Pacific Region Infrastructure Facility

Waste Audit Report Cook Islands

Consultants' Final Report

January 2021

This report was prepared by external consultant, Tonkin & Taylor International Ltd, with the support of the Pacific Region Infrastructure Facility (PRIF).

PRIF is a multi-agency coordination mechanism aimed at improving the delivery of development assistance from donors and development partners to the infrastructure sector in the Pacific region. The PRIF development partners are the Asian Development Bank, Australian Department of Foreign Affairs and Trade, European Union, European Investment Bank, Japan International Cooperation Agency, New Zealand Ministry for Foreign Affairs and Trade, United States Department of State and the World Bank Group.

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Note: In this publication, "$" refers to United States dollars unless otherwise stated.

Contents

Contents (continued)

Appendixes

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 on two islands - Rarotonga and Aitutaki
- 146 household samples
- 169 interviews
- 53 business samples
- 62 interviews
- 100 stockpile assessments
- 95 landfill audits

Waste generation rates

- Average household generation per day is 1.0kg (with a range of 0.1kg - 3.8kg per household per day)

Household key compostion trends

- Rarotonga—Hygiene products (40%), and organic waste (24%) were the largest components
- Aitutaki—Hygiene products (35%), glass (25%), and metals (14%) were the largest components

Business composition trends

- Business waste varied by sector
- Across all business sectors the largest components included paper/ cardboard and plastic. Metals, organic, glass, and other (typically textiles) were also present

Recovery of recyclables

- Good capture of glass for recycling on both Rarotonga and Aitutaki
- Cans and plastic containers were also put out for recycling by both households and businesses

Stockpiles in Cook Islands

- Most commonly stockpiled material—ferrous metal
- Stockpiles located at General Transport awaiting sufficent volumes and suitable markets for export
  - Whitewear and steel have been exported over the past 12 months
  - Aluminium and plastic were exported early in 2019
- Significant number of stockpiles located at the waste facility in Aitutaki—roofing iron, asbestos, and whiteware

Rarotonga Landfill composition

- 24.6% paper
- 19.7% plastics
- 5.5% metals
- 4.6% other
- 0.6% e-waste
- 0% fishing
- 21.1% organics
- 14.9% hygiene
- 4.6% single use items
- 3.9% glass
- 0.3% batteries

Interview outcomes

- High satisfaction with current collection service
- Reasonable willingness to pay for collection service
- Alternatives to collection were common—burn, bury, feeding food scraps to animals, composting organics
- Businesses had a higher willingness to pay for collection services and higher satisfaction with the existing service
- Insights provided into pre -COVID 19 waste volumes, particularly businesses

2. Introduction

The Pacific Region Infrastructure Facility (PRIF) engaged specialists from Tonkin & Taylor International Limited to undertake waste audits in the Cook Islands and Fiji. This report presents the findings of the waste audit undertaken for the Cook Islands. The methodology applied for the audit was as per the Waste Audit Methodology—a step-by-step manual to conduct comprehensive waste audits in small island developing states, produced by PRIF.[1] The audit was undertaken by Tonkin & Taylor International Limited in close collaboration with the Ministry of Infrastructure Cook Islands, the National Environment Services, the Aitutaki Island Administration and other key stakeholders in the waste sector. The audit took place from 5 August 2020 to 9 September 2020 inclusive.

The Cook Islands waste audit are part of a Pacific wide audit program implemented by the PRIF and other agencies. The PRIF-funded audits are undertaken in cooperation with the United Nations Environment Programme, the World Bank, and the South Pacific Regional Environment Program, through the European Union-funded PacWaste Plus program and with support from the Australian-funded Pacific Ocean Litter Project.

The information and data gathered from the waste audits will be used to support the development and monitoring of waste and resource recovery projects and provide the basis for recommendations on infrastructure and policy interventions. The regional dataset will be used to identify and evaluate potential regional projects to improve waste management in the region.

[1] PRIF (2019) Waste Audit Methodology. A step-by-step manual to conduct comprehensive waste audits in SIDs (small island developing states).

3. Background

3.1 Socioeconomic Background

The Cook Islands comprise 15 small islands and a combined population of about 17,500, speaking Cook Islands Maori and English. Rarotonga has over 74% of the population, about 13,000, and is the administrative center for the region. Aitutaki is the second most populated island, with about 1,900 people.

Gross domestic product (GDP) per capita is high compared to other Pacific Island nations ($20,354[2] in 2018).[3] However, the economy faces challenges including remoteness from trade centers, small labor force, limited natural resources, and adaption to climate change.

Tourism is the largest source of revenue (accounting for around 60% of GDP). The tourism industry has been the main driver of growth in recent years, attracting over 170,000 visitors per year across the Cook Islands.[4] There was a continual increase of around 15–20 thousand more each year between 2015 to 2017.

Accommodation and hospitality also employ a large share of the population, alongside wholesale, retail, and public administration. Agriculture and fishing are important to the economy, with the main local products for export including recreational boats, fish, and fruit juice.

At the time of the audit, the coronavirus disease (COVID-19) had been declared a global pandemic by the World Health Organization. Like many other Pacific Island nations, the Cook Islands avoided an outbreak by closing international borders. This has meant that the Cook Islands has had no tourist visitors since March 2020. The impact of COVID-19 and the closed international borders on audit findings is further discussed in Section 5.9.

3.2 Legislation

The summary of relevant legislation was sourced from the Stocktake of Existing and Pipeline Waste Legislation: Cook Islands. Prepared by the Melbourne Law School at the University of Melbourne, Australia with Technical Assistance from Monash University. 16 March 2020.

Currently no specific waste management legislation is in place, and waste management falls under general environmental and public health legislation.[5] The National Solid Waste Strategy 2013–2016 provides analysis and context for waste management, including noting a lack of data on waste management and generation as a barrier to understanding of the national waste situation.

Government departments with waste responsibilities in the Cook Islands include:

- National Environment Services
- Ministry of Infrastructure Cook Islands
- Island environment authorities
- Ministry of Health
- Ministry of Agriculture

[2] GDP is reported in US dollars.
[3] For information see https://www.dfat.gov.au/geo/cook-islands/Pages/cook-islands-country-brief
[4] As per the Cook Islands Annual Report 2019, – draft total visitors in July 2019—June 2020: 9 months of data due to border closure. National Sustainable Development Plan Indicator Report 2017: visitor arrivals 161,362.
[5] See the Environment Act 2003, Public Health Act 2004.

Pipeline legislative activities for waste management and governance in the Cook Islands (in September 2020) included:

- ***Passage of Solid and Hazardous Waste Bill***—A proposed dedicated legislative framework for solid and hazardous waste management and to assist with the implementation of commitments under multilateral environmental agreements.
- ***Introduction of a ban on single use plastics***—This would be introduced as part of the Solid and Hazardous Waste Bill.
- ***Development of an Advance Disposal Fee***—This would involve collection of an advance disposal fee for a range of products potentially including vehicles, electronics, and single use packaging. This would be enabled as part of the Solid and Hazardous Waste Bill.

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

3.3 Waste Services

3.3.1 Household waste

3.3.1.1 Rarotonga

Household waste is collected weekly. A mixture of containers, rubbish bags, and bins are used for rubbish and recyclables containment. Waste is manually loaded into a single compactor truck that services residential and small commercial customers across the island. Residents separate glass, cans (aluminum and steel), plastic bottles (PET and HDPE), and glass bottles for recyclables. This collection is undertaken by a private contractor commissioned by the Ministry of Infrastructure Cook Islands.

Recyclables are collected alongside rubbish and are manually loaded into a dedicated collection vehicle and trailer. Waste is taken to the Rarotonga Waste Facility for disposal in the landfill.

3.3.2 Commercial waste

Small businesses can use the collection service offered to households for both rubbish and recyclables. The collection from the small businesses is undertaken at the same time as the household collections.

Larger businesses can opt for a user pays collection service or transport their waste directly to the Rarotonga Waste Facility or Aitutaki Waste Facility. Businesses wanting to purchase a collection service will do so with the provider directly and not through the Ministry of Infrastructure Cook Islands. There is no direct regulation of commercial collections, but all collection providers have to take waste to the Rarotonga Landfill.

The Cook Islands Trading Corporation Limited collects, consolidates, and export, various recyclable materials from their operations and other businesses.

A number of other commercial waste collectors operate in Rarotonga servicing businesses, bringing waste to the Rarotonga Waste Facility for disposal.

3.3.3 Hazardous waste

Programs are in place to capture, store, and export hazardous wastes, including electronics e-waste (computers, monitors, other electrical appliances), used batteries (lead acid and dry cell batteries) and used oil. Where materials are captured, they are stored until there is sufficient quantity for export. Consolidated materials are stored as follows:

- Electronic waste container at Rarotonga Waste Facility
- Electronic waste collected and stored at General Transport awaiting export
- Whiteware collected and stored at General Transport awaiting export

3.3.4 Other wastes

Airport waste is incinerated at Rarotonga Airport. Waste produced at the port is burned in a designated area in large steel drums, with recyclables dropped at the recycling center in Arorangi. Clinical waste from Rarotonga Hospital is incinerated onsite. Communication during the audit period with the Airport Authority confirmed that waste brought into Rarotonga via aircraft is incinerated and charged by 20-kilogram (kg) bag, but volume of waste from incoming aircraft is not known. Sewage and wastewater from incoming flights is emptied into the sewage treatment system on airport grounds.

We have used data derived from a feasibility study in 2016, which identified that the hospital burns waste several times a week; the airport indicates it burns around 2–400 kg waste per day (50–100 tonnes per year) in 2016.[6] The reduction in aircraft movements into Rarotonga is expected to result in decreased volumes of incinerated waste, sewage, and wastewater from aircraft.

3.3.5 Rarotonga Waste Facility

3.3.5.1 Inputs to landfill

Solid waste from government collections, private sector collections and general household and business waste is taken directly to the facility and disposed at the Rarotonga Landfill at the Rarotonga Waste Facility. Recyclables collected from households and businesses are taken to the Rarotonga Waste Facility and stored separately in designated bays, including glass bottles, cans, paper, and cardboard (the latter bailed). The site is nearing capacity. The waste audit does not cover identification of management and environmental impacts associated with Rarotonga and Aitutaki landfills.

3.3.5.2 Landfill infrastructure

From 2012, waste material was placed on a concrete pad and baled daily (Monday to Friday) into 1 x 1.5 meter bales for placement in the landfill. Baling ceased in 2017, when costs for baling became too expensive. The landfill is lined (clay, geosynthetic clay liner, HDPE) and had been filled to ground level by around 2016. Currently, waste is placed loose in the landfill and periodically compacted with an excavator. There is a sorting bay area for plastic bottles and glass bottles at the rear of the recycling center. The industrial baler compacts plastic bottles and aluminum and tin cans. A glass crusher is housed within the recycling center building. The site includes primary and secondary treatment ponds for wastewater. Sludge from the ponds and landfill leachate is disposed at the landfill, which has a design life of 15 years and was commissioned in 2005. The photos present two views of the landfill in mid-2020.

[6] See the Waste Management Feasibility Study prepared by Tonkin & Taylor International Limited, 2016

Rarotonga Landfill. Two views from the access road (photos by Tekao Herrmann, during the waste audit).

Current waste disposal charges recover some of the costs of disposal. In 2016, $180,000 was recovered from charges, equivalent to $120/tonne for the disposal of 1,500 tonnes of waste. This revenue covers the operational costs at the Rarotonga Waste Facility but does not offset the costs of collection or assumed cost of capital for the Rarotonga Landfill.

Previous assessments[7] have noted that to recover the full costs of collection and disposal would require waste charges to be increased to around $550/tonne.

3.3.5.3 Waste acceptance

Hazardous waste (i.e., chemicals, vehicle oil, or batteries), e-waste, and asbestos are not accepted at the waste facility. Green waste is also not accepted. Liquid waste (wastewater, septage, and grease oil) is accepted for processing in the treatment ponds.

[7] See the Waste Management Feasibility Study, Tonkin & Taylor International Limited, 2016.

3.3.6 Aitutaki Landfill

3.3.6.1 Inputs to landfill

Household waste is collected weekly on Fridays. A mixture of containers, rubbish bags, and bins is used for rubbish and recyclable containment. Waste and recycling are manually loaded into an open truck servicing residential and commercial customers. Residents separate glass bottles, cans (aluminum and steel), and plastic bottles (PET and HDPE).

Waste and recyclables are taken to the Aitutaki Waste Facility for disposal. Cans were compressed in a baler onsite but no recyclable materials are currently diverted from landfill.

The island administration undertakes the collection with support from local council staff. Each household was provided with a 120 liter mobile garbage bin, i.e., wheelie bins in 2012/13. Households use these bins when still serviceable or a range of other containers. Waste is manually loaded on to the island council truck.

Solid waste from government collections and waste brought directly to the facility is disposed of at the Aitutaki Landfill at the Aitutaki Waste Facility (see photo).

Aitutaki Landfill. The Aitutaki landfill site (photo by Tekao Herrmann, during the waste audit).

3.3.6.2 Landfill infrastructure

Waste material is currently unloaded adjacent to the landfill and then transferred to the filling area using a loader. The landfill is lined but exposure to the elements including significant tropical storms has resulted in significant deterioration of the exposed liner. The site has significant remaining capacity based on filling rates to date. The site includes primary and secondary treatment ponds for wastewater.

Aitutaki has a plastic bottle baler and a baler for aluminum cans. Although no export of recyclables is currently undertaken. The landfill has a design life of 20 years and was commissioned in 2005.

3.3.6.3 Waste acceptance

Hazardous waste (i.e., chemicals, vehicle oil, or batteries), e-waste and asbestos are not accepted at the waste facility. Green waste is also not accepted. Liquid waste (wastewater, septage, and grease oil) is accepted.

4. Methodology

4.1 Audit Team

4.1.1 Roles and responsibilities

The audit was undertaken by a project team comprising a Team Leader (Chris Purchas), Country Coordinator (Tekao Herrmann), and Waste Auditor (Anna Ainsworth). The project team worked with local agencies and a locally appointed audit team to deliver the audits. The key agencies involved in the audit were the Ministry for Infrastructure Cook Islands, the National Environment Service, and the Aitutaki Island Administration.

It was intended that the audit team be present in the Cook Islands for some or all of the audit period, but COVID-19 travel restrictions meant that the team leader and waste auditor participated remotely. The Country Coordinator was present in the Cook Islands for the entire waste audit.

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

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

The audit and data collection approach were designed to allow 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, in person if possible),
- Form-based data collection on mobile phones or tablets to ensure data is collected consistently,[8]
- live or end-of-day data submission to allow review of data collected,[9] and
- periodic check-in by telephone or video daily to track sample collection, data quality, and challenges as they arise.

4.1.2 Stakeholders

Key delivery partners working alongside Tonkin & Taylor International Limited to deliver the waste audits include the following:

- Ministry of Infrastructure Cook Islands
- National Environment Service
- Aitutaki Island Administration

A number of key stakeholders supported the delivery of the audits, including residents, business owners, and commercial waste operators. Table 4.1 describes stakeholders and the engagement undertaken.

[8] Data collected through survey 123 and received by Tonkin & Taylor International Limited on ArcGIS Enterprise – a mapping and analytics software system for GIS.
[9] Data is stored on the Tonkin & Taylor International Limited secure system in project folders

Table 4.1: Stakeholder Engagement Undertaken

Stakeholder	Description of audit interface	Stakeholder engagement
Householders	• Bag collection • Interviews	• Letter delivery[a] • Media release in local paper prior to the audit • News item on Cook Islands Television • Description on local radio in the week prior to the audit • Project brief release on social media platforms • Face-to-face interviews
Businesses owners	• Bag collection • Interviews	• As above
Commercial operators (collectors and disposers)	• Landfill disposal (visual audits) • Stockpile audits	• Face-to-face discussions • Interviews where required

[a] Delivered to households explaining audit and instructions to leave bags at entry to driveway prior to audit.
Note: The engagement aligns with the methodology defined within the Waste Audit Methodology—A Step-By-Step Manual to Conduct Comprehensive Waste Audits in Small Island Developing States, PRIF, 2019.
Source: Authors

4.2 In-Country Training

Training of the waste audit team was achieved through a range of guides and training materials developed for use without support from the consulting team. Training for the Cook Islands audit program consisted of the following:

- Tonkin & Taylor International Limited coordinating the introductory, health and safety, and training session on waste audit procedures on Day 1. This was undertaken with and an in-country coordinator in attendance and the team leader and waste audit specialist attending by video conference.
- 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.
- A "dummy run" for each of the surveys collecting data and familiarization with roles.
- follow-ups (daily or more often as required) from the beginning of the audit period to continually answer staff questions and queries.

4.3 Identification of Waste Audit Sites

A sampling plan was developed based on the most recent household and business statistics from the Ministry for Finance and Economic Management.[10] A sample of 150 households across Rarotonga and Aitutaki was determined to provide a balance between precision achieved and the time required to sample, sort, and weigh the samples obtained. A sample of 50 businesses across Rarotonga and Aitutaki (from an estimated total of 1,000 businesses) were selected. The audit program comprised:

- 8 days sample collection on Rarotonga.
- 2 days sample collection on Aitutaki.

[10] http://www.mfem.gov.ck/statistics

Maps generated by the Ministry of Infrastructure Cook Islands showing a breakdown by households and different business types by area were used to select sample locations and were provided to the audit team. Where locations were unsuitable for sampling,[11] the team would move onto the next household/business of the same category.

4.4 Sampling Methodology

Samples were collected in accordance with the sampling procedures summarized in sampling guides. Table 4.2 summarizes audit components and methodology. The detailed audit methodology is included as an attachment to the Cook Islands Audit Plan (0). The methodology applied has been derived from the Waste Audit Methodology—A Step-by-Step Manual to Conduct Comprehensive Waste Audits in Small Island Developing States, produced by PRIF.

Table 4.2: Audit Methodology

Audit component	Description
1. Sample collection from households and businesses	Rubbish bags collected from businesses/households identified on audit maps. Samples to be taken are photographed and bags labelled with unique ID, with a corresponding tag placed on a nearby tree/fence. The location is also photographed to assist in identifying the location for component 3.
2. Sort and weigh of household/ business bags	Samples transported to a location for waste sorting. Waste was sorted into primary categories and defined secondary categories. Waste in each category was weighed with data and photographs recorded in the sample collection application.
3. Household and business interviews	For each household or business where a waste sample was collected, a second team returned to complete an interview. The interview was recorded on a standard digital form.
4. Landfill audit	Audits were completed at Rarotonga Landfill and Aitutaki Landfill. Waste composition and quantity was estimated, and all loads recorded for the audit period. Each load was recorded including photographs and estimated composition and quantity.
5. Stockpile assessment	Stockpile audits were completed based on information provided by the Ministry of Infrastructure Cook Islands and island administration. Materials characteristics and quantity were estimated. Each stockpile was recorded including photographs and estimated composition and quantity.

Note: Audit methodology as per Waste Audit Methodology—A Step-by-Step Manual to Conduct Comprehensive Waste Audits in Small Island Developing States, produced by PRIF in 2019.
Source: Authors.

4.4.1 Audit targets

The audit plan for the Cook Islands outlined the number of samples to be collected, based on the population and number of households and businesses across the islands. The sample size provides a balance between gaining a representative sample and the time available for collection and sorting samples from households and businesses. Individual sample locations were randomly selected from across each Island (Table 4.3).

[11] For example, waste was not left outside that property, the waste left outside a property was not clearly identifiable to a specific property, e.g., multiple apartments. Prior to the audit, knowledge of the collection routes was considered when identifying a random and representative sample. Where waste was taken by residents to the end of the road for collection, samples were not taken from these locations. Only where a sample could be accurately linked to a property was a sample taken.

Table 4.3: Sample Numbers

Sample Type	Rarotonga	Aitutaki	Total
Household	120	30	**150**
Business	42	8	**50**

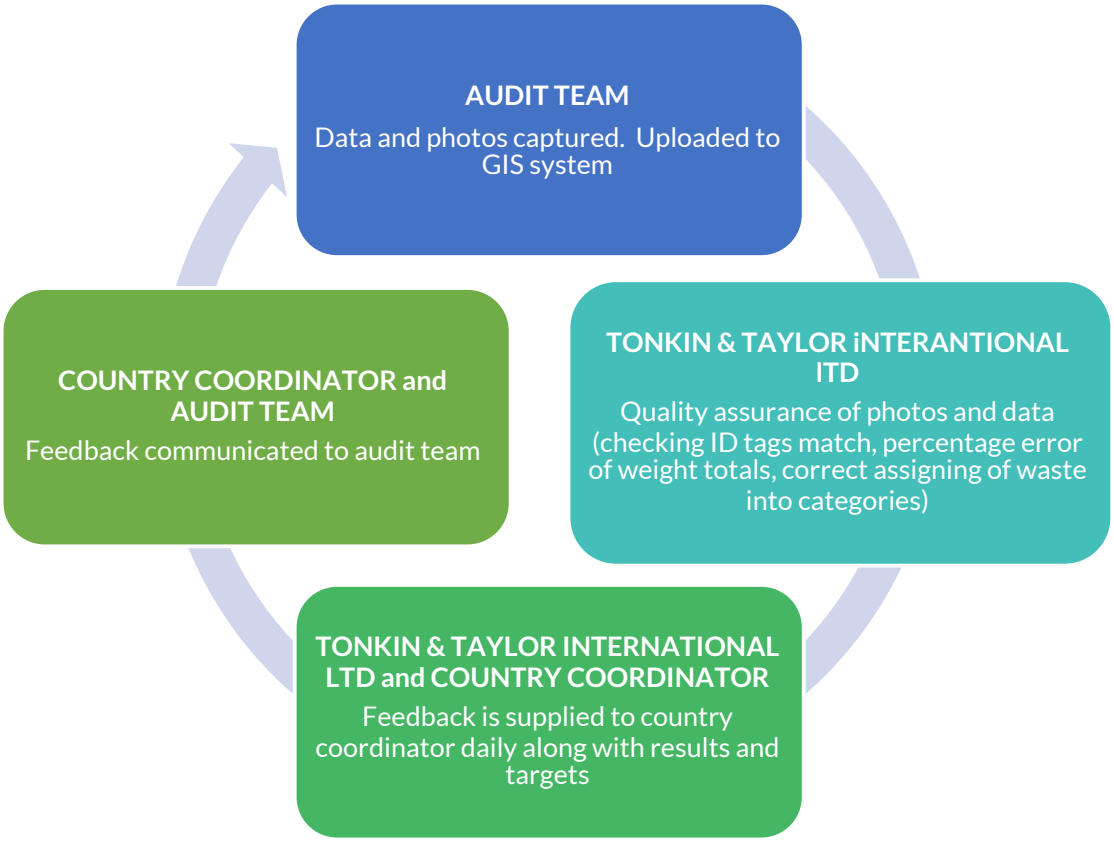
Note: Cook Islands Audit Plan. Source: Authors.

4.5 Validation Procedure

The audit process and data collection approach were designed to allow remote supervision, data checking, and ongoing feedback to the audit team throughout. Figure 4.1 illustrates key aspects of the remote audit approach.

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, which allowed for real time quality checking of data by the consultant team remotely. The Waste Audit Specialist would then provide feedback findings to the country coordinator daily or more frequently as required, creating a continuous feedback loop.

Figure 4.1: Continuous Feedback Loop in Place To Ensure Quality of Audit Outputs



Note: Cook Islands Audit Plan.
Source: Authors.

5. Audit Findings

5.1 Introduction

The audit was undertaken during 10 August–9 September 2020 on Rarotonga and Aitutaki (the two most populated islands, which were selected for data collection). From 6 August to 9 August 2020 the audit was put on hold due to heavy rainfall, which caused island-wide flooding on Rarotonga. The flooding required some of the audit team to be reassigned to support the clean-up.

5.2 Summary of Data Collected

Table 5.1 summarizes the total audits undertaken in Rarotonga and Aitutaki.

Table 5.1: Summary of Sample Numbers Collected for the Cook Islands

Sample type	Rarotonga	Aitutaki	Total	Sample plan
Household				
Samples taken	120	26	146	150
Interviews	133[a]	36[b]	169	150
Business				
Samples	49	4	53	50
Interviews	53	9	62	50
Stockpile assessments	42	58	100	Not applicable
Landfill load audits	93	2	95	Not applicable

Not applicable - stockpile assessments and landfill load audits are specific to each country. It is not suitable to set a target.
[a] Where there was a difference of more than 15% between the total sample weight recorded (before the waste was separated into categories) and the end weighs for all categories totaled the data was excluded from further analysis. For these samples, the data collected through the interviews has been reflected in this report.
[b] Data collected in Aitutaki differed from Rarotonga due to the behaviors adopted by both householders and businesses. Multiple households and businesses properties managed waste through burial on site i.e., there was no waste put out for collection that could be sampled. Interviews were undertaken with those households and businesses who do not put any waste or recycling out for collection.
Note: Data derived from the waste audits undertaken in Rarotonga and Aitutaki. Source: Authors.

The target number of businesses and households for sorting and weighing was not achieved at Aitutaki. The household sample collection identified that a high proportion of households burn or bury rubbish on individual properties instead of leaving waste for collection. Where waste was not placed for collection, the audit team conducted interviews to gather information on waste trends.

Many businesses have their own waste management/disposal arrangements. For example:

- food waste used as animal feed;
- garden waste is burned onsite;
- burn pits are used for the disposal of non-recyclable waste and are used by residents, small and larger sized businesses on both Rarotonga and Aitutaki;
- some businesses have reported undertaking their own crushing of glass for use as aggregate and filter media to use across their operation; and
- organic waste (food and garden waste) is composted or buried in shallow pits.

The amount of material managed on-site by various businesses on Rarotonga or other islands has not been quantified in the audit.

5.3 Household Audit Findings

5.3.1 Access to waste collection services

A high number of the households from the two sampled islands have access to a waste collection service. Table 5.2 summarizes feedback on the collection service for households, including a waste collection rating, recorded for both islands.

Table 5.2: Summary of Access to Collection Services

	Rarotonga	Aitutaki
Total households interviewed	133	36
Percentage with access to collection service	94%	93%
Average collection service rating	8.3	7.6
Comments	• No complaints given, it's a free service • Forgetting to collect/leave recyclable materials behind • Damage to bins • Reliable service—timing and collection day • Uncertainty around recycling remaining separated • Encouragement for more appropriate personal protective equipment to be worn • Note that there is a good service by other contractors	• Waste collection service is free • Damage to bins • Reliability—timing—variable across responses—timing on day and actual day for collection • Tend to mix sorted rubbish into general when collecting • Bulky waste not collected • Notice provided if collection will not be undertaken

Note: Data collected and recorded from interviews held with householders. Source: Authors.

Alternative approaches to managing waste were highlighted through the interviews. It is common practice for householders and businesses to select a number of options for the same waste stream. For example, in some households food scraps were recorded as part of the waste stream, fed to animals, and used for home composting (Table 5.3).

Table 5.3: Options for Waste Management Adopted by Households Identified during Audit

	Rarotonga	Aitutaki
Material	Disposal options	Disposal options
Waste	• Burn • Bury (in some instances) • Note: both were highlighted as alternatives to collection—even where collection was available	• Burn • Bury (more common) • Note: alternative to waste collection
Green waste	• Burn • Compost • Note: alternative to waste collection	• Burn • Compost • Note: alternative to waste collection
Sanitary	• No alternatives identified	• No alternatives identified
Bulky items	• Transported to landfill • Stored	• Transported to landfill • Stored
Food scraps	• Largely fed to animals • A small amount composted	• Largely fed to animals

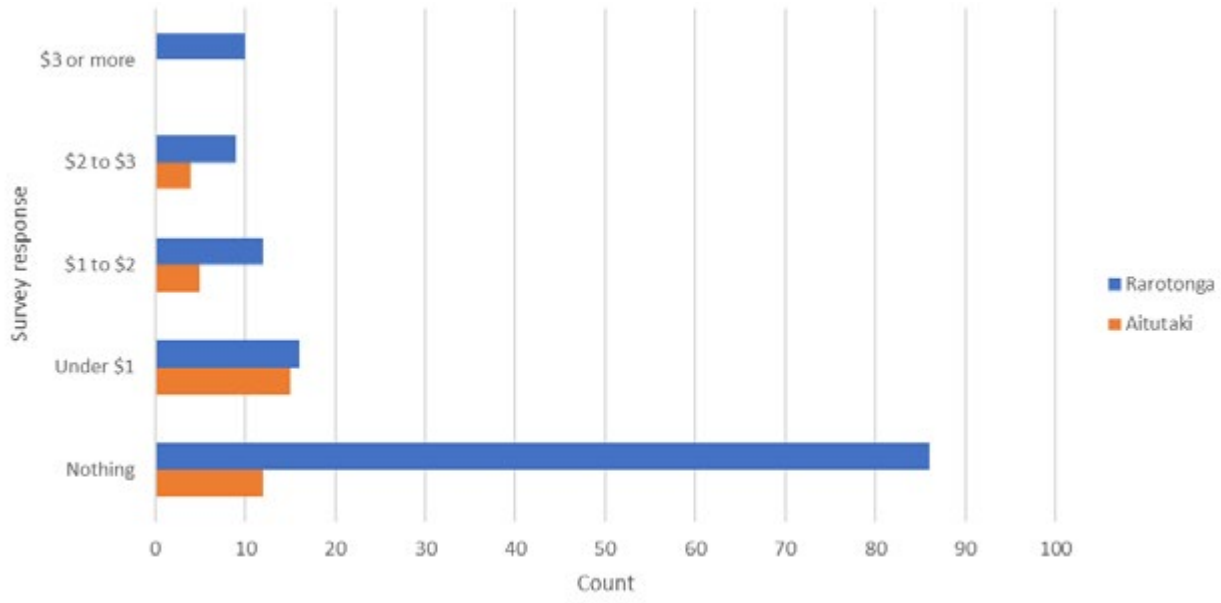
Note: Data collected and recorded from interviews held with householders. Source: Authors.

There is a number of factors that drive householder decisions for waste management. The interviews suggest that these include:

- cost to use a service (affordability). It is important to note that the current waste collection service is free of charge for households and businesses (only in Aitutaki). This does not necessarily correlate to a larger proportion of people using the service
- reliability of the collection service (timing of collections and staff behaviors)
- the volume of waste households produce which can drive alternative management methods.
- culture and past behaviors across both islands have a role to play in how waste is managed. Previously in Rarotonga there was more burying of waste at home, which has decreased over time through education and the collection service became more widely used. However, in Aitutaki a significant proportion of both households and businesses continue to burn and bury their waste on site.

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

Figure 5.1: Willingness to Pay for Household Collection of Rubbish —Survey Outcomes in Rarotonga and Aitutaki19



Note: Data collected and recorded from interviews held with householders.
Source: Authors.

A free collection service is the dominant preference for households in Rarotonga. On Aitutaki, the preference was less clear with most responses indicating a willingness to pay some fee for collection. Table 5.4 summarizes household willingness to pay for a waste collection service and the maximum fee they would be willing to pay for this service.

Table 5.4: Willingness to Pay

Payment option	Rarotonga	Aitutaki
Nothing	65%	33%
Up to $1 per collection	12%	42%
$1–$2 per collection	9%	14%
$2–$3 per collection	7%	11%
More than $3 per collection	8%	0%

Note: Data collected and recorded from interviews held with householders. Source: Authors.

5.3.2 Household waste composition

5.3.2.1 Rarotonga

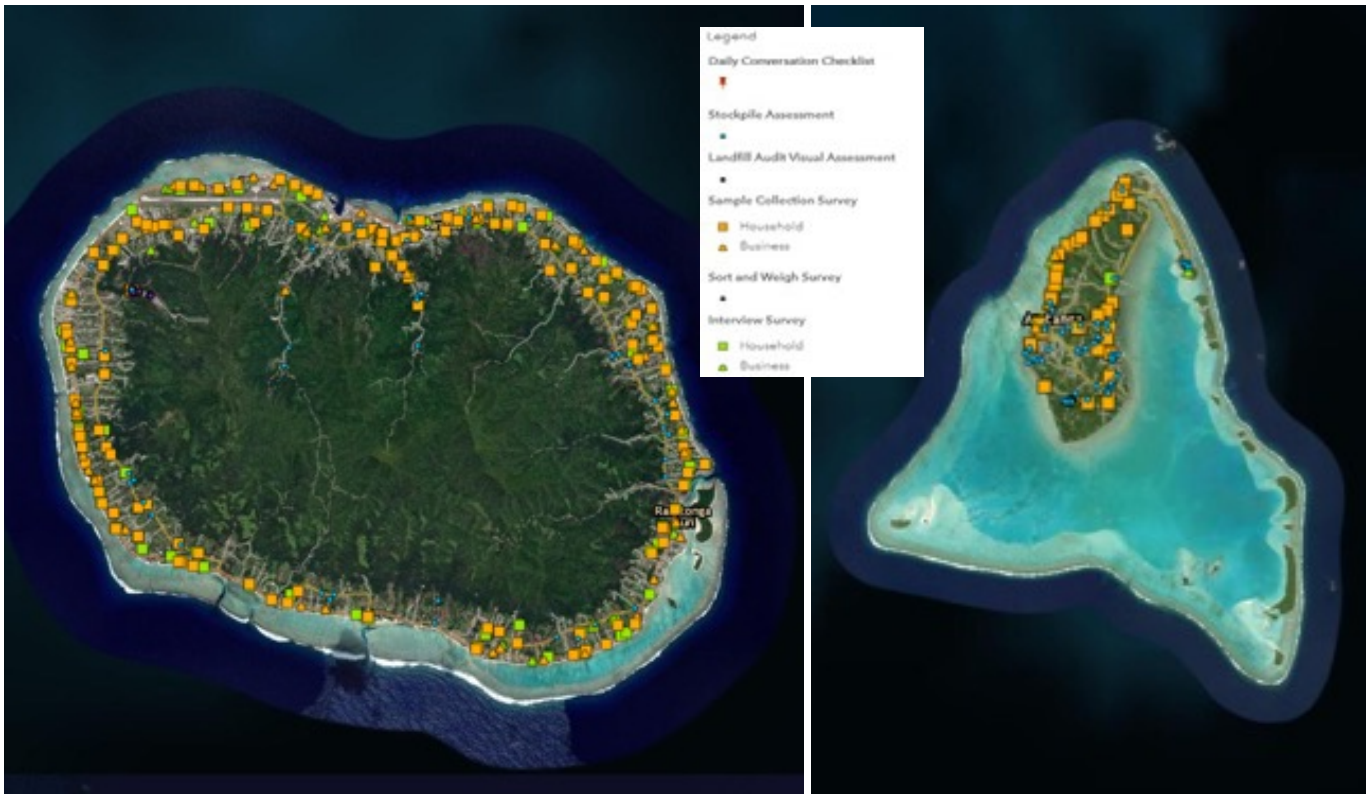
Rubbish is placed at the roadside in bags within a bin or bags placed on the ground for collection. Recyclables are generally separated in a range of containers provided by the household. Materials collected for recycling are aluminum, glass, and plastic. Recyclables are manually loaded into a dedicated trailer. In August 2019, the Ministry of Infrastructure Cook Islands restructured the refuse and recycling collection service to have each day of the week allocated to one part of the island. Where there may not be a collection at household or small business property, waste and recycling is to be taken to the end of the road for collection.

A typical roadside collection for a household in Rarotonga can be seen in the photo.

The audit team collected recyclables and rubbish from 10 August to 14 August 2020 inclusive. From 15 August till the end of the audit period, only the rubbish placed for collection was sampled from the relevant households. Locations of samples can be seen in Figure 5.2.

Waste for Collection. Typical waste collection from households in Rarotonga (photo by the waste audit team).

Figure 5.2: Sample Locations and Legend for Households and Businesses in Rarotonga and Aitutaki



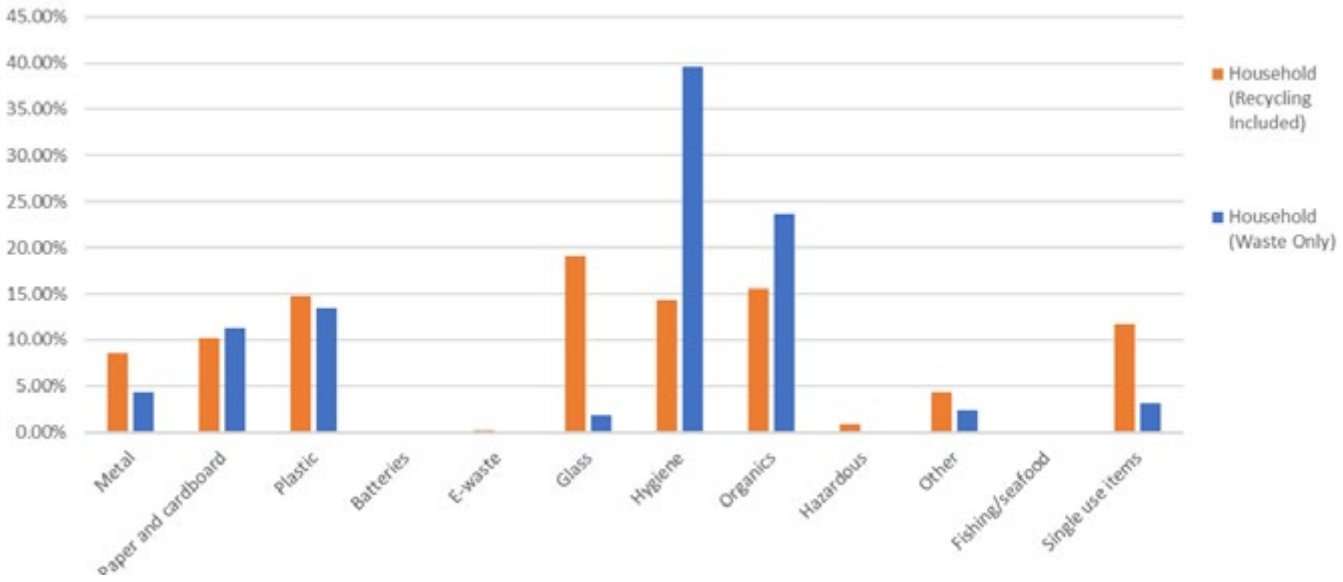
Note: Locations were identified prior to the waste audit. The map shows a good spread of data samples across both Rarotonga and Aitutaki. Individual data for households and businesses is not provided in this report.
Source: Tonkin & Taylor International Limited

The data have been separated and presented including and excluding recyclables placed for collection. This provides an insight into those materials that households actively separated for recycling. This was due to the collection of recyclables alongside the waste stream in the early part of the audit.

Household waste was separated into 12 categories and additional sub-categories where required. 0 lists these categories and their included materials.

Figure 5.4 shows the average composition of waste from households in Rarotonga and presents the proportion of materials in rubbish placed for collection (the blue columns) and the proportion of all materials placed for collection (the orange columns).

Figure 5.3: Rarotonga Average Household Composition Summary



Note: Data derived from the separation of household waste samples into waste categories which were weighed and recorded in the survey 123 app.
Source: Authors.

The discussion on data has been taken mainly from those collections where only waste was put out for collection. Comparisons between the differences when both waste and recycling are put out for collection and waste only have also been highlighted.

Hygiene products (40%) and organic waste (24%) were the largest components of the waste stream. These materials have a high water content and weigh more. Pictures from Rarotonga Landfill in indicate that a large volume of plastics is sent to landfill. This is representative of the samples collected, which include a large volume of plastics. Plastics weigh less than hygiene and organic waste. This project did not identify moisture content within different waste materials and thus composition is based on a weight. Examples of typical hygiene products and organic waste are shown in the photos.

Waste. Examples of hygiene products (left) and organic waste (right) (photo by the waste audit team).

Other significant waste material categories included metals (4%), paper and cardboard (11%), plastic (13%), glass (2%), other (2%), and single use items (3%). No batteries, e-waste or fishing related items were observed in the household waste stream.

A comparison between samples collected with and without recyclables indicates good capture of glass for recycling, with very little observed in the waste only samples (2%) compared to 19% when recyclables were included. The difference between composition of metals, cardboard and plastics between the two samples was very little (i.e., > 3 %). This suggests around a 50% capture of these materials for recycling.

The composition of the "other" sort category was dominated by textiles (dish cloths, clothes, and shoes). The single use items category (12%) when waste was collected both alongside recycling and separated, composed the following items: supermarket plastic bags, styrofoam and cardboard takeaway containers, styrofoam, paper and plastic beverage containers, and bottle lids. The category was dominated by plastic bags and takeaway containers.

5.3.2.2 Aitutaki

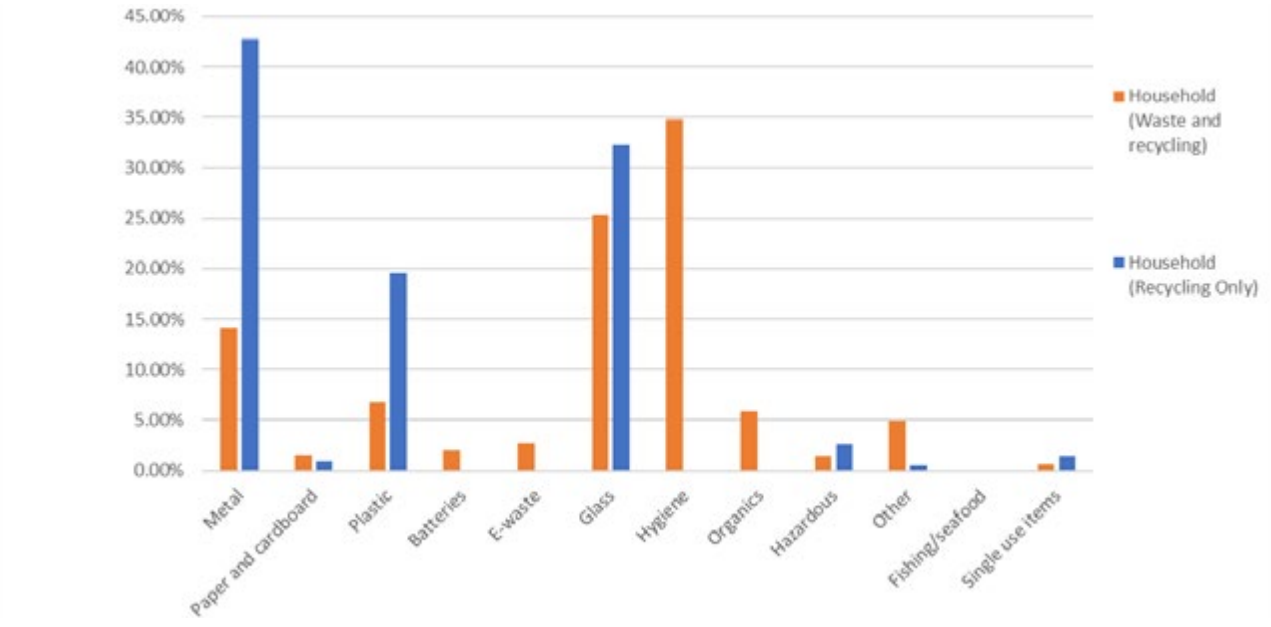
Waste and recyclables are placed at the roadside in bags, bins or containment. Recyclable materials are generally separated and include aluminum or steel cans, plastic bottles and glass. All waste and recycling is currently sent for disposal. A typical roadside collection for a household in Aitutaki.

Collection. Typical roadside collection in Aitutaki (photos taken by waste audit team).

Waste and recyclables were collected from those properties which put waste and recycling out for collection, all of which are taken to Aitutaki Landfill for disposal. Around 37% of properties surveyed said they do not put any waste out for collection. Instead, it is incinerated at home or deposited in a pit on properties.

With no separate recyclables collection, all waste and recyclable materials placed for collection were collected as part of the audit. In Aitutaki, it is common practice for householders to place only their recycling for collection. We have separated out the samples collected from households into two categories. Following a review of the photos taken during the sample collections and review of the data from the sort and weigh, a split was made including those households that only placed recycling for collection and those that placed both recycling and waste for collection as indicated in Figure 5.4.

Figure 5.4: Aitutaki Average Household Waste Composition Summary



Note: Data derived from the separation of household waste samples into waste categories which were weighed and recorded in the survey 123 app.
Source: Authors.

The largest material composition identified through the sort and weigh of waste and recycling were hygiene (35%), glass (25%), and metals (14%), based on weight. A large proportion of glass is separated out for recycling, similar to Rarotonga. Note the small difference between recycling only and waste and recycling samples. The proportion of materials recycled is dominated by metals (43%), glass (32%), and plastics (20%) when reviewing recycling only samples. The pictures from Aitutaki Landfill below indicate a large volume of plastics are sent to landfill. Due to the nature of plastics, they weigh less than other waste materials for the same volume, e.g., organics and hygiene products. The presence of organics is higher in the samples collected from households in Rarotonga than from Aitutaki. Reasons for this could include the use of alternative methods for organic waste, e.g., feeding to animals or depositing green waste on properties where it is created. These types of methods are also used in Rarotonga.

Typical examples of these materials are shown in the photos here.

Household Collection. Typical sort and weigh for plastics (left), paper and cardboard (middle), and organics (right), (photos taken by waste audit team).

Less than 2% of the total composition comprised batteries, e-waste, glass, hazardous, or fishing items. In comparison to household data captured from Rarotonga, there appeared to be a larger portion of e-waste, glass, and hygiene in the household waste samples; a similar proportion of other and hazardous waste products were found.

The presence of single use items was 0.6%, which was composed of the following items: styrofoam plates, bottle lids, and cigarette contents. With a dominance in the presence of bottle lids. This is over 10% lower by proportion of the single use items identified in the sort and weigh data for combined recycling and waste collection samples.

A detailed breakdown of composition is provided in table 5.5.

For containers placed out for collection as part of the waste and/or recycling stream the following has been noted:

- Plastic drinks containers—both large (2-liters, Just Juice, Sprite, Coca Cola, Keri), and small (< 1 liter Coca Cola, juices).
- Plastic containers—food (condiments) non-food—washing liquid—Sunlight and other.
- Glass bottles—green glass bottles: Steinlager, V, Clear—Corona, condiments.
- Cans (both human and animal contexts)—drinks (Sprite, Woodstock, Mountain Dew, Pepsi) food—large (Watties, Heinz) and small tins (Palm), tinned animal food.

The overall waste composition for households has been provided having combined the data from the sort and weight survey for both Rarotonga and Aitutaki.

Table 5.5: Waste Composition for Households Identified as Part of the Sort and Weigh of Samples Collected for Rarotonga and Aitutaki

	Fishing/ Seafood	Paper and Cardboard	Plastic	Metal	Single Use Plastic	Batteries	e-waste	Glass	Hygiene	Organics	Hazardous	Other Waste
Composition	**0.0%**	**8.3%**	**12.2%**	**9.1%**	**2.4%**	**0.5%**	**0.7%**	**9.4%**	**36.1%**	**17.9%**	**0.5%**	**2.9%**
Lower range	0.0%	7.5%	12.0%	8.8%	2.3%	0.0%	0.1%	4.5%	18.4%	13.1%	0.0%	1.2%
Upper range	0.0%	12.9%	17.2%	18.2%	4.0%	2.3%	0.8%	12.0%	34.9%	22.6%	1.3%	4.1%

Source: Authors.

Interviews with householders provided the data to estimate the average quantity of waste from sampled households for Rarotonga and Aitutaki combined.[12] The estimated generation of household waste per household per day is 1.0 kg (within a range of 0.1 kg–3.8 kg per household per day). During the interviews, questions including how many people live at the household were used to provide an estimate of the average weight of waste and/or recycling collected per person per week for households. For completeness, we have provided a breakdown below of the data collected for total weight of waste per household and the number of people living at the property.

Waste and recycling samples—average 5.0 kg per person per week (range 0.4 kg–26.6 kg per person per week).

Waste only samples–average 4.3 kg per person per week (range 0.7 kg–14.0 kg per person per week).

[12] The data used to calculate the composition of waste collected from households in Rarotonga and Aitutaki has been derived from samples collected from all household properties. The total weight of samples collected was averaged using the count. The total sample weight per week was divided by 7 days to provide a weight per household per day. This is the methodology as presented in the Waste Audit Methodology—A Step-by-Step Manual to Conduct Comprehensive Waste Audits in Small Island Developing States produced by PRIF.

5.3.3 Recyclable collection and composition

5.3.3.1 Rarotonga

In general, glass, metals, and plastics (in some instances cardboard food packaging) were separated and put out for recycling. Examples of typical household recycling presented at the roadside are seen in the pictures.

Household Materials. Typical household recycling materials presented at roadside for collection in Rarotonga (photos taken by waste audit team).

General observations made include:

- Glass (in general) is separated for recycling and put out for collection in containers/bags/bins as appropriate to the volume produced. Containing the following:
  - beer bottles (green and brown)
  - other beverage bottles (energy drinks and wine)
- Metals mainly comprised:
  - aluminum drink cans
  - food tin cans
- The audits provided further insight into the use of drinks cans. Household interviews reported an average of 1 drink can per person, per household, per week. The range varied between 0 to 12 cans per week.
- Plastics mainly comprised:
  - clear plastic bottles (e.g., juice containers, fizzy drinks, water bottles, detergents)
  - plastic food containers (e.g., ice cream, margarine).
- Household interviews reported an average of 1 plastic water bottle per person per household per week with a range of 0 to 4 bottles per person, per week (a small number of these may be glass).

Observations made where recyclables were noted as part of the waste stream audited through the sort and weigh. General observations include:

- Very little glass was observed in the waste stream. This observation is supported by sort and weigh data. Glass that was observed generally comprised food jars.
- A small number of aluminum cans or food cans were observed in the waste stream.
- Recyclable plastic in the waste stream was more frequently observed, although the predominant plastic materials in the waste streams were soft and flexible plastics. An example of sort and weigh composition of plastic in the waste stream is shown in .

5.3.3.2 Aitutaki

In general, aluminum or steel cans, plastic bottles and glass are separated and put out for collection. The photos have made it possible to identify households that put out recycling only and those putting out both waste and recycling for collection.

Examples of typical household recycling presented at the roadside are shown in the photos below.

Household Waste. Sort and weigh of household plastic (photo taken by waste audit team).

Household Waste. Typical household materials presented at roadside for collection in Aitutaki (photo taken by waste audit team).

General observations of recyclable materials in Aitutaki include:

- Glass (in general) is separated from the waste stream and put out for collection in containers/bags/bins as appropriate to the volume produced. Containing the following:
  - beer bottles (green and clear)
  - food jars
- Metals mainly comprised:
  - aluminum drink cans
  - food tin cans
- The audits provided further insight into the use of drinks cans. Household interviews reported an average of 3 drinks can per person, per household, per week. The range varied between 0 to 24 cans per week.
- Plastics mainly comprised:
  - Clear plastic bottles (e.g., fizzy drinks, water bottles, detergents)
  - Plastic food containers (e.g., margarine)
- Household interviews reported an average of 3 plastic water bottle per person per household per week with a range of 0 to 12 bottles per person, per week.

5.4 Business Audit Findings

Access to waste collection services

A higher number of businesses have access to a waste collection service in Rarotonga compared with those based in Aitutaki. Table 5.6 summarizes feedback on the collection service for businesses including a waste collection rating, recorded for both islands.

Table 5.6: Summary of Access for Businesses to Collection Services

	Rarotonga	Aitutaki
Total No. interviewed	52	8
Percentage with access to collection service	92%	38%
Average collection service rating	8.8	9.0
Comments	• Forgetting to collect/leave recyclable materials behind • Damage to bins • Reliable service—timing and collection day • Note that there is a good service by other contractors, not under contract to the Ministry of Infrastructure Cook Islands for the delivery of the household and small business refuse and recycling collections. • Invoice for billing is slow	• Waste collection service is free • Reliability—timing—actual day for collection • Notice provided if collection will not be undertaken

Note: Data collected and recorded in survey 123 app, from interviews held with businesses.
Source: Authors.

Alternative approaches to managing waste were highlighted through the interviews. It is common practice for a number of options to be selected by businesses for the same waste stream.

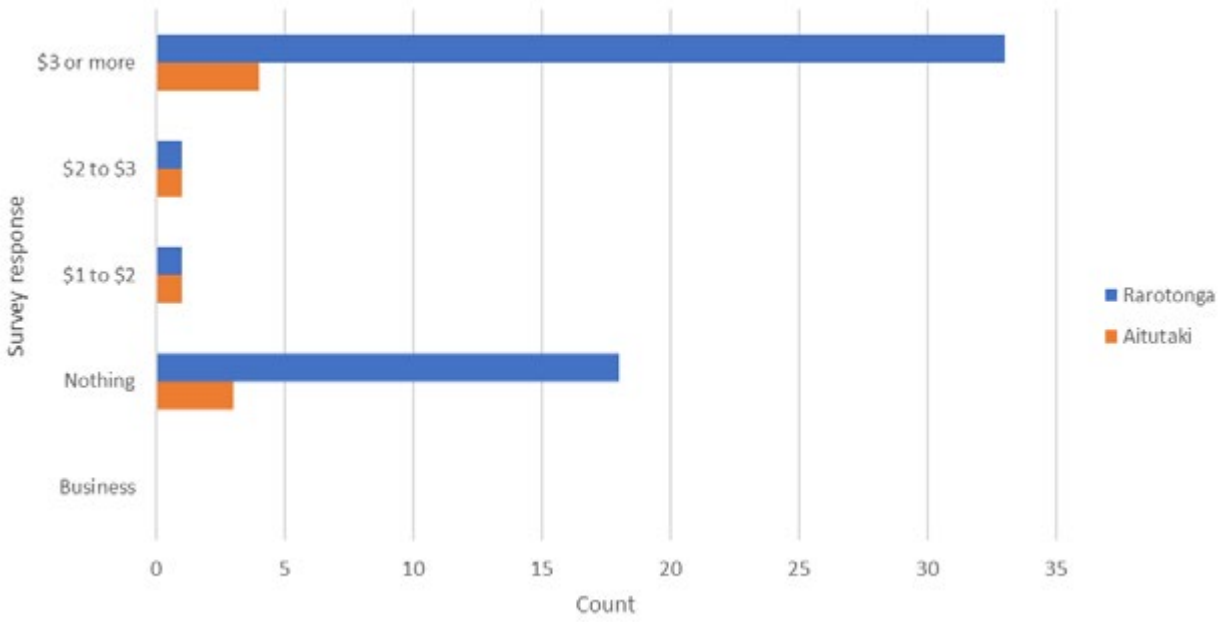
The options undertaken by businesses identified through the audit are identified in Table 5.7.

Table 5.7: Waste Management Options Adopted by Households and Businesses Identified during the Audit

Description	Rarotonga	Aitutaki
Material	Disposal options	Disposal options
Waste	• Burn • Bury (in some instances) • Note: both were highlighted as additional to or alternatives to collection	• Burn • Bury (more common) • Note: alternative to waste collection
Green waste	• Burn • Compost • Note: alternative to waste collection	• Burn • Compost • Note: alternative to waste collection
Sanitary	• No alternatives identified	• No alternatives identified
Bulky items	• Transported to landfill • Stored	• Transported to landfill • Stored
Food scraps	• Largely fed to animals • A small amount composted	• Largely fed to animals

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

Figure 5.5: Willingness to Pay for Business Collection of Rubbish —Survey Outcomes in Rarotonga and Aitutaki.



Source: Authors

Table 5.8: Willingness to Pay—Businesses

Payment option	Rarotonga	Aitutaki
No payment	34%	33%
$1–$2 per collection	2%	11%
$2–$3 per collection	2%	11%
More than $3 per collection	62%	44%

Businesses in Rarotonga indicated they were willing to pay for waste collection with the predominant option selected being $3 or more. Only a small sample of businesses were interviewed in Aitutaki and responses were mixed ranging from nothing to more than $3. In terms of potential for charging, Table 5.8 provides a breakdown of the responses.

5.4.2 Businesses waste composition

The total number of businesses audited by type is shown in Table 5.9, this provides the count, or the number of businesses which were audited during the waste audits.

Table 5.9: Business Audit Overview

Business Type	Rarotonga		Aitutaki	
	Sort and Weigh	Interview	Sort and Weigh	Interview
Accommodation	13	13	1	5
Hospitality	10	9	2	2
Education	7	7	0	0
Retail	11	16	0	1
Office	2	2	0	0
Services	3	3	1	1
Sport and Leisure	2	3	0	0
Total	49	53	4	9

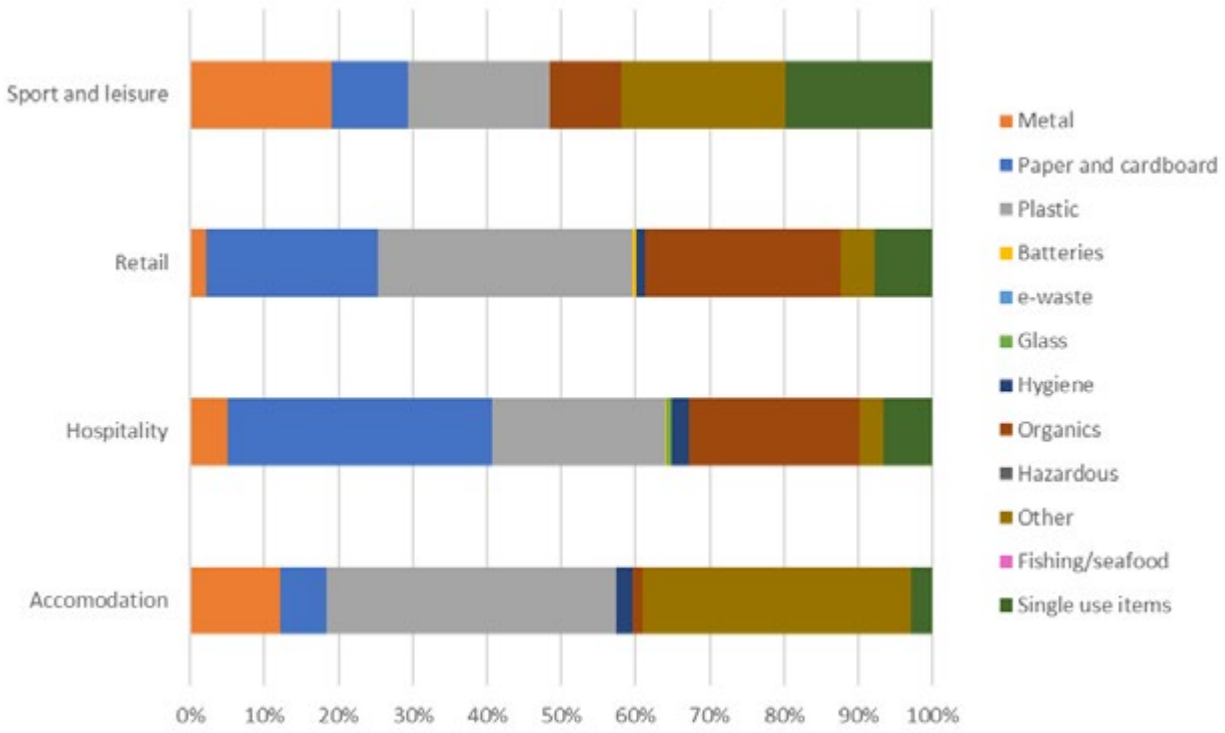
Businesses for sampling were randomly selected. A range of sectors were selected to provide a wide cross section of data. The targeted sample numbers for the sort and weigh were not achieved in Aitutaki. During the collection of waste samples, it was identified that a number of businesses identified for sampling do not put waste or recycling out for collection. This is common practice in Aitutaki for households and businesses. Those businesses identified for collection where waste and/or recycling was not placed out for collection were still included in the audits and a member of the team would return and undertake an interview.[13]

- Commentary and observations made through these interviews are noted below.
- Some businesses had not put waste and recycling out on the day samples were collected (observation).
- "It takes 3 months to fill our can bin and plastic bottles bin" (commentary).
- "Rubbish stored in bins is then burned in a hole" (commentary).
- "Other people also dump waste in our bins, preventing them from putting the bins out" (commentary).
- "Reasonable charge at the landfill, leading to self-haul of items" (commentary).

5.4.2.1 Rarotonga

The composition of waste collected, sorted and weighed from each of the business types for Rarotonga and Aitutaki is shown in Figures 5-6, 5-7 and 5-8.

Figure 5.6: Composition of Waste from Businesses in Rarotonga, with Recycling Excluded



Note: Data derived from the sorting and weighing of waste samples collected from businesses in Rarotonga. The data used to calculate the composition of waste collected from businesses in Rarotonga and Aitutaki has been derived from those samples collected from businesses when recycling was not collected.
Source: Authors.

The dominant waste categories across all business types on Rarotonga were metals, paper, plastics. Organics was also significant, with the exception of accommodation businesses.

[13] Due to the nature of those using the waste collection service—it was decided that interviews would be conducted for those households which put waste out for collection and those which do not.

Metals contributed to over 47% of the total waste stream (with recycling included) for sport and leisure. A significant portion of metals were recycled. Sports and leisure had the highest proportion of single use items (20% by proportion of the waste stream).

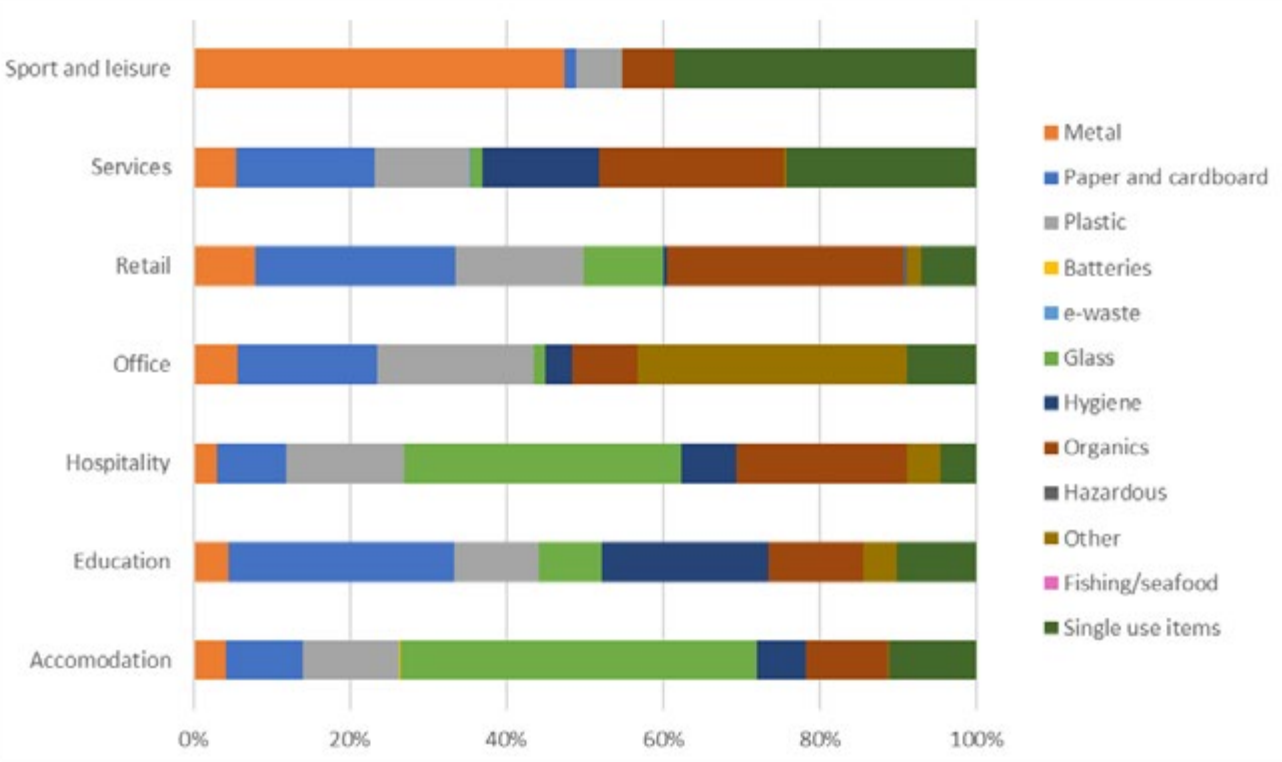
Paper and cardboard and plastics represents a similar proportion of the entire waste stream across all sectors.

Organics and the other category represent a similar proportion of the waste stream for both retail and hospitality as would be expected for these business types.

The other category taking up a larger proportion of the waste stream for accommodation and sport and leisure. The use of single use items is noted across all business sectors.

The breakdown by business type for samples taken when both recycling and waste were collected has been presented below. This enables an understanding of those materials which are actively recycled by business types.

Figure 5.7: Composition Of Waste From Businesses In Rarotonga With Recycling Included



Note: Data derived from the sorting and weighing of waste samples collected from businesses in Rarotonga, when recycling was collected alongside the waste put out for collection.
Source: Authors.

Available data have been used to develop estimates for the total amount of waste generated by large businesses in Rarotonga. This is based on landfill visual assessments undertaken at the Rarotonga Waste Facility.

Glass and metals are the two materials which are most actively targeted by businesses for recycling. There will likely be recycling of other materials.

A large portion of 'other' category items were present during the sort and weigh. These were often associated with textiles. A sample of photos of the 'other' category from the sort and weigh are shown in the photos.

Waste: Examples of the "other" category from the sort and weigh (photos by the waste audit team).

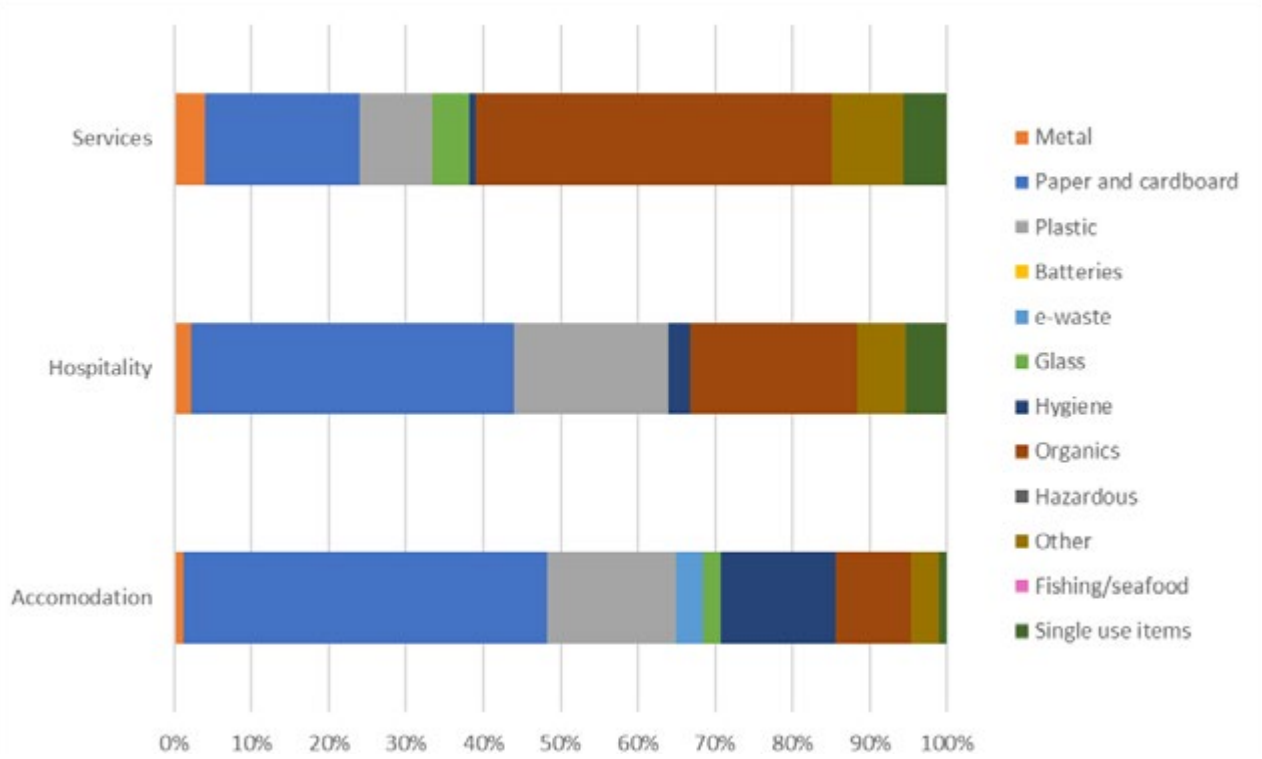
5.4.2.2 Aitutaki

Business waste composition has been shown and explained below.

The dominant waste categories across all business types were paper and cardboard, organics and plastics. Due to the smaller number of business samples taken in Aitutaki, there is no comparison between those putting out both recycling and waste and recyclable only, except for hospitality, where plastics made up over 94% of the total waste stream.

The use of single use items is noted across all business sectors.

Figure 5.8: Composition of Waste from Businesses in Aitutaki



Note: The data used to calculate the composition of waste collected from businesses in Rarotonga and Aitutaki has been derived from those samples collected from businesses when recycling was not collected.
Source: Authors.

The overall waste composition for businesses has been calculated by combining the data from the sort and weigh survey for both Rarotonga and Aitutaki and is presented in Table 5.7. This table presents the composition of waste samples across all samples collected. The lower and upper range have been calculated at a 95% confidence interval.

With regards to containers placed out for collection as part of the waste and/or recycling stream from businesses the following has been noted (which reflects the types of containers noted through the household surveys):

- plastic drinks containers—both large (Just Juice, Sprite, Coca Cola, Keri), small (Coca Cola, juices, Dr Pepper, Fanta, Monster and water bottles (pump).
- plastic containers—food (condiments) non-food—washing liquid—Sunlight and other.
- glass bottles—green glass bottles: Steinlager, V, Clear—Corona, condiments.
- cans (both human and animal contexts)—drinks (Red Bull, L&P, Sprite, Woodstock, Mountain Dew, Coca Cola, Pepsi), food (Watties, Heinz, Palm) and animal food—dog and cat food.

Table 5.10: Waste Composition for Businesses Identified as Part of the Sort and Weigh of Samples Collected for Rarotonga and Aitutaki

	Fishing/ Seafood	Paper and Cardboard	Plastic	Metal	Single Use Plastic	Batteries	e-waste	Glass	Hygiene	Organics	Hazardous	Other Waste
Composition	**0.0%**	**32.9%**	**23.6%**	**3.7%**	**5.7%**	**0.1%**	**0.6%**	**1.1%**	**4.0%**	**22.8%**	**0.0%**	**5.4%**
Lower range	0.0%	15.8%	17.1%	2.0%	4.4%	0.0%	0.0%	0.0%	0.3%	12.6%	0.0%	2.4%
Upper range	0.0%	33.9%	42.1%	8.1%	10.9%	0.6%	0.7%	1.2%	5.0%	31.0%	0.0%	12.9%

Note: Samples taken from businesses were sorted and weighed into categories which has provided the data to estimate the composition of waste from sampled businesses for Rarotonga and Aitutaki. The data used to calculate the composition of waste collected from businesses in Rarotonga and Aitutaki has been derived from those samples collected from businesses when recycling was not collected.
Source: Authors.

5.5 Funding Assessment

The current costs for operation and contracts associated with the Rarotonga Landfill have been provided in Table 5.11. An assessment of the current cost per cubic meter based on the data provided for incoming waste into Rarotonga Landfill has been calculated.

The current weekly refuse and recycling collection for small businesses and households has a contracted cost of $630,000.[14] With no cost recovery this service is funded directly by the Ministry for Finance and Economic Management.

Table 5.11: Contract Cost for household and Small Business Refuse and Recycling

Waste Collection Cost—T&M Heather Ltd Contract (annual cost)	Total Dwellings on Rarotonga	Weekly Collection for Refuse and Recycling Cost (assuming 52 collections per year)
$630,000a	3,233	$3.75/collectionb

[a] Ministry of Infrastructure Cook Islands provided information for T&M Heather Limited who deliver the waste collection contract.
[b] Calculated using the total waste collection cost and total dwellings on Rarotonga.
Note: Data provided by the Ministry of Infrastructure Cook Islands for waste collection contract cost. Cost per collection calculated based on total number of dwellings and contract cost.
Source: Ministry of Infrastructure Cook Islands.

Using the landfill data presented in Section 0, the total solid waste to landfill was calculated to be 2,805 cubic meters (m3) for the period from 1 September 2019–31 August 2020.

[14] Data provided by the Ministry of Infrastructure Cook Islands

Costs for liquid waste disposal over the same period was $13,295.0 Revenue from solid waste was $183,705 for 2,805 m3. This equates to an estimated $65.5 per cubic meter received by the facility for incoming solid waste.

The operational cost for the Rarotonga Landfill equates to around $575,600 (excluding the households and small business collection contract cost). Data provided by Ministry of Infrastructure Cook Islands excluding liquid waste, the operational cost per m3 equates to $204.50. The shortfall of $139 per m3 is covered by the budget allocation to the Ministry of Infrastructure Cook Islands of around $615,000. It should be noted that the volumes given here incorporate a reduction in waste volumes to landfill since the COVID-19 pandemic.

5.6 Stockpiles

5.6.1 Informal stockpiles

An audit of stockpiles located on Rarotonga and Aitutaki was undertaken. The scope included:

- waste awaiting processing, recycling or reuse;
- potentially hazardous materials;
- organic waste.

The audit team consulted with local stakeholders to identify known stockpile locations which generally covered the extent of both islands. In Aitutaki, a significant number of stockpiles were located at the waste facility, the largest being roofing iron, asbestos and whiteware. Other smaller stockpiles of material included green waste, oil containers, tires, batteries, aluminum cans and scrap metal.

No stockpiles of significance were located at the Rarotonga waste facility.

The most commonly stockpiled material identified was ferrous metal. Sources of ferrous metal included a large number of end-of-life vehicles (cars, trucks, heavy machinery), roofing iron and general scrap metal. This was relevant for both Rarotonga and Aitutaki.

The audit team reported a number of fly tipping sites consisting of mixed waste. Although frequently stockpiled items were identified in small volumes amongst mixed waste streams, these piles have been excluded. A number of abandoned vehicles were identified on both Rarotonga and Aitutaki. These were considered a stockpile where two or more end-of-life vehicles were located in the same place. In addition to the stockpiles listed in Table 5.12, five single abandoned cars were identified on Rarotonga and nine on Aitutaki.

Table 5.12: Type and Estimated Quantity of Materials in Stockpiles on Rarotonga and Aitutaki[15]

	Rarotonga			Aitutaki		
Description	Weight (tonne)	Count (units)	Volume (m3)	Weight (tonne)	Count (units)	Volume (m3)
Trucks	177	27	…	117	18	…
Boats	1	1	…	1	1	…
Motorbikes	0	0	…	4	23	…
Cars	141	94	…	95	63	…
Vans	43	22	…	18	9	…
Heavy machinery	30	3	…	290	29	…
Roofing iron	0	21	…	5	260	…
Other metal	1	…	20	7	…	110
E-waste	0	…	2	4	…	100

[15] Data collected of the stockpiles located across Rarotonga and Aitutaki and recorded during the audit. All visual assessments identifying the approximate volume and number of items (count) in each stockpile. Weight in tonnes has been calculated applying assumptions for different materials.

Table 5.12: Type and Estimated Quantity of Materials in Stockpiles on Rarotonga and Aitutaki (continued)

Description	Rarotonga			Aitutaki		
	Weight (tonne)	Count (units)	Volume (m3)	Weight (tonne)	Count (units)	Volume (m3)
Whiteware	1	…	3	113	…	500
Demolition	0	…	2	1	…	4
Plastics	0	…	0	0	…	1
Tank	0	0	-	0	1	…
Timber	0	…	1	2	…	10
Aluminum cans	0	…	0	7	…	45
Green waste	3	…	20	12	…	83
Batteries	0	0	…	0	83	…
Tires	0	…	50	2	…	202
Glass	0	…	0	0	…	0
Hazardous	0	…	0	4	…	17
Shipping containers	0	0	…	6	…	3

'…' has been provided where no volume has been defined through data collection. The count of items was recorded and the equivalent tonnage was calculated.
Note: Data collected of the stockpiles located across Rarotonga and Aitutaki and recorded during the audit. All visual assessments identifying the approximate volume and number of items (count) in each stockpile. Weight in tonnes has been calculated applying assumptions for different materials.
Source: Authors.

Examples of stockpiles found in both Rarotonga and Aitutaki have been identified in the photos below.

Stockpiles. Examples in Rarotonga (general transport) (left) and Aitutaki (located next to the landfill) (right) (photos taken by the waste audit team).

5.6.2 Stockpiles awaiting export

An ongoing piece of work, funded by PacWaste, is investigating the need for an advanced disposal fee. The scope of this work covers the need to reflect the full cost of recovering and disposal of waste to landfill, among other objectives.

5.6.2.1 Cook Islands General Transport

In addition to the material identified in stockpiles located around the islands (Table 5.12) Cook Islands General Transport also stockpiles materials awaiting sufficient volumes for export offshore. Cook Islands General Transport provided data on the total recovered materials exported between January 2019 and August 2020. To our knowledge, there are no other exporters of material offshore from Rarotonga or Aitutaki. Stockpiles of materials stored at the Aitutaki Landfill are transferred to Rarotonga (Cook Islands General Transport) when volumes are sufficient. A summary of the data from September 2019–August 2020 has been provided in Table 5.13.

Table 5.13: Cook Islands General Transport Exports of Recovered Material

Description	Steel[a]	Whiteware[d]	Aluminum[b]	Plastic (plastic bottles)[e]
Total export (tonnes) (September 2019–August 2020)	158.6	0.6	0	0.4
Total export (units) (September 2019–August 2020)	. . .c	9.8 units	0	1 bale of compacted plastic (estimate)

[a] Steel, this covers scrap steel only. Aluminum is separated from steel due to the higher value of return for steel.
[b] Aluminum has historically been exported by Cook Islands General Transport, but not in the last 12 months.
[c] Units were not calculated for steel due to the variability in exported material sizes and items.
[d] Whiteware units assumed to be average size of a fridge/freezer and washing machine (62.5 kg). This is based on the photos taken of stockpiles as part of the audit. Whiteware is separated into those items which can be reused onshore and those items which are no longer working, damaged or excess to requirements are sent offshore for recycling. Most whiteware is from domestic use, but also includes some commercial volumes.
[e] Plastics—this category covers used plastics and not new plastic.
Source: Data provided by Cook Islands General Transport for exported materials from January 2019

Key information regarding the export of materials from Cook Islands General Transport include:

- Steel exports from Cook Islands General Transport have continued (averaging between 0 and 44 tonnes per month between September 2019 and August 2020).
- Historically, exports of plastic and whiteware have been higher, but these did not continue into 2020. Exports of whiteware or plastic have not occurred since October 2019.
- Exports of Aluminum (17.8 tonne across January and February 2019) have not been recorded since February 2019. It is likely that this is due to insufficient volumes of material ready for export and falling prices in those markets previously used. At this stage, we cannot identify the destination for the exported materials.
- The stockpiles including recyclables located in Aitutaki have been present since around 2012. Prior to this, much of the material was stockpiled (since 2005, when the site was opened) and removed from the island through a joint venture between New Zealand Aid and Recycling Cook Islands (General Transport). Materials removed included roofing iron and other scrap metal following Cyclone Pat in 2010.

5.6.2.2 Heavy machinery

Heavy machinery was sent in 2014 to the Cook Islands for use on the outer islands. The machinery is spread across 11 islands. The machinery includes tractors, loaders, trucks/pickups, ships, excavators, agricultural implements and buses. Given the expected life span of this machinery it is likely that this equipment will be coming to its end of useful life over the next few years, if not already. This data is presented in Table 5.14.

5.7 Landfill

5.7.1 Rarotonga Landfill

Data provided by the Ministry of Infrastructure Cook Islands for Rarotonga Landfill was used to estimate the total waste disposed to landfill. Data for commercial customers from April to August 2020 and the private drop off data for September 2019—August 2020 were received. In the absence of pre-April 2020 data for commercial customers—an assessment of volume reduction was estimated from the incoming waste volumes from the private drop off data. Average reduction was over 27% in private drop off volumes of waste to the landfill. A 27% increase in commercial customer waste volumes to landfill was added to pre-April 2020 data, absent actual waste volumes.

From this data we have estimated that around 2,805 m3 of waste was deposited into Rarotonga Landfill from September 2019–August 2020. By considering the source of waste (based on landfill records) and the likely composition based on the household and business audits and visual assessment work completed for this audit, an overall waste composition has been developed (Table 5.15. The following compositions derived from the sort and weigh were applied accordingly:

- Businesses—composition for Rarotonga and Aitutaki businesses combined.
- Mixed—household and small businesses—composition for Rarotonga and Aitutaki households and small business combined.
- Households—composition for Rarotonga and Aitutaki households only combined.

Table 5.14: Heavy Machinery Destined for Export

Island	Number of Heavy Machines	Tonnage
Aitutaki	28	271
Mangaia	20	165
Atiu	14	127
Mauke	10	224
Mitiaro	9	78
Palmerston	1	10
Pukapuka	9	86
Manihiki	11	104
Rakahanga	10	70
Penrhyn	11	76
Nassau	4	290
Total	**127**	**1,501**

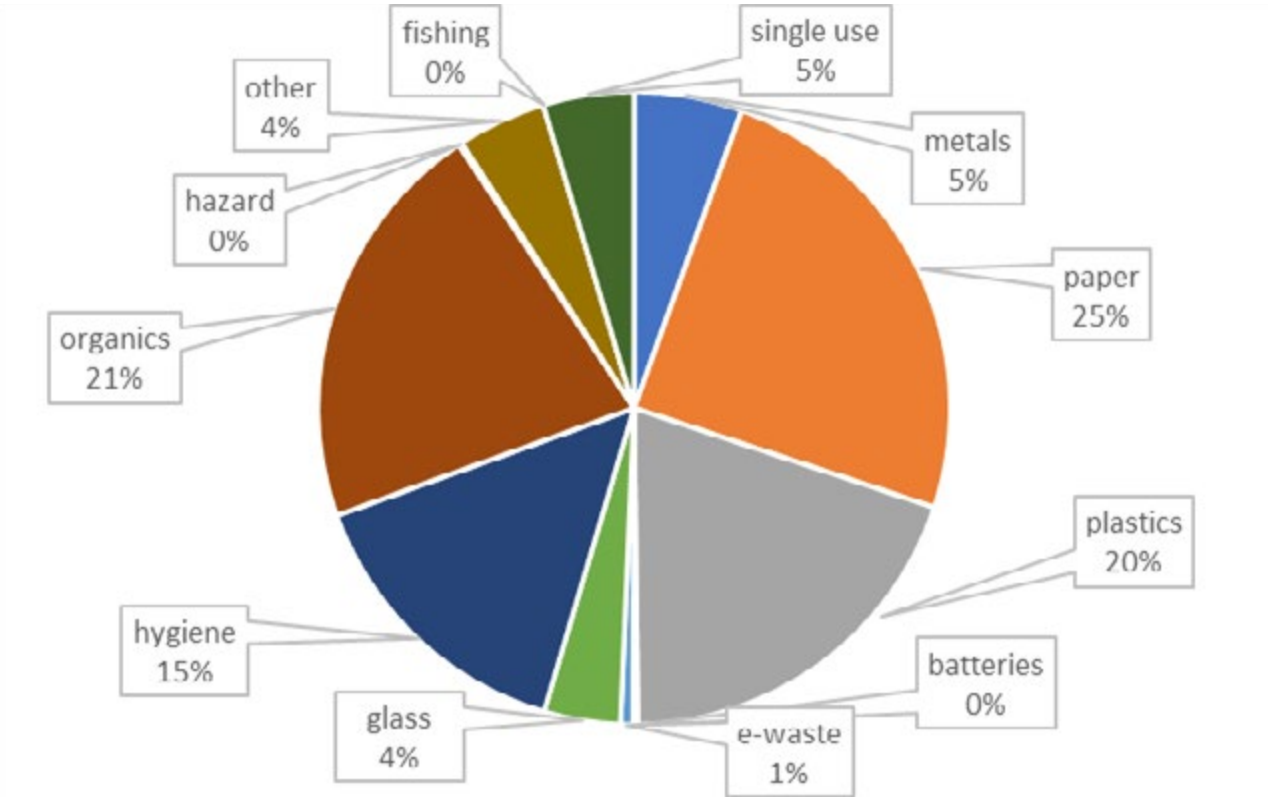
Source: Ministry of Infrastructure Cook Islands

Table 5.15: Estimated Volume of Solid Waste Deposited into Rarotonga Landfill, September 2019–August 2020

Materials	Total Volume m3 (Sept 2019– Aug 2020)
Metals	155
Paper	689
Plastics	553
Batteries	7
e-Waste	18
Glass	110
Hygiene	418
Organics	593
Hazardous	5
Other	128
Fishing	0
Single use	130
Total	**2,805**

Source: Authors.

Figure 5.9: Percentage Waste Composition for Rarotonga Landfill



Source: Authors.

5.7.2 Aitutaki landfill

Data received for Aitutaki Landfill from the Aitutaki Island Administration cover the months of February to August 2020 (Table 5.16). The volume of waste accepted into the landfill was calculated by applying the same pricing assumptions as applied to the data for Rarotonga Landfill. Materials being stockpiled within the Aitutaki Landfill grounds are listed as stockpiled materials and do not form part of the landfilled waste volume. Materials stockpiled included: roofing iron, whiteware, batteries, and empty oil containers.

Table 5.16: Aitutaki Landfill Waste Volumes

Month	Volume accepted (m3) (February–August 2020)
February	5.6
March	0.5
April	6.5
May	5.6
June	3.8
July	4.9
August	10.0
Total	**36.9**

m3 = cubic meters.
Source: Waste dockets provided by Aitutaki Island Administration

Waste to landfill obviously declined during March 2020, but not from April onwards in the volume of waste. When excluding the data for March and August 2020, the average input volume to the landfill per month was 5.3 m3. Based on this average volume (applied to September 2019–January 2020) an estimated 63.1 m3 of waste was accepted at Aitutaki Landfill over September 2019–August 2020.

5.8 Customs Data

An assessment of the customs data for imported and exported goods has been undertaken (Table 5.17). Import and export data from January 2020–August 2020 and 25% of the value of exported and imported goods from 2019 has been presented. The HS codes identified as high and medium importance are defined in Table 5.17.

Figure 5.10 shows the import and export values of the high and medium importance HS codes as a proportion of the total value. The proportion of high and medium importance customs codes compared to total import or export has been consistent since 2015.

Table 5.17: Breakdown of Customs Data for Key Import and Export Data

Total import value (CIF value) + 50% (25% 2019 NZ$ + YTD: Jan-Aug) for the Cook Islands	Total import value (CIF value) + 50% (25% 2019 NZ$ + YTD: Jan-Aug)—for HS codes identified as medium and high importance	Estimated number of units—imported—for HS codes identified as medium and high importance	Total export value (FOB value) + 50% (25% 2019 NZ$ + YTD: Jan-Aug)	Total export value (CIF value) + 50% (25% 2019 NZ$ + YTD: Jan-Aug)—for HS codes identified as medium and high importance	Estimated number of units exported—for HS codes identified as medium and high importance
NZ$228,908,125	NZ$157,376,519 (68.8% of total imported value).	21,353,381	NZ$34,463,176	NZ$2,271 (0.01% of total exported value). Over 89% of export value is fish.	4,064a
	Plastic products (39 only)—NZ$11,944,377 Single use plastic items—NZ$901,910 (3920, 3921—Plastics; plates, sheets, film, foil and strip). Bottled water (full) (2201, 2202)—NZ$4,087,570	Total plastic product units—1,054,190 Single use plastic items: 200,424 units (19% of total plastic product) Bottled water (including flavoured) empty units: 1,487,153.		Those materials of note for export: Aluminum–waste and scrap (4,061 kilograms) paper based cartons, boxes (2.6 tonnes[b]) plastic articles (0.5 bales)–plastic bottles (assumed as crushed and bailed).	

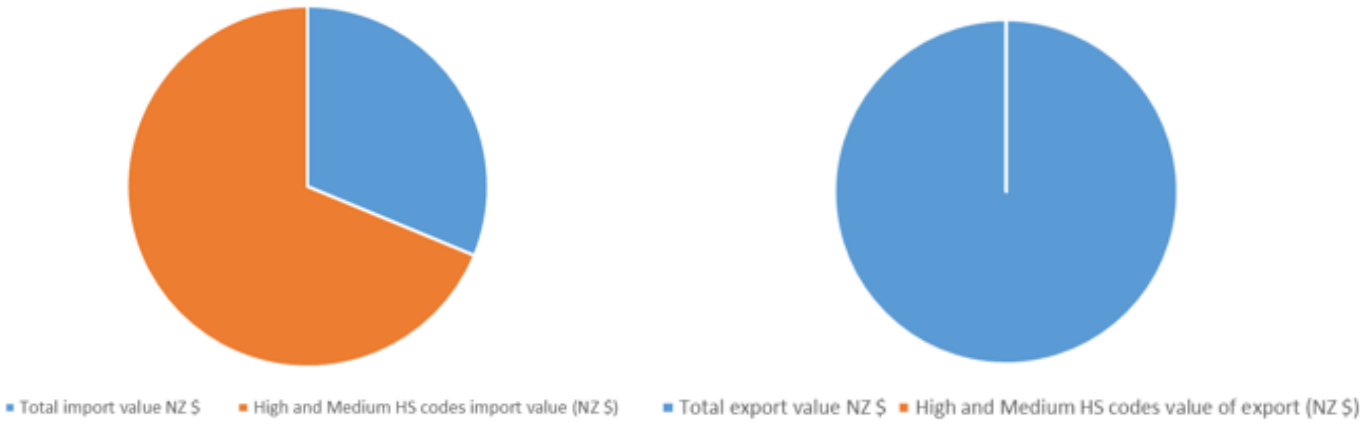
[a] Aluminum (units based on a unit cost of NZ $0.99 per kg)—plastics based on cost per tonne of recycled plastic—$650, paper—based on $10 per unit.

[b] Estimate based on $90 per tonne. https://www.mfe.govt.nz/publications/waste/recycling-cost-benefit-analysis/5-markets-and-value-materials

Note: Customs data received from the Statistics Office, Ministry of Finance and Economic Management. Data presented if for those materials identified as high and medium priority—see Appendix 4 for further details.

Source: Ministry of Finance and Economic Management.

Figure 5.10: Total Import and Export Value and Proportion of High and Medium Defined HS Codes



Source: Author based on data from the Ministry of Finance and Economic Management, Cook Islands.

5.8.1 Tourism arrivals and waste generation

At this early stage (December 2020) since the beginning of COVID-19, tourism in the Cook Islands ceased when the borders closed, preventing the entrance of visitors. Cruise ships were also cancelled during this period and are yet confirmed to resume. This will lead to a reduction in the volumes of quarantine waste (from incoming vessels) requiring incineration. This has also had an impact on economic activity and associated waste generation from tourism activity including accommodation, hospitality and adventure activities.

5.8.2 Waste Management Protocols

The port of entry management protocols for the Cook Islands have been defined in the Cook Islands Biosecurity Act 2008. The requirement for all solid waste entering the country is that it is incinerated.

Wastewater and sewage waste are disposed of into the sewage treatment system on the grounds of Rarotonga International Airport. An incinerator is located on the airport grounds to dispose of waste arriving on aircraft.

5.8.3 Single use plastics

The number of single use plastic items (plates, sheets, film, foil, and strip) is estimated to equate to an estimated 0.2 units per person per week, or 1.2 units per household.[16]

The number of water bottles imported into Rarotonga is estimated at around 1,487,153 per annum. Equating to approximately 1.6 water bottles per week per person based on the population of 17,500.

Estimated based on the sort and weigh data for households in Rarotonga and Aitutaki, the average number of water bottles produced is 2.9 per household per week (within a range 0–50 per household).

Interviews undertaken with businesses as part of the audits provided data around the number of water bottles produced per business. This was an estimated 9.9 water bottles per business per week (with a range of 0–144 bottles per business). Noting that the 144 bottles per week was produced by an accommodation provider in Rarotonga.

[16] Single use items data derived from Customs data (HS codes - 3920, 3921 only)

5.9 COVID-19

During the business surveys we gained insight through interviews on COVID-19 impact, including on the amount of waste and recycling they produce. Key statements included:

- "We are generating half as much waste as prior to COVID-19".
- An accommodation provider also noted that typical volumes of waste were twice the current (September 2020) waste they are producing.
- One retail provider noted that their business relies on locals and the impact of COVID-19 has not had a huge impact on their waste streams produced.
- One of the many resorts located in Aitutaki provided a breakdown of waste and recycling produced by their operations since December 2019. Since 21 March 2020, the borders to the Cook Islands have been restricted, preventing tourists from entering. The average of waste produced from January 2020 (280 kg for the month), dropping down to between 20–41 kg per month through April–June and then 0 kg through July and August.

Analysis of data for Rarotonga Landfill, has provided some insight into the reduction in volume of waste sent to landfill post March 2020. A 27% reduction in waste occurred for those businesses who pay cash to use the landfill. In the absence of data (pre-April 2020) for those customers on account—which covers businesses, household and a mixture of household and business waste coming into the landfill—the application of the 27% was used to factor up pre-April volumes in the absence of data.

5.10 Audit Summary

- There is good capture of glass for recycling on both Rarotonga and Aitutaki; cans and plastic containers were also put out for recycling.
- Significant components of household waste include hygiene products, organic waste, metal, paper/cardboard, and single use items.
- Satisfaction is high with the current collection service and willingness to pay for that service is reasonable.
- Alternatives to using the collection service were common, with burning, burying, and feeding food scraps to animal all noted.
- Business waste varied by sector, but in all cases significant components included paper/cardboard and plastic. Metals, organic, glass and other (typically textiles) also featured to a varying degree.
- Businesses had a higher willingness to pay for collection services and similarly high level of satisfaction with the existing survey.
- Single use items are present in both materials put out for recycling and waste landfill on both Rarotonga and Aitutaki.
- The majority of stockpiles identified were metals—vehicles and whiteware.
- The total volume of waste disposed to Rarotonga Landfill for the period of September 2019–August 2020 was an estimated 2,805 m3.
- There has been a reduction in waste sent to Rarotonga Landfill since COVID-19 and the associated border closure. This has contributed to a reduction of waste to landfill of around 27%.
- The import/export data suggests very little material is exported for recycling or recovery.

Appendix 1: Cook Islands Audit Plan Report

A1. Audit Overview

A1.1 Approach

This audit plan sets out the approach to collecting a range of information on solid waste management and resource recovery in the Cook Islands through a national waste audit. The approach was developed for a program of national waste audits across the Pacific funded by a range of partners, including the Asian Development Bank, the European Union, and the World Bank.

Data on waste and resource recovery is difficult to collect and highly variable. Both quantity and characteristics vary over time and as a result of a range of factors including:

- weather
- economic activity
- influence of major projects, e.g., large construction projects

The national audit attempts to assemble a "snapshot" of waste management and resource recovery through a suite of data collection activities and integrated analysis of the resulting information. The audit includes:

i. Sampling waste from a selection of households and businesses
ii. Sorting the sampled waste into pre-defined categories (Refer Section 2.3.2)
iii. Estimating the composition of waste disposed of to landfill
iv. Estimating the quantity of waste in stockpiles e.g., scrap metal, plastics or e-waste.
v. Discussing waste management and resource recovery with key government and non-government stakeholders.

The audit also uses existing data sources to supplement data collected during the audit, for example import/ export data, national household, and business statistics.

A1.2 Audit Objectives

The national audit program aims to provide consistent data on waste management and resource recovery across the Pacific. This data will be used to design country and regional projects to improve resource recovery. It is anticipated that the national audits will be repeated periodically to assess changes in waste management and resource recovery at a national and regional level.

The Cook Islands audit aims to accomplish the following:

- Develop a picture of waste management and resource recovery in the Cook Islands.
- Provide baseline information to inform the development of waste regulations for the Cook Islands.
- Provide baseline information on waste disposal in Rarotonga to inform the development of a long term residual waste disposal solution.

A.1.3 Delivering the Audit with COVID-19-Related Travel Restrictions

The audit will be supported by a project team comprising a Team Leader (Chris Purchas), Country Coordinator (Tekao Hermann) and Waste Auditor (Anna Ainsworth). The project team will work with local agencies and a locally appointed audit team to deliver the audits. A key objective is to training local staff to enable future audits to be completed with minimal input from an international team.

If possible, the audit team will be present in the Cook Islands for some or all of the audit period. Travel restrictions due to the COVID-19 Pandemic mean that this is unlikely to be possible for the Team leader and waste auditor. The country coordinator will be present in the Cook Islands for the waste audit.

The training and audit delivery process has been designed to allow the project team to provide support and supervision remotely if required. This includes:

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

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

- Daily start-up meetings with the various audit teams (by telephone or video if required, in person if possible).
- Form based data collection to ensure data is collected in a consistent fashion.
- Live or end of day data submission to allow review of data collected.
- Periodic check in by telephone or video each day to track sample collection, data quality and challenges as they arise.

If the full project team is in the Cook Islands the sort and weigh audit, household/business interviews, landfill audit and stockpile audits will be supervised by the project team. In all cases a local lead will be identified and trained with a focus on building local capability for future audits.

If travel to the Cook Islands is not possible the country coordinator will provide local supervision with the waste auditor and team leader provide remote supervision.

A2. Audit Plan

A2.1 Audit Program

We have allowed an audit program of 14 days. Timing will be subject to travel arrangements but is likely to include 8-10 days on Rarotonga and 1-2 days on Aitutaki.

The audit will start with induction of the audit team including training for specific roles (sample collection, household/business interviews, sort and weigh). We anticipate having several teams as outlined in Figure A2.1. Indicative timing is provided in Figure A2.2 with a more detailed Gant Chart provided as an attachment.

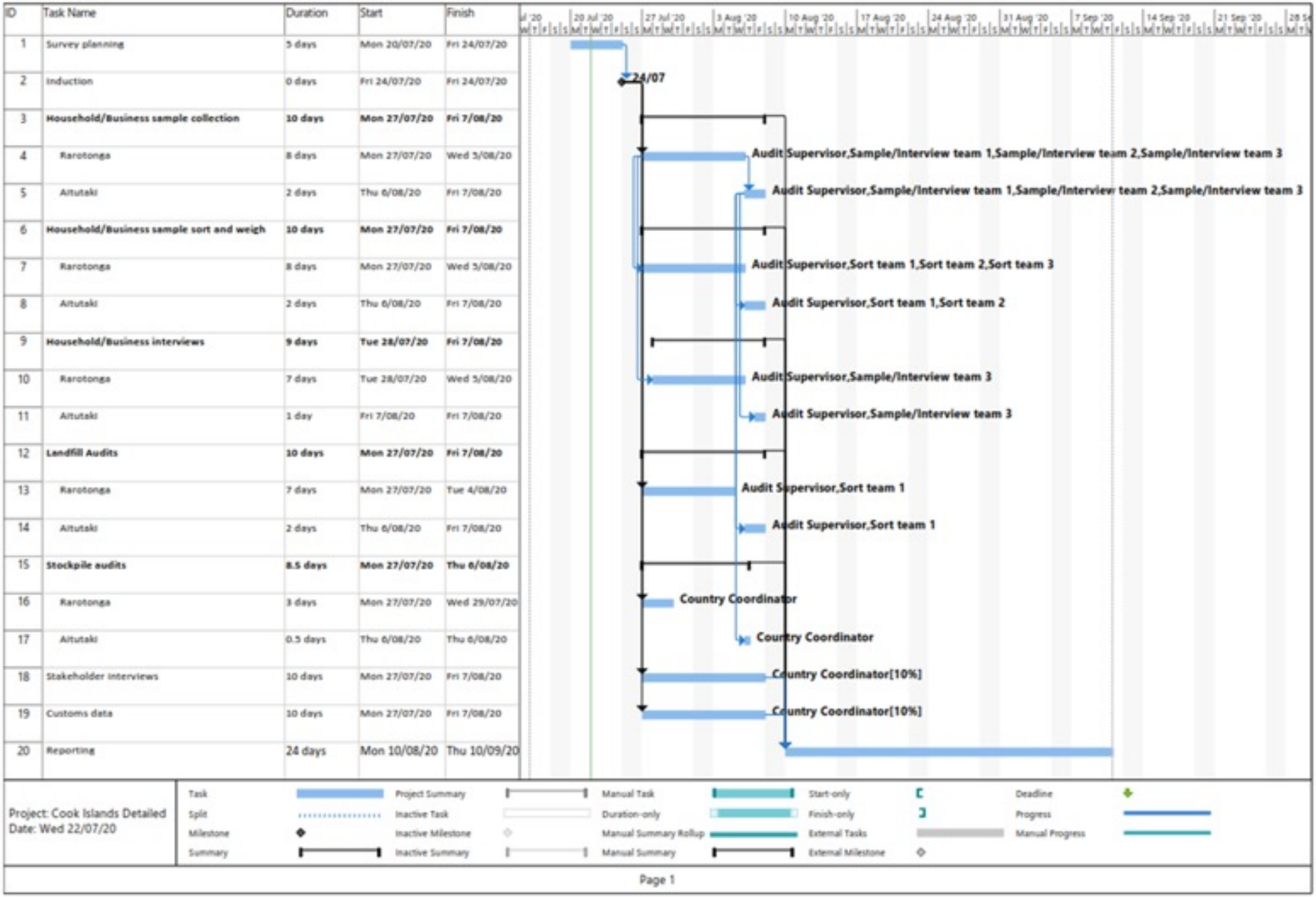
Figure A1.1: Role descriptions

The sample collection (Role 1) and interview (Role 3) teams will each comprise 2-3 people including at least one fluent in Cook Islands Maori. The sort/weigh team (Role 2) will comprise 2-3 people plus a supervisor. The landfill audit and stockpile assessments will be completed by a 1-2 person team depending on likely vehicle numbers through the landfill site being assessed. The country coordinator, waste audit lead and team leader will provide supervision as required.

Figure A1.2: Indicative schedule (Rarotonga)

This visual shows how and when the different roles start and end or when they overlap and with which team

Role No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
ROLE 1	Induction (morning) Team A (afternoon) Team B (afternoon)	Team A Team B	Team A Team B	Team A Team B	Team A Team B	Team A Team B	Team A Team B	Team A Team B		
ROLE 2	Induction (morning) Team C (afternoon) Set up site or out with Teams A + B	Team C	Team C	Team C	Team C	Team C	Team C	Team C	Team C	
ROLE 3	Induction (morning)		Team B	Team B	Team B	Team B	Team B	Team B	Team A Team B	Team A Team B
ROLE 4	Induction (morning) Team D (afternoon) Set up site or out with Teams A + B	Team D	Team D	Team D	Team D					
ROLE 5	Induction (morning)					Team D	Team D	Team D	Team D	Team D



ID	Task Name	Duration	Start	Finish
1	Survey planning	5 days	Mon 20/07/20	Fri 24/07/20
2	Induction	0 days	Fri 24/07/20	Fri 24/07/20
3	**Household/Business sample collection**	**10 days**	**Mon 27/07/20**	**Fri 7/08/20**
4	Rarotonga	8 days	Mon 27/07/20	Wed 5/08/20
5	Aitutaki	2 days	Thu 6/08/20	Fri 7/08/20
6	**Household/Business sample sort and weigh**	**10 days**	**Mon 27/07/20**	**Fri 7/08/20**
7	Rarotonga	8 days	Mon 27/07/20	Wed 5/08/20
8	Aitutaki	2 days	Thu 6/08/20	Fri 7/08/20
9	**Household/Business interviews**	**9 days**	**Tue 28/07/20**	**Fri 7/08/20**
10	Rarotonga	7 days	Tue 28/07/20	Wed 5/08/20
11	Aitutaki	1 day	Fri 7/08/20	Fri 7/08/20
12	**Landfill Audits**	**10 days**	**Mon 27/07/20**	**Fri 7/08/20**
13	Rarotonga	7 days	Mon 27/07/20	Tue 4/08/20
14	Aitutaki	2 days	Thu 6/08/20	Fri 7/08/20
15	**Stockpile audits**	**8.5 days**	**Mon 27/07/20**	**Thu 6/08/20**
16	Rarotonga	3 days	Mon 27/07/20	Wed 29/07/20
17	Aitutaki	0.5 days	Thu 6/08/20	Thu 6/08/20
18	Stakeholder interviews	10 days	Mon 27/07/20	Fri 7/08/20
19	Customs data	10 days	Mon 27/07/20	Fri 7/08/20
20	Reporting	24 days	Mon 10/08/20	Thu 10/09/20

A2.2 Household/Business Sampling

A sampling plan has been developed based on the most recent household and business statistics from the Ministry for Finance and Economic Management.[17] A sample of 150 households across Rarotonga and Aitutaki provides a reasonable level of precision balanced with the time required to sample, sort and weigh the samples obtained. Similarly, a sample of 50 businesses across Rarotonga and Aitutaki (from an estimated total of 1,000 businesses) provides a robust sample. We have assumed 20–30 minutes per household/business for sample collection. This translates to:

- 8 days sample collection on Rarotonga
- 2 days sample collection on Aitutaki

Table A1.1: Household/Business Sampling Plan

Location	Total Dwellings	%	Sample no.		Businesses	%	Sample No.
RAROTONGA	**3,233**	**72.9%**	**120**		**828**	**83.8%**	**42**
Kiikii-Ooa-Pue-Tupapa	502	11.3%	19		126	12.8%	6
Takuvaine	193	4.4%	7		27	2.7%	1
Tutakimoa-Teotue	79	1.8%	3		42	4.3%	2
Avatiu-Ruatonga-Atupa	270	6.1%	10		59	6.0%	3
Nikao-Panama	378	8.5%	14		93	9.4%	5
Ruaau-Arerenga	358	8.1%	13		81	8.2%	4
Akaoa-Betela	217	4.9%	8		61	6.2%	3
Murienua	252	5.7%	9		42	4.3%	2
Titikaveka	410	9.2%	15		129	13.1%	7
Ngatangiia	292	6.6%	11		92	9.3%	5
Matavera	282	6.4%	10		76	7.7%	4
SOUTHERN ISLANDS	**940**	**21.2%**	**30**		**152**	**15.4%**	**8**
Aitutaki	503	11.3%	30		116	11.7%	8
Mangaia	157	3.5%	0		21	2.1%	0
Atiu	131	3.0%	0		7	0.7%	0
Mauke	97	2.2%	0		8	0.8%	0
Mitiaro	52	1.2%			0	0.0%	0
NORTHERN ISLANDS	**262**	**5.9%**	**0**		**8**	**0.8%**	**0**
COOK ISLANDS	**4,435**	**100.0%**	**150**		**988**	**100.0%**	**50**

A2.3 Household/Business Waste Sort and Weigh

A2.3.1 Sorting arrangements

The waste sampled from households and businesses will be sorted at a central location.
We have assumed 20-30 mins to sort each sample.

- On Rarotonga this will be at the Rarotonga Waste Facility with 8 days for the sort and weigh.
- On Aitutaki this will be at the Aitutaki Waste Facility with 2 days for sort and weigh.

[17] See http://www.mfem.gov.ck/statistics

A2.3.2 Sorting categories

Materials will be sorted into primary categories and where possible into secondary categories.

Table A1.2: Primary categories

Category 1	Examples
Metal	Aluminum cans, aluminum recyclable, steel containers, white goods, end-of-life vehicles, metal other
Paper and cardboard	Cardboard, liner paperboard (LPB—cardboard container lined with plastic or aluminum), composite, paper
Plastic	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 and 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, containerized used oil, hazardous (other)
Other	Textiles End-of-life renewable energy equipment Tires Rubble/concrete incl Ceramics

Table A1.3: Specific materials type categories

Category 1	Examples
Fishing/seafood	Metal, Plastic, wood [also classified according to
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

A2.4 Household/Business Interviews

For each household or business where a waste sample has been collected a second team will return to complete an interview. The interview will be recorded on a standard form and is intended to collect information on household or business characteristics that are likely to be correlated to waste generation and resource recovery behavior.

We have assumed 20-30 mins per household for survey completion. This translates to

- 8 days sample collection on Rarotonga.
- 2 days sample collection on Aitutaki.

A2.5 Landfill Audits

Audits will be completed at Rarotonga Landfill and Aitutaki Landfill. Waste composition and quantity will be estimated and all loads recorded for the audit period. Each load will be recorded including photographs and estimated composition and quantity.

The site auditor will visually estimate the proportion of materials in each primary category and where possible note materials present for secondary categories. Site records will also be reviewed to determine load source and numbers (as information allows).

Table A1.4: Primary Categories

Category 1	Examples
Metal	Aluminum cans, aluminum recyclable, steel containers, white goods, end-of-life vehicles, Metal other
Paper and Cardboard	Cardboard, liner paperboard (cardboard container lined with plastic or aluminum), composite, paper
Plastic	PET containers, HDPE containers, LDPE containers, PVC containers, PP, EPS, PS, Flexibles/film, Other plastic
E-Waste	Non-rechargeable, Rechargeable, Lead acid batteries, Mobile phone, Power tool batteries, Lithium Batteries, Lithium ion batteries, Other batteries TVs, Mobile phones, Electrical Items and 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, containerized used oil, hazardous (other)
Other	Textiles End-of-life renewable energy equipment Tires Rubble/concrete including ceramics

A2.6 Stockpile Audits

Stockpile audits will be completed based on information provided by the Ministry of Infrastructure Cook Islands and island councils. Materials characteristics and quantity will be estimated. Each stockpile will be recorded including photographs and estimated composition and quantity.

A3. Data Sources

A range of data sources will be used for the audit process. These include:

- National statistics (households, demographics, businesses)
  From the Cook Islands Statistics Office (www.mfem.gov.ck/statistics)
- Customs import/output data
  From the Cook Islands Customs Service (www.mfem.gov.ck/customs)
- Household/Business sampling data entry sheet
- Household/Business waste audit data entry sheet
- Landfill audit data entry sheet
- Stockpile audit data entry sheet
- Stakeholder interview records

A4. Reporting

The report structure will be confirmed as the project progresses but is likely to reflect the indictive table of contents set out below.

Section 1: Literature Review/ Country Profile:

Background
Socio Economic Background
Stakeholders—Roles and Responsibilities
Waste Service Provision

Section 2: Methodology

Training of local counterparts
Highlight Waste Audit sites
Sample collection
Interviews

Section 3: Validation Procedures

Section 4: Audit Findings

4.1 Household

- Percentage of Households surveyed that have access to garbage collection services
- Assessment on types of wastes generated by households. Information is to be highlighted in a graph clearly depicting the percentage of recyclables, hazardous waste (if any), organics and bulky or difficult waste.
- Recyclables are to be separated into PET, HDPE, LDPE, PVC, Glass, Paper, Cardboard etc.
- Household Generation rate

4.2 Businesses

- Types of commercial facilities audited incl retailers, manufacturers.
- Assessment on types of wastes generated by different facilities
- Recyclables separated into PET, HDPE, LDPE, PVC, Glass, Paper, Cardboard)
- Assessment of the collection services available to commercial facilities
- Funding arrangements and assess feasibility of such funding mechanism

4.3 Landfill

- Information to be captured includes but not limited to:
- Name of landfill(s) audited
- The nature of the landfill—design, waste 'catchment, location.
- Key characteristics—gate fee charged, percentage of funding received from government and the average Annual maintenance cost for the landfill.
- Segregation undertaken on site, allocation of cells for special wastes
- Assessment of the long-term use of the site should current waste trends continue

4.4 Customs

- Assessment of Import and Export data with special mention of potential packaging waste
- Criteria needed to regulate imports for items that would potentially be difficult wastes.
- Assessment of tourists' arrival and potential wastes generated especially for cruise ships
- Port of entry waste management protocols—are there any legal requirement for all wastes to be incinerated?
- Single Use Plastics

Appendix 2: Waste Sort Categories

Primary Categories

Category 1	Examples
Metal	Aluminum cans, aluminum recyclable, steel containers, white goods, end of life vehicles, metal other
Paper and cardboard	Cardboard, liner paperboard (cardboard container lined with plastic or aluminum), composite, paper
Plastic	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, and 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, containerized used oil, hazardous (other)
Other	Textiles End-of-life renewable energy equipment Tires Rubble/concrete including ceramics

Specific materials type categories

Category 1	Examples
Fishing/seafood	Metal, Plastic, 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 3: Detailed Waste Composition Breakdown

Materials	Rarotonga (including recycling)	Rarotonga (excluding recycling)	Aitutaki (waste and recycling)	Aitutaki (recycling only)
Metals	8.6%	4.4%	14.1%	42.8%
Paper	10.2%	11.3%	1.6%	0.9%
Plastics	14.8%	13.5%	6.7%	19.6%
Batteries	0.1%	0.0%	1.9%	0.0%
e-Waste	0.2%	0.1%	2.7%	0.1%
Glass	19.1%	1.8%	25.4%	32.2%
Hygiene	14.4%	39.6%	34.8%	0.0%
Organics	15.5%	23.6%	5.9%	0.0%
Hazardous	0.9%	0.1%	1.4%	2.6%
Other	4.4%	2.5%	4.9%	0.4%
Fishing	0.0%	0.0%	0.0%	0.0%
Single use	11.8%	3.1%	0.6%	1.4%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Business waste composition—sort and weigh data only—Rarotonga (recycling included)							
Materials	**Accommoda-tion**	**Education**	**Hospitality**	**Office**	**Retail**	**Services**	**Sport and leisure**
Metals	4.2%	4.6%	2.9%	5.7%	8.0%	5.5%	47.4%
Paper	9.8%	28.8%	9.0%	17.9%	25.5%	17.6%	1.5%
Plastics	12.3%	10.8%	15.0%	20.0%	16.5%	12.1%	5.9%
Batteries	0.2%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
E-waste	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%
Glass	45.6%	8.0%	35.4%	1.3%	10.0%	1.5%	0.0%
Hygiene	6.1%	21.3%	7.1%	3.5%	0.6%	14.9%	0.0%
Organics	10.6%	12.1%	21.7%	8.4%	30.1%	23.6%	6.7%
Hazardous	0.0%	0.1%	0.1%	0.0%	0.4%	0.0%	0.0%
Other	0.1%	4.2%	4.2%	34.4%	1.9%	0.3%	0.0%
Fishing	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Single use	11.1%	10.1%	4.6%	8.8%	7.0%	24.2%	38.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Business waste composition—sort and weigh data only—Rarotonga (waste only)				
Materials	Accommodation	Hospitality	Retail	Sport and leisure
Metals	12.1%	5.0%	2.2%	19.1%
Paper	6.4%	35.8%	23.0%	10.3%
Plastics	39.0%	23.3%	34.4%	19.1%
Batteries	0.0%	0.1%	0.6%	0.0%
e-Waste	0.0%	0.0%	0.0%	0.0%
Glass	0.0%	0.7%	0.0%	0.0%
Hygiene	2.1%	2.4%	1.1%	0.0%
Organics	1.4%	23.0%	26.3%	9.5%
Hazardous	0.0%	0.0%	0.0%	0.0%
Other	36.2%	3.2%	4.6%	22.1%
Fishing	0.0%	0.0%	0.0%	0.0%
Single use	2.8%	6.6%	7.8%	19.9%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Business waste composition—sort and weigh data only—Aitutaki				
	Waste and recycling			Recycling only
Materials	Accommodation	Hospitality	Services	Hospitality
Metals	1.2%	2.3%	4.1%	0.0%
Paper	47.1%	41.7%	19.9%	0.0%
Plastics	16.6%	19.9%	9.5%	94.9%
Batteries	0.0%	0.0%	0.0%	0.0%
e-Waste	3.5%	0.0%	0.0%	0.0%
Glass	2.4%	0.0%	4.8%	0.0%
Hygiene	14.9%	2.8%	0.8%	0.0%
Organics	9.7%	21.7%	46.0%	0.0%
Hazardous	0.0%	0.0%	0.0%	0.0%
Other	3.6%	6.3%	9.2%	0.0%
Fishing	0.0%	0.0%	0.0%	0.0%
Single use	1.0%	5.3%	5.7%	5.1%
Total	**100%**	**100%**	**100%**	**100%**

Appendix 4: HS Codes

Category	Priority	HS Codes
Aluminum packaging	M	7611,7612,7613
Asbestos	M	2524,6811.40,6812
Bottle lids	M	3923.50
Ceramics	H	6901,6902,6903,6904,6905,6906,6907,6908,6909,6910,6911,6912,6913
Cigarette packets	H	2402,4813
Composite	H	4807
Computer equipment	M	8471,8443,8528.42,8528.52,8528.62,
Construction	M	9406,2523,6810
Containerized used oil	H	2709,2710.91,2710.99,3811
Cosmetics	M	3304,3305,3401
Drink containers alcoholic	H	2203,2204,2205,2206,2207,2208
Drink containers milk and vinegar	H	0401,2209
Drink containers soft drink	H	2202
Drink containers water	H	2201
Electrical items and peripherals	M	8525,8526,8527,8528,8508,8509,8510,8513,9504,8523,4417,8471,8518,8543,8544,9001,9405
End of life Vehicles	H	8427,8428,8429,8430,8701,8702,8703,8704,8705,8706,8707,8708,8709,8710,8711,8712,8714,8715,8716
End-of-life vehicles air	H	88
End-of-life vehicles ocean	H	8407.21,8409,8901,8902,8903,8904,8905,8906,8907,8908,9506
EPS containers	H	0402,0404,3903.11
Feminine hygiene	M	9619.00.10,9619.00.20
Flexibles/film	H	3919,3920
Flexibles/film packaging	H	1905
Fluorescent tubes	M	8539.31
Footwear	M	64
Fuel	M	2710.12,2710.19,2710.20,2711.12,2711.13
Gas bottles	M	7311,7613
Glass fines	M	7002,7018
Glass jars	M	7010,2007,2103,2005,7013,2001,2001.10,2001.90,2002,2003,2008
Glass other	M	7001,7003,7004,7005,7006,7007,7008,7009,7011,712,7013,7014,7015,7016,7017,7019,7020,9001,9002,9617
HDPE containers	H	0403.90,0404,1517,3901.20,3915.10,3901.20,3923.21.25
Household chemicals	M	3402,3404,3405
LDPE containers	H	3901.10,3904.10,3904.21,3904.22,3916.10,3920.10
Lead acid batteries	H	8507.10

Category	Priority	HS Codes
Lithium ion batteries	H	8507.60
LPB	H	4804.42,4804.52,4811,3912.12
Medical waste	M	3002,3003,3004,3005,3006.70,8419.20,3822,9021
Metal not Al, Fe	H	74,75,78,79,80,81
Metal other	M	8309,2710.12.6,2710.19.6
Misc. machinery	M	8474
Mobile phones	M	8517.12
Mobile phones	H	8517
Nappies	H	9619.00.30,9619.00.40
Non-rechargeable batteries	M	8506
Other plastic	M	3915.90,3926,3307,9404.21,9404.29,9612,3905,3906,3907,3908,3909,0910,3918.90,3917.31,3917.32,3917.33,3917.39,3917.40,3916.90,3921.13,3921.14,3921.19,3921.90,3922,3923.29,3923.30,3923.40,3923.50,3923.90,3925.20,3925.30,3925.90,3926
Other sanitary waste	M	4818
Paint	M	3207,3208,3209,3210,3212,3213
Paper	M	4707,4801,4802,4803,4804,4805,4806,4808,4809,4810,4812,4814,4815,4816,4817,4820,4821,4822,4823,49
PET containers	H	3917.21,3907.60,3920.62
Pharmaceutical	M	3006
Plastic Kitchenware	H	3924
Plastic Water Tanks	H	3925.10.90
PP containers	H	3902.10,3917.22,3920.20
PS containers	H	3903.19,3903.20,3903.30,3903.90,3915.20,3920.30,3921.11
Pumps and filters	M	8413,8421.21
PVC containers	H	3917.23,3904,3918.10,3915.30,3920.43,3920.49,3916.20,3920.43,3920.49
Rechargeable Batteries NiMH NiCD	M	8507.30,8507.40,8507.50
Plastic bags	H	3923.21,6305
Rubber not tires	M	4001,4002,4003,4004,4005,4006,4007,4008,4009,4010,4014,4015,4016,4017
Scrap aluminum	H	76
Scrap iron	H	72,73
Steel containers	M	7310,7311,1602.10.50,2008.99.18,1902.30,3208,3209,3210,3211
Textiles	M	50,51,52,53,54,55,56,57,58,59,60,61,62,63
Toner cartridges	M	8443.99
Toys	M	9503,9504
TVs	M	8528.7
Tires	H	4011,4012,4013
White goods	H	8516,8422.11,8421.12,8450,8418,7321,8415
Wood/timber	M	44,9401.50,9401.60,9403.30,9403.40,9403.50

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