



**SPREP**  
Secretariat of the Pacific Regional  
Environment Programme



**PacWastePlus**  
PACIFIC WASTE MANAGEMENT

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# Waste Audit Report

## NIUE

July 2021



Supported by the Australian Government  
through the Pacific Ocean Litter Project



The information and data gathered from these waste audits will be used by countries in the Pacific to support the development and monitoring of waste and resource recovery projects and recommend the infrastructure and policy interventions required. The regional dataset will also be used to identify and evaluate potential regional projects that would improve waste management in the region.

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**Acknowledgment:** SPREP, through the PacWastePlus programme engaged Tonkin & Taylor International Limited (T+TI) to undertake a waste audit in five Pacific Island countries. This report presents the findings of the waste audit undertaken for Niue. The methodology applied for this waste audit was as per the Waste Audit Methodology – a step-by-step manual to conduct comprehensive waste audits in SIDs, produced by the Pacific Regional Infrastructure Facility (PRIF).

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

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# 1 Executive summary

## Summary of audit activities

- Five surveys completed
  - waste collection followed by a sort and weigh
  - interviews
  - landfill audits
  - stockpile assessments
- Data collected across Niue
  - 114 household and commercial samples collected
  - 104 household samples
  - 11 commercial samples
  - 99 household interviews
  - 10 commercial interviews
  - 12 stockpile assessments
  - 43 landfill loads audited

## Waste generation rates

- Average household generation per day is 0.8kg (with a range of 0.2kg - 3.0kg per household per day).

## Household key composition trends

- Organics (20.7%) was the largest component of the waste stream, closely followed by paper and cardboard (15.7%), metals (15.6%) and plastics (14.5%).
- The recycling stream consisted of plastic (47.5%), metal (16.6%) and glass (34.1%).

## Commercial composition trends

- Paper cardboard (22.6%) was the largest component of the waste stream, plastics (12.1%) and metals (11.1%) were also significant.

## Recovery of recyclables

- Collection of glass, metals (cans), plastics and paper and cardboard.
- Still significant quantities of recyclables in general waste collected from households.

### Stockpiles in Niue

- Most commonly stockpiled material: metals, e-waste, white goods and aluminium cans (by weight).

### Vaiea Landfill composition

- 16.4% paper
- 14.8% plastics
- 15.0% metals
- 7.4% other
- 1.5% e-waste
- 0.0% fishing
- 20.0% organics
- 9.7% hygiene
- 9.1% single use items
- 3.6% glass
- 0.7% batteries

### Makato Landfill composition

- 17.6% paper
- 15.0% plastics
- 14.2% metals
- 9.2% other
- 1.3% e-waste
- 0.0% fishing
- 18.4% organics
- 9.1% hygiene
- 9.6% single use items
- 3.5% glass
- 0.6% batteries

### Interview outcomes

- Households - 9.1/10 level of satisfaction with the collection service which is offered free of charge to householders. With a preference for over 78% of householders interviewed for this to remain free of charge.
- Commercials - 9.0/10 level of satisfaction with the collection service which is offered free of charge. Note: only 1 of the 4 commercials who responded this question provided a rating.

## 2 Introduction

The Secretariat of the Pacific Regional Environment Programme (SPREP) engaged Tonkin & Taylor International Limited (T+TI) to undertake a waste audit in Niue. This report presents the findings of the waste audit undertaken for Niue. The methodology applied for this waste audit was as per the *Waste Audit Methodology – a step-by-step manual to conduct comprehensive waste audits in SIDs, produced by the Pacific Regional Infrastructure Facility (PRIF)*<sup>1</sup>.

The waste audit was undertaken by the Department of Environment of the Ministry of Natural Resources in close collaboration with T+TI. In view of the Covid-19 pandemic, T+TI worked remotely, supporting the delivery of the waste audit working in collaboration with other key stakeholders. The audit took place from 15 February to 2 April 2021.

The results from the Niue waste audit are part of a Pacific wide audit programme being implemented by the SPREP and other agencies. This audit is funded by SPREP through the EU-funded PacWaste Plus programme and with support from the Australian-funded Pacific Ocean Litter Project. Other audits in the region are funded by the United Nations Environment Programme (UNEP), the World Bank and the Pacific Regional Infrastructure Facility (PRIF).

The information and data gathered from the waste audits will be used by countries in the Pacific to support the development and monitoring of waste and resource recovery projects and recommend the infrastructure and policy interventions required. The regional dataset will also be used to identify and evaluate potential regional projects that would improve waste management in the region.

This audit report details how the Niue Audit was delivered. The report is structured as outlined below:

- Section 3 sets out the context for the audit including socio economic background, statutory framework for waste management in Niue and existing waste services.
- Section 0 provides the audit methodology including the approach to managing the audit team remotely, training provided, sampling approach and validation procedures.
- Section 5 presents the audit findings.



<sup>1</sup> PRIF (2019) Waste Audit Methodology. A step -by-step manual to conduct comprehensive waste audits in SIDs.

## 3 Background

### 3.1 Socio-economic background

Niue is a small island nation located in the South Pacific. The population of the island was last assessed in the 2017 census to be 1,719<sup>2</sup>. The languages spoken include Vagahau (Niuean) and English.

Gross domestic product (GDP) per capita is US\$5,800<sup>3</sup>. The composition by sector for Niue is services (49.5%), industry (26.9%) and agriculture (23.5%).

However, the economy faces challenges including:

- Environmental, social and economic threats from poor waste management and pollution;
- Remoteness from trade centres;
- Small labour force;
- Limited natural resources;
- Deteriorating housing, hospitals and capital plant; and
- Adaption to climate change.

Main sources of income for Niue include tourism, fruit juice manufacturing and remittances from offshore population. GDP per capita was to USD\$17,032 per capita in 2018<sup>4</sup>. The tourism industry has remained steady between 2016 – 2019 with an average of 11,100 tourists per annum, 75% are non-native to Niue<sup>5</sup>. Revenue from tourism amounted to 15 million NZD in 2018/2019<sup>6</sup> which accounted for 41% of contributions to GDP in 2018 (\$11,700,000)<sup>7</sup>.

At the time of conducting the audit Covid-19 had been declared a global pandemic by the World Health Organisation. Like many other Pacific Island nations, Niue has avoided an outbreak by closing their international boarder. The impact of Covid-19 and the closed international borders on audit findings is further discussed in Section 7.

### 3.2 Legislation

The summary of relevant legislation has been sourced from the *Stocktake of existing and pipeline waste legislation report*<sup>8</sup>. These have been listed below in Table 6.1.

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<sup>2</sup> Niue Household and Population Census, 2017

<sup>3</sup> [https://theodora.com/wfbcurrent/niue/niue\\_economy.html](https://theodora.com/wfbcurrent/niue/niue_economy.html)

<sup>4</sup> <https://www.mfat.govt.nz/en/countries-and-regions/pacific/niue/>

<sup>5</sup> <https://niue.prism.spc.int/?s=tourism>

<sup>6</sup> <https://www.mfat.govt.nz/en/countries-and-regions/pacific/niue/>

<sup>7</sup> Pacific Tourism: Covid 19 Impact and Recovery. Sector Status Report: Phase 1B, Ministry for Foreign Affairs and Trade New Zealand, 5 May 2020

<sup>8</sup> Stocktake of existing and pipeline waste legislation: Fiji. Prepared by the Melbourne Law School at the University of Melbourne, Australia with technical assistance from Monash University on behalf of the Secretariat of the Pacific Regional Environmental Programme (SPREP) 2020

Table 6.1: Legislation summary

Legislation name	Description
Environment Act 2015	Sets out a number of 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.
Water Act 2012	The Environment Director may cause a program of investigation and monitoring of water quality to be prepared, which may provide for the collection, collation and analysis of data including, without limitation, the quality of water resources.

There is currently no specific waste management legislation in place in Niue.

Waste management is covered under the Environment Act 2015 which sets out a number of 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 Water Act 2012 also references waste in relation to information requirements for water pollution licences<sup>9</sup>.

An analysis of the national waste situation was undertaken in the National Integrated Waste Management Strategy (NIWMS) 2010 – 2015. This was developed after the 2000 Waste Management Plan could not be fully implemented due to insufficient resources.

Implementation of the National Integrated Waste Management Strategy and accompanying Action Plan are now coordinated by the Niue Department of Environment. The Action Plan refers to the Environment Department taking the lead in establishing a body to oversee implementation of the Strategy.

### 3.3 Waste Management Protocols

Pipeline legislative activities for waste management and governance in Niue (current as of March 2021) include:

- **Introduction of a ban on single use plastic bags** – this ban will include single-use plastic bags, straws, and polystyrene boxes. The ban was reported to have commenced on 1 July 2019 however no supporting regulations have been identified online.
- **Niue Waste Recycling Facility** – recycling facility for glass and PET bottles, extending to other wastes. This facility was due to be operational by the end of 2019 however it is unclear whether this has been established as there is little supporting legislation in place and evidence online. Most recently the Government of Niue tendered for the development of the Resource Recycling Centre in late 2020.
- **Ratification of MEAs (Multilateral Environmental Agreements)** – Niue is currently not party to the Basel, Minamata and Rotterdam Conventions. If ratification proceeds, national implementing legislation would be necessary, such as waste regulations for hazardous waste shipments identified as a priority in the Action Plan accompanying the NIWMS.

Further information on waste legislation can be sourced in the references noted above.

<sup>9</sup> <https://www.gov.nu/wb/pages/legislation/niue-acts.php>



### 3.4 Stakeholders – roles and responsibilities

Government departments with waste responsibilities in Niue are set out in Table 6.2.

**Table 6.2: Stakeholder roles and responsibilities**

Stakeholder	Responsibility
National Government	
Department of Environment – Ministry of Natural Resources	<p>Under the Environment Act 2015, the department is responsible for designing and implementing programmes for waste management and pollution control, in collaboration with other departments.</p> <p>Their role also covers regulation and policy development, monitoring and enforcement, operation (collection and disposal) for solid, liquid (including sludge) and hazardous wastes.</p> <p>The Department of Environment are also responsible monitoring and enforcement of medical waste and recycling of solid waste – regulatory role.</p>
Department of Agriculture, Forestry and Fisheries (DAFF) – Ministry of Natural Resources	<p>Responsible for regulation and policy development, monitoring and enforcement, operation (collection and disposal) for quarantine wastes – regulatory role.</p> <p>Responsibility for the Stockholm Convention and Waigani Convention implementation.</p>
Department of Health – Ministry of Social Services	<p>Responsible for the regulation and policy development for medical waste on the island – regulatory role.</p> <p>Under the Water Act 2012 the Health Director may cause a program of investigation and monitoring of public water supply quality to be prepared, which may provide for the collection, collation and analysis of data including, without limitation, the quality of water in the public water supply system.</p>
Department of Public Works -Ministry of Infrastructure	<p>Under the Water Act 2012 the Public Works Director may cause a program of investigation and monitoring of water resources to be prepared, which may provide for the collection, collation and analysis of data including, any matters in connection with the availability of groundwater or its suitability for use or its protection from depletion, wastage, or pollution of water resources.</p>
Subordinate Agencies	
Niue Catholic Mission	Management of the aluminium can recycling programme in Alofi North.
Niue Fooou Hospital	Responsible for the collection and disposal of medical waste on the island.

### 3.5 Waste services

#### 3.5.1 Household waste

Solid waste collection for the island of Niue is contracted to Makani Contractors by government. The current contract cost is NZ \$62,000 per annum up to 2019. From 2020, this cost has increased to NZ \$80,000. Reasoning for this increase has been due to increased tourism (prior to border closure in

2020), high maintenance costs and fuel costs. The Department of Environment are investigating the costs to return the service to a government operation.

- Wheelie bins are the preferred method to contain waste before collection. In the 1990's the Department of Health supplied 240 litre wheelie bins to some households.
- Between 2019 – 2020, all households in Niue were provided new wheelie bins through funded projects:
  - Two villages, a total of 100 householders, were supplied with 140 litre (L) bins by the Global Environment Facility (GEF) funded Ridge to Reef project.
  - The remaining 12 villages (550 households) were provided with 120L bins through the Australian Aid funded Waste Management Project.

Although bags and other easily accessible containers can be used, there have been issues with animals scavenging through the waste causing a nuisance. Waste is manually loaded into a single compactor truck that services both residential and small commercial customers.

Special wastes including septic tanks and lead-acid batteries are collected separately by staff of the Department of Environment<sup>10</sup>. These wastes are discussed further in report Section 3.5.6.

Household collections of hazardous waste by the Department of Environment occur across all 14 villages on the island and include:

- E-waste and white goods which is collected monthly; and
- Household special waste including e-waste, white goods, batteries, asbestos, stockpiled plastic bottles – which are collected six-monthly.

### 3.5.2 Household recycling

The Department of Environment provides 450 red recycling crates (20 litre) for recycling glass, metals (aluminium and steel cans) and plastics. The preferred approach is for households to place glass in the crates while bottles that do not fit into the crate are placed in rubbish bags beside the crates. Recyclables are collected using the same vehicle that services the general waste collection on alternate days to the general waste collection. Recyclables are manually loaded into the vehicle.

A recycling programme for aluminium cans is operated by the Catholic Church Mission (CCM) located in Alofi North. The government pays \$0.12 per can to the CCM who buy the cans from the community at \$0.10 per can. It takes up to 6 months to fill one container for export to New Zealand. Despite this programme being in place, aluminium cans remain common within the waste collections across the island.

### 3.5.3 Delivery of the waste collection

The island is divided into three zones for waste and recycling collection purposes as detailed in Table 6.3.

**Table 6.3: Niue Household Waste Collection Schedule**

Location	Collection day(s) <sup>11</sup>	
	General waste	Recycling
Island wide	Monday and Thursday	Wednesday (fortnightly)

<sup>10</sup> Niue Island – National Integrated Waste Management Strategy, 2010 – 2015

<sup>11</sup> Timing may change for operational reasons. The Department of the Environment is considering changing to a weekly recycling collection.

### **3.5.4 Charging**

The cost of the waste collection service is covered by the Government.

### **3.5.5 Commercial waste**

Commercial waste from small commercials on the island is collected on the same collection round as household waste and dropped off directly to 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 the 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.

### **3.5.6 Hazardous waste**

Hazardous waste found in Niue includes asbestos, POPs, electrical and electronic waste (e-waste), waste oil, hazardous liquids (pesticides, paints and chemicals) and car batteries.

#### **3.5.6.1 E-waste**

E-waste across the island is collected periodically through a government scheme and stockpiled at Huihui (temporary storage site) and Makato Landfill. There are two full containers of e-waste at the Huihui site alongside an exposed/unprotected stockpile. E-waste is due to be transported to the new recycling facility, however due to Covid-19 the development of this facility has been delayed.

Other e-waste streams including white goods (refrigerators and stoves) are taken to Makato landfill.

The Environment Department undertakes special e-waste collection and disposal programme every six months. However, this service is subject to funding with funding related delays resulting in illegal dumping of e-waste on the island. Due to limited storage space, collections of e-waste have been postponed since 2020 to reduce double handling, because of the lack of machinery to assist with the collection and the delayed opening of the new recycling facility.

The quantity of e-waste in Niue is currently unknown. Niue's 2010 – 2015 Waste Strategy identified that electronic item imports into Niue have been increasing since 1997. These items will inevitably become e-waste.

To help address the current e-waste management issues on the island a small reuse sector in Niue has started to emerge. Companies including Vili Franchise Limited dismantle and reuse some e-waste parts from refrigerators, stoves and washing machines. The proposed recycling facility will allow for the dismantling and processing of e-waste where applicable prior to export overseas for recycling or safe disposal.

#### **3.5.6.2 Healthcare waste**

There is an incinerator located at the hospital located in Fagalilika used to incinerate hazardous healthcare waste. It has been reported that the incinerator is not operating efficiently in the absence of training and maintenance. General waste generated at the hospital is segregated and collected through the roadside waste collection rounds for disposal at the landfill.

#### **3.5.6.3 Asbestos**

Asbestos was introduced to the island in the form of cement roof sheets following the post cyclone rebuild of properties in 1959 – 1960. These roof sheets became waste product in 2004 – 2005 following infrastructure damage sustained from Cyclone Heta. In response to cyclone Heta, the Niue Government with the assistance of New Zealand Aid and a PacWaste project were able to ship over 50 containers of asbestos from the island. Hazardous waste has previously been exported by New Zealand based contractor John Wichman.

#### **3.5.6.4 Waste oil**

The main producers of waste oil in Niue include the Niue Power Corporation (NPC), the Public Works Department and private garages and the community. During Cyclone Heta the central recycling waste collection site located in Amanau was washed away, which included the tank container.

In March 2010, the stockpiled quantity of waste oil at NPC was estimated at 12,000 litres. This oil was stored in metal drums which had deteriorated over the years and began leaking oil onto the ground.

In 2011, 10 industrial bulk containers (IBC) with a 1,000-litre capacity each were purchased to provide more secure storage of the waste oil at Amanau. The Public Works Department also plans to purchase IBCs to be placed at Public Works compound for waste oil. All mechanical businesses and Government departments handling waste oil have IBCs for containment. Other tanks are also expected to be placed at suitable locations for waste oil from the private sector and community.

Collection and storage of waste oil was taken over by the Bulk Fuels Agency and is stored within their compound located in Alofi. The used oil is stored in a tank container which takes between 6-9 months to fill. Previously waste oil was exported to New Zealand.

#### **3.5.6.5 Waste Chemicals**

Other hazardous waste chemicals are dropped off at Makato Landfill and the Huihui site by individuals and commercials. Government departments and secondary schools across the island are serviced with a three-monthly collection using the Department of Environment's vehicle when available. The chemical drums are currently placed in a locked shipping container. The shipping container is in poor condition.

The Department for Environment are seeking financial support for the purchase of more storage drums.

#### **3.5.6.6 Persistent Organic Chemicals (POP)**

From 1997-2006 Niue was a beneficiary of the AusAID-funded 'POPs in PICs' project, to remove and destroy stockpiles of POPs in 13 Pacific Island Countries (PICs). Under this project a total of 3,971 kilograms of chemicals and chemical containers were removed from Niue and transported to Australia for incineration. The project could not collect all chemicals, therefore approximately ten packed and sealed drums of acids, copper fungicide, lime sulphur spray, laboratory chemicals, and methyl bromide are stored in a designated shipping container in drums at the Huihui site. The shipping container storing these drums has been deteriorating since 2005 and the drums are required to be transferred to a more secure container. The drums containing pesticides and insecticides also appear to have leaked into the container. The Environment Department does not have any more supplies or storage areas to safely store this waste. This has resulted in illegal dumping of paint and chemicals at the Huihui site next to the e-waste.

#### **3.5.6.7 Car batteries**

Car batteries are periodically collected from around the island using a hired truck and stored openly in a designated area at Makato Landfill and have previously been stored at the Huihui site. The batteries are stockpiled before exported overseas for recovery. The 2010-2015 Waste Strategy estimated there are around 300 batteries at the Huihui site, this figure is predicted to have increased significantly since then. There is currently a lack of appropriate vehicles for collection, with costs having risen since the Covid-19 pandemic. Safety equipment is also difficult to purchase (Tyvek coveralls, face masks and safety gloves). Safety equipment is purchased as funds become available.

### **3.5.7 Other wastes**

#### **3.5.7.1 End-of-life vehicles**

The disposal and recovery of end-of-life vehicles are currently managed by an external agency with the cost directly covered by the customer. The fee associated with the recovery and disposal is often high as it is dependent on the hired machinery required to uplift the vehicle and transport across the island. Double handling of end-of-life vehicles and limited space for storage also add to the costs. As a result, there is a large volume of end-of-life vehicles stockpiled across the island, particularly at a site in Tuaki-Hakupu and Amanau.

Waste tyres around the island can be sent to landfill, however they are predominantly repurposed by the community for the following:

- Canoe fishermen use the tyres for the storage of their canoes;
- Along the coastline;
- Gardening; and
- In recent months tyres have been used as fuel for burning waste from Covid-19 quarantine sites.

#### **3.5.7.2 Septic tank waste**

The main liquid waste stream generated on the island is septic waste from septic tank systems (sealed and unsealed) and water seal latrines. Sealed septic tanks systems are accepted as an environmentally sound option. Water latrines and unsealed septic tanks release raw sewage directly into the ground which can result in direct contamination of the water lens. The island has a general lack of awareness on the maintenance of septic tank systems; therefore, the tanks are regularly only emptied when they present an issue. The Department of Environment own a 6,000-litre sludge pump truck which can be hired at \$56 per load to empty household septic tanks. There are currently no proper records kept of the quantities of septic tank sludge collected and dumped. There is no defined disposal facility for liquid waste, including septic tank sludge, as a result this is disposed of directly to the ground on an overgrown patch of land<sup>12</sup>.

#### **3.5.7.3 Quarantine waste**

Niue does not accept waste from cruise ships passing the island. Visitor waste from the wharf is managed by Biosecurity Division of Department of Agriculture, Forestry and Fisheries (DAFF). The waste is disposed of in the wood fire incinerator at the Huihui site. The quantities of waste being incinerated from the airport and port is not currently recorded. The incinerator is also not working to optimum efficiency with an accumulation of by products and ash developing over time. All quarantine waste is currently burnt without separation in the incinerator. The waste may contain large quantities of recyclables such as aluminium cans and bottles.

### **3.6 Waste facilities**

Several landfills are currently used across Niue with Government not wanting waste to be concentrated on one site and having experienced land lease issues previously. The location of each is noted in Figure 2.1. Vaiea and Makato are the main landfill sites. The Makato Landfill has been proposed for closure for some time; however, waste is still accepted and closure has yet to be confirmed.

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<sup>12</sup> Niue Island – National Integrated Waste Management Strategy, 2010 – 2015



Figure 6.1: Niue waste facilities locations

### 3.6.1 Vaiea Landfill

#### 3.6.1.1 Landfill infrastructure

Vaiea Landfill is two hectares and owned by the Environment Department. The plan is to operate the landfill under the same contractor as the Makato Landfill, Mr Jacobsen, and replicate Makato Landfill operations, when funding allows.

The site has a lease life of 28 years and there are plans to rehabilitate the landfill if funding is made available. Vaiea Landfill currently has uncontrolled access and is open 24 hours a day, seven days per week.

The site is not lined and there is no evidence of leachate. Burning of the rubbish takes place at the site, although there is risk of bushfires due to its location.

Figure 6.2 provides pictures of the landfill, taken during the audit period.



*Figure 6.2: Vaiea Landfill*

### **3.6.1.2 Charging at the landfill**

No fees are collected for waste disposed at Vaiea Landfill.

### **3.6.1.3 Inputs to landfill**

Solid waste and recyclables from government and general household collections (from the south of the island) are brought directly to Vaiea Landfill. Waste is not segregated at Vaiea Landfill. No other commercial waste is accepted at Vaiea Landfill.

Waste is placed loose in the landfill and a bulldozer is hired monthly to push the waste back. No compaction takes place.

The site was not supposed to be a waste area, however following the clean-up of asbestos onsite, there was space for the temporary storage of scrap metals and e-waste. The stockpiling of materials at Vaiea Landfill is expected to continue until the recycling facility is up and running, when materials will be moved.

### 3.6.2 Makato Landfill

#### 3.6.2.1 Landfill infrastructure

Makato Landfill is located on the west side of the island close to the civil quarry. The land is leased by the contractor who undertakes the islands household waste collections and manages the site.

The site is two hectares, although over recent years, the waste has extended beyond the site boundary. Therefore, efforts are being made to tidy up and rehabilitate the area where extension has occurred. Land boundary markers have not been laid out by surveyors to prevent further extension beyond the site boundary.

There is a general lack of engineering controls such as leachate collection and treatment which increase the risk of pollution of the water lens, which is Niue's only source of potable water.

There is no weighbridge present onsite. Bins are located at the gate of the site for those who arrive at the landfill outside of the operating hours.

The tractor owned by the Department for Environment is not operational and the cost to fix this is higher than the operational costs for pushing back the waste when required. The contractor operating the site uses the Department of Environment's excavator and tractor (when operational). Other plant used on the site include a hired D2 bulldozer that is primarily based at the landfill. A shredder is hired from DAFF for management of organic wastes (once volumes are large enough) at NZ \$100 per day.

The site is secured with fencing and locked gates with designated opening times details in Table 6.4.

**Table 6.4: Makato Landfill operational hours**

Date	Operational hours
Monday - Saturday	7am – 10 am, 3pm – 6pm
Sunday	Closed

The contract for the landfill expired at the end of June 2020. A renewal of this contract is under negotiation to renew the lease with the current landowners.

The landfill is located at a higher elevation than the low water mark level, therefore the site is not susceptible to sea level rise. The cyclone risk to the site is related to its elevation and current management regime (waste deposited in open piles). There are plans to rehabilitate the landfill if funding is made available.

#### 3.6.2.2 Charging at the landfill

No fees are collected for waste disposed at Makato Landfill.

#### 3.6.2.3 Inputs to landfill

Makato Landfill was due to be closed in 2012, however the use of the site was extended, and it is not known how long the site will remain open.

Solid waste from government collections, private sector collections and general household and commercial waste from Alofi north and south is disposed at Makato Landfill. The landfill also accepts waste dropped off directly by households and commercials. The waste streams accepted include recyclables, organics, scrap metals, batteries, e-waste, waste oil, white goods, and general waste. The site manager is present on site and sorts the waste streams into designated categories. The following activities also occur, clearing of the site, invasive species controls, composting and supervising waste disposal during business hours.



Currently waste is placed loose in the landfill and no compaction takes place. About once per month, but sometimes more, depending on the amount of waste required to be pushed back, the Department for Environment contracts Niue Timber Products and the Public Works Department to push back the waste in the landfill at \$100 per hour<sup>13</sup>.

The site is operational six days per week. Allowing commercials who operate at different times of the day to drop off waste within the opening hours of the site.

**Table 6.5: Management details for wastes which are segregated at Makato Landfill**

Material	Storage	Further details of individual waste streams
<b>Garden organics</b>	Open, segregated bay on site.	Government owns the waste. Processed on site into compost and provided to local homeowners as a household garden amenity, free of charge. Storage is variable and depends on demand. Three shredders are available through the Department of Agriculture, Forestry & Fisheries (DAFF) which farmers can borrow to produce mulch or aid the composting process. This is free of charge provided the farmer can transport the equipment to their property and return them back to DAFF.
<b>Glass bottles</b>	Dedicated area for storage on site.	Government owns the waste. Glass is segregated from other waste streams on entry to Makato Landfill and crushed using a glass crusher. the glass crusher is not of commercial standard and therefore struggles to crush whole bottles. Larger pieces of glass not crushed are landfilled. Crushed glass is collected every three months and is mixed with tar and aggregate to fill potholes around the island <sup>14</sup> .
<b>Aluminium cans</b>	Large, caged area on site.	Government owns the waste and other individuals who choose to collect the aluminium cans for other purposes. The aluminium cans are sold for recovery but not by Government but a third party for export. Storage is up to one month. One shipping container is filled every six to nine months and export continues to occur.
<b>Plastic bottles</b>	Palletised and wrapped in plastic wrap before being moved to shipping containers.	Government owns the waste but is flexible and allow for people to repurpose plastic bottles. Plastic bottles are stored in large lift bags and transported to the Huihui site for storage, while the recycling facility is being developed. The department is looking at a machine similar to the Shruder developed by the Plastic Collective <sup>15</sup> to manage plastic bottles in Niue. Segregated plastic bottles are not exported, due to no current agreement in place with New Zealand.
<b>Paper and cardboard</b>	Collected at the landfill	There is no separate collection of paper and cardboard only. Segregated and burned on site (due to the presence of flies and vermin) or collected by customers.

<sup>13</sup> Niue Island – National Integrated Waste Management Strategy, 2010 – 2015

<sup>14</sup> At the time of this report the glass crusher at Makato is currently not working, therefore a stockpile of glass has developed at Makato

<sup>15</sup> <https://www.plasticcollective.co/resource-recovery/>

Other wastes		
E-waste	Collected, palletised, and wrapped in plastic (open storage).	Government owns the waste. Island wide collections take place annually. E-waste is collated at Makato Landfill, placed on pallets, wrapped in plastic, and sent to the Huihui site for storage until the recycling facility is ready. Segregated e-waste is not exported but stored long term. Future plans for e-waste include dismantling and processing of individual items at the recycling facility. Niue is awaiting appropriate facilities in New Zealand to be developed before being able to export the e-waste.
Scrap waste (corrugated roofing iron, car parts, legacy waste, washing machine ringers and old shipping containers)	Dedicated area at the landfill	Government owns the waste. . Scrap waste remains onsite at Makato Landfill due to its large bulky size and a lack of equipment to enable handling.  Scrap waste has been previously exported. However, there is no programme currently in place and funding constraints. Should funding become available, export would again be considered.
White goods	Dedicated area at the landfill	Government owns the waste. Island wide collections take place annually. The waste is collated at Makato Landfill, placed on pallets, wrapped in plastic, and sent to the Huihui site for storage until the recycling facility is ready. Segregated white goods are not currently exported. Future plans for white goods include dismantling and processing individual items at the recycling facility. Awaiting the establishment of further processing within New Zealand.
Batteries Gas bottles	Palletised and wrapped in plastic wrap before being moved to shipping containers.	Government owns the waste but is flexible and allow for people to repurpose the waste. Batteries and gas bottles are collected at Makato Landfill and stored separately. After three months of collections, the batteries and gas bottles are transferred separately to the Huihui site for storage. Once a significant volume of batteries and gas bottles are stored, export is arranged.
IBC waste oil	IBC container	Government owns the waste. Waste oil is exported overseas.

### 3.6.3 Huihui site - temporary storage location

#### 3.6.3.1 Landfill infrastructure

The site is located in Huihui outside of the residential area opposite the cemetery on less than one hectare of land. The site is currently used as a temporary storage site until the Islands recycling facility has been constructed and is fully operational. The site will be repurposed for other projects from next year. There are plans to rehabilitate the landfill if funding is made available.

A shipping container is present at the landfill site to store hazardous wastes including chemicals and bagged asbestos. Due to a current lack of funding, the waste chemicals and asbestos continue to remain onsite. There is currently no management plan for hazardous chemicals.



Figure 6.3: Huihui site

### 3.6.3.2 Inputs to landfill

Huihui is used as storage site for recyclables and hazardous waste only i.e., no general waste disposal occurs. Despite warning signs against illegal dumping displayed on site, general waste is dumped at times.

Wastes accepted at Huihui is subject to approval by the Department of Environment who own the site. There are zones for the different wastes although illegal drop-offs without approval occur which results in contaminated waste streams without containment. Some waste streams are further managed by visitors who extract the valuable materials.

Waste streams accepted include:

- Assorted plastic;
  - PET plastic and tin cans are bagged and stockpiled in a contained area. There is a preference to use super sacks to contain the waste, however these can only be ordered in quantities of 500 bags at one time and therefore are costly;
  - Other plastics including large drums and paint buckets are stock piled openly;
- Aluminium cans;
- Glass bottles;
- Recyclables;
- White goods;
- E-waste;

- Asbestos;
- Tar;
- Chemicals; and
- LPG gas bottles (when empty are exported).

Commercials can utilise this facility to dispose of e-waste, white goods, and cardboard.

### **3.6.4 Mutalau Landfill**

#### **3.6.4.1 Landfill infrastructure**

Mutalau landfill is one hectare in size. Due to its closure, there is no infrastructure present on the site. The waste in the landfill is scattered over a wide area with controlled fires to reduce the hazard of flies within the landfill area.



*Figure 6.4: Mutalau Landfill*

#### **3.6.4.2 Inputs to landfill**

This site has been closed for five years to the public, however dumping of waste from events and waste disposal from close by villages still occurs. Although the landfill is temporarily closed, the landowners are discussing the next steps.

### **3.6.5 Future changes proposed by the Department for Environment for waste management**

#### **3.6.5.1 Hazardous wastes**

The e-waste collection for the island is due to be reinstated in June/July 2021 to coincide with World Environment Day. This is dependent on funding available from projects and reliant on careful planning to avoid double handling of waste.

There are currently no programmes in place to capture, store and export hazardous wastes. The management of hazardous wastes is completed on a case-by case basis when funding is available to address particular waste streams.

### 3.6.5.2 Recycling Centre

A recycling centre for the island is currently under development at the south end of the airport runway. Negotiations with the successful contractor, for the commencement of construction will be confirmed mid-2021, with a predicted open date for Q4 2021. Once the facility is operational it will replace the Huihui site for storage and processing and support Makato and Vaiea landfills by removing the recoverable materials.

The drawings in Figure 6.5 were issued to potential contractors in late 2019. They illustrate the proposed layout for the recycling centre.

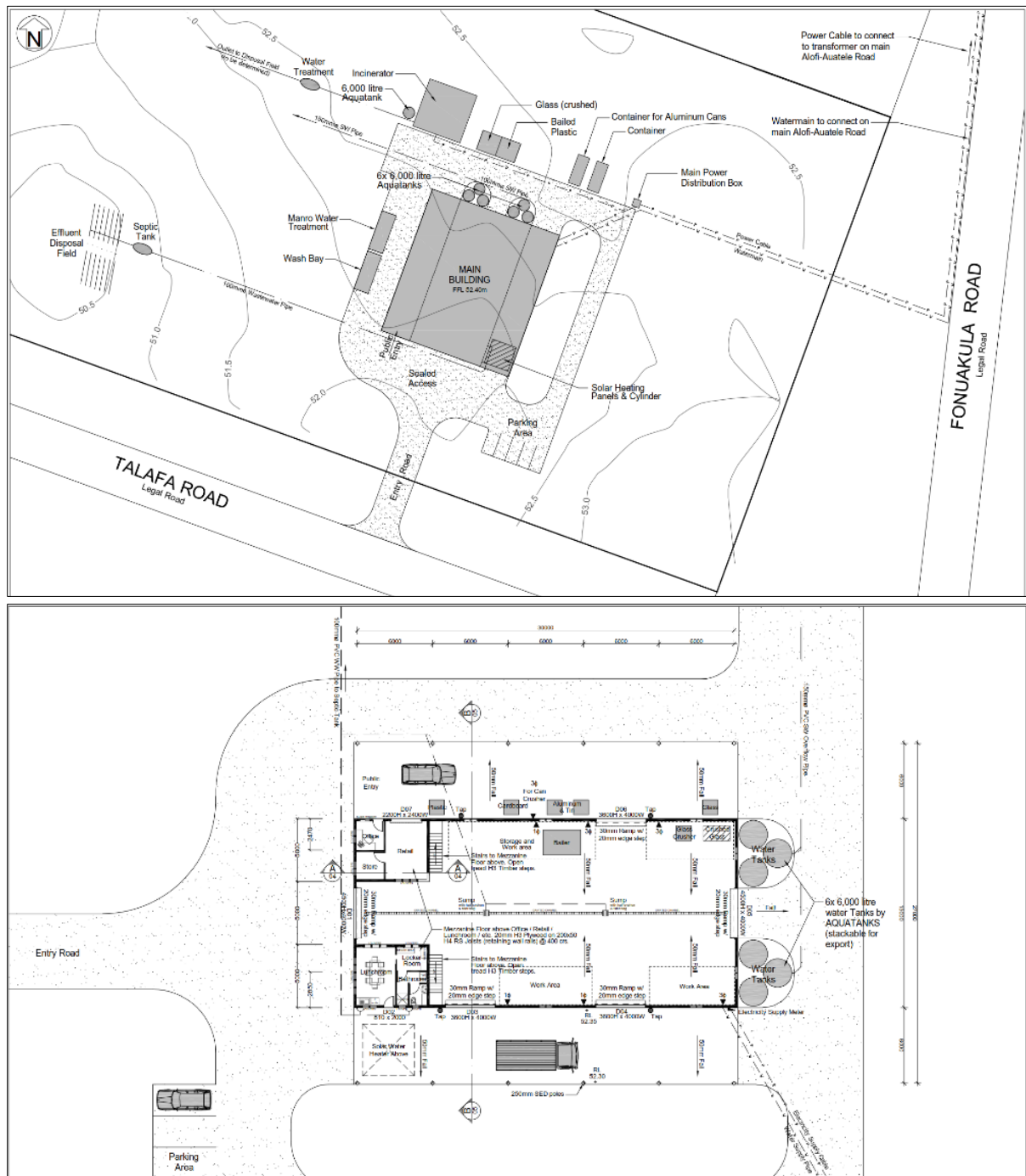


Figure 6.5: Niue Recycling Facility - Tender Issue drawings

The site will accept and process glass and PET plastics with provision for expansion to include other recyclable items. In addition to the recycling facility, there are also plans for a sewage treatment plant that will address the current dumping of septic system sludge at the edge of the runway. This component will be part of the Ridge to Reef Project.

### 3.6.5.3 Other wastes

Other initiatives for resource recovery and waste minimisation in Niue include:

- Importation ban on plastic shopping bags since 1 March 2020;
- An introduction of levies (Waste Standard Regulations) was drafted in 2016. However, stakeholders have not found common ground on certain areas and as a result the levies have not been endorsed nor implemented. Resubmission is in progress and legal advice has been sought, however the likely timing of endorsement and implementation is unknown; and
- A review of the 2010-2015 Niue Waste Management Plan is still required to identify the improvement opportunities for the islands waste management.



## 4 Methodology

### 4.1 Audit Team

#### 4.1.1 Roles and responsibilities

The audit was undertaken by a T+TI project team working closely with local agencies. The T+TI team comprised Team Leader (Chris Purchas), Country Coordinator (Tekao Herrmann) and Waste Auditor (Anna Ainsworth). The T+TI project team worked with an in country focal point and a team of 7 staff from the Department of Environment of the Ministry of Natural Resources.

It was intended that the T+TI project team be present in Niue for some or all of the audit period. Travel restrictions due to the Covid-19 meant that the T+TI team participated remotely. The T+TI Country Coordinator was present remotely for the entire waste audit period. While the in country focal point was available for the duration of the waste audit managing the waste audit activities on the ground.

##### 4.1.1.1 Responsibilities

A description of the responsibilities for each role has been provided in Table 6.6.

Table 6.6: Responsibilities of the project team

Role	Responsibilities
Team Leader	Provide effective communication of progress for the waste audit. Provide regular reporting and updates to the SPREP Project Manager and Niue Focal Point.
Country Coordinator	Provide remote support for the duration of the waste audit. Provide daily feedback to the in country focal point and audit team.
Waste Auditor	Reporting of the waste audit for Niue.
In country Focal Point	Delivering the physical audits in Country on the ground with remote support from the Country Coordinator and Waste Auditor.

#### 4.1.2 Audit Planning

Communications with the in country focal point – Haden Talagi, Director for the Department of Environment began in September 2020. Haden coordinated the creation of an audit team in Niue which consisted of staff from the Department of Environment. A total of 7 people attended the training day. The identification of individuals to take part in the audit included consideration of experience in previous waste audits, some understanding of the waste operations in Niue and being able to operate a smart phone to input the raw data. It was agreed that team members that were identified to input the raw data would use their own personal phones.

Personal protective equipment required for the audit was provided by T+TI and was shipped from New Zealand to Niue. This included the following:

- Coveralls;
- Disposable gloves;
- Protective gloves – to go over the top of the disposable gloves;
- Face masks;
- First aid kit;
- Wheelie bin liners – 240 litre and 120 litre;
- Tongs – long and short handled;

- Dustpan and brush;
- Masking tape;
- Hand sanitiser;
- Safety glasses; and
- Scales for the sort and weighing of waste samples.

Equipment unable to be shipped, but sourced in Niue included:

- Vehicles required to collect waste samples and undertake stockpile assessments were hired in country;
- Petrol for use in the hire vehicles;
- Raincoats to work during wet weather;
- Bins and sorting containers; and
- Sim cards providing data for phones to upload audit data from survey forms.

#### **4.1.2.1 Health and Safety**

The importance of ensuring that health and safety is considered integral to the delivery of the waste audit was communicated continually from the first remote meeting with the in country focal point. Due to the nature of the physical sorting and weighing of waste, a requirement for those team members involved in this part of the audit to receive vaccinations of Tetanus, Hepatitis A and B (where available). Due to the Hepatitis A vaccine not being available in Niue, only Hepatitis B and Tetanus were given. Proof of vaccinations for the in-country audit team is provided to T+TI.

T+TI produced a Job Safety Analysis (JSA) for the waste audit in Niue. This provides details on the audit methodology and describes the hazards associated with the tasks undertaken as part of the audit. Each hazard is considered individually, and mitigation measures outlined. The JSA is reviewed and discussed alongside a health and safety presentation which forms part of the training. Each individual taking part in the waste audit is required to sign the JSA, which confirms that they have understood and agree to the information. A copy of the JSA is included in the Niue training report.

#### **4.1.3 Audit Training**

The training and audit delivery process was designed to allow the project team to provide support and supervision remotely. Remote training was achieved through:

- Training material based on a mix of videos, written material, and presentations;
- On-line quizzes to test understanding of key audit and safety concepts; and
- Provision for telephone or video conference delivery from a remote team.

The audit process and data collection approach was also designed to allow for remote supervision as much as possible if required. Key aspects included:

- Daily start-up meetings with the various audit teams (by telephone or video if required);
- Form based data collection on mobile phones or tablets to ensure data is collected in a consistent fashion<sup>16</sup>;
- Live or end of day data submission to allow review of data collected<sup>17</sup>; and
- Periodic check in by telephone or video each day to track sample collection, data quality and challenges as they arise.

<sup>16</sup> Data collected through Survey 123 and received by T+TI on ArcGIS Enterprise

<sup>17</sup> Data stored on the T+TI secure system in project folders



The remotely located T+TI Country Coordinator was available throughout the audit period to answer any questions from the audit team, provide feedback on the data and ensure that the team are comfortable with the health and safety requirements for the audit.

Training of the waste audit team was undertaken on the 9 and 10 February 2021 and involved a range of guides and training materials.

The training for the Niue audit team was managed by the T+TI (Country Coordinator) remotely providing introductions with the in-country project team.

The T+TI Country Coordinator was on hand to answer any questions through the day by video conference. The training included:

- Working through “how to guides” for each survey component;
- An explanation of how to use the data collection software (on mobile phones), followed by an afternoon of training on the survey data input; and
- “Dummy run” for each of the surveys collecting data and familiarisation with roles.

The focus on training was supported throughout the audit activity through daily (or more frequent) contact and review of data being submitted through the data collection apps each day.

#### 4.1.4 Stakeholders

The key delivery partners working alongside T+TI to deliver the waste audits:

- Ministry of Natural Resources – Department of Environment;
- Ministry of Social Services – Department of Health;
- Finance and Planning – Customs Department;
- Ministry of Infrastructure – Department of Works;
- Chamber of Commerce – Commercial Sector; and
- Community.

Several key stakeholder groups supported the delivery of the audits with details of the consultation and engagement activities included in Table 6.7.



**Table 6.7: Stakeholder engagement**

Stakeholder	Description of audit interface	Stakeholder engagement
Householders	<ul style="list-style-type: none"> <li>• Bag collection</li> <li>• Interviews</li> </ul>	<ul style="list-style-type: none"> <li>• Letter delivery providing details of audit to participating households<sup>18</sup></li> <li>• Media release through Facebook</li> <li>• Description on local radio in the week prior to the audit</li> <li>• Face to face interviews</li> </ul>
Commercial owners	<ul style="list-style-type: none"> <li>• Bag collection</li> <li>• Interviews</li> </ul>	<ul style="list-style-type: none"> <li>• Letter delivery-providing details of audit to participating commercials<sup>19</sup></li> <li>• Media release through Facebook</li> <li>• Description on local radio in the week prior to the audit</li> <li>• Face to face interviews</li> </ul>
Commercial operators (collectors and disposers)	<ul style="list-style-type: none"> <li>• Landfill disposal operators</li> </ul>	<ul style="list-style-type: none"> <li>• Face to face discussions</li> <li>• Interviews where required</li> </ul>

## 4.2 Sampling methodology

Samples were collected in accordance with the sampling procedures summarised in the sampling guides. A summary of audit components and methodology is provided in Table 6.8.

The audit methodology is detailed in the Niue Audit Plan (Appendix A). The methodology applied has been derived from the Waste Audit Methodology – A step-by-step manual to conduct comprehensive waste audits in SIDs<sup>20</sup>, this is attached as an Appendix to the audit plan.

The audit plan was developed based on the most recent household and commercial statistics from the Niue Statistics Office. The target sample numbers also reflect experience on similar audits and are intended to ensure that there is adequate data to provide a statistically valid estimate of waste characteristics and quantity.

A target sample size of 100 households across Niue was determined to provide a balance between the level of precision achieved and the time required to sample, sort and weigh the samples obtained. A target sample size of 20 commercials across Niue were selected.

The target numbers allow for some reduction in sample numbers in the event of operational issues during sample collection. They also account for the potential for some sample results to be excluded from analysis during quality assurance.

A sample is the entire contents of a bin or bag/s put out for collection. The sample represents the waste produced by that household over the period of one week.

<sup>18</sup> Delivered to households explaining audit and instructions to leave bags at entry to driveway prior to audit.

<sup>19</sup> Delivered to households explaining audit and instructions to leave bags at entry to driveway prior to audit.

<sup>20</sup> Published by PRIF

**Table 6.8: Audit methodology**

Audit component	Description
1. Sample collection from households and commercials	<p>Rubbish bags/waste collected from bins collected from commercials/households identified on audit maps. Samples taken were photographed and bags labelled with unique ID numbers, with a corresponding tag placed on a nearby tree/fence. The location was photographed to assist in identifying the location for Component 3. Sample locations are presented in Figure 6.6.</p> <p>Bags of two sizes (120 litre and 240 litre) were provided to householders for the audit, these were then put out for collection by these households and commercials on collection day. The entire contents of the bin for the one household was emptied into the bag/s depending on the quantity of waste. A waste sample is the entire contents of the bin put out for collection.</p>
2. Sort and weigh of household/commercial bags	<p>Samples were transported to the Huihui site for waste sorting. Waste was sorted into primary categories and defined secondary categories. A list of these categories and their included materials is included as Appendix A. Waste in each category was weighed with data and photographs recorded in the sample collection application. The audit methodology uses weight to determine composition rather than volume. The methodology does not include the identification of moisture content across different waste materials.</p>
3. Household and commercial interviews	<p>For each household or commercials where a waste sample has been collected a second team returned to complete an interview. The interview was recorded on a standard form.</p>
4. Landfill audit	<p>Audits were completed at Makato and Vaiea landfill sites. Waste composition and quantity were estimated, and loads recorded during the audit period. Each load was recorded including photographs and estimated composition and quantity.</p>
5. Stockpile assessment	<p>Stockpile audits were completed based on information provided by the Department of Environment. Stockpiles in Makato, Vaiea and Huihui were assessed during the audit. Materials characteristics and quantity were estimated. Each stockpile was recorded including photographs and estimated composition and quantity.</p>

### 4.3 Identification of households and commercial premises

Maps showing sample locations by household and commercials were provided to the audit team. Where locations were unsuitable for sampling, the team would move onto the next household or commercial premise of the same category. The locations of those households and commercial premises sampled are shown in Figure 6.6. The audit programme comprised of seven days<sup>21</sup> sample collection in Niue.

Knowledge of collection arrangements was considered when identifying a random and representative sample.

<sup>21</sup> Day 1 was not included in the 7 days, was for training and dummy runs.



## 4.4 Summary of data collected

The total number of household and commercial samples, stockpile assessments completed, and landfill loads audited are summarised in Table 6.9. Table 6.9 shows the difference between sample plan targets and actual sample numbers.

Table 6.9: Summary of sample numbers collected in Niue<sup>24</sup>

Sample type	Niue actual sample	Niue sample plan
<b>Household</b>		
Samples taken	110	100
Interviews	99	100
<b>Commercial</b>		
Samples	11	20
Interviews	10	20
Stockpile assessments	12	N/A
Landfill load audits	43	N/A

A number of factors resulted in the difference between the Sample Plan and the actual audit numbers for this audit. These were:

- Weather disruptions impacting on the ability of the audit team to collect samples;
- Productivity of the team sorting the waste into categories, weighing and recording this data;
  - In the first few days of the audit, it typically takes time for the team to familiarise themselves with the process of physically sorting the waste, ensuring the right waste is captured in the right category and the subsequent input of data into the phone. This reduces the productivity of the team during the first few days. This was the case in Niue limiting the total number of samples collected;
- The potential for individual samples to be unsuitable for inclusion in some of the data analysis (specifically the composition of the waste stream). This is due to data discrepancies, for example a decimal point is inserted in the wrong place;
- Outliers in composition is also an important consideration when presenting the data;
  - When producing waste composition data, for this project we complete a robust quality assurance and data review process, which accounts for the different in total start weight (total sample weight) and the total weight of the individual waste categories combined. The difference between these two numbers is calculated as a % difference. If the confidence interval or difference is more than +15% or -15% different, then we do not use this data for determining the composition of waste presented in this report. A margin of difference outside of this range (15% to -15%), reduces our confidence in the data submitted; and
- Commercials being closed or owners off island during the audit period, mainly due to Covid-19 impacts in no tourism.

Where data has been excluded from calculations when the confidence interval is applied, this has been noted throughout the report.

<sup>24</sup> Data derived from the waste audits undertaken in Niue

## 4.5 Validation procedure

The audit process and data collection approach was designed to allow for remote supervision, data checking and ongoing feedback to the audit team throughout the audit process.

Key aspects include are illustrated in Figure 6.8.

Each audit component had a standard digital form. All information was recorded on smart phones and submitted to the ArcGIS platform as it was collected. Allowing for real time quality checking of data by the consultant team remotely. The Waste audit specialist would then feedback findings to the Country Coordinator daily or more frequently as required, creating a continuous feedback loop (Figure 6.8).

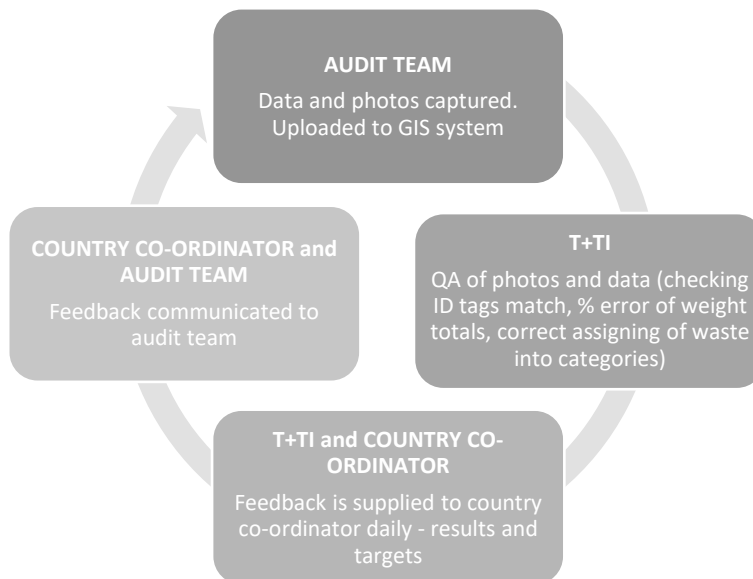


Figure 6.8: Continuous feedback loop in place to ensure quality of audit outputs.



## 5 Audit findings

### 5.1 Introduction

The audit was undertaken between 15 February and 2 April 2021, excluding Fridays, Saturdays and Sundays.

### 5.2 Household audit findings

The household sample collection identified that a significant proportion of households store bulky waste items on individual properties.

#### 5.2.1 Access to waste collection services

Access for households to a waste collection service has been provided in Table 6.10, this summarises feedback on the collection service for households including a waste collection rating (Table 6.10).

**Table 6.10: Summary of access to collection services**

Total interviewed	99
% with access to collection service	99% (98/99 responses)
Average collection service rating	8.9
Comments	<ul style="list-style-type: none"><li>• Reliable service in terms of the day.</li><li>• On the day of collection, the timing is inconsistent.</li><li>• They always take all waste away.</li><li>• Twice weekly collection.</li><li>• We drop our own rubbish at the landfill.</li><li>• Free collection service.</li><li>• No waste is left behind.</li></ul>

Alternative approaches to managing waste were highlighted through the interviews. It is common practice for a number of options to be selected by householders for the same waste stream. For example, in some households food scraps were recorded as part of the waste stream, fed to animals.

**Table 6.11: Waste management activities adopted by households**

Material	Disposal options
Waste	<ul style="list-style-type: none"> <li>• Collected</li> <li>• Transport to landfill</li> </ul>
Garden organics	<ul style="list-style-type: none"> <li>• Burn</li> <li>• Transport to landfill</li> <li>• Stored</li> <li>• Composted at property</li> <li>• Collected</li> </ul>
Sanitary	<ul style="list-style-type: none"> <li>• Collected</li> <li>• Transport to landfill</li> <li>• Burn</li> <li>• Stored</li> </ul>
Bulky items	<ul style="list-style-type: none"> <li>• Collected</li> <li>• Transport to landfill</li> <li>• Stored</li> <li>• Dumped (left off the property and not at the landfill)</li> <li>• Transport for recycling</li> </ul>
Food scraps	<ul style="list-style-type: none"> <li>• Collected</li> <li>• Stored</li> <li>• Composted at property</li> <li>• Bury</li> <li>• Transport to landfill</li> <li>• Fed to animals (pigs and chickens)</li> </ul>

The identified management activities adopted by householders is due to the following reasons:

- Collection service is provided by the Niue Government and is well used;
- Reliability of the collection service (timing of collections and bin handling) means sometimes recyclable materials are placed in the waste container;
- Two collections per week for recycling sometimes make it easier to put materials in the general waste container;
- Food scraps are used for pig/chicken feed;
- Aluminium cans in particular are captured under the recycling programme;
- Illegal dumping and littering should be addressed;
- Encouragement of waste segregation and composting;
- Charging by car load not by bag at the landfill;
- Bigger bins for recycling;
- More awareness on separation of waste streams, particularly bulky waste; and
- Bulky waste collection requested.

Participants were surveyed on their willingness to pay for collection services. Outcomes from this question are presented in Figure 4.1.



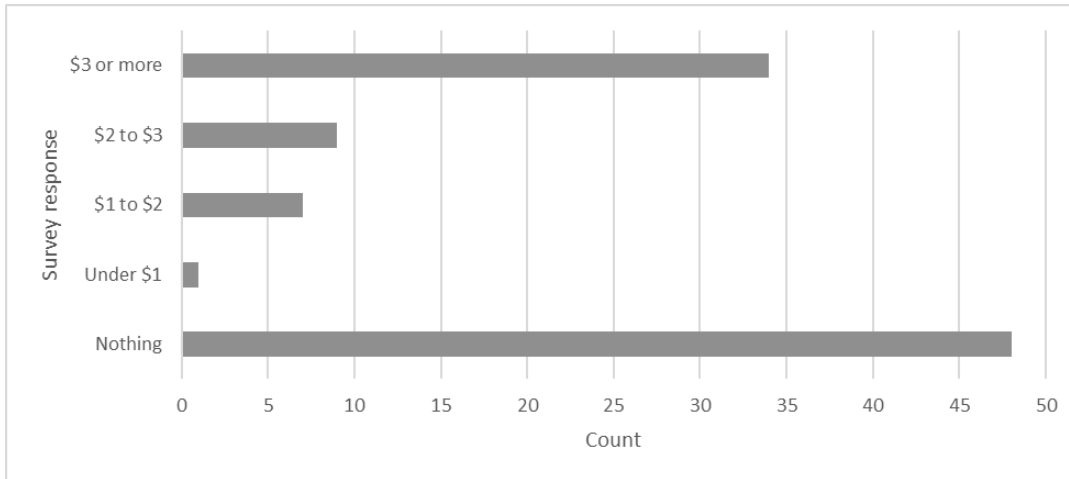


Figure 6.9: Willingness to pay for households collection of rubbish – survey outcomes in Niue

Household willingness to pay for their waste collection service and the maximum fee they would be willing to pay for this service is summarised in Table 4.3.

Table 6.12: Willingness to pay

Willingness to pay	Percentage composition
Nothing	48%
Under \$1	1%
\$1 to \$2	7%
\$2 to \$3	9%
\$3 or more	34%

### 5.2.2 Household waste composition

During the audit there was evidence of households separating recyclables from general waste for collection through the fortnightly service provided by the Department of the Environment.

Red recycling crates were used with additional material stored in cardboard boxes prior to collection.

Typical roadside waste containers and examples of waste put out for collection can be seen in Figure 4.2 (note: bags were provided for the audit to aid sample collection).



Figure 6.10: Typical waste collection from households in Niue

The average composition of waste by weight from households in Niue is shown in Figure 4.3.

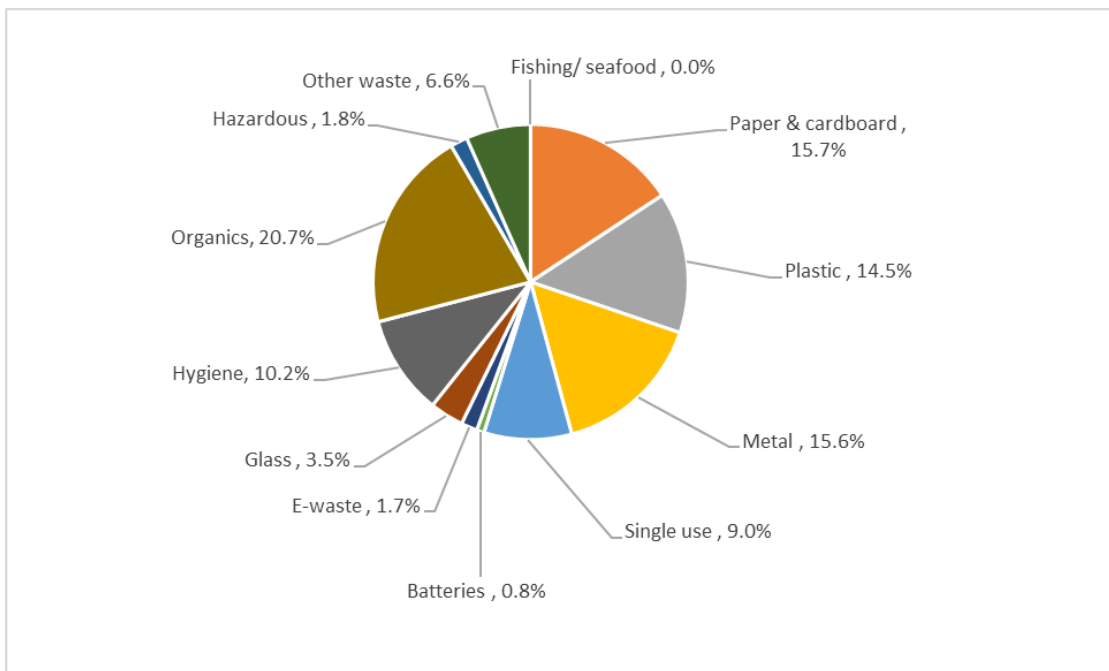








Figure 6.11: Niue average household waste composition summary

Key audit findings by category and photos have been identified in Table 6.13.

**Table 6.13: Waste material findings**

Waste material	Description	Pictures
Organics	Dominated by food and garden organics.	
Paper and cardboard	Dominated by cardboard boxes.	
Metals	<p>Cans (both human and animal contexts) – drinks (aluminium) – V, Steinlager, juice, Coca Cola, Fanta, other cans).</p> <p>Food – small tins (coated steel) various sizes and brands.</p>	
Plastics	<p>Plastic drinks containers – small (0.6 litre), larger (1.5 litre) water bottles (PET), small juice bottles (various), 1.5 litre Sprite bottles (PET), Just Juice (1 and 2.4 litre), G Force (0.75 litre) and Wave (0.5 litre) (PET).</p> <p>Plastic containers – food (condiments), ice cream tubs (2 litre), non-food – body wash (HDPE).</p>	
Hygiene products	Dominated by nappies and sanitary products.	

Waste material	Description	Pictures
Single use items (9.0%)	Dominated by supermarket plastic bags. Category also included plastic takeaway plates, plastic takeaway containers, straws and plastic beverage containers.	

Lower composition items include:

- Glass (3.5%) – green bottles (V), brown bottles (ginger beer) and clear glass bottles (juice, wine bottles and Schweppes Lemonade), condiments (small i.e., jam) and spirit bottles.
- Other waste<sup>25</sup> (6.6%) was dominated by textiles – mainly clothing.
- There were low proportions of e-waste (laptop parts), batteries, hazardous waste and fishing related items observed.

The number of containers present in the waste stream was very small due to the recycling collection service that is available (Refer to Section 5.2.4).

The lower and upper range for each component of household waste have been calculated at a 95% confidence interval and are presented in Table 6.14 and Figure 6.12. This provides a measure of the range of estimated proportion for each material that might be expected for repeated composition surveys for households in Niue.

Interviews with householders has provided the data we have used to estimate the average quantity of waste from sampled households for Niue<sup>26</sup>. The estimated generation of waste per household per day is 0.8 kg (within a range of 0.2 kg – 3.0 kg **per household per day**).

Due to the absence of fishing/seafood identified during the survey, the margin of error in the range has not been provided.

<sup>25</sup> Other waste includes textiles, EOL renewable energy equipment, tyres, rubble/concrete including ceramics.

<sup>26</sup> The data used to calculate the composition of waste collected from households in Niue has been derived from samples collected from all household properties during the audit only. The total weight of samples collected was averaged using the count (total number of samples. This is the methodology as presented in the Waste Audit Methodology – A step-by-step manual to conduct comprehensive waste audits in SIDs produced by PRIF.

**Table 6.14:** Waste composition for households identified as part of the sort and weigh of samples for Niue<sup>27</sup>

	Fishing/ seafood	Paper and cardboard	Plastics	Metals	Single use	Batteries	E-waste	Glass	Hygiene	Organics	Hazardous	Other waste
<b>Composition</b>	<b>0.0%</b>	<b>15.7%</b>	<b>14.5%</b>	<b>15.6%</b>	<b>9.0%</b>	<b>0.8%</b>	<b>1.6%<sup>28</sup></b>	<b>3.5%</b>	<b>10.2%</b>	<b>20.7%</b>	<b>1.8%</b>	<b>6.6%</b>
<b>Lower range</b>	n/a	14.7%	13.7%	15.5%	6.7%	0.0%	0.5%	1.6%	6.8%	18.8%	0.5%	4.6%
<b>Upper range</b>	n/a	17.4%	16.8%	17.8%	10.0%	1.4%	2.2%	4.4%	11.8%	24.7%	2.3%	7.9%

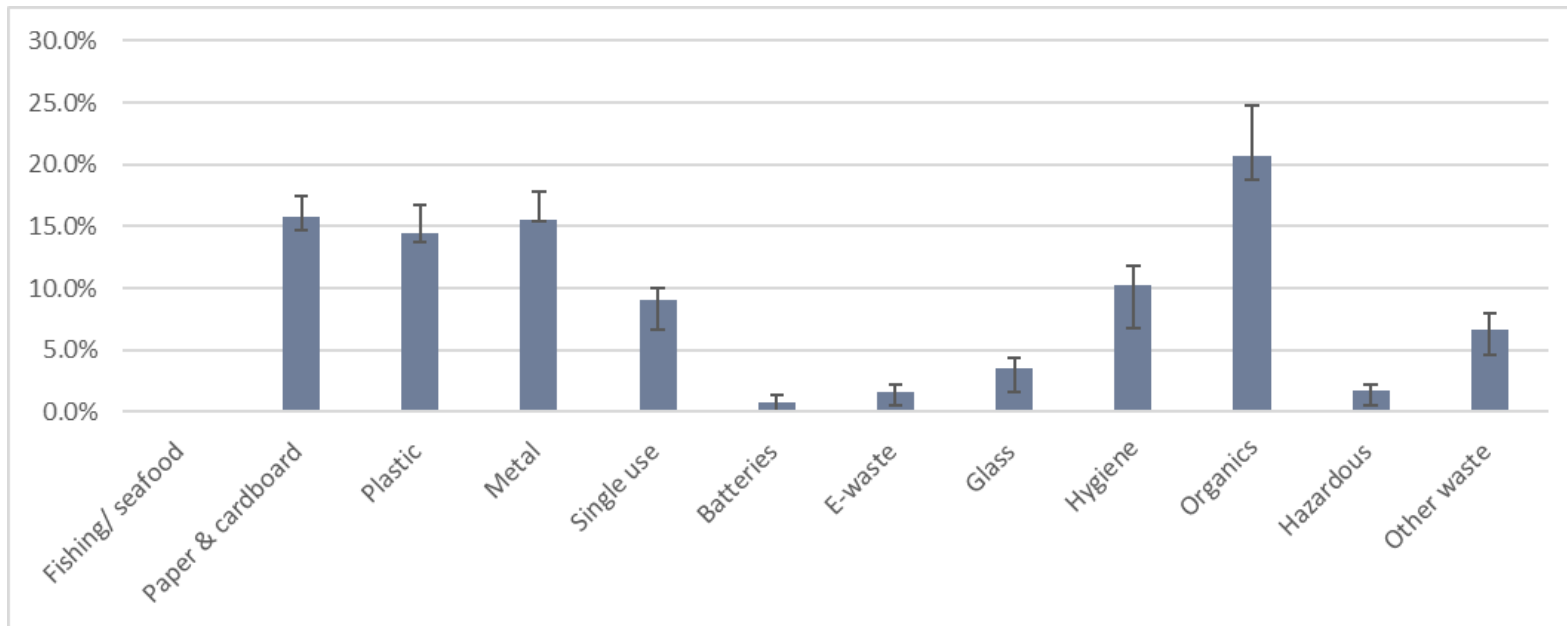


Figure 6.12: Waste composition for households identified as part of the sort and weigh of samples collected for Niue

<sup>27</sup> Confidence interval of +15% and -15% applied during data analysis. 67/110 samples were within this range and have been used to derive the composition.

<sup>28</sup> Rounded down from 1.66% due to rounding to allow sum to 100.0%

### 5.2.3 Potentially recyclable materials

A range of potentially recyclable material was identified through the waste survey.

Paper and cardboard, plastics, metals, and organics were recorded as the most dominant categories in the household waste samples. Glass and single use were also identified but were less significant. This is despite the fortnightly household recycling collection.

Examples of these waste streams following separation as part of the audit are seen in Figure 6.13.

Key points to note:

- Plastics are present with a high proportion of single use items suitable for recycling, if markets can be secured.
- Metals, paper, and cardboard are present at a relatively high proportion of the total household waste stream. Metals are already being captured through the existing recycling collection and paper and cardboard could be easily recycled where markets are accessible.

The interview data suggested a wide range of household usage/generation. Average figures provide a useful indication of likely quantities of materials but should be validated for example using a large sample size for household surveys and/or considering sales data.



Figure 6.13: Typical recyclable items identified through the sort and weigh of samples collected in Niue

Detailed observations for potentially recyclable materials identified in the waste samples has been provided in Table 6.15.

**Table 6.15: Observations by material**

Material	Key materials	Detail on observations
Organics	Dominated by food organics.	Organics were identified as the largest portion of household waste samples. Pictures of the organic's category highlights a large portion of food organics. With the presence of garden organics.
Glass	Green, brown, and white glass.	White glass – beer bottles (Heineken), spirit bottles (1 litre bottles) and jars. Green - beer and wine bottles. Brown glass – ginger beer.
Metals	Aluminium drink cans. Food tin cans (some are coated with steel). Foil trays.	The data provided is the sample of households from across Niue. Household interviews reported an average of 2.8 (3) drinks can per person, per household, per week. The range varied between 0 to 21 cans per week between samples collected. Using the average from the household interview data collected, across Niue, this equates to 4,675 cans per week for the population (est 1,700). Over one year this is estimated to be around 243,100 drinks cans <sup>29</sup> per year. This is considered at the upper end of the number of drinks cans likely to be produced <sup>30</sup> .
Plastics	Mainly comprised small (0.6 litre), larger (1.5 litre) water bottles (PET), small juice bottles (various), 1.5 litre Sprite bottles. Plastic containers – food (condiments), ice cream tubs (2 litre), non-food – body wash (HDPE).	Household interviews reported an average of 2.7 (3) plastic water bottles per person per household per week with a range of 0 to 15 bottles per person, per week. Using the average from the household interview data collected, across Niue this equates to 4,521 per week for the whole population. Over one year this is estimated to be around 235,064 plastic bottles per year. This is likely to be at the upper end of the number of water bottles produced per week.
Paper and cardboard	Dominated by cardboard boxes	Cardboard boxes, egg cartons, cereal boxes, milk cartons, tissue boxes and food packaging boxes.

#### 5.2.4 Recycling composition

Typical roadside recyclables put out for collection can be seen in Figure 6.14. When there is not enough room in the crate, additional materials were placed in bags.

<sup>29</sup> Note the number of drinks cans and plastic bottles are based on the data collected from the audit data only and is based on a population of 1,700.

<sup>30</sup> If this data is to be used to inform potential recyclables for capture, it will be important to validate these numbers with further survey work specifically capturing a larger sample of households.



Figure 6.14: Typical recycling collection from households in Niue

The average composition of recyclables by weight collected from households is shown in Figure 6.15 and Table 4.7.

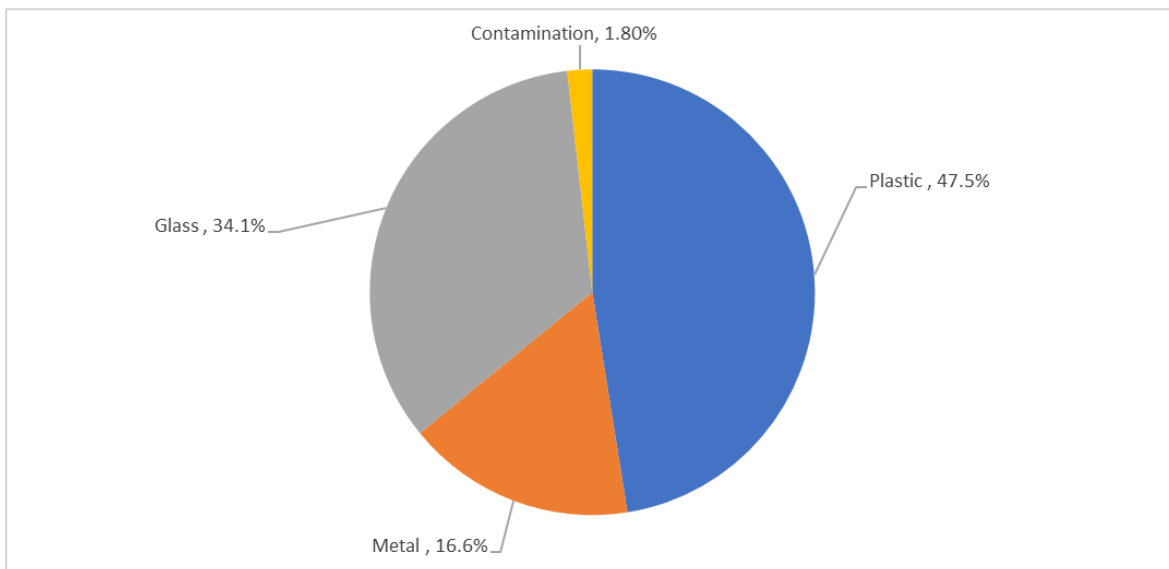




Figure 6.15: Niue household recycling composition



Key audit findings by category have been provided in Table 6.16.

**Table 6.16: Waste material findings**

Recyclable material	Description	Pictures taken during the audit
Plastics	Plastic drinks containers – small (0.6 litre) and larger (1.5 litre) water bottles (PET), 1.5 litre Sprite bottles (PET).	
Metals	Cans – drinks (aluminium) - Coca Cola, Sprite, Pepsi, beer and other cans.	
Glass	Glass bottles – green, brown and clear glass bottles: beer, other drinks, condiments (small and large) and spirit bottles.	

Small fractions of organics and paper were present in one and two samples respectively. The audit data suggests that the recyclable stream has a very low rate of contamination due to household segregation.

The lower and upper range for the proportion of each component of the recycling stream have been calculated at a 95% confidence interval. The analysis is presented in Figure 6.16. This provides a measure of the range of estimated proportion for each material that might be expected for repeated composition surveys for households in Niue.

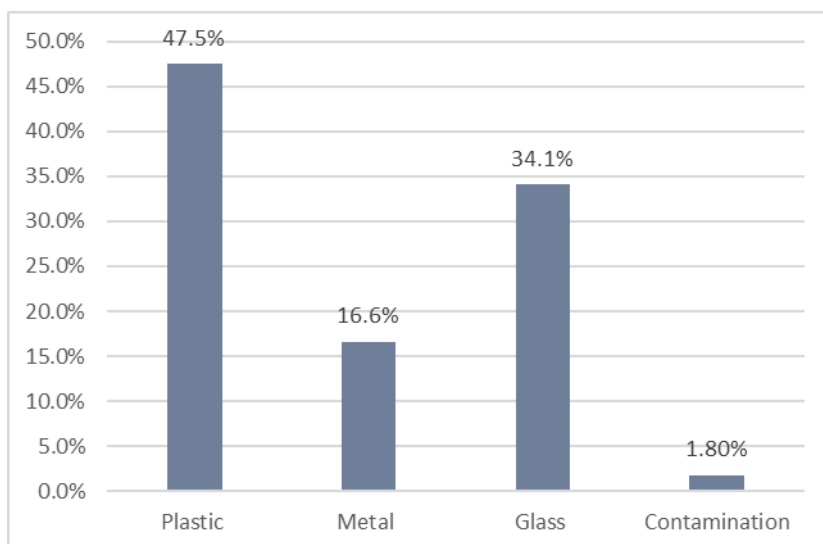


Figure 6.16: Recycling composition for households identified as part of the sort and weigh of samples collected for Niue

### 5.3 Commercial audit findings

The total number of commercials audited by type is shown in Table 6.17, this provides the count, or the number of commercials which were audited during the waste audit. Where there is a difference between the number of sort and weigh surveys completed and the interviews completed this indicates that the sort and weigh data has been excluded from the analysis through the quality assurance process.

Table 6.17: Commercial waste sample numbers

Commercial Type	Sort and weigh	Interview
Retail/clothing	1	1
Retail/hardware store	1	1
Services	4	3
Hospitality	4	4
Museum	1	1
<b>Total</b>	<b>11</b>	<b>10</b>

#### 5.3.1 Access to waste collection services

Table 6.18 below table summarises feedback on the collection service including a waste collection rating.

**Table 6.18: Summary of access to collection services<sup>31</sup>**

<b>Total interviewed</b>	<b>10</b>
% of commercials who access a collection service	40% <sup>1</sup>
% of commercials who do not access a collection service	60%
Average collection service rating	9 <sup>32</sup> (out of 10)
Commentary to the collection service rating	<ul style="list-style-type: none"> <li>• Producing less waste currently as there are no tourists</li> <li>• One commercial stated a preference to be charged per car load and not per bag</li> <li>• Large amounts of cardboard boxes produced</li> <li>• Some commercials have their own methods for recycle/reuse recycling plastic bottles</li> </ul>

It is common practice for a number of options to be selected by commercials for the same waste stream. Options undertaken by commercials identified through the audit are identified in Table 6.19.

**Table 6.19: Options for waste management adopted by commercials**

Material	Disposal options
<b>Waste</b>	<ul style="list-style-type: none"> <li>• Transported to landfill</li> <li>• Collected</li> </ul>
<b>Garden organics</b>	<ul style="list-style-type: none"> <li>• Transported to landfill</li> <li>• Burn</li> <li>• Dump</li> <li>• Store</li> </ul>
<b>Sanitary</b>	<ul style="list-style-type: none"> <li>• Transported to landfill</li> <li>• Collected</li> <li>• N/A (meaning waste stream not relevant)</li> </ul>
<b>Bulky items</b>	<ul style="list-style-type: none"> <li>• Transported to landfill</li> </ul>
<b>Food scraps</b>	<ul style="list-style-type: none"> <li>• Transported to landfill</li> <li>• N/A (meaning waste stream not relevant)</li> </ul>

Participants were surveyed on their willingness to pay for collection services. Outcomes of the survey are presented in Figure 6.17.

<sup>31</sup> Data collected and recorded in survey 123 app, from interviews held with commercials

<sup>32</sup> Sample size of four who responded to the question and only one commercial who uses the collection service.

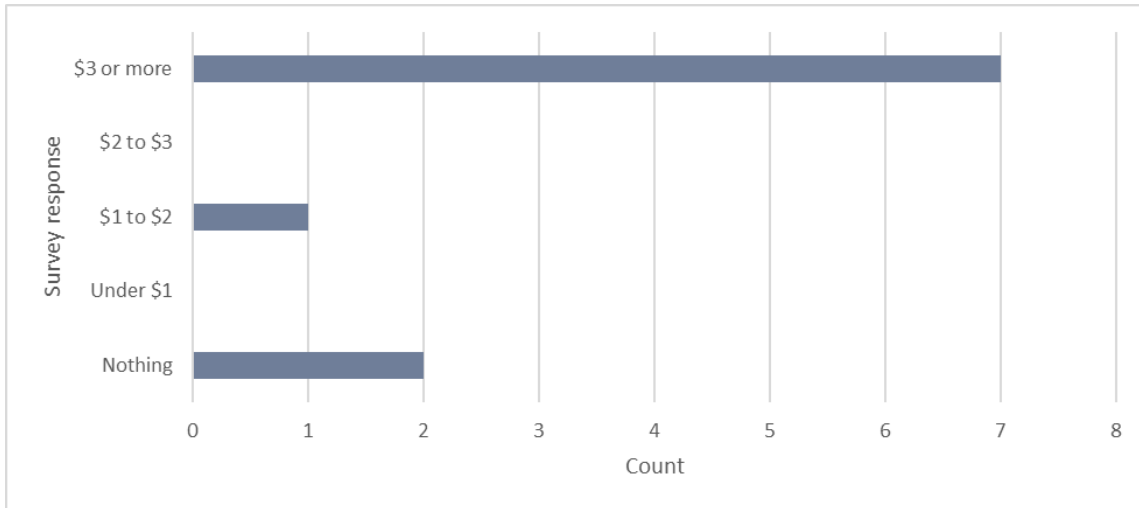


Figure 6.17: Willingness to pay for commercial collection of waste – survey outcomes in Niue

In terms of potential for charging a breakdown of responses has been provided in Table 6.20.

Table 6.20: Willingness to pay - commercials

Willingness to pay	Percentage composition
Nothing	20%
Under \$1	0%
\$1 to \$2	10%
\$2 to \$3	0%
\$3 or more	70%

### 5.3.2 Commercial waste composition

The composition of commercial waste collected, sorted, and weighed for Niue is shown in Figure 6.18.

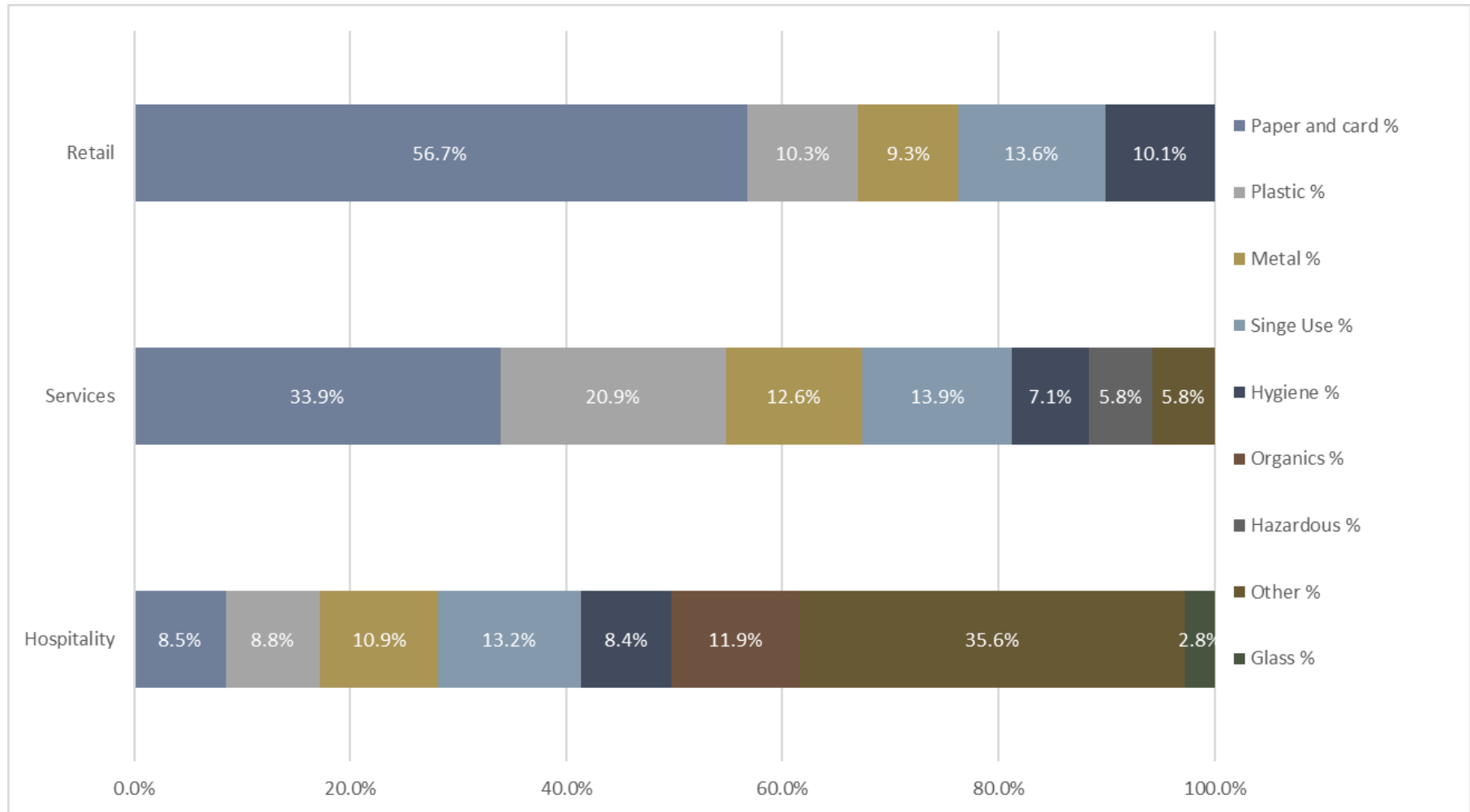


Figure 6.18: Composition of waste from commercials in Niue

Below we have provided commentary on the likely proportions of waste categories from the waste samples collected and sorted for the 11 commercials in Niue.



The samples sorted and weighed, provide a snapshot of the likely composition from these types of commercials.

The combined data (for 11 commercial premises) provides an indicator of commercial waste composition overall.

The data collected during the audit suggests that the dominant waste categories across the commercial types surveyed were paper and cardboard and other waste<sup>25</sup>. Followed by single use items and plastics, both similar by weight. Details of the findings have been provided in Table 6.22.



**Table 6.21: Commercial waste findings**

Waste material	Description	Pictures taken during the audit
Paper and cardboard	<p>Dominated by cardboard boxes and cardboard packaging. Retail contained 56% and services 34%.</p>	
Single use items	<p>Similar composition across commercial samples. Between 13-14% in composition by weight. Single use items included: plastic takeaway plates, straws, plastic drinks containers, supermarket bags and polystyrene plates.</p>	
Organics	<p>Food organics only present in the hospitality samples and not retail or services.</p>	
Metals	<p>Drinks cans including aluminium – V, Sprite, Pepsi and other cans). Food cans - steel - various brands.</p>	

Waste material	Description	Pictures taken during the audit
Plastics	Plastic drinks containers – small and large (water bottles) (PET), juice containers (HDPE) and Coca cola bottles (PET). Plastic containers – mainly single use items for example: plastic and polystyrene plates (PS), plastic takeaway food containers (PET, PP) plastic takeaway cups (PET or PP) and ice cream tubs (2 litre).	Photos not provided, given the lower proportion of composition.
Glass	Clear glass bottles (sauces).	

The overall waste composition for commercials is presented in Table 6.22 and Figure 6.19.

The lower and upper range have been calculated at a 95% confidence interval. This provides a measure of the range of estimated proportion for each material that might be expected for repeated composition surveys for commercials in Niue.

Due to the absence of fishing/seafood, batteries and e-waste identified during the survey, the margin of error in the range has not been provided.





Table 6.22: Waste composition for commercials identified as part of the sort and weigh of samples collected for Niue<sup>33</sup>

	Fishing/ seafood	Paper and cardboard	Plastics	Metals	Single use	Batteries	E-waste	Glass	Hygiene	Organics	Hazardous	Other waste
<b>Composition</b>	<b>0.0%</b>	<b>22.6%</b>	<b>12.1%</b>	<b>11.1%</b>	<b>13.4%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>1.6%</b>	<b>8.4%</b>	<b>6.9%</b>	<b>1.5%</b>	<b>22.3%</b>
<b>Lower range</b>	n/a	12.2%	7.2%	6.5%	11.6%	n/a	n/a	0.0%	2.9%	0.4%	0.0%	0.0%
<b>Upper range</b>	n/a	42.7%	19.1%	17.8%	20.4%	n/a	n/a	2.2%	13.8%	20.1%	3.3%	29.6%

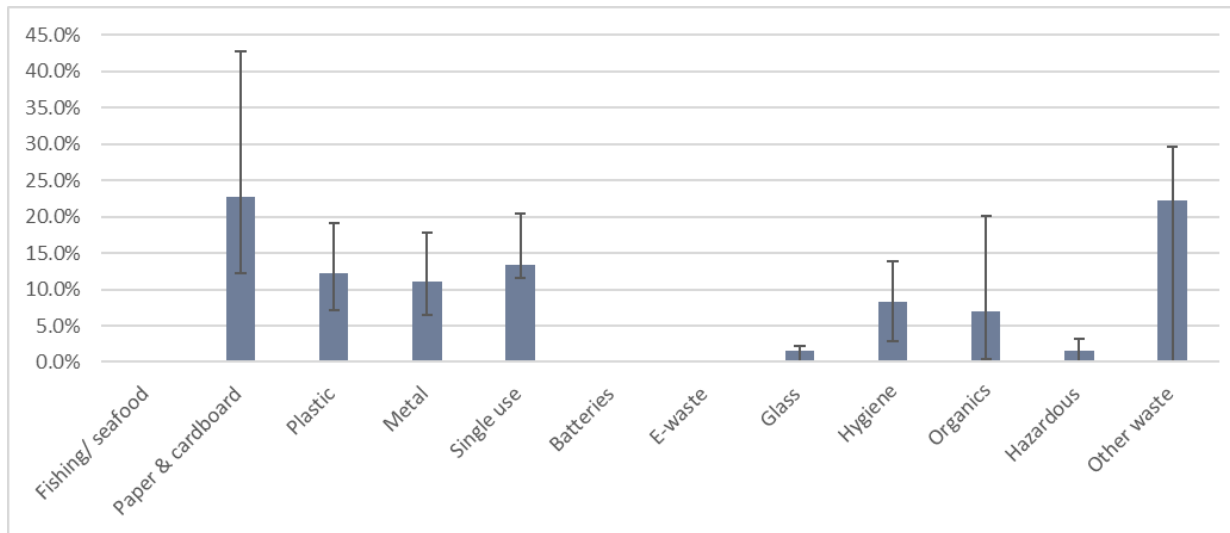


Figure 6.19: Waste composition for commercials identified as part of the sort and weigh of samples collected for Niue

<sup>33</sup> Confidence interval of +15% and -15% applied during data analysis. 7/11 samples were within this range and used to calculate the waste composition

## 5.4 Landfill Audit

Data provided by the Department for Environment has been combined with the sort and weigh samples (likely composition) to provide a likely mixed waste composition.

### 5.4.1 Composition

In the absence of updated waste to landfill annual volumes, the following assumptions have been made (

Table 6.23).

**Table 6.23: Assumptions**

Information	Assumptions
The numbers of waste collection truck loads	Vaiea and Makato landfill sites (through 2020 and 2021) receive one per site, twice per week.
Compactor truck volume.	20.24m <sup>3</sup>
Likely quantities and event waste composition.	50% paper and packaging, 10% food organics, 20% other general mixed waste.
The portion of waste from private commercials has been estimated for Makato landfill using the below:	Average weight of commercial samples sorted during the audit (one week of waste) (27kg per commercial).
	An estimated 50 commercials in Niue.
	Factoring this up to one year.
The portion of waste delivered to the landfills from the roadside collection has been estimated using the following:	No commercial waste is taken to Vaiea Landfill.
	One 20.24m <sup>3</sup> compactor truck twice per week is taken to both Makato and Vaiea landfills in 2020 and 2021. Of which 95% is household waste and 5% is small commercials waste.
	Volume to weight ration – 225kg/m <sup>3</sup> .
	Household waste sample composition from the sort and weighing has been applied.

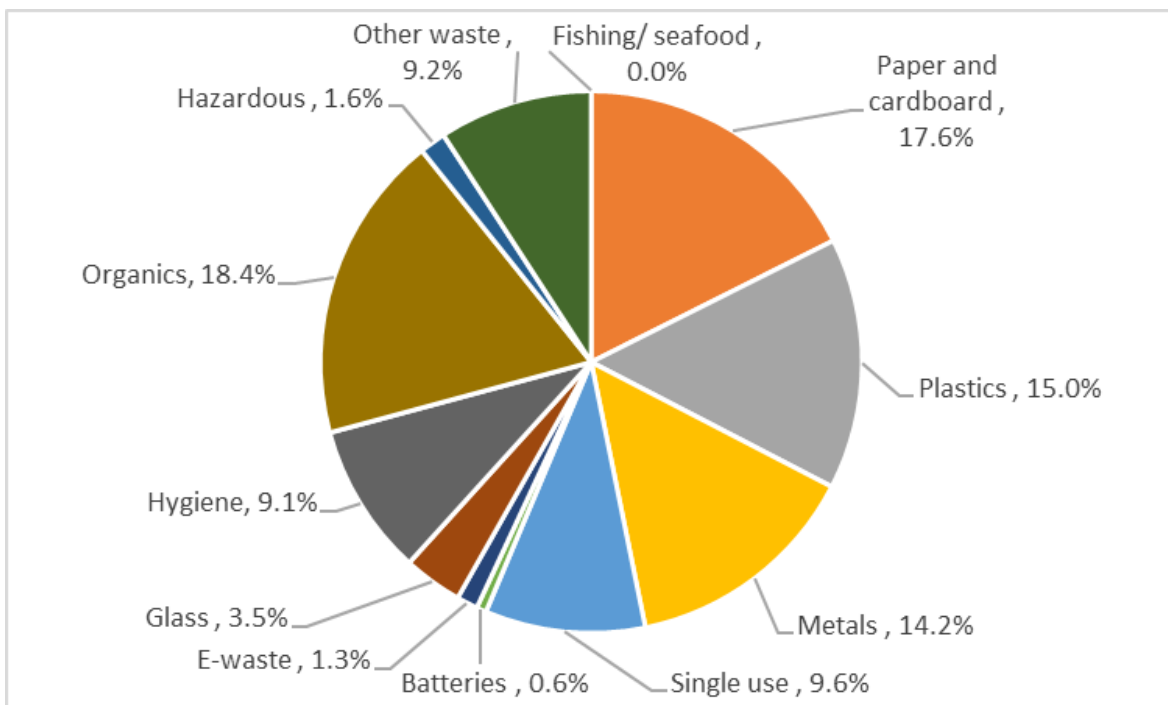
This suggests that the total waste to each landfill is approximately:

- 594 tonnes per year for Makato Landfill.
- 494 tonnes per year for Vaiea Landfill.

**Table 6.24: Estimated composition of solid waste by weight to Makato and Vaiea landfills for 2020**

Materials	Makato		Vaiea	
	Composition %	Tonnage	Composition %	Tonnage
Fishing/ seafood	0.0%	0.0	0.0%	0
Paper and cardboard	17.6%	104.5	16.4%	81
Plastic	15.0%	89.1	14.8%	73
Metal	14.2%	84.3	15.0%	74
Single use	9.6%	56.8	9.1%	45
Batteries	0.6%	3.5	0.7%	3
E-waste	1.3%	7.5	1.5%	7
Glass	3.5%	20.9	3.6%	18
Hygiene	9.1%	53.9	9.7%	48
Organics	18.4%	109.5	20.0%	99
Hazardous	1.6%	9.3	1.7%	8
Other waste	9.2%	54.6	7.4%	37
<b>Total</b>	<b>100.0</b>	<b>594</b>	<b>100.0</b>	<b>494</b>

This data excludes volumes of materials which have been identified in stockpiles in Table 4.15. Waste composition at the two landfills is similar. Commercial waste (not collected through the roadside collection service) is delivered to Makato Landfill only, which brings about a difference in the proportion of paper and cardboard, single use items, hygiene, organics and other waste.



*Figure 6.20: Percentage waste composition for Makato Landfill*

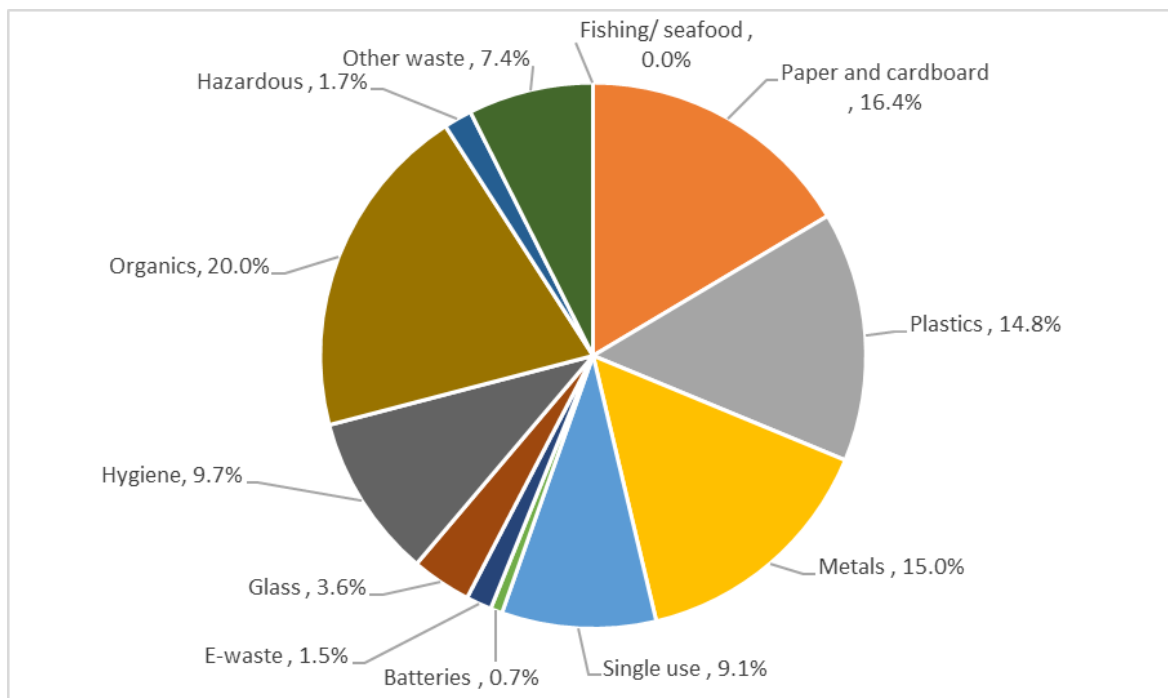


Figure 6.21: Percentage waste composition for Vaiea Landfill

The agricultural sector makes up 23.5% of Niue’s economy and as a result organic waste is a large proportion of waste generated on the island. Organic waste is usually disposed of within the general waste collection as there is little awareness around composting and its benefits. The Niue Island Organic Farmers Association (NIOFA) promotes the principles of organic farming including composting or organic waste. However, composting is not actively practiced by NIOFA members, mainly because of the small quantities of organic waste generated.

Information provided by the Department for Environment indicates that the pre-covid Government waste collection produced 1-2 more truckloads of waste, twice per week.

#### 5.4.2 Assessment of operational costs

Current costs for operation and contracts associated with waste collection and waste facilities have not been made available for this audit.

The annual budget and operational cost for Makato Landfill is NZ \$50,000 - 60,000 per year which includes fuel and machinery maintenance. Information from the Department of Environment details that Makato Landfill is currently operating at a loss, with this cost absorbed by the Department of Environment. Reasoning and value of this loss has not been provided. Total waste to Makato Landfill per annum (based on 2020 and 2021 data) is approximately 594 tonnes. This equates to a cost between NZ \$84-101 per tonne.



Operational costs for Vaiea Landfill have not been provided.



### 5.5 Stockpiles

The audit team used local knowledge to identify known stockpile locations. The audit team also identified areas of illegal dumping activity of general waste. These have not been included in the stockpile assessment.



Quantities of materials present in stockpiles (including those present at community landfills) was identified through the stockpile assessment survey. The types and estimated quantities of materials found in stockpiles across Niue has been provided in Table 4.16.

Table 6.25: Type and estimated quantity of materials found in stockpiles in Niue.



	Weight (tonne)	Volume/ count (units)/ litres	Location	Photos captured during the audit
Truck	97.5	15	Amanau (Alofi south)	
Car	277.5	185	Male loa Hakupu, Kaimiti, Industrial park (Alofi), Amanau (Alofi south). There are a number of areas where end of life vehicles are being dumped by mechanic businesses or the general public.	


	Weight (tonne)	Volume/ count (units)/ litres	Location	Photos captured during the audit
Vans	20.0	10	Industrial park (Alofi), Amanau (Alofi south)	
Batteries	0.3	50	Huihui site	

	Weight (tonne)	Volume/ count (units)/ litres	Location	Photos captured during the audit
Building materials	0.7	3m <sup>3</sup>	Makato Landfill	
Roofing iron	3.6	178 (sheets)	Huihui, Vaiea, Mutalau and Makato landfills	

	Weight (tonne)	Volume/ count (units)/ litres	Location	Photos captured during the audit
Other metals	24.3	385m <sup>3</sup>	Huihui, Vaiea and Mutalau landfills	
E-waste	15.8	415m <sup>3</sup>	Huihui site and Vaiea Landfill.	No photos available as mixed with other stockpiles.
White goods	55.6	247m <sup>3</sup>	Huihui site, Mutalau landfill, Industrial Park (Alofi) and Makato Landfill.	



	Weight (tonne)	Volume/ count (units)/ litres	Location	Photos captured during the audit
Plastics	10.3	795m <sup>3</sup>	Huihui, Vaiea, Mutalau and Makato Landfills.	
Aluminium cans	40.8	265m <sup>3</sup>	Catholic Church, Alofi north, Vaiea and Mutalau landfills. Approximately 80m <sup>3</sup> of aluminium cans stored at the Catholic Church in Alofi North. Some cans are compacted and baled, whereas others are stored in large flexible bags.	
Garden organics	12.0	80m <sup>3</sup>	Vaiea, Mutalau and Makato landfills	No photos available as mixed with other stockpiles
Glass	5.9	17m <sup>3</sup>	Mutalau Landfill	
Hazardous	9.5	40m <sup>3</sup>	Huihui site	

	Weight (tonne)	Volume/ count (units)/ litres	Location	Photos captured during the audit
Waste oil	6	6,000 litres	Stored in 1,000 litre intermediate bulk containers (IBCs) at Kaimiti and Alofi South.	
Asbestos		3,650m <sup>2</sup>	Although exact quantities of asbestos remaining on the island are unavailable it is estimated that 3,650m <sup>2</sup> of asbestos from Niue High School was removed and buried. It is estimated that there are still 347 houses on the island that contain asbestos roofing. Many of these houses were abandoned after Cyclone Heta. These still pose a health risk to the local population.	No photos available.

Assumptions associated with identifying the weight in tonnes of the stockpiles identified have been provided in Appendix C.

## 6 Customs data

An assessment of the customs data for imported and exported goods has been undertaken for 2021 and 2020 data and presented in Table 6.1 and Table 6.2. Data provided by Matson South Pacific Limited has been extracted by commodity code based on all ports where goods into Niue are imported from and exported to. Data by HS code is not collected by Matson South Pacific Limited, and Customs Niue were unavailable to provide the data requested.

The data provided was in the form of TEU units, 20-foot shipping container units. This data has been converted into tonnages for the purposes of this report.

The import tonnages have been calculated based on TEU units multiplied by 14, as per advice from the shipping company.

**Table 6.1: Breakdown of customs data for key import data<sup>34</sup>**

Import items	TEU units (2020)	2020 (Jan-Dec) quantity (tonnes)
Beverages	5	70
Boat	0	0
Building Products	9	126
Concrete and cement products	56	784
Food stuffs	61	854
Machinery	5	63
Roofing Iron	0.5	6
Steel	3	49
Timber and timber products	1	10
Vehicles	104	1453
<b>Total</b>	<b>244</b>	<b>3,415</b>
Other items	541	5,615

**Table 6.2: Breakdown of customs data for key export data**

Export items	TEU units (2020)	2020 (Jan-Dec) quantity (tonnes)
Beverages (non-alcohol) <sup>35</sup>	3	15.2
<b>Total</b>	<b>3</b>	<b>15.2</b>
Other	553	-

<sup>34</sup> Import data has been provided in TEU units and an estimated 14 tonne per TEU provides the metric tonne data

<sup>35</sup> Aluminium cans – 154kg/m<sup>3</sup>

## 7 COVID 19

The New Zealand Ministry of Foreign Affairs and Trade working alongside the Pacific Tourism Organisation developed a report detailing the effects of Covid 19. The report details that Niue has a 'very strong tourism status analysis and planning' with a 'core group of successful operators – with some flexibility' therefore faces a less severe impact on the tourism industry which has been established<sup>36</sup>.

The impact of the Covid-19 response in Niue on waste generation and composition is difficult to accurately quantify without data on these aspects before and after the start of the pandemic. Information from sources on the island have detailed the quantities of garden organics and construction waste have increased compared to pre-covid levels. Waste generation typically correlates well with economic activity i.e., there are likely to be limited impacts related to Covid-19. This suggests that the data collected for this audit is relevant and reflective of waste generation and composition for Niue.

Since the Covid-19 pandemic quarantine waste from MIQ is burnt immediately twice per week. There were plans to have a designated incinerator for quarantine waste from Covid-19 however there is lack of funding available for this.



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<sup>36</sup> Pacific Tourism: Covid 19 Impact and Recovery. Sector Status Report: Phase 1B, Ministry for Foreign Affairs and Trade New Zealand, 5 May 2020

## Appendix A: Waste sort categories

Table B1: Primary categories

Category 1	Examples
Metals	Aluminium cans, Aluminium recyclable, Steel containers, White goods, End of life vehicles, Metal other.
Paper and cardboard	Cardboard, liner paperboard (LPB - cardboard container lined with plastic or aluminium), composite, paper.
Plastics	PET containers, HDPE containers, LDPE containers, PVC containers, PP, EPS, PS, Flexibles/film, Other plastic.
Batteries	Non-rechargeable, Rechargeable, Lead acid batteries, Mobile phone, Power tool batteries, Lithium Batteries, Lithium-ion batteries, Other batteries.
E-waste	TVs, Mobile phones, Electrical Items & Toner Cartridges
Glass	Glass bottles, Glass jars, Glass fines, Glass other.
Hygiene	Feminine Hygiene, Pharmaceutical, Medical waste, Nappies, Other sanitary waste.
Organics	Food, Wood/timber, Garden organics, Other organics.
Hazardous	Paint, Fluorescent tubes, Household chemicals, Asbestos, Clinical (medical), Gas bottles, Mercury, Containerised used oil, Hazardous (other).
Other	Textiles, EOL renewable energy equipment, Tyres, Rubble/concrete including Ceramics.

Table B2: Specific materials type categories

Category 1	Examples
Fishing/seafood	Metal, Plastics, wood.
Single use items	Beverage containers, Cigarette butts, Cigarette packets, Straws, Coffee cups, Bags - heavy glossy typically branded carry bags, supermarket type light weight carry bags, Takeaway containers - plastic, other EPS/Styrofoam, paper. Bottle lids

## Appendix B: Assumptions for stockpile assessment quantities

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Assumptions for stockpile assessment quantities		
Item	Quantity	Unit
Bus	6500	kg
Boat	500	kg
Cars	1500	kg
Van	2000	kg
Asbestos roofing	9.2	kg
Other metals	63	kg/m3
E-waste	38	kg/m3
Garden organics	150	kg/m3
Batteries	5	kg
Tyres	8	kg
Minibus	4100	kg
Cabinets	40	kg
Ladders	13.6	kg
Cardboard	670	kg/m3
Large metal drums	200	kg
Small metal drums	75	kg
Gas cylinder	1000	kg

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