the future using the waste facility register suggested in the DCMR Framework.

Supplementary KPI 3: Total weight of waste recovered

	Total weight of waste recovered (tonnes per annum): Insufficient data • Currently, a recycling programme for aluminium cans is run by the CCM. The CCM buys cans from the public at NZ $0.10 which are then sold to the government for NZ $0.12 per can. These cans are stored in shipping containers for export to New Zealand. It can take up to 6 months to fill one container for export. Aluminium cans nonetheless remain common in household waste collections in Niue. • At the time of the audit, a recycling facility was under development. The site will be situated by the airport outside of Alofi. After it becomes operational, the recycling facility will replace the Huihui landfill site for the storage and processing of recoverable materials, and recyclables will also be extracted from Makato and Vaiea landfills. – The DoE has provided Niuean residents with 450 x 20-litre recycling crates for glass, aluminium and steel cans, and plastics.
	• Assumes the shipping container is 20 ft, with a volume of 33.2 m^3 for one shipping container. Assume two full shipping containers per year.
	• No dimensions for shipping containers are provided in the report. • No weight of total recovered waste (tonnes per annum) provided.
	• This metric is expected to change significantly following the construction of the planned recycling centre. Completion of the waste facility register suggested in the DCMR Framework should provide the necessary information to report a more accurate performance indicator in the future.

Supplementary KPI 4: Volume and type of stockpiled hazardous waste

	Volume and type of stockpiled hazardous wastes (m^3): – Asbestos: Insufficient data – E-waste: 415 m^3 – Healthcare and pharmaceutical waste: No data – Used oil: 6 m^3 – Used tyres: No data – Obsolete chemicals: No data • Only Vaiea landfill hazardous waste stockpiles were reported. • An estimated 40 m^3 of hazardous waste comprising mostly of asbestos and e-waste is stored at the Huihui temporary storage site.
	• None
	• No data was provided for hazardous waste stockpiles at the Makato landfill. • An estimated 3,650 m^2 of asbestos was removed from Niue High School and buried. This was not converted to a volume given a lack of data. There remain 347 houses on the island with asbestos roofing. Many of these houses were left empty after Cyclone Heta (2004) but are still dangerous to the community. No estimate of associated asbestos waste amounts was made available. • No information on stockpiles of obsolete chemicals, used tyres, or healthcare and pharmaceutical waste was provided. • The proportion of asbestos to e-waste was not provided for the Huihui site.
	• The volume of other hazardous waste stockpiles in Niue remains unknown which makes it difficult to assess the potential risk posed to the community and environment. • It is recommended that future data aim to record the estimated volume of each suggested category of hazardous waste separately to provide an indication of the size and presence of stockpiled hazardous waste in the Cook Islands. • Landfill audits, stockpile assessments, and the completion of the waste facility register proposed by the DCMR Framework will provide the information required to calculate this performance indicator.

Supplementary KPI 5: Marine plastic pollution potential

Results	**Marine plastic pollution potential (tonnes per annum): 0.222**
Assumptions	• Assumes a national weight of mismanaged waste, based on household audit samples. – This calculation uses the total weight of waste generated, subtracted by the weight of waste captured by collection services. The difference is the estimate for mismanaged waste used in this calculation. – Mismanaged waste is defined as all waste which is not captured in collection services, and ends up buried/burned/littered etc. • Uses a proportion of plastics captured in MSW composition.
Data gaps	• Requires a more reliable metric for mismanaged waste.
Key considerations	• The results suggest that the potential for marine plastic pollution is low, while the waste capture rate and collection service coverage is high. • Waste plastics which are not managed in an environmentally sound manner are likely 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 a community survey, specifically gathering responses on: – Number of positive responses indicating awareness; – Number of available services; and – Number of survey participants.
Key considerations	• Completion of a community survey in the future is required to report to this KPI. Monitoring the community's awareness provides an indication of the success of education initiatives and the effective use of existing waste management services.

Supplementary KPI 7: Proportion of strategic waste management initiatives implemented

Results	**Proportion of waste management initiatives implemented (%): 85.00%** – Number of successfully implemented initiatives = 17 out of 20 – Number of planned/pipeline initiatives = 3 • Implemented initiatives include: – National Integrated Waste Management Strategy 2010-2015 – National Strategic plan 2016-2026 – Sustainable Coastal DevelopmentPpolicy 2008 • Pipeline initiatives include: – Ratification of waste-related MEAs – Niue waste recycling facility – Single-use plastics ban
Assumptions	• None
Data gaps	• None
Key considerations	• There is currently no specific waste management legislation in place in Niue. • Niue's *Environment Act 2015* covers waste management activities that require development consent such as landfills, recycling facilities, wastewater systems, and human waste disposal systems. • It is predicted that Niue's planned waste recycling facility will significantly change waste management on the island. The facility was due to be operational by the end of 2019 however it is unclear whether the facility has become operational due to limited supporting legislation in place. – The Niue government tendered the development of the recycling centre in late 2020.

Supplementary KPI 8: Commercial waste capture rate

Results	**Commercial waste capture rate (%): 40.00%** • Commercial waste from small businesses (or commercials) on the island is collected on the same collection round as household waste and dropped off directly at Makato Landfill. There is no cost associated with this collection for commercials. The cost is covered by Government. • Larger commercials transport their waste directly to landfill sites or in addition to standard collection days if large quantities are produced. Commercials are not required to pay for the disposal of waste, regardless of the volume. • This KPI is measured as the fraction of the total waste captured through formal waste management services over the total waste generated by businesses.
Assumptions	• The average weight of commercial samples was 27 kg/per business/week. • An estimated 50 businesses were present in Niue during the time of the audit. – Results in a commercial waste generation rate of 70.2 tonnes per annum. • With a commercial service coverage of 40%, the capture rate is 28.1 tonnes per annum.
Data gaps	• Quantification of alternative disposal methods such as disposal to drop-off points or direct transport of commercial waste to landfill. • Commercial waste generation rates by business type.
Key considerations	• 28.1 tonnes of commercial waste (i.e. 40% of a total of 70.2 tonnes) per annum is captured by waste management services.

Supplementary KPI 9: Commercial collection service coverage

Results	**Commercial collection service coverage (%): 40.00%** • 10 businesses across Niue were interviewed during the audit. • Based on the interviews conducted, 40% of businesses in Niue have access to some form of collection service. • The audit report estimates that 50 businesses were present in Niue at the time of the audit.
Assumptions	• The sample size of 10 businesses allows adequate representation of Niue's commercial collection service coverage on the national level.
Data gaps	• No information on service coverages or number of participating businesses beyond the conducted surveys were identified.
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 will provide more data on 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 a landfill or received and stockpiled at a 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 of if these wastes are not managed separately.

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