Pacific Region Infrastructure Facility

Waste Audit Report Fiji

Consultants' Final Report

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

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Abbreviations

ADB	Asian Development Bank
CDL	Container Deposit Legislation
CEO	chief executive officer
F$	Fiji dollars
GDP	gross domestic product
HDPE	high-density polyethylene
IUCN	International Union for Conservation of Nature
J-PRISM II	Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management in Pacific Island Countries Phase II
JSA	job safety analysis
kg	kilogram
L	liter
OEPPC	Office of Environmental Planning and Policy Co-ordination
PET	polyethylene terephthalate
PRIF	Pacific Regional Infrastructure Facility
T+TI	Tonkin & Taylor International Limited
UNEP	United Nations Environment Programme

Preface & Acknowledgements

Solid waste infrastructure and management across Fiji is integral to the well-being of the Fijian people and the environmental protection of the country. Effective solid waste management in Pacific island countries is critical for sustainable development, preservation of the natural environment, and maintaining the health and quality of life of residents. To investigate improvements that could be made to solid waste infrastructure in the Pacific, waste audits are needed to understand the quantities and composition of waste in each country.

This report provides a description of current waste management methods used across two locations in Fiji: Ba Town and Labasa (Town). The audit methodology used in these two locations and the audit findings, separated by households and commercial enterprises (businesses) for Labasa, are also presented. The findings of these audits will inform development of solid waste management across the Pacific, with aims to improve recovery rates of waste materials. The work in Ba Town and Labasa complements audit work completed in Lautoka and Levuka, and planned for Suva. When combined, this information will provide a clear insight into waste quantity and composition across Fiji.

This report was prepared by Tonkin & Taylor International Ltd, an environmental and engineering consultancy firm. The consultants completed the report with support from Fiji's Department of Environment and Ministry for Local Government, Ba Town Council, Labasa Town Council, and local communities.

Tonkin & Taylor International Ltd is grateful to the partners of the Pacific Region Infrastructure Facility, the Pacific Community, the Fiji Recycling Association, and the Government of Fiji for their valuable guidance, inputs, and cooperation throughout the preparation of this publication.

It is hoped that this report will become a valuable planning reference for national and municipal governments, infrastructure investment organizations, and other asset management practitioners operating in Pacific island countries and beyond.

Executive Summary

Summary of audit activities in Labasa

- The following activities were completed:
  - waste collection
  - sort and weigh
  - interviews
  - landfill audits
  - stockpile assessments
- Data collected in Labasa:
  - 118 household and commercial samples collected
  - 104 household samples
  - 14 commercial samples
  - 25 household and 10 commercial interviews
  - 6 stockpile assessments
  - 263 landfill loads audited

Waste generation rates

- Average household generation per day is 2.6 kilograms (kg), with a range of 0.1 kg to 7.4 kg per household per day.

Household key compostion trends

- Labasa - Organics (37.3%), plastics (17.4%), and paper and cardboard (16.8%) were the largest components.

Commercial composition trends

- Commercial waste varied by sector.
- Across all commercial sectors the largest components included paper and carboard, organics, and plastics.

Recovery of recyclables

- There was some capture of recyclable materials at the waste facility: polyethylene terephthalate bottles, aluminium cans, and scrap metals.
- Buses, cars, and vans were stored at multiple locations around Labasa.

Stockpiles in Labasa

- Most commonly stockpiled materials are vehicles: cars, vans, four-wheel drives, and buses.

Labasa waste facility composition (landfilled waste only)

- 19.8% paper
- 10.3% plastics
- 2.0% metals
- 14.6% other
- 0.4% e-waste
- 0.0% fishing
- 45.3% organics
- 3.2% hygiene
- 0.5% single-use items
- 3.8% glass
- 0.0% batteries

Interview outcomes

- Households: On average 7.1 out of 10 level of satisfaction with the collection service. In Labasa, 84% of householders in Labasa were willing to pay F$1–F$2 for the service.
- Commercials: 7 out of 10 level of satisfaction in Labasa for the current collection service, for those who receive a service. In Labasa, 60% of commericals interviewed were willing to pay F$2–F$3 for the service.

1. COVID-19 Considerations

At the time of the audit, COVID-19 had been declared a global pandemic by the World Health Organization. Since April 2020, Fiji's international borders have remained closed. The impact of the country's COVID-19 response on waste generation and composition is difficult to accurately quantify without data on these aspects before the pandemic.

Waste generation typically correlates well with economic activity, i.e., there are likely to be limited impacts related to COVID-19 in the audit locations where tourism is not a significant economic driver. This suggests that the data collected for this audit are relevant and reflective of waste generation and composition for the locations audited.

Donor partners of this project have provided the following information sourced from the Statement from the Permanent Secretary for Health & Medical Services, Dr James Fong, 10 August 2021, as follows:

Enhanced cleaning protocols to manage the risk of a COVID-19 outbreak have resulted in some increases in waste generated for disposal. The COVID-19 pandemic has increased the generation of medical waste in Fiji. Since the pandemic outbreak beginning in April 2020 (after field work was completed for the waste audit covered in this report), there have been over 36,000 COVID-19 cases reported. COVID-19-related waste includes waste produced by:

i) Hospitalized patients (estimated to be in excess of one tonne per day as of August 2021).

ii) Active cases (including those in hospitals and those isolating at home) are estimated to produce around 3.4 kilograms (kg) per day. This includes increased use of personal protective equipment, quarantine and isolation facilities waste, and in-home waste (Jiangtao and Zheng 2020). This is additional to normal waste generation.

iii) Screening and swabbing activities (masks, gloves, swab materials) are estimated to have produced over 20 tonnes of additional waste (as of August 2021).

2. Context for Waste Audits in Fiji

Three working partners were commissioned to undertake audits across Fiji:

i) The Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management in Pacific Island Countries Phase II (J-PRISM II). This project is for waste data collection covering Suva. It was unable to be completed due to COVID-19 restrictions. It is planned for completion when Fiji's COVID-19 restrictions allow. Timing has yet to be confirmed.

ii) The International Union for Conservation of Nature (IUCN) commissioned the Plastic Waste National Level Quantification and Sectorial Material Flow Analysis in Fiji. This was undertaken in January 2020 by Asia Pacific Waste Consultants as part of the Plastic Waste-Free Islands Project. Landfill samples were collected at Vunato disposal site, Lautoka (north Suva), and Levuka. Household and commercial samples were also collected from multiple locations across Fiji.

iii) This report was commissioned by the Pacific Region Infrastructure Facility (PRIF), a multipartner coordination and technical assistance facility with partners including the Asian Development Bank, Australia's Department of Foreign Affairs and Trade, the European Investment Bank, the European Union, the Japan International Cooperation Agency, New Zealand's Ministry of Foreign Affairs and Trade, the United States' Department of State, and the World Bank Group. Tonkin & Taylor International Limited (T+TI) delivered audits in:

   a) Ba Town (although the audit could not be fully completed due to Cyclone Ana in January 2021, followed by COVID-19 restrictions throughout the year); and

   b) Labasa.

2.1 Reasoning for Audit Locations

In 2020, Fiji's Ministry of Local Government undertook conversations around the various waste audits planned across the country. Due to the scope of the projects, Asia Pacific Waste Consultants, the IUCN, the Japan International Cooperation Agency, PRIF, and T+TI participated. The focus of the conversations was on ensuring that the audits would complement one another, and together would provide a full picture of waste quantity and composition across Fiji.

The Fiji Waste Association was engaged in early discussions when planning the waste audits, and undertook a review of the draft report.

The Ministry of Local Government provided T+TI with contacts into the local councils for Ba and Labasa. Suva will be covered by the audit proposed by J-PRISM.

T+TI worked with Ba Town Council and Labasa Town Council to identify the appropriate approach to capture data for the waste audit commissioned by PRIF.

3. Introduction

PRIF has engaged specialists from T+TI to undertake waste audits in the Cook Islands and Fiji. This report presents the findings of the waste audits undertaken for Fiji. The methodology applied for this waste audit was as per PRIF's Waste Audit Methodology: A Common Approach, a step-by-step manual to conduct comprehensive waste audits in small island developing states (PRIF 2019).

In view of the COVID-19 pandemic, T+TI worked remotely, supporting delivery of the waste audit by working collaboratively with other key stakeholders.

The audits for this project were planned for two regions: Ba District (including Ba Town, Vatulaulau, Vadravadra, and Yalalevu) and Labasa.

On Vanua Levu, the audit in Labasa was coordinated by the Department of Environment of Labasa Town, located in the Macuata Provincial Council. The audit was undertaken daily between 21 January and 19 April 2021, with the exclusion of Saturdays and Sundays as these are nonworking days for the audit team.

The audit in Ba District began on 19 January 2021, with periodic delays due to natural weather events, including Cyclone Ana, as well as delays with equipment and resourcing staff. As COVID-19 cases were reported in the community in April 2021, the waste audit was unable to be remobilized. Some data collection was conducted in January 2021, however we do not have a complete dataset from the five surveys. Analysis of the data has therefore not been possible given the small amount, however, the background for Ba Town has been provided in this report. Due to the ongoing COVID-19 outbreak in Fiji, the audit in Ba Town will not be completed.

The results of the waste audit are part of a Pacific-wide audit program being implemented by PRIF and other agencies. The PRIF-funded audits are being undertaken in cooperation with the Asian Development Bank, the Secretariat of the Pacific Regional Environment Programme (through the European Union-funded PacWaste Plus program and with support from the Australian-funded Pacific Ocean Litter Project), the United Nations Environment Programme, and the World Bank. The J-PRISM II project is due to start in Suva once COVID-19 restrictions are lifted.

This report also includes key results taken from the draft Plastic Waste-Free Islands Project, Plastic Waste National Level Quantification and Sectorial Material Flow Analysis in Fiji, produced by Asia Pacific Waste Consultants (funded by the IUCN). Where data have been used, they have been explicitly referenced.

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

This audit report details how the Labasa audit was delivered. The report is structured as follows:

- Section 4 sets out the context for the audit, including socioeconomic background, statutory framework for waste management in Fiji, and existing waste services.
- Section 5 provides the audit methodology, including the approach to managing the audit team remotely, training provided, sampling approach, and validation procedures.
- Section 6 presents the audit findings.
- Section 7 presents an assessment of the customs data for imported and exported goods
- Section 8 presents the estimated overall waste statistics for Fiji drawing on the data collected during the waste audit in Labasa, and collected as part of the Plastic Waste- Free Islands Project Fiji.

4. Background

4.1 Socioeconomic Background

The Republic of Fiji (Fiji) comprises over 332 islands and more than 500 islets. The two main islands (Vanua Levu and Viti Levu) are home to around 87% of the population of 884,887 people (Table 4.1). The languages spoken include iTaukei (Fijian), English and Hindi.

Table 4.1: Population Living in Each Region of Fiji

Location	Population	Households	Commercials
Fiji	884,887	Not defined	
Ba district	39,372	Not defined	Not defined
Ba	15,846	3,782	688
Macuata Province	65,978	Not defined	Not defined
Labasa district	49,369	Not defined	Not defined
Labasa	26,601	6,130	837

Source: Fiji Bureau of Statistics. 2018.

Gross domestic product (GDP) per capita in Fiji is generally high compared to other Pacific Island nations. According to the Statistics Section of Australia's Department of Foreign Affairs and Trade, during 2019 Fiji's GDP per capita was $6,043, although during 2020 this decreased to $4,370 in direct relation to the sharp decline in the country's tourism sector due to COVID-19 (DFAT 2021). Other than recent challenges from COVID-19, economic challenges include:

i) remoteness from trade centers,

ii) limited natural resources, and

iii) adaptation to climate change

Fiji's main sources of income include tourism and exports of water, fish, and fuel wood, as indicated by the Observatory of Economic Complexity (OEC 2019). Sugar cane exports remain a significant industry, but have reduced following Cyclone Winston in 2016. The tourism industry has grown year on year, with nearly 900,000 visitors in 2019, according to the Fiji Bureau of Statistics (Mira, 2020). The Fiji Bureau of Statistics, as quoted in Raj Mira's 2020 report, has indicated that tourism accounted for around 34% of Fiji's GDP in 2019 (Mira, 2020).

Labasa itself is generally an agricultural town. Ba is also an agricultural center and populated mostly by Indo-Fijians, making it a cultural destination for tourists.

4.2 Legislation

The summary of relevant legislation covering elements of waste management in Fiji has been sourced from Peel et al. (2020). These have been listed in Table 4.2.

Table 4.2: Summary of Waste Management Legislation

Legislation name	Description
Acts	
Environment Management Act 2005	General environmental management and pollution control legislation, which extends to pollution caused by a variety of hazardous and other wastes. Single-use plastic bag ban - Introduced as part of Section 45A of the Environmental Management Act in January 2020. Section 45A makes it an offence to manufacture, sell, supply, or distribute a plastic bag that compromises in whole or part polyethylene with a thickness of less than 50 microns. Ban in effect as of January 2020.
Environment and Climate Adaptation Levy Act 2015 (as of 5 August 2019)	Includes the environment and climate adaptation levy of plastic bags.
Environment Management (Budget Amendment) Act 2019	Prohibits the manufacture, supply, and distribution of plastic bags.
Environment Management Amendment Bill 2020 – Bill no 42	Prohibiting import and export of polystyrene products: polystyrene trays, takeaway containers, plates, and cups, from 1 August 2021. Does not apply to polystyrene used for packaging or other applications.
Public Health (Budget Amendment) Act 2018	Extends the scope of council's garbage collection services to areas outside the municipal boundaries.
Ozone Depleting Substances Act 1998 (at 1 December 2016)	Regulates the importation, exportation, sale, storage and use of ozone-depleting substances to give effect to Fiji's obligations under the Montreal Ozone Protocol.
Litter Act 2008 (as of 1 August 2018)	General prohibition on littering in public places and offence provisions.
Local Government Act 1972	Defines establishment, function, power, and administration of local government.
Customs Act 1986	Import conditions for certain goods.
Regulations	
Environmental Management (Waste Disposal and Recycling) Regulations 2007	Prevents environmental pollution by controlling the discharge and disposal of solid and liquid wastes, air emissions, and hazardous substances.
correct	Implementation of the plastic bag levy in Fiji. The charge must be collected by a cashier at the point of sale, when a plastic bag is sold by a commercial operation to a consumer. It shall then be paid to the Chief Executive Officer and Commissioner of Inland Revenue. On 1 January 2020, an amendment to the Environment and Climate Adaption Levy Act 2019 was made to increase the levy from F$0.20 to F$0.50.
Customs (Prohibited Imports and Exports) Regulations 1986 (as of 8 June 2019)	Specifies conditions for import of certain goods, including biodegradable plastic bags and radioactive substances.
Ozone-depleting substances regulations 2010	Regulates the importation, exportation, sale, storage, and use of ozone-depleting substances to give effect to Fiji's obligations under the Montreal Ozone Protocol.
Strategies and Plans	
Fiji National Solid Waste Management Strategy 2011–2014	Implementation plan for solid waste management.
National Plan for Implementation of the Stockholm Convention on Persistent Organic Pollutants in Fiji Islands 2006	Implementation Plan for Fiji's obligations under the Stockholm Persistent Organic Pollutants Convention.

F$ = Fiji dollars.
Source: J. Peel, L. Godden, A. Palmer, R. Gardner, R. Markey-Towler, and L. Innes. 2020. Stocktake of Existing and Pipeline Waste Legislation: Republic of Fiji. Secretariat of the Pacific Regional Environment Programme, Samoa. https://www.sprep.org/sites/default/files/documents/publications/waste-legislation-fiji.pdf.
Waste management falls under general environment and public health legislation (Government of Fiji 1935 and 2005) . The National Solid Waste Strategy 2011–2014 provides some analysis and context for waste management, including noting a lack of data on waste management and generation as a barrier to understanding the national waste situation.

4.3 Waste Management Protocols

Pipeline legislative activities for waste management and governance in Fiji (as of June 2021) are detailed in Table 4.3.

Table 4.3: Pipeline Legislation Activities

Pipeline Activities	Description	Timeframe
Container Deposit Scheme	Requires the collection of a monetary deposit on beverage containers at the point of sale. A partial or full refund can be given to consumers if they return the container to an authorized redemption center. The structure for the Container Deposit Scheme has not been finalized.	This law has not officially been passed through Fijian government[1]. There is currently no enforcement date set for the Container Deposit Legislation
Advance disposal fee (name yet to be defined)	This would involve collection of an advanced disposal fee for a range of products potentially including vehicles, electronics, and single-use packaging.	Undefined
National Integrated Waste Management Strategy (draft)	Not yet published	Unknown

Note: Information correct as of August 2021.
Source: J. Peel, L. Godden, A. Palmer, R. Gardner, R. Markey-Towler, and L. Innes. 2020. Stocktake of Existing and Pipeline Waste Legislation: Republic of Fiji. Secretariat of the Pacific Regional Environment Programme, Samoa. https://www.sprep.org/sites/default/files/documents/publications/waste-legislation-fiji.pdf.

4.3.1 Stakeholder Roles and Responsibilities

Government departments with waste responsibilities in Fiji are presented in Table 4.4.

Table 4.4: Stakeholder Roles and Responsibilities

Stakeholder	Responsibility
Ministry of Waterways and Environment	Administers the Environment Management Act 2005. Responsible for protection of natural resources and for control and management of developments, waste management, and pollution control; for establishment of a national environment council; and for related matters.
Ministry of Local Government Housing and Community Development	Responsible for administering the Local Government Act 1972 (Cap. 125), including monitoring compliance by councils and providing advice and support. More recently, the ministry has delivered capacity-building programs to help strengthen governance and leadership within councils. The ministry has wide authority over councils.
Fiji Revenue and Customs Services	Responsible for imported items to Fiji under the Customs Act 1986.
Ba Town Council	Responsible for the organization and control of solid waste in Ba District.
Labasa Town Council	Responsible for the organization and control of solid waste in Labasa.

Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

[1] Xinhua. 2020. Fiji Unveils Container Deposit Legislation for Greener Nation. 9 September. http://www.xinhuanet.com/english/2020-09/09/c_139355703.htm#:~:text=According%20to%20Fiji%20Broadcasting%20Corporation,to%20an%20authorized%20redemption%20center

4.4 Ba Town Waste Services

4.4.1 Household Waste

A waste collection service is provided to the urban residents of Ba Town by Ba Town Council with the collection coverage rate2 provided below:

i) 100% of Ba Town
ii) 100% of Yalalevu
iii) 100% of Vadradra (falls within the extended boundary)
iv) 75% of Vatulaulau (falls within the extended boundary)

Collections occur three times per week in Ba Town and Yalalevu, and once per week in Vatulaulau and Vadradra. Ba Town Council carries out collection using two (4 tonne) compactor trucks.

Households of Ba Town within the collection boundary place their waste outside their properties in waste bins, usually 60 liter (L), or bags. A maximum of two bags or bins of waste is collected per household. Waste is manually loaded into a single compactor truck that services both residential and small commercial customers.

Rural areas outside of these boundaries do not receive a waste collection, as funds do not cover these areas and are therefore required to take their waste directly to the landfill

4.4.2 Household Recycling

There is currently no recycling collection within Ba Town.

4.4.3 Commercial Waste

A waste collection service is provided to commercial and industrial facilities of Ba, including Ba Town, Vadravadra, Yalalevu, and Yatulaulau, by Ba Town Council and other private companies. The commercial service operates alongside the household service, collecting waste weekly. Currently three commercial facilities within the town boundary use the council service, while other commercials within the town boundary opt to use private companies or transport their waste to the landfill themselves.

4.4.4 Other Recyclables

Ba Town Council also offers a recyclable drop-off location at the council office. Office papers are collected once per month. Polyethylene terephthalate (PET) bottles are collected by the Health Department, and are later collected by the Foundation for Rural Integrated Enterprises & Development (FRIENDS FIJI LTD) for repackaging (BTC 2019).

4.4.5 Charging

Commercial waste attracts a user-pays charge, which is paid at the landfill. Charges are on a volume basis, as there is no weighbridge at the Maururu rubbish dump (hereafter referred to as Maururu Landfill).

The town boundary collection is funded by Ba Town Council, with Vatulaulau and Vadradra funded by local government. The remaining rural areas do not receive a collection as there is no funding available.

[2] Availability of waste collection services to the population for each area

4.4.6 Hazardous Waste

Hazardous waste found in Ba Town includes e-waste, white goods, and used oil.

E-waste and white goods are collected by Ba Town Council on a quarterly basis, when households can dispose of these materials from their properties. Commercial hazardous waste is not a concern within Ba Town, due to the low quantities produced. There are no reported stockpiles of hazardous waste as advised by Ba Town Council.

Programs delivered by Ba Town Council are in place to capture, store, and export hazardous wastes including 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 sufficient quantities are available for export. Where export of these materials is undertaken, quantities are provided in the customs data section. Destinations of exported good include: the People's Republic of China and Tuvalu for e-waste; Australia and Tuvalu for white goods; Australia, Christmas Island, Kiribati, Samoa, Solomon Islands, and Vanuatu for cells and batteries (FBS 2019).

4.4.6.1 Medical Waste

Ba Town Council staff estimate that around 99% of waste generated at hospitals and medical centers in Ba is sent to Lautoka for incineration. A second incinerator, MediBurn 20, is located at Lautoka Hospital. Any remaining waste not treated in the on-site incinerators is buried at Maururu Landfill, although no data are collected on likely volumes, which are expected to be low.

4.4.6.2 Other Wastes

4.4.6.2.1 Food Organics

Ba Town Council has created its own small-scale composting facility for garden organics, located at the back of Ba Market. The facility is managed by Ba Town Council and is free of charge for market stall owners only. There is no mandatory requirement for market stall owners to use the facility. Council workers and staff manage operations on site. Once matured, the compost is used in council gardens. Surplus material is sold, however there is usually very little left, therefore this is not currently a sustained revenue for council. Burning of garden organics on site has also been highlighted.

At the Ba Correctional Centre, 10 compost bins were installed to cater for food organics produced by the kitchen. Compost produced is used on the center's vegetable farm.

4.4.6.2.2 Garden Organics

A garden waste collection service occurs four times per year and additionally on an as-needed basis. Garden organics are transported to Maururu Landfill in a 3-tonne open truck. There is a location for garden organics only to be dropped off at the landfill. These organics are left to decompose, with some shredding undertaken.

4.4.6.2.3 White Goods

White goods are collected at the same frequency and using the same vehicle as garden organics. Collected white goods arrive at the landfill and are disposed of alongside industrial and commercial waste.

In 2018, a reported 1,909 trips to the landfill were made for both garden organics and white goods. No further breakdown by garden organics and white goods is available (Ba Town Council, 2021)

4.4.6.2.4 Programs Led by Ba Town Council

Ba Town Council also lead a number of community education programs. These include a clean school Program, a recycling program, and a 5R (reduce, reuse, recycle, recover, and residual management) awareness program.

4.5 Ba District Waste facilities

4.5.1 Landfill Infrastructure

Maururu Landfill is privately owned and operated by Ba Town Council. The landfill is situated on a hilly area within a pine forest, outside the urban boundaries of Ba Town, approximately 5 kilometers away. The site has been operational since 1979 (Figure 4.1).

The site is secured with fencing and a gate controlled by council employees on Mondays, Wednesdays, and Fridays, from 8:00 a.m. to 3:30 p.m. When there is a shortage of staff on these days, the gates are left open and the site is unmanned. On Tuesdays, Thursdays, and Saturdays, access is limited to council trucks only, as the drivers have a key for the site.

Waste material is covered with a layer of soil and compacted when the machinery is present on site.

The landfill was extended in 2018, which created additional capacity and, as a result, the site has an extra 20- to 30-year life span.

Figure 4.1: Schematic Drawing of Maururu Landfill

Source: Ba Town Council. 2019. Tentative Solid Waste Management Master Plan.

When machinery, including excavators and a bulldozer, are required, these are hired for a specific period of time.

Details of vehicles used to undertake collections have been provided in Table 4.5.

Table 4.5: Vehicles Used for Waste Collections by Ba Town Council

Number Plate	Area Used	Truck Type	Capacity (cubic meters)	Capacity (tonnage)	Procurement
IX 763	Municipal	Compactor	12	7	Funded by government
JU 588	Municipal	Compactor	12	7	Funded by government
DM 341	Municipal & Peri-Urban	Open Truck	9	5	Council funding

Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

4.5.2 Charging at the Landfill

Ba Town Council charge for disposal of waste at Maururu Landfill. The charge applies to all households and commercials in Ba. Waste disposal fees are paid at the council office in Ba Town prior to the disposal of waste. There is no weighbridge located at the landfill. The vehicle driver presents the council receipt to the landfill operator for disposal. The fees are detailed in Table 4.6.

Table 4.6: Maururu Landfill Disposal Fees

Waste Quantity	Fee
< 1 tonne	F$23.70
1–3 tonnes	F$42.65
> 3 tonnes	F$66.35
Tavua Town Council (three times per week)	F$0

< = less than, > = greater than, F$ = Fiji dollars.
Source: Ba Town Council. 2019. Tentative solid waste management master plan for Ba Town Council.

4.5.3 Inputs to the Landfill

Solid waste from Ba Town Council and private sector collections that is dropped off directly to the site (including both public and private commercials) is disposed of at the landfill. The site does not accept any hazardous or liquid wastes. For no fee, the landfill also accepts household-generated waste from Tavua Town Council three times per week.

Garden organics are disposed of at Maururu Landfill, with some shredding undertaken. White goods are taken to the industrial waste area of the landfill.

In 2018, an estimated 14,175 tonnes of waste was estimated to have entered Maururu Landfill, based on records for the number of trips and vehicle tonnages used (BTC 2019).

The general public and industries are major generators of municipal liquid wastes that are mixed with water. These liquid wastes are passed into the sewer lines for treatment.

4.6 Labasa Waste Services

4.6.1 Household Waste

Household waste is collected from the roadside in bags and/or bins with a capacity between 42 L and 85 L.

A waste collection service is outsourced by Labasa Town Council through a contracted waste company. Collections are three times a week in urban areas, aiming to reach each household once per week. Collections for peri-urban areas occur once per week only.

Collection services in Labasa:

i) Council contractor service provided by a private company (Industrial Sheet Metal & Plumbing) to collect from two wards, Nasea North and Nasea, using a 9-tonne tipper truck.

ii) Council collection: household and commercial waste is collected from two wards, Naseakula Ward and Vatia, using a 9-tonne compactor truck owned by council.

iii) Some peri-urban areas (Nacula, Namara Temple Road, Naseakula village, Vuniwai Subdivision, and Western Wreckers Road) receive a once-per-week council collection on a Wednesday through user-pays services. Waste is manually loaded into the collection vehicle by council employees.

4.6.2 Household Recycling

There is a weekly garden organics collection (collecting grass cuttings and flower trimmings only) from households. Garden organics are transported to the landfill. The collection is delivered by a council contractor using a 3-tonne tipper truck. Council also provides a subsidy for people buying compost bins for use at home.

4.6.3 Commercial Waste

Commercials receive the same waste collection as households. The contractor services the main central commercial district, collecting waste once per week using a 3-tonne tipper truck. Collections operate 6 days per week, from Monday through to Saturday.

Commercials using the council's collection service are required to place their waste within "wheelie" bins in an allocated area within a private compound. The contractor is then able to enter the compound for waste collection. Waste is manually loaded into a 9-tonne compactor truck by council employees.

4.6.4 Charging

Household waste collection requires users to pay for the service, with no funding available from the council or local government. The collection fees are detailed in Table 4.7.

Table 4.7: Labasa Annual Waste Collection Fee

Service	Annual collection fee in F$	Annual collection fee in A$	Annual collection fee in $
Residential	F$101.37	A$66.42	$48.22
Commercial	F$243.28	A$159.38	$115.71

$ = United States dollars, A$ = Australian dollars, F$ = Fiji dollars.
Note: Fees are as of July 2021. Conversion rates are F$1 to A$0.65 and F$1 to $0.47.
Source: Labasa Town Council provided data for the project. 2021.

4.6.5 Hazardous Waste

Hazardous wastes include e-waste, white goods, and industrial waste. The Labasa Town Council requires owners of such waste to arrange for disposal of these items at Namara dump (hereafter referred to as Namara Landfill). Separate fees apply for these waste streams.

There are currently no programs in place to manage hazardous waste outside of Labasa Town`s municipal ratepayers. This can lead to dumping of hazardous waste in the region. Batteries for hybrid and electric cars are an emerging problem in terms of appropriate management, but there is a current lack of data on the numbers requiring management at end of life.

4.6.6 Quarantine Waste

Labasa Airport stockpiles waste and transports it to Namara Landfill for disposal. This occurs once per month. It is not known if this waste is burnt at the landfill before disposal.

4.6.6.1 Hospital Waste

General waste from Labasa Hospital is collected three times per week as part of the Labasa Town Council service and taken to Namara Landfill. This is not an official service offering: Labasa Town Council offers this service as a courtesy to the hospital.

Medical waste generated at Labasa Hospital is disposed of at the on-site main incinerator. There is a back-up Mediburn 20 incinerator located at the hospital. However, it is believed this is not in operation as the stack has not been located correctly for use.

4.6.7 Other Waste

Redundant vehicle parts, water-holding containers, and nonhazardous industrial waste requires owners of the waste to arrange for the disposal of these items at Namara Landfill.

4.7 Labasa Waste Facilities

4.7.1 Landfill Infrastructure

Namara Landfill is approximately 20,000 square meters and located on a Mangrove area north of Labasa Town. The site has been owned and operated by Labasa Town Council for over 30 years (Sagapolutele 2016).

In 2014, the landfill underwent major rehabilitation works turning the site from an open dumpsite to a structured landfill. Works were undertaken to improve the resilience of the site to flooding, which included the introduction of hazardous and e-waste storage areas to ensure separation of hazardous waste and general wastes (SPREP 2014). Leachate is collected in a leachate pond developed as part of the works in 2014 at the northern end of the site, alongside landfill gas collection now undertaken at the site. There is also an e-waste storage building located at the landfill. The works in 2014 were an estimated $250,000 provided by the Australian Agency for International Development (AusAid).

The site is secured by gate, with access controlled by one landfill attendant and one laborer employed by Labasa Town Council. These staff are on site Monday to Friday (8:00 a.m. to 4:30 p.m.) and Saturday (8:00 a.m. to 1:00 p.m.).

The landfill has capacity to accommodate waste from Labasa Town, with limited space to cater for waste from other areas, in particular from peri-urban areas. Equipment used for landfill operations is detailed in Table 4.8.

Table 4.8: Namara Landfill Equipment

Equipment	Use	Owned or Hired
Shredder	Used to shred garden organics from the market.	Council-owned, donated by the Secretariat of the Pacific Regional Environment Programme.
Blackhoe (digger)	Used to move waste around the landfill.	Council-owned, donated by the Japan International Cooperation Agency.
Solo Mist Blower (12 liter)	Used for spraying to minimize flies and mosquitoes at the landfill.	Council-owned.
Excavator	Used to push waste, create space, and cover waste in the landfill cells with soil.	Hired by a council contractor on a weekly basis.

Source: Labasa Town Council provided data for the project, 2021.

Waste is highly compacted as more space is required. The landfill has a disaster cell, which is used for waste as the result of a natural disaster. Typically, flooded food items and other stock items that are condemned from stores after the disaster are sent to the disaster cell. There are two additional cells in the landfill for disposal of general waste.

Waste at work: Different waste processing operations at Namara Landfill.



4.7.2 Charging at the Landfill

Charging at Namara Landfill is detailed in Table 4.9.

Table 4.9: Namara Landfill Disposal Fees

Capacity	Ratepayers	Non Ratepayers
Garbage		
1 to 5 bags/sacks	F$3	F$5
< 3 tonnes	F$10	F$15
> 3 tonnes	F$20	F$30
Hazardous waste		
1 to 5 bags/sacks	F$10	F$15
< 3 tonnes	F$20	F$30
> 3 tonnes	F$40	F$60

< = less than, > = greater than, F$ = Fiji dollars.
Note: Fees effective from 5 March 2020.
Source: Labasa Town Council provided data for the project. 2021.

4.7.3 Inputs to the Landfill

The main customers for the landfill include council contractors, council workers, ratepayers, householders from the extended town boundary, and government departments during clean-up campaigns for extended town boundary areas.

4.7.4 Outputs from the Landfill

PET bottles, aluminum cans, and scrap metal are collected from landfilled waste for recycling by waste pickers. There is no formal contract between Labasa Town Council and the waste pickers: this is an informal approach to the extraction of recyclables. PET bottles and aluminum cans are packed into large bags, which are stored at Namara Landfill until full.

These bags are then transported to the Coca-Cola Amatil Warehouse in Labasa before they are taken to a recycling facility in Suva by Mission Pacific Fiji, a recycling program initiated by Coca-Cola Amatil (Fiji) in 1999. Waste pickers also use the landfill to hand-pick scrap metal and white goods for reuse.

In 2020, PET bottles (5.6 tonnes), timber (1.0 tonnes), scrap metal (0.7 tonnes), and aluminum cans (0.6 tonnes), were extracted at the landfill from incoming waste, for a total of 8.0 tonnes in reduced waste. (Labasa Town Council provided data for the report, 2021).

Compost produced at the landfill is sold to the public at a rate of F$3.30 for 5 kg. The revenue from compost sales remains with the landfill.

Wastepaper is collected from schools within Labasa town each Friday by Charan Group Companies upon request. The waste paper is stored at Namara Landfill prior to transfer to Charan's sister company, South Pacific Waste Recyclers, located in Suva. Collections have been on hold since 2020, with freight costs for waste paper being very high, especially between Vanua Levu and Viti Levu. Negotiations for delivery to South Pacific Waste Recyclers have not yet taken place, so the future of this service is uncertain. There are commercial-scale cardboard recycling operators.

5. Methodology

5.2 Audit Team

5.1.1 Roles and Responsibilities

The audit was undertaken by a Tonkin & Taylor International Limited (T+TI) project team working closely with local agencies. An overview of the team is provided in Table 5.1.

Table 5.1: Project Team for Waste Audits

Role	Ba District	Labasa
Team Leader	Chris Purchas (Tonkin & Taylor International Ltd)	
Country Coordinator	Tekao Herrman (Tonkin & Taylor International Ltd)	
In-Country Focal Point	Ronika Mishra	Seini Ubitau
Audit Team	8 staff from Ba Town Council	7 staff from Labasa Town Council
Number of attendees at audit training	8	7

Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

It was intended that the T+TI project team be present in Fiji for some or all of the audit period. Travel restrictions due to COVID-19 meant that the T+TI team participated remotely. The T+TI country coordinator was present remotely for the entire waste audit period. The in-country focal points were available for the duration of the waste audit, managing the waste audit activities.

5.1.1.1 Responsibilities

A description of the responsibilities for each role has been provided in Table 5.2.

Table 5.2: Responsibilities of the Project Team

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

SPREP = Secretariat of the Pacific Regional Environment Programme.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

5.1.2 Audit Planning

An Audit Plan for Fiji was prepared by T+TI. The identification of individuals to take part in the audit included consideration of experience in previous waste audits, having some understanding of the waste operations in each island, and being able to operate a smart phone to input the raw data. It was agreed that team members identified to input the raw data would use phones provided by T+TI.

Equipment, including personal protective items required for the audit, was provided by T+TI and was shipped from New Zealand to Ba Town Labasa. This included:

i) mobile phones,
ii) coveralls,
iii) disposable gloves,
iv) protective gloves (to go over the top of the disposable gloves),
v) face masks,
vi) first aid kit,
vii) wheelie bin liners (240 L and 120 L),
viii) tongs (long- and short-handled),
ix) dustpan and brush,
x) masking tape,
xi) hand sanitizer, and
xii) safety glasses.

Equipment unable to be shipped but sourced in the country included:

i) vehicles required to collect waste samples and undertake stockpile assessments (hired),
ii) petrol for use in the hire vehicles,
iii) scales for the weighing of waste samples,
iv) bins and sorting containers, and
v) SIM cards to provide data for phones (to upload audit data from survey forms).

5.1.2.1 Health and Safety

Ensuring health and safety was considered integral to the delivery of the waste audit. The importance of this was continually communicated with the in-country focal point from the very first remote meeting.

Due to the nature of the physical sorting and weighing of waste, there was a requirement for team members involved in this part of the audit to receive vaccinations for Hepatitis A and Hepatitis B (where available) and Tetanus. Hepatitis A and Hepatitis B vaccines were not available in some of the regions, as shown in Table 5.3.

Table 5.3: Vaccinations Given for the Fiji Waste Audits

Vaccinations	Ba District	Labasa
Tetanus	Given	Given
Hepatitis A	Not available	Not available
Hepatitis B	Not available	Given

Source: Ba Town Council and Labasa Town Council provided information for the project. 2021.

Confirmation was provided of vaccinations given to the in-country audit team.

T+TI produced a job safety analysis (JSA) for waste audits undertaken in the Ba district and Labasa. This provided details on the audit methodology and describes the hazards associated with the tasks undertaken as part of the audit. Each hazard was considered individually, and mitigation measures outlined. The JSA was reviewed and discussed alongside a health and safety presentation, which formed part of the training. Each individual taking part in the waste audit was required to sign the JSA, which confirmed that they understood and agreed to the information. A copy of the JSA was included in the Ba district and Labasa training reports.

5.1.3 Audit Training

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

i) training material based on a mix of videos, written material, and presentations;
ii) online quizzes to test understanding of key audit and safety concepts; and
iii) provision for telephone or video conference delivery from a remote team.

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

i) daily start-up meetings with the various audit teams (by telephone or video if required);
ii) form-based data collection on mobile phones or tablets to ensure data collection in a consistent fashion3;
iii) live or end-of-day data submission to allow review of data collected4; and
iv) periodic check-in by telephone or video each day to track sample collection, data quality, and challenges as they arose.

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

Training of the waste audit teams was undertaken in January 2021 as detailed in Table 5.4, and involved a range of guides and training materials. The training for the Fiji audit teams was managed by T+TI (Country Coordinator and Team Leader) remotely providing introductions with the in-country project team.

Table 5.4: Training Dates

Waste Audit Area	Training Date
Ba District	18/01/2021
Labasa	22/01/2021

Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

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

i) working through "how-to guides" for each survey component;
ii) an explanation of how to use the data collection software (on mobile phones), followed by an afternoon of training on the survey data input; and
iii) "dummy runs" for each of the surveys, including collecting data and familiarization with roles.

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

5.1.4 Stakeholders

The key delivery partners working alongside T+TI to deliver the waste audits are detailed in Table 5.5.

Table 5.5: Key Delivery Partners

Ba District	Labasa
Ba Town Council	Labasa Town Council
Community	
Ministry of Waterways and Environment	
Ministry for Local Government	

Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

[3] Data collected through Survey 123 and received by T+TI on ArcGIS Enterprise.
[4] Data are stored on the T+TI secure system in project folders.

Several key stakeholder groups supported delivery of the audits, with details of the consultation and engagement activities included in Table 5.6.

Table 5.6: Stakeholder Engagement Undertaken

Stakeholder	Description of Audit Interface	Stakeholder Engagement	
		Ba District	Labasa
Householders	• Bag collection • Interviews	• Letter delivery providing details of audit to participating households[a] • Council emailing contacts in database • Community noticeboards • Face-to-face interviews	• Letter delivery providing details of audit to participating households • Council emailing contacts in database • Community noticeboards • Face-to-face interviews
Commercial owners	• Bag collection • Interviews	• Letter delivery-providing details of audit to participating commercials • Council emailing contacts in database • Community noticeboards • Face-to-face interviews	• Letter delivery providing details of audit to participating commercials • Council emailing contacts in database • Community noticeboards • Face-to-face interviews
Commercial operators (collectors and disposers)	• Landfill disposal operators • Stockpile audits	• Face-to-face discussions • Interviews where required	• 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 Pacific Region Infrastructure Facility. 2019. Waste Audit Methodology: A Common Approach.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

5.2 Sampling Methodology

Samples were collected in accordance with the sampling procedures summarized in the sampling guides. A "sample" is the entire contents of a bin or bag put out for collection. The sample represents the waste produced by that household over the period of 1 week.

The audit methodology is detailed in the Fiji Audit Plan (0). The methodology applied has been derived from the Pacific Region Infrastructure Facility's Waste Audit Methodology: A Common Approach, which is attached as an appendix to the audit plan.

The audit plan was developed based on the most recent household and commercial statistics from the Fiji Bureau of Statistics. The target sample numbers also reflect experience on similar audits, and are intended to ensure that there are adequate data to provide a statistically valid estimate of waste characteristics and quantity. Target sample size needed to provide a balance between the level of precision achieved and the time required to sort and weigh the samples obtained. The target sample sizes determined for each location in the audit are detailed in Table 5.7. This information has been taken from the audit plan for Ba Town and Labasa. The number of households and commercials has been defined in Table 4.1.

Table 5.7: Target Sample Size for Waste Samples

Waste Audit Area	Households	Commercials
Ba District	110	40
Ba town	40	15
Labasa	120	30

Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

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

A summary of audit components and methodology is provided in Table 5.8.

Table 5.8: Audit Methodology

Audit Component	Description
1. Sample collection from households and commercials	Rubbish bags/waste collected from bins collected from commercials or households identified on audit maps. Samples taken were photographed and bags labelled with unique identification numbers, with a corresponding tag placed on a nearby tree or fence. The location was also photographed to assist in identifying the location for Component 3. (Refer to table 5.1 below). Bags of two sizes (120 liter and 240 liter) were provided for the audit. These were then put out for collection by households and commercials on collection day. The entire contents of the bin for the one household were emptied into the bag/s, depending on the quantity of waste. A waste sample is the entire contents of the bin put out for collection.
2. Sort and weigh of household/commercial bags	Samples transported to the waste disposal sites for waste sorting. Waste was sorted into primary categories and defined secondary categories. (See Appendix 2) Waste in each category was weighed with data and photographs recorded in the sample collection application. The audit methodology uses weight rather than volume to determine composition. The methodology does not include the identification of moisture content across different waste materials.
3. Household and commercial interviews	For each household or commercial where a waste sample was collected, a second team returned to complete an interview. The interview was recorded on a standard form.
4. Landfill audit	Audits were completed at Maururu Landfill and Namara 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 in-country audit team. Stockpiles in Labasa were assessed during the audit. Materials characteristics and quantity were estimated. Each stockpile was recorded including photographs and estimated composition and quantity.

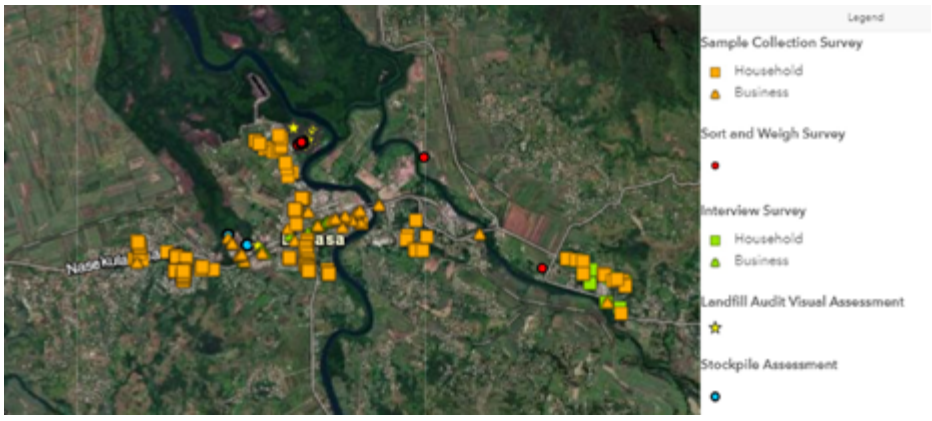
Note: Fiji Audit Plan
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

5.3 Identification of Households and Commercial Premises

Maps showing sample locations by household and commercials were provided to the audit team. Where locations were unsuitable for sampling, the team would move onto the next household or commercial premise of the same category. The locations of those households and commercial premises sampled for Labasa are shown in Table 5.1.

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

Figure 5.1: Sample Locations in Labasa



Notes: Locations based on global positioning systems. Where interviews have been undertaken at the same location as sample collection, only the sample collection survey is shown on the map.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

5.4 Summary of Data Collected

The total number of household and commercial samples, stockpile assessments completed, and landfill loads audited are summarized in Table 5.9.

Table 5.9: Summary of Sample Numbers Collected in Labasa

Sample Type	Labasa
Household	
Samples taken	104
Interviews	25
Commercial	
Samples	14
Interviews	10
Stockpile assessments	6
Landfill load audits	263

Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

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

i) Productivity of the team sorting the waste into categories, weighing and recording this data.
   - In the first few days of an audit, it typically takes time for the team to familiarize themselves with the process of physically sorting the waste, ensuring the right waste is captured in the right category and the subsequent input of data into the phone. This reduces the initial productivity of the team. This was the case, limiting the total number of samples collected.

ii) The potential for individual samples to be unsuitable for inclusion in some of the data analysis (specifically the composition of the waste stream).
   - This is due to data discrepancies, for example, a decimal point is inserted in the wrong place.

iii) Outliers in composition are also an important consideration when presenting the data.
   - When producing waste composition data for this project, we completed a robust quality assurance and data review process. This accounts for the difference in total start weight (total sample weight) compared to the total weight of the individual waste categories combined. The difference between these two numbers is calculated as a percentage difference. A margin of difference outside of +/–15% reduces our confidence in the data submitted. If the confidence interval or difference was more than +/–15%, we did not use these data for determining the composition of waste presented in this report.
   - It has been noted throughout the report where data have been excluded from calculations when the confidence interval is applied.

iv) Weather disruptions impacting on the ability of the audit team to collect samples.

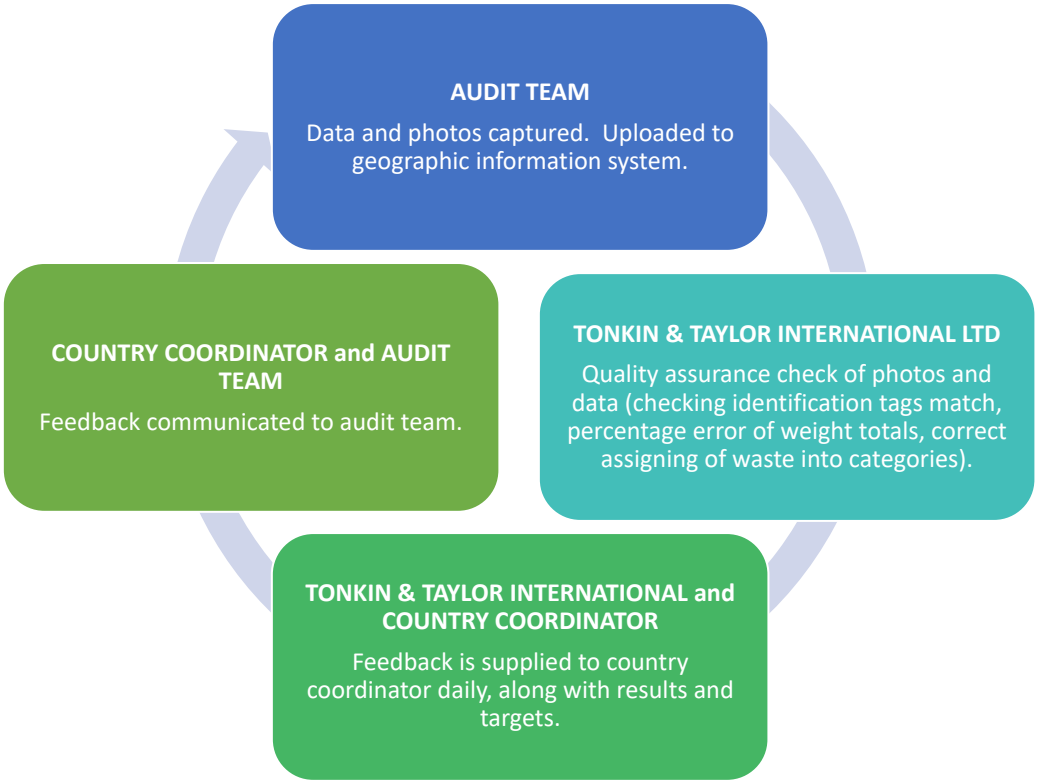
v) The COVID-19 outbreak in Fiji from April 2019.
   - This ultimately prevented remobilization of the audit team to complete the Ba district waste audit.

5.5 Validation Procedure

The audit process and data collection approach were designed to allow for remote supervision, data checking, and ongoing feedback to the audit team throughout the audit process. Key aspects of the process are illustrated in Figure 5.2.

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. This allowed for real-time remote quality checking of data by the consultancy team. The waste audit specialists would then feedback findings to the Country Coordinator daily, or more frequently as required, creating a continuous feedback loop (Figure 5.2.).

Figure 5.2: Audit Process and Data Collection Approach



Note: Taken from the Fiji Audit Plan
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

6. Waste Audit Findings for Labasa

6.1 Introduction

The audit was undertaken between 21 January and 19 April 2021. Delays in delivering the audit were due to natural weather events including cyclone Ana, affecting equipment and staff availability.

6.2 Household Audit Findings

The household sample collection identified that a significant proportion of household waste is collected from waste collection services, with some bulky waste and food scraps transported to the landfill.

6.2.1 Access to Waste Collection Services

Access for households to a waste collection service has been provided in Table 6.1.

Table 6.1: Summary of Access to Waste Collection Services

Total interviewed	25
Percentage with access to collection service	100%
Average collection service rating	7.1/10
Comments	Reliability of collection re: timing, bin provision, and cleanliness following collection 2/25 respondents commented that some waste was left scattered after collection. 3/25 requested a more precise time for waste collection. 14/25 reported having no bins. Pictures of waste samples collected from households showed that waste was not always contained within a bin for collection.

Note: Data collected and recorded from interviews held with householders.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

It is common practice for a number of options to be selected by householders and commercials for the same waste stream (Table 6.2).

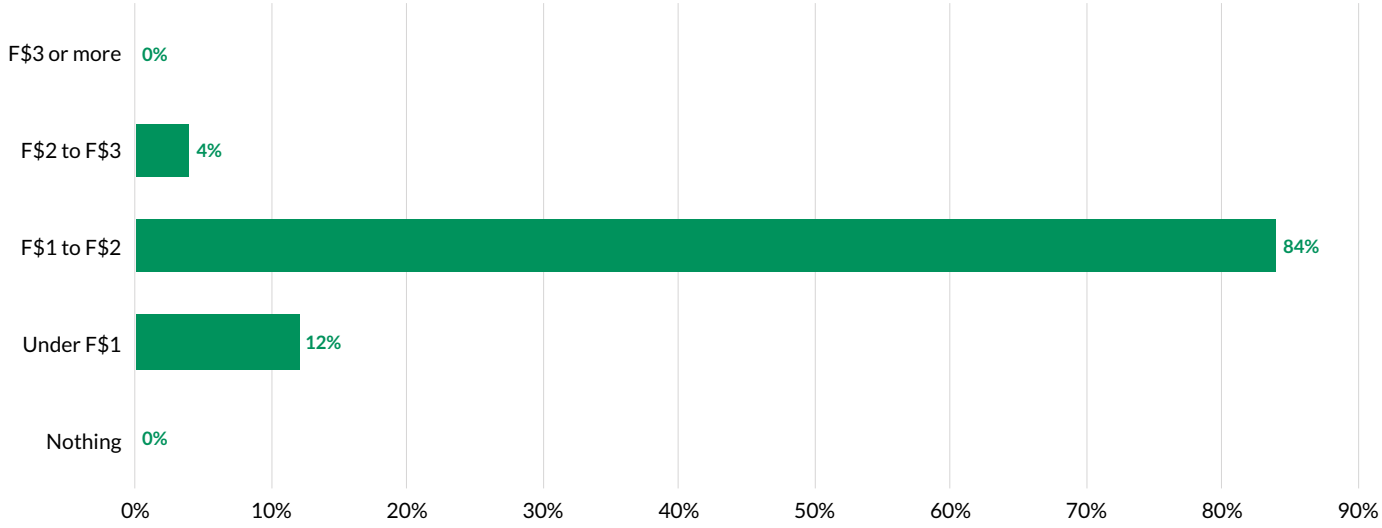
Table 6.2: Waste Management Activities Adopted by Households

Material	Disposal Options
Waste	Collected through the waste collection service. Transported to landfill.
Garden organics	Collected through the garden organics collection service. Transported to landfill and deposited in a separate area for green waste.
Sanitary	Collected through the waste collection service
Bulky items	Collected through the waste collection service. Transported to landfill. Stored at household.
Food scraps	Collected through the waste collection service. Transported to landfill.

Note: Data collected and recorded from interviews held with householders.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Participants were surveyed on their willingness to pay for a waste collection service in Fiji dollars per week5. Outcomes from this question are presented in Figure 6.1. Annual collection charges for residents in Labasa are F$101.37 (approximately F$2 per week).

Figure 6.1: Willingness to Pay for Collection of Household Waste (F$ per week)



F$ = Fiji dollars

Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Based on the willingness to pay for household collection, 84% of respondents were willing to pay between $52 and $104 per year for a waste collection service.

6.2.2 Household Waste Composition

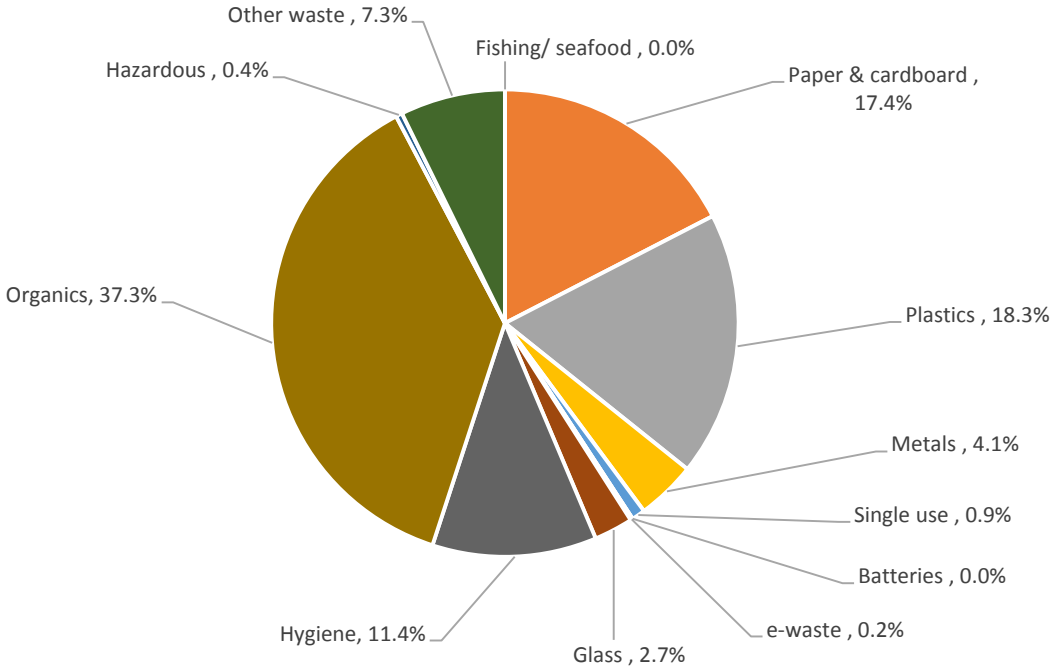
Black bags and labels were provided for the audit, to empty the contents from bins put out for collection, provide double bagging of waste, and enable identification of samples when recording during the sorting and weighing of samples.

Typical waste. Garbage bags put out for collection from households in Labasa.

The average composition of waste by weight from households in Labasa is shown in the photos above. The graph presents the proportion of waste by category for waste from households placed for collection.

[5] Question: How much are you willing to pay for waste collection per week (total cost). Participants were also asked about their willingness to pay for a single 60 L rubbish bag.

Figure 6.2: Average Composition of Household Waste in Labasa



Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Key audit findings by category, accompanied by photos, have been identified in Table 6.3. Organics (37.3%), plastics (18.3%), and paper and cardboard (17.4%) were the largest components of the waste stream.

Table 6.3: Waste Material Findings In Household Samples

Waste Material	Description	Photographic Representation
Paper and cardboard	Dominated by cardboard boxes, small and large packaging boxes, and newspaper.	 
Plastics	Dominated by soft plastics, cling wrap, carry bags, and food bags. Plastic drinks containers: small (0.6 liter) water bottles (PET), small soft drink bottles, small and large juice bottles (various).	 
Organics	Dominated by food waste, e.g., vegetables, fruit, and eggshells.	
Hygiene	Dominated by nappies.	

PET = polyethylene terephthalate.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Metals, glass, and other waste6 were recorded in smaller quantities.

i) Metals was dominated by food cans in various sizes and brands.

ii) Glass was dominated by alcohol beverage bottles and food condiment bottles.

iii) Other waste was dominated by textiles and shoes.

The lower and upper ranges for each component of household waste have been calculated at a 95% confidence interval and are presented in Table 6.4 and Figure 6.3. This provides a measure of the ranges of estimated proportion for each material that might be expected for repeated composition surveys for households in Labasa. Due to the absence of fishing and/or seafood items (not food organics) and batteries identified during the survey, the margin of error in these ranges has not been provided.

Waste sample size provided the data for estimating the average quantity of waste from sampled households for Labasa7. The estimated generation of waste per household per day is 2.6 kg (within a range of 0.1 kg to 7.4 kg per household per day).

To calculate average waste generation per person, we take the average number of persons per household in Fiji, which is 4.9 (FBS 2018), and apply this to the 2.6 kg per household per day average (calculated based on samples collected). The average waste generation per person is 0.53 kg per person per day.

[6] Other waste includes textiles, end-of-life renewable energy equipment, tyres, and rubble or concrete (including ceramics).
[7] The data used to calculate the composition of waste collected from households in Labasa have been derived from samples collected from all household properties during the audit only. The total weight of samples collected was averaged using the count (total number of samples). This is the methodology as presented in the Pacific Region Infrastructure Facility's Waste Audit Methodology: A Common Approach (PRIF 2019).

Table 6.4: Waste Composition of Household Samples in Labasa

	Fishing/ Seafood	Paper and Cardboard	Plastics	Metals	Single-Use Items	Batteries	e-Waste	Glass	Hygiene	Organics	Hazardous	Other Waste
Composition	0.0%	17.4%	18.3%	4.1%	0.9%	0.0%	0.2%	2.7%	11.4%	37.3%	0.4%	7.3%
Combined weight (kg)	0.0	83.5	87.7	19.7	4.5	0.0	0.8	12.9	54.5	178.5	2.1	34.8
Average weight per sample (kg)[b]	0.0	0.9	1.0	0.2	0.0	0.0	0.0	0.1	0.6	2.0	0.0	0.4
Lower range	0.0%	13.3%	14.9%	2.9%	0.1%	0.0%	0.0%	1.6%	7.9%	31.3%	0.2%	3.5%
Upper range	0.0%	21.5%	21.7%	5.3%	1.8%	0.0%	0.4%	3.8%	14.8%	43.2%	0.7%	11.0%

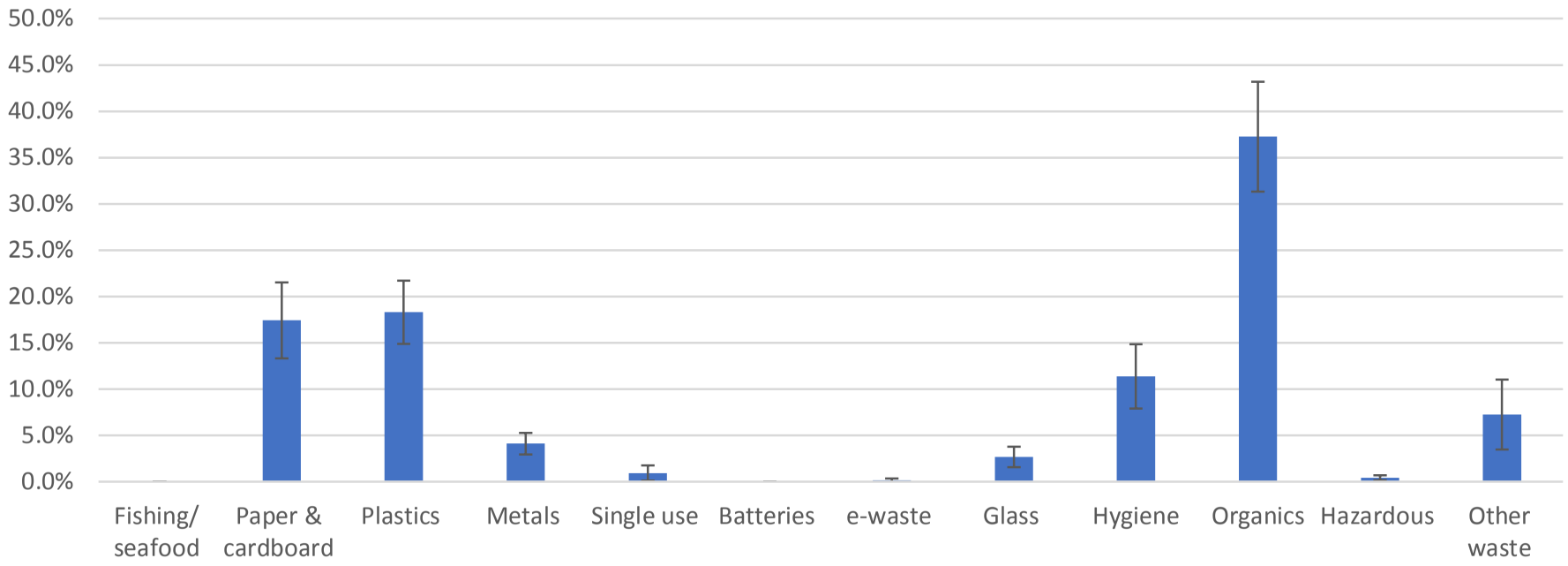
kg = kilogram

Notes:

1. Count of data used (91). Total weight (kg) per category divided by count to provide average weight per sample.
2. Categorization of waste by category was undertaken in line with Pacific Region Infrastructure Facility. 2019. *Waste Audit Methodology: A Common Approach.*
3. Confidence interval of +15% and -15% applied during data analysis: 91 of 104 samples were within this range and have been used to derive the composition.

Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Figure 6.3: Proportion of Waste by Type in Household Samples in Labasa



Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

6.2.3 Potentially Recyclable Materials

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

Typical recyclable items (right). Identified through the sorting and weighing of samples collected during the audit.

Detailed observations for potentially recyclable materials identified in the waste samples have been provided in Table 6.5. Key points to note:

Plastics are present, with a high proportion of soft plastics (18.3%) suitable for recycling if markets can be secured.

Paper and cardboard (17.4%) represent a relatively high proportion of the total household waste stream. These are easily recycled, where markets are accessible.

Improvement of the existing system is needed to ensure that targeted recyclables are collected effectively.

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

Table 6.5: Observations on Potentially Recyclable Materials

Material	Key Composition	Detailed Observations
Paper and cardboard	Dominated by food packaging and cardboard boxes.	Other cardboard items include newspaper, egg boxes, and food and nonfood cardboard packaging.
Metals	Dominated by food cans: small tins (coated steel) various sizes and brands.	The data provided are the samples of households from across Labasa. Household interviews reported an average of 0.52 (rounded) (1) drink cans per person per household per week. Using the average from the household interview data collected, across Labasa district, this equates to 25,672 cans per week for the population (estimated at 49,369). This is estimated to be around 1,334,938 drink cans[a] per year. This is considered at the upper end of the number of drinks cans likely to be produced[b].
Plastics	Dominated by soft plastics: cling wrap, carry bags, and food bags. Plastic drinks containers: small (0.6 liter) water bottles (PET), small soft drink bottles, small and larger juice bottles (various).	Household interviews reported an average of 0.84 (rounded) (1) plastic water bottles per person per household per week, with a range of 0 to 2 bottles per person per week. Using the average from the household interview data collected, across Labasa district this equates to 41,404 per week for the whole population (49,369). This is estimated to be around 2,153,015 plastic bottles per year. This is likely to be at the upper end of the number of water bottles produced per week.

PET = polyethylene terephthalate.

[a] The number of drinks cans and plastic bottles is based on the data collected from the audit data only.

[b] If these data are to be used to inform potential recyclables for capture, it will be important to validate these numbers with further survey work specifically capturing a larger sample of households. Drink cans for Labasa only (population 26,601) and not district wide, 13,833 per week and 719,291 per year. Plastic bottles for Labasa only and not district wide 41,404 per week and 2,153,015 per year.

Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

6.3 Commercial Audit Findings

The total number of commercials audited by type is shown in Table 6.6.

Table 6.6: Commercial Waste Sample Numbers

Commercial Type	Sort and Weigh	Interview
Retail and trade (retail shops, offices)	8	6
Supermarkets	4	1
Mixed small business	0[a]	1
Commercial and household[b]	1	1
Accommodation Foodservices	0a	1
Total	**13**	**10**

[a] Results were not within the confidence interval of +15% or –15%, therefore the data were unable to be used.
[b] Defined as a business being located within or below a household, so that the waste collected was a mixture of both household and commercial waste but assessed by the audit team as dominated by commercial waste.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

6.3.1 Access to Waste Collection Services

Table 6.7 summarizes feedback on the collection service, including a waste collection rating.

Table 6.7: Summary of Commercial Access to Collection Services

Total interviewed	10
Percentage of commercials with access to collection service	100%
Average collection service rating	7.0 out of 10
Commentary on the collection service rating	Reliability in terms of waste being collected on the defined day, provision of bins for waste containment, and more frequent waste collections. • 4 of 10 commercials reported that not all waste is collected on collection day. • 1 commercial reported that no appropriate bins are provided and requested an allocated area for commercial disposal. • 1 commercial requested daily waste collection.

Note: Data collected and recorded in Survey123 app, from interviews held with commercials.
a - Respondents included retail and trade and the missed household and commercial samples.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

It is common practice for multiple options to be selected by commercials for the same waste stream. Options undertaken by commercials identified through the audit are identified in Table 6.8.

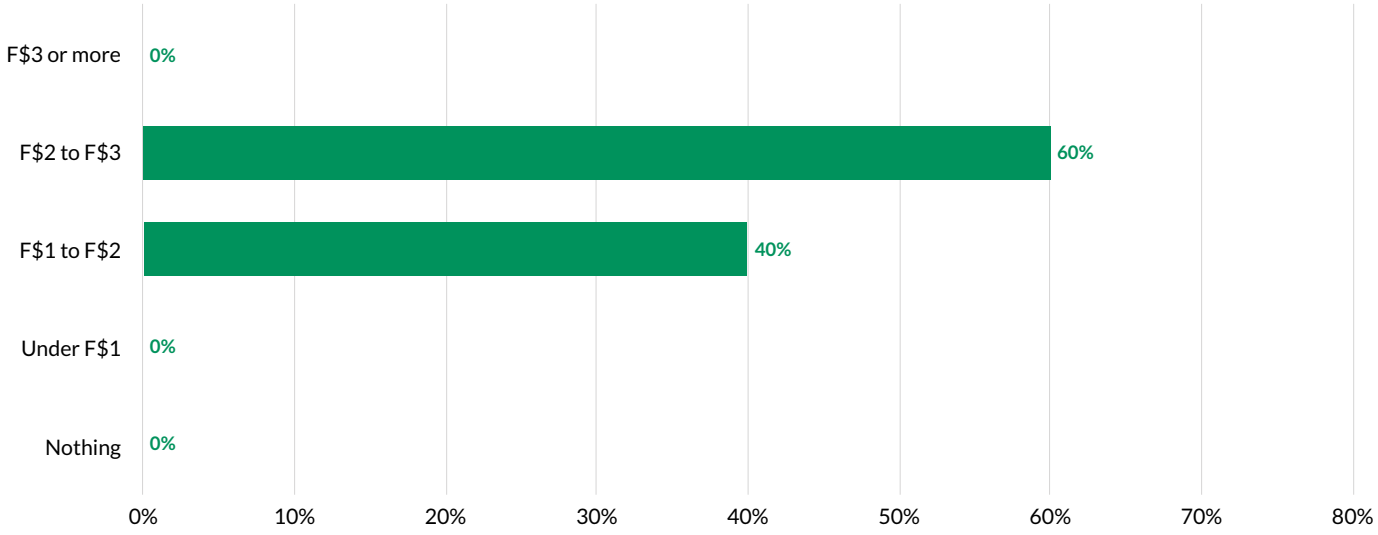
Table 6.8: Waste Management Options Adopted by Commercials

Material	Disposal Options
Waste	Transported to the landfill (waste collection service)
Garden organics	Collected as part of the garden organics collection service and taken to the landfill
Sanitary	Collected as part of the waste collection service and taken to landfill
Bulky items	Transported to the landfill Collected as part of the white goods collection service Store on site
Food scraps	Collected as part of the waste collection service and taken to landfill

Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Commercial participants were surveyed on their willingness to pay for collection services[8]. Outcomes from this question are presented in Figure 6.4. Annual collection charges for commercials in Labasa are F$243.28 (almost F$5 per week).

Figure 6.4: Willingness to Pay for Collection of Commercial Waste (F$ per week)



F$ = Fiji dollars.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Based on the willingness to pay for commercials, 40% of respondents were willing to pay between $52 and $104 per year, and 60% of respondents were willing to pay between $104 and $156 per year.

Commentary and observations made through these interviews are:

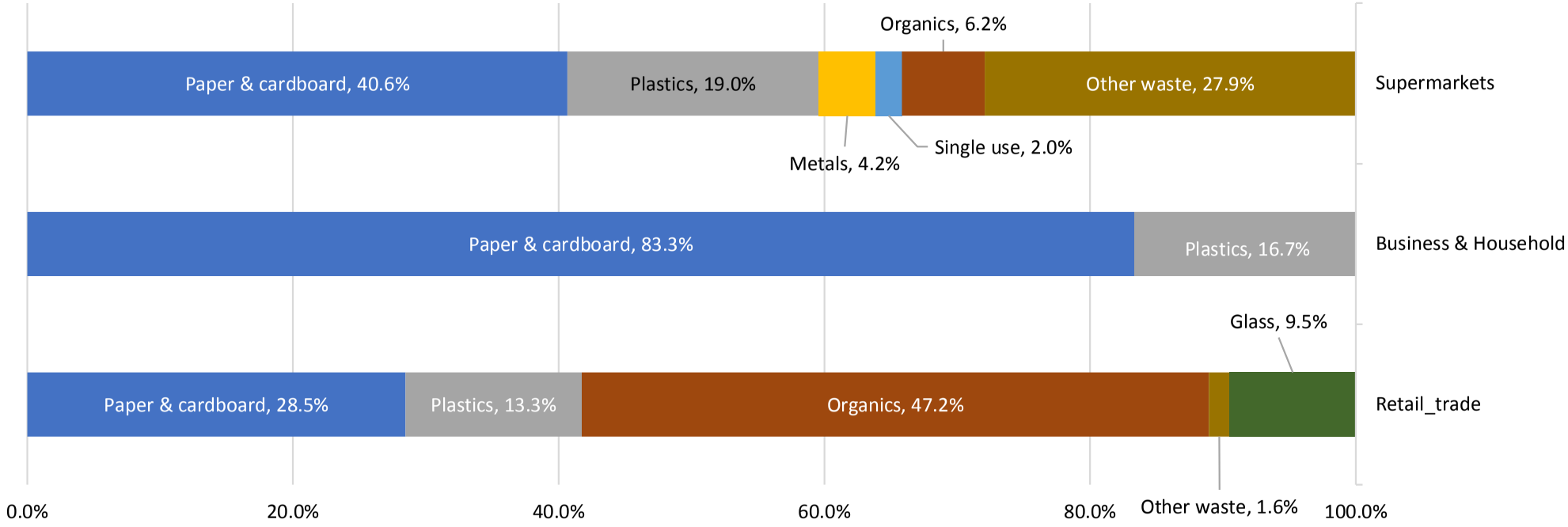
i) Waste collection requested to be undertaken daily.
ii) Request for bins to be provided.
iii) Request for allocated commercial-only collection location.

[8] Question: How much are you willing to pay for waste collection per week (total cost)? Participants were also asked about their willingness to pay for a 60 L rubbish bag.

6.3.2 Commercial Waste Composition

The composition of commercial waste collected, sorted, and weighed for Labasa samples is shown in Figure 6.5.

Figure 6.5: Average Composition of Commercial Waste in Labasa



Note: Data derived from the sorting and weighing of waste samples collected from commercial enterprises in Labasa.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Below we have provided commentary on the likely proportions of waste categories from the waste samples collected and sorted for commercials in Labasa. The samples sorted and weighed provide a snapshot of the likely composition from these types of commercials. The combined data provide an indicator of commercial waste composition overall.

Key audit findings by category, and with accompanying photos, have been identified in Table 6.9. The data collected suggest that the dominant waste categories for retail commercial types surveyed were paper and cardboard (28.5%), organics (47.2%), and plastics (13.3%).

Table 6.9: Waste Material Findings in Commercial Samples

Waste Material	Description	Photographic Representation
Paper and cardboard	Dominated by cardboard boxes and cardboard packaging. These dominated the commercial and household samples, and almost half of the supermarket samples.	
Plastics	Dominated by soft plastics, packaging, food wrappers, and cling film. Some plastic drinks containers also noted: small (0.6 liter) soft drink PET bottles, water bottles (1.0 liter), and large PET bottles for cooking oil.	 
Organics	Predominantly food waste and garden waste from retail and trade samples.	
Glass	Brown glass alcohol bottles of different brands. Glass was only identified in the retail and trade samples.	

PET = polyethylene terephthalate.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

The overall waste composition for commercials is presented in Table 6.10 and Figure 6.6

The lower and upper ranges have been calculated at a 95% confidence interval. This provides a measure of the range of estimated proportion for each material that might be expected for repeated composition surveys for commercial premises in Labasa. No samples in the categories of fishing and/or seafood items (this excludes food organics), hygiene, hazardous waste, or batteries were identified during the survey. As such, their margin of error has not been provided.

Samples taken from commercials were sorted and weighed into categories, which has provided the data to estimate the composition of waste from sampled commercials in Labasa.

Table 6.10: Waste Composition of Commercial Samples in Labasa

	Fishing/ Seafood	Paper and Cardboard	Plastics	Metals	Single-Use Items	Batteries	e-Waste	Glass	Hygiene	Organics	Hazardous	Other Waste
Composition	0.0%	33.9%	15.2%	1.4%	0.6%	0.0%	0.0%	6.2%	0.0%	32.8%	0.0%	9.9%
Combined weight (kg)	0.0	21.4	9.6	0.9	0.4	0.0	0.0	3.9	0.0	20.7	0.0	6.3
Average weight per sample (kg)[a]	0.0	1.6	0.7	0.1	0.0	0.0	0.0	0.3	0.0	1.6	0.0	0.5
Lower range	0.0%	15.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	15.7%	0.0%	2.7%
Upper range	0.0%	52.2%	30.7%	2.8%	1.3%	0.0%	0.0%	12.2%	0.0%	49.9%	0.0%	17.2%

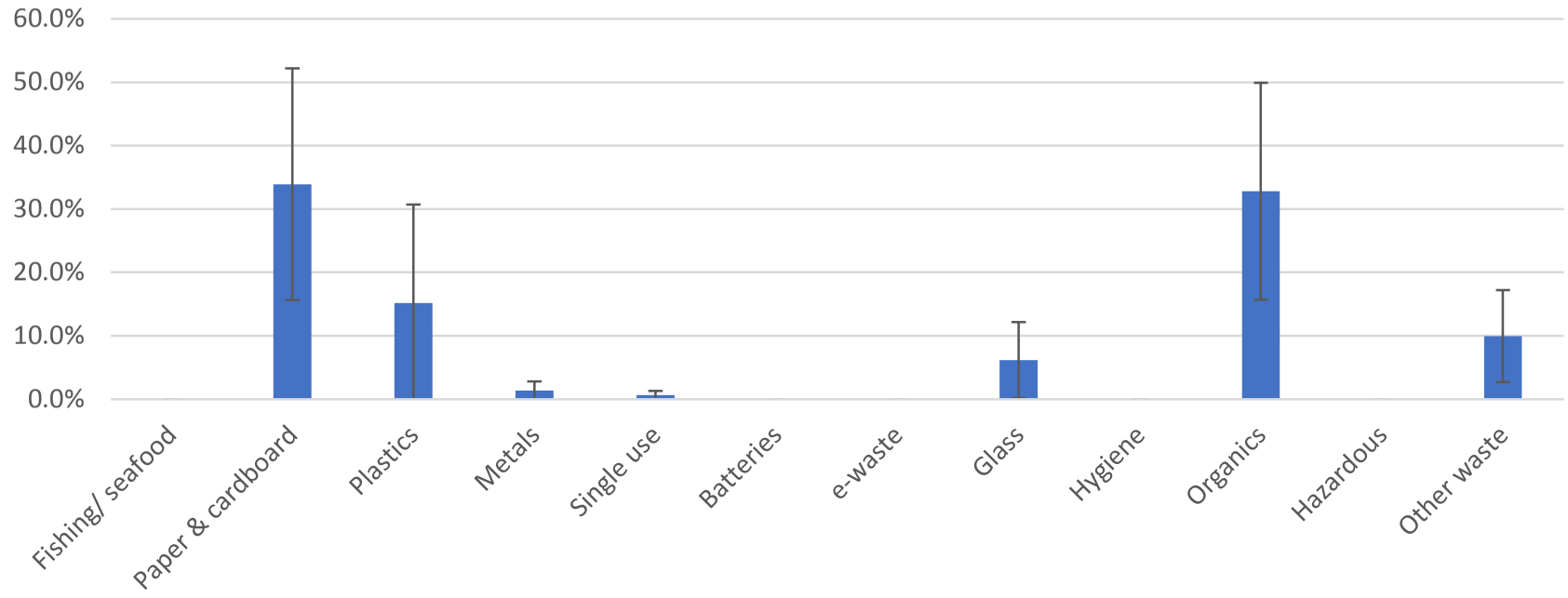
kg = kilogram

[a] Count of all data used (13). Total weight (kg) per category divided by count to provide average weight per sample.

Note: Confidence interval of +15% and –15% applied during data analysis: 13 of 14 samples were within this range and used to calculate the waste composition.

Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Figure 6.6: Proportion of Waste by Type in Commercial Samples in Labasa



Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

6.4 Landfill Audit

Landfill annual tonnages were provided by Labasa District Council for the 5 years to 2020. The following assumptions have been made based on this information.

Table 6.11: Assumptions on Volumes of Waste at Namara Landfill

Information	Assumptions
General waste: 4,851 tonnes per year	Household and commercial waste sample compositions combined with the landfill audit data
Extra refuse: 1,911 tonnes year.	40% of extra refuse is 100% garden organics 60% of extra refuse - application of household and commercial waste sample compositions combined with landfill audit data
Street sweeping and drain cleaning: 181 tonnes per year	Composition applied in the absence of sort and weigh data for street sweepings – 10% garden organics and 90% rubble/concrete (common composition applied to street sweepings)
Market garden organics: 72 tonnes per year	Composition applied – 100% garden organics

Source: Tonkin & Taylor International Ltd and Labasa Town Council, 2021

This suggests that the total waste to Namara Landfill is approximately 7,015 tonnes per year.

6.4.1 Composition

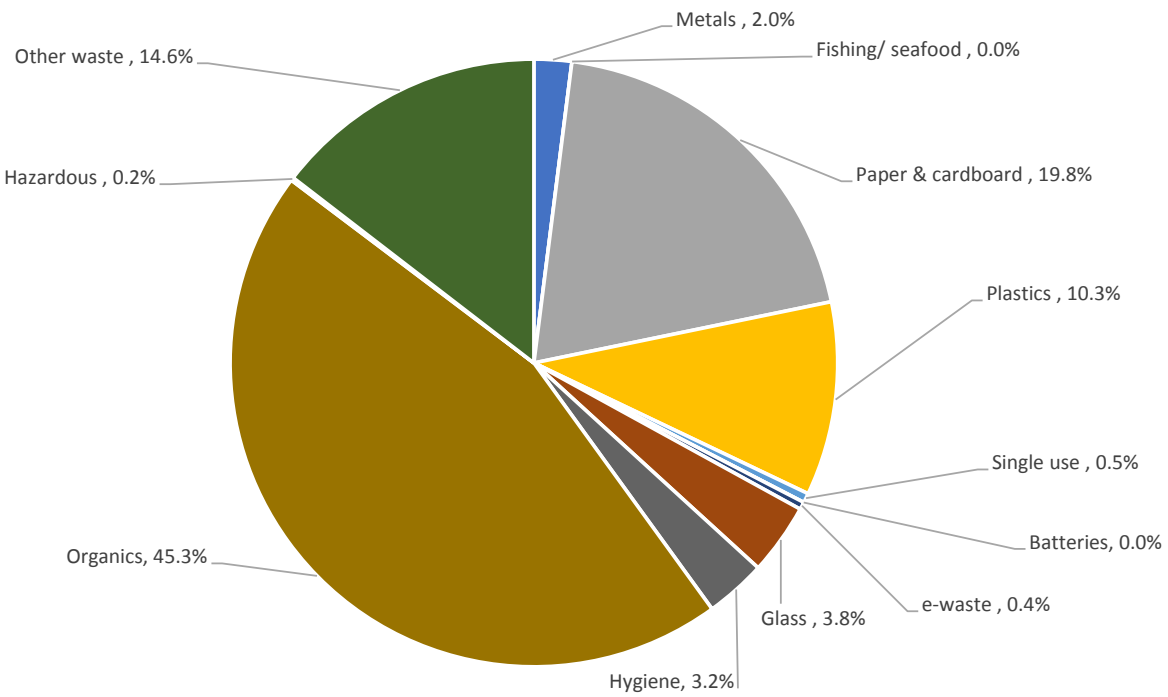
By considering the source of waste, landfill visual assessment data, and using the sort and weigh audit data for households and commercials, an overall waste composition has been developed (refer to Table 6.12)

Table 6.12: Estimated Composition of Solid Waste at Namara Landfill

Materials	Proportion	Tonnage per Year
Fishing/seafood	0.0%	0.0
Paper and cardboard	19.8%	1386.4
Plastics	10.3%	723.5
Metal	2.0%	140.5
Single-use items	0.5%	35.8
Batteries	0.0%	0.0
e-waste	0.4%	28.0
Glass	3.8%	265.9
Hygiene	3.2%	227.3
Organics	45.3%	3174.7
Hazardous	0.2%	11.4
Other waste	14.6%	1021.4
Total	100.0%	7015.0

Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Figure 6.7: Proportion of Waste by Type at Namara Landfill



Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

This assessment of total waste excludes the volumes of materials identified in stockpiles as per Table 6.11 (section 6.5).

Photographs from the audit indicate that a large volume of cardboards boxes are generated by commercials and sent to Namara Landfill. This is representative of the samples collected, which included a large volume of materials in the paper and cardboard category.

Due to their nature, plastics, paper, and cardboard (when dry) are lighter for a given volume than hygiene and organic waste (garden and food organics).

6.4.2 Assessment of Operational Costs

Current costs for the council-operated waste collection services, landfill maintenance, excavation works at the landfill, laborers, and security services were provided by Labasa Town Council for 2020.

When considering total expenditure for solid waste management (waste collection, landfill incidentals, excavation works, laborers, and security services) this is estimated to be F$196,078 per year, equating to a unit cost of F$28 per tonne. Revenue from compost sales has not been accounted for.

6.5 Stockpiles

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

The types and estimated quantities of materials found in stockpiles across Labasa has been provided in Table 6.11. Assumptions associated with identifying the weight in tonnes of the stockpiles identified have been provided in Appendix 3.

Stockpiles in Labasa are generally located at the Vakamasisuasua Industrial Area.

Table 6.13: Materials Found in Stockpiles in Labasa

Item Type	Weight (tonne)	Item Count/ Volume	Location	Photographic Representation
Trucks/buses	97.5	15 units	Vakamaisuasua Industrial Area, Peri-urban area.	
Cars	55.5	37 units	Vakamaisuasua Industrial Area, Peri-urban area.	
Vans	12	6 units	Peri-urban area.	
Tires	0.1	8 units	Vakamaisuasua Industrial Area.	
Other metals	0.9	14 cubic meters	Peri-urban area.	
Used oil[a]	2,608	2,868,917 liters	Fiji (not just Labasa) There is no separation by area. Bluescope Pacific Steel (Fiji) Pty Ltd located in Suva have been the main receivers of used oil[b]. Used oil is burnt in a steel processing plant owned by Bluescope and located in Suva. 2014 estimate for Fiji.	
Asbestos[c]		300.1 square meters	Three locations have been identified in Labasa where remedial actions are recommended: Labasa Hospital, Labasa College, and the Water Authority of Fiji. 2015 estimate for Labasa.	

[a] Secretariat of the Pacific Regional Environment Programme. 2016. Cleaner Pacific 2025: Pacific Regional Waste and Pollution Management Strategy 2016–2015.
[b] Araspring Ltd. 2018. Used Oil Report – Fiji, Niue, Kiribati, Vanuatu, SCL.
[c] J. O'Grady, D. Robotham, and C. Midgley. 2015. Survey of the Regional Distribution and Status of Asbestos Contaminated Construction Material and Waste - Best Practice Options for its Management in Pacific Island Countries. Report for the Republic of Fiji.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

7. Customs Data

An assessment of the customs data for imported and exported goods has been undertaken and presented in Table 7.1.

Table 7.1: Breakdown of Customs Data for Key Imports

Total Import Value for Fiji	Import for Harmonized System Codes Identified as Low, Medium, and High Importance	Estimated Weight Imported
F$6,010,521,300	• Plastic products (39 only) • Single-use plastic items (3920, 3921 - Plastics; plates, sheets, film, foil, and strip	Goods imported (high, medium, and low priority); quantities as per data provided: • 948,554 tonnes • 30,668,256 units • 134,108 liters (reported as la, but assumed to be liters, additional to the volume in liters below) • 969,037,431 liters • 150,561 cubic meters • 1,050,270 square meters • 2,108,394 (pairs of items, i.e., footwear). • Total plastic products including contents: 40,479 tonnes • Single-use plastic items: 3,973 tonnes (9.8% of total plastic products).

F$ = Fiji dollars. Note: Data presented are for those materials identified as high, medium, and low priority.
Source: Customs data received from the Fiji Bureau of Statistics, July 2021.

Table 7.2: Breakdown of Customs Data for Key Exports

Total Export Value for Fiji	Export for Harmonized System Codes Identified as Low, Medium, and High Importance	Estimated Weight Exported
F$1,177,350,659	• Ferrous metals and scrap (HS code 7204) • Motor cars and other motor vehicles (HS code 8703 • Cells and batteries primary (HS code 8506) • Motorcycles including mopeds (HS code 8711) • Plastics and articles thereof (HS code 39) • Single-use plastic items (3920, 3921 - Plastics; plates, sheets, film, foil, and strip)	Goods exported (high, medium, and low priority); quantities as per data provided: • 747,376 tonnes • 1,936,843 units • 39579 liters (reported as la, but assumed to be liters, additional to the volume in liters below) • 386,833,848 liters • 175,699 (pairs of items, i.e., footwear) • 49,795 cubic meters • 57,630 square meters • Ferrous metals and scrap: 9,275 tonnes exported to India; Korea; New Zealand; Kiribati; Australia; Bangladesh; and Sri Lanka. • Motor cars and motor vehicles: 14 units exported to Samoa; Australia; New Zealand; Solomon Islands; Cook Islands; Papua New Guinea; and Pakistan. • Cells and batteries primary: 2,143 units exported to Vanuatu; Australia; Christmas Island; Kiribati; Solomon Islands; and Samoa. • Motorcycles including mopeds: 3 units exported to New Zealand. • Plastics and articles thereof: 4,033 tonnes exported to the People's Republic of China; Tuvalu; Kiribati; New Zealand; Tonga; Samoa; Nauru; Papua New Guinea; Cook Islands; Australia; Federated States of Micronesia; Vanuatu; Wallis and Futuna Islands; Germany; Spain; Hawaii; Hong Kong, China; High Seas; Indonesia; Japan; Korea; Malaysia; Niue; Philippines; Singapore; Tonga; Taipei,China; Viet Nam; and United States. • Single-use plastic items: 85 tonnes (2% of total plastic products) exported to the People's Republic of China; Tuvalu; Kiribati; New Zealand; Tonga; Samoa; Nauru; Papua New Guinea; Cook Islands; Australia; Micronesia; Vanuatu; and Wallis and Futuna Islands.

F$ = Fiji dollars, HS = Harmonized System. Notes:
1. Data presented are for those materials identified as high, medium, and low priority.
2. Export economies are listed by volume of materials received.
Source: Customs data received from the Fiji Bureau of Statistics, July 2021.

8. Estimated Overall Waste Statistics for Fiji

Drawing on the data collected during the waste audit in Labasa, and collected as part of the Plastic Waste-Free Islands Project Fiji, T+TI can present the headline statistics below.

Key points to note:

i) Data collected as part of the Plastic Waste-Free Islands Project Fiji for Vunato disposal site (south of Lautoka) and Levuka are assumed to be representative of Viti Levu.

ii) Data collected as part of this report—Waste Audit Report Fiji (Labasa)—for Namara Landfill are assumed to be representative of Vanua Levu.

iii) Audits in Suva did not take place due to COVID-19 restrictions. An audit, conducted by J-PRISM II, will be undertaken when restrictions are lifted.

It is important to note that this information, presented to provide an estimate of waste composition at a national level, draws on limited data. The current lack of data for Suva is a significant limitation and it is expected that the information presented here will contribute to building the overall picture of waste consumption across Fiji.

8.1 Average Weight of Waste to Landfill

8.1.1 Fiji

The data presented here are derived from landfill audits undertaken at Vunato disposal site and Levuka and household and commercial samples. The household and commercial samples were randomly distributed in Lautoka and Labasa to reflect distribution; urban versus rural areas; and low, medium, and high incomes.

The combined data indicated in the report for waste generation is:

i) 0.23 kg per person per day for household waste.

Data above are taken from Asia Pacific Waste Consultants' (2021) draft report following the Plastic Waste-Free Islands Project Fiji. A breakdown by urban and rural areas has not been provided.

8.1.2 Labasa (reflective of Vanua Levu)

i) 2.6 kg per household per day average.

ii) Equates to an estimated **0.53 kg per person per day.**

Based on an average household size of 4.9 people for Fiji, as per the 2017 Population and Housing Census. Data derived from the waste audits undertaken in Labasa.

8.1.3 Analysis Based on Combined Data

The composition data from both reports for household and commercial waste were applied to the estimated total waste to landfill (154,497 tonnes per year). This provided the following estimates of per capita waste to landfill:

i) 0.23 kg per person per day for Viti Levu, based on 83.5% of the total population of 884,887 for Fiji; and

ii) 0.53 kg per person per day for Vanua Levu, based on 16.5% of the population of 884,887 for Fiji.

This provides an average generation rate of 0.28 kg per person per day for Fiji.

The landfill composition for Fiji and Labasa has been provided below.

As part of defining the waste produced per person per day and overall landfill composition for Fiji, T+TI applied the following assumptions:

i) A split in population of 83.5% Viti Levu and 16.5% Vanua Levu.
ii) Household waste composition from the waste audits in Labasa has been applied to the proportion of household waste for Vanua Levu.
iii) Commercial waste composition from the waste audits in Labasa has been applied to the proportion of commercial waste for Vanua Levu.
iv) Household waste composition from the waste audits undertaken as part of the Plastic Waste-Free Islands Project Fiji has been applied to the proportion of household waste for Viti Levu.
v) Commercial waste composition from the waste audits undertaken as part of the Plastic Waste-Free Islands Project Fiji has been applied to the proportion of commercial waste to Viti Levu.
vi) Tourism waste composition derived from the Plastic Waste-Free Islands Project for Fiji.
vii) Fishing and/or seafood waste composition derived from the from the Plastic Waste-Free Islands Project for Fiji.
viii) Stockpiles of materials and those not ending up in landfill are not included.

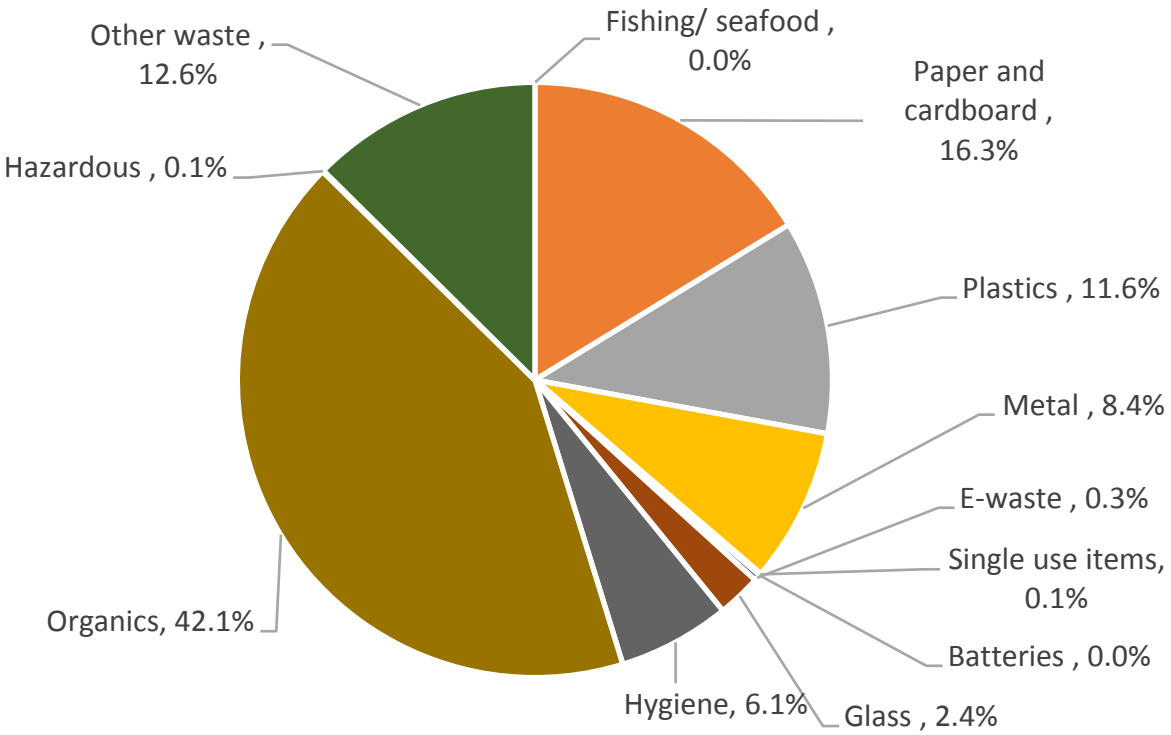
These assumptions have provided the overall waste composition in Table 8.1 and Figure 8.1.

Table 8.1: Estimated Overall Waste Composition for Fiji

Materials	Tonnage per Year	Proportion
Fishing/seafooda	0	0.01%
Paper and cardboard	25,986	16.3%
Plastics	18,294	11.6%
Metal	12,881	8.4%
Single-use items	157	0.1%
Batteries	0	0.0%
e-waste	518	0.3%
Glass	3,616	2.4%
Hygiene	9,080	6.1%
Organics	64,369	42.1%
Hazardous	98	0.1%
Other waste	19,499	12.6%
Total	154,497	100.0%

[a] Note: fishing and seafood data included metals and plastics (which was equivalent to 15.3 tonnes of the total 154,497 tonnes).
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Figure 8.1: Proportion of Landfill Waste by Type for Fiji



Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

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Appendix 1:
Fiji – Labasa Audit Plan

A1.1 Introduction

A1.1.1 Pacific Waste Audits Background

The Pacific Region Infrastructure Facility (PRIF) has engaged specialists from Tonkin + Taylor International Limited (T+TI or the Consultant) to undertake waste audits in the Cook Islands and Fiji. The Japan International Cooperation Agency (JICA) and the International Union for Conservation of Nature (IUCN) are also completing waste audit activity in Fiji and the Pacific Region Infrastructure Facility (PRIF) is leading efforts to coordinate the audits to minimize duplication of effort.

The waste audits in these countries are part of a Pacific wide audit activity being implemented by PRIF in cooperation with the United Nations Environment Programme (UNEP), the Asian Development Bank, World Bank and Secretariat of the Pacific Regional Environment Programme (SPREP) (through the European Union-funded PacWaste Plus programme and with support from the Australian-funded Pacific Ocean Litter Project).

The information and data gathered from the waste audits can be used by countries to support the development and monitoring of waste and resource recovery projects and to recommend the infrastructure and policy interventions required.

A1.1.2 Waste Audit Scope

The Consultant will work with locally engaged counterparts (nominated by the national Focal Points), forming an 'Audit team' to collect information and datasets from selected households and businesses, landfill and National Customs Authority. The Consultant will draw upon analysis of the information and datasets collected during the audit to deliver the Fiji Audit Report. Data and reporting completed for JICA and IUCN audit activities will also be referenced where available.

In the context of the COVID-19 Pandemic the Consultant will identify, in consultation with the Fiji Focal Point and the PRIF Project team, an approach for confirming the key activities and delivery arrangements for the waste audit – based on this National Audit Plan.

The key activities to be conducted as part of this Project are:

1) **Audit planning:** the Consultant will work with national Audit Lead to design the waste audit process for each country. This will involve applying the waste audit methodology (https://www.theprif.org/document/regional/solid-waste-management-and-recycling/waste-audit-methodology-common-approach) with a focus on collecting information that is useful for country policy development, monitoring and operational purposes as well as for regional projects.
2) **Waste Audits:** The waste audit will be undertaken as a collaborative effort between the Audit team and the local staff. In addition to data collection, a key focus of the audit work will be the training and capacity building of the Focal Points and those local personnel engaged to perform the waste audits to complete future audits - including analysis and reporting.

   The waste audits will include an assessment of the quantity and characteristics of waste disposal and recovery. This will be achieved through a combination of collection and sorting of samples of waste, questionnaires and visual survey of materials entering disposal sites.

   A summary assessment of the capacity of public institutions and of the private sector to play effective roles in a regional recycling network will be conducted. An update of the country regulatory framework will also be developed.

This Fiji National Audit Plan is the first deliverable for the waste audit process for Fiji and outlines the methodology and planned approach for delivery of the audit work.

A1.2 Audit Overview

A1.2.1 Approach

This National Audit Plan sets out the approach to collecting a range of information on solid waste management and resource recovery in Fiji through a waste audit. Audit work will be completed in Labasa and Ba. JICA is planning to complete audit work in Suva and Lautaka, the IUCN is completing audit work focused on tourism and fisheries in Suva, Lautoka, and Levuka.

Recognizing that both waste quantities and characteristics vary over time as a result of a range of factors the waste audits will attempt to assemble a 'snapshot' of waste management and resource recovery through a suite of data collection activities and integrated analysis of the resulting information. Factors that influence waste and need to be noted when considering audit results include:

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

Consistent with the PRIF Terms of Reference and the common audit methodology, the waste audit will include:

1) sampling waste from a selection of urban, peri-urban, and rural households and businesses;
2) sorting the sampled waste into pre-defined categories (refer TableA1.3);
3) estimating the composition of waste disposed to landfill;
4) estimating the quantity of waste in stockpiles, e.g., scrap metal, plastics, or e-waste; and
5) discussing waste management and resource recovery with key government and nongovernment stakeholders.

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

A1.2.2 Audit Objectives

The overarching objective of the waste audit is to provide consistent data on waste management and resource recovery across the Pacific. Through the analysis of this data, PRIF is aiming to empower individual Pacific island countries to make evidenced-based decisions, to inform the design of effective country waste management projects and to improve resource recovery.

It is anticipated that the waste audits will be repeated periodically to assess changes in waste management and resource recovery at a national and regional level.

The objectives of the waste audit are:

- Develop a picture of waste management and resource recovery in Fiji.
- To provide baseline information to inform the development of waste regulations and policies (for example, advanced disposal fees for containers, electronics or vehicles) for Fiji.
- To provide baseline information on waste disposal in Fiji to inform the development of sustainable residual waste collection disposal solutions.
- To train local personnel to enable future waste audits to be completed with little or no input from external consultants.

A1.2.3 Delivery of the National Audits

The waste audit will be delivered by several Consultant personnel including a Team Leader, Country Coordinator, Waste Auditor and a locally appointed audit personnel (together the **Audit team**). A list of key project Management and Audit team personnel is included in Appendix A1.5.

The Audit team will work cooperatively with Fiji audit lead and representatives of other relevant national agencies to deliver the waste audits. This will assist to ensure that the objective of training national personnel to undertake future audits is achieved.

Although the intention was that the Audit team would be present in Fiji for the period of the waste audit, current and forecast travel restrictions resulting from the COVID-19 pandemic limit the Consultant's ability to participate in all audit activities.

Consequently, the waste audit training process has been designed to allow the Consultant's external experts to provide instruction, support and supervision remotely, including:

- The delivery of training material based on a mix of videos, written material and on-line presentations;
- On-line quizzes to test understanding of key audit and safety concepts; and
- The provision of expertise, guidance or instruction in audit delivery by telephone or video conference.

The waste 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 Audit team personnel (by telephone or video if required).
- Form-based data collection to ensure waste audit 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 Consultant team is able to travel to Fiji the key audit activities will be supervised by that 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 Fiji is not possible by the Consultant's personnel throughout the scheduled audit period, the national agencies will provide local oversight for delivery of key audit activities with the Consultant's Waste Auditor and Team Leader providing remote supervision.

A Risk Register (Appendix A1.6) has been developed and will be reviewed and updated periodically by the Consultant throughout the Project.

A1.3 Audit Plan

A1.3.1 Audit Design

The first task for the Audit team is to complete the audit design. The process for audit design is set out in the Standard Waste Audit methodology (https://www.theprif.org/document/regional/solid-waste-management-and-recycling/waste-audit-methodology-common-approach).

The initial focus will be on setting up the audit for successful delivery. This includes

- Developing detailed health and safety documentation

- Reviewing background material provided by ADB/PRIF, SPREP/PacWaste Plus, Country Focal Points.
- Completing background research on existing waste management systems and approaches in country.
- Confirming audit objectives
- Developing a sampling strategy:
  - To cover households and businesses
  - To cover geographical variables
  - Reflecting waste and recycling collection arrangements (e.g., timing, containers, targeted materials)
- Confirm audit process logistics - obtaining country specific data (customs etc.), confirming in-country audit teams.

It is anticipated that the audit design process will take 4 weeks from the initial inception meeting with the Country Audit lead.

A1.3.2 Audit Team Training

Immediately prior to commencing data collection the Audit team will be trained. The focus of the training will be on ensuring the audits can be completed safely and provide robust data on waste and resource recovery activities and opportunities.

The training is designed to be delivered with the Consultant personnel in country or participating remotely. Training materials will include a mix of videos, written material and on-line presentations supported by on-line quizzes to test understanding of key audit and safety concepts.

The training and support will be ongoing during the audit process through supervision by the consultant team. This will take place in person if possible but due to travel COVID-19 related travel restrictions is more likely to take place remotely. Key supervision activities will include:

- The provision of expertise, guidance, or instruction in audit delivery in person, by telephone or video conference.
- Daily start-up meetings with the Audit team.
- Form-based data collection to ensure waste audit 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.

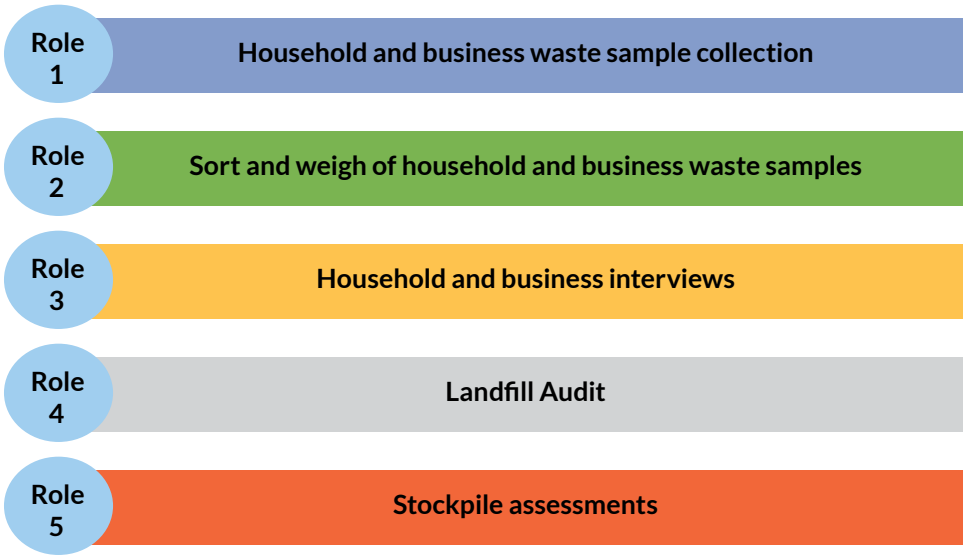
A1.3.3 Audit Roles and Schedule

The Consultant have proposed an audit period of several weeks. Precise timings will be subject to the confirmation of travel approvals and associated administrative arrangements for the audit, but is likely to include:

- Approximately 6-8 days sample collection and analysis in Labasa including supporting household and business interviews.
- Approximately 6-8 days sample collection and analysis in Ba including supporting household and business interviews.
- Landfill and stockpile audits will take place at the same sample as the business and household sampling in each area.

The audit schedule will commence with the induction of the Consultant team including training for those specific team Roles outlined in Figure A1.1. Indicative timing is provided in Figure 3.2 with a more detailed Waste Audit Schedule (Gant Chart) provided at Appendix A1.8.

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 [local language]. The sort/weigh team (Role 2) will comprise 2-3 people plus a supervisor. The landfill audit and stockpile assessment (Roles 4 and 5) 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 for Household and Business Sampling

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

A1.3.4 Household and/or Commercial (Business) Sampling

A sampling plan has been developed by the Consultant based on the most recent household and business statistics from the Fiji Bureau of Statistics.

A1.3.4.1 Labasa

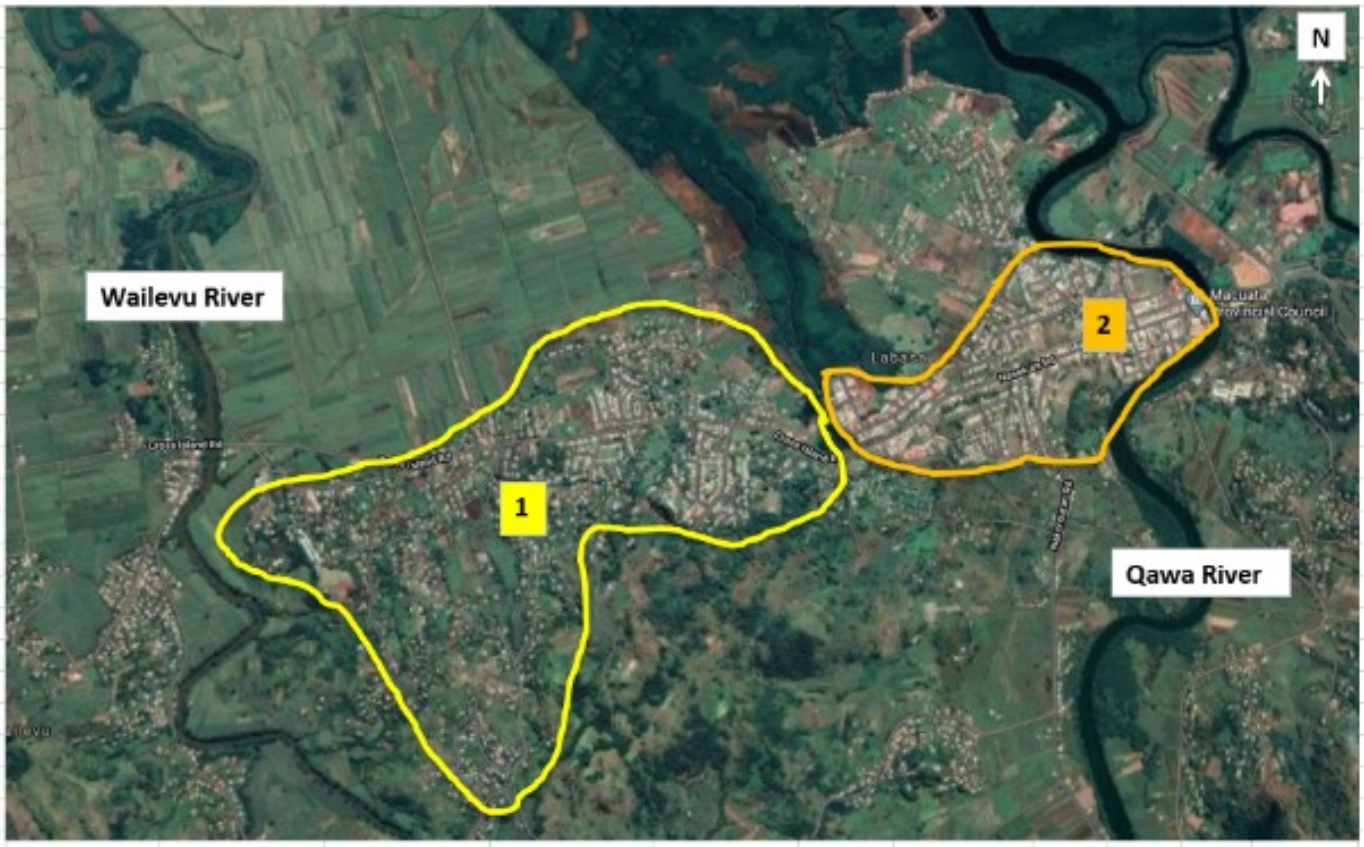
A sample of 120 households across Labasa provides a reasonable level of precision balanced with the time required to sample, sort and weigh the samples obtained. Similarly, a sample of 30 businesses across Labasa provides a robust sample. We have assumed 20–30 mins per household/business for sample collection. This translates to:

- 6–8 days sample collection for households and businesses

Table A1.1: Household and Business Sampling Plan

Area	Map code	No. Households to survey	No. businesses to survey	Total	Time for Audit			
Labasa west	1	60	10	**70**	Households	5	to	8 days
Labasa east	2	60	20	**80**	Businesses	1	to	2 days
TOTAL		120	30	**150**	Total time	**6**	**to**	**9 days**

Figure A1.3: Labasa Sampling Areas



A1.3.4.2 Ba

A sample of 110 households across Ba provides a reasonable level of precision balanced with the time required to sample, sort and weigh the samples obtained. We have assumed 20-30 mins per household/ business for sample collection. This translates to:

- 6–7 days sample collection at Ba and surrounding area.

Table A1.2: Household and Business Sampling Plan

Area	No. households to survey	No. businesses to survey	Total				
Ba Town	40	15	55				
Yalalevu	30	15	45				
Vatulaulau	20	5	25	**Time for Audit**			
Vadravadra	20	5	25	Households	5	to	7 days
				Businesses	2	to	3 days
Total	**110**	**40**	**150**	**Total time**	**6**	**to**	**9 days**
Sigatoka (provisional)	40	10	50	Time incl Sigatoka	8	to	13 days

Figure A1.4: Ba Sampling Areas

A1.3.5 Household and/or Commercial Waste Sort and Weigh

A1.3.5.1 Sorting Arrangements

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

For Labasa this will be at Namara Landfill with 6–8 days for the sort and weigh.

For Ba this will be at Maururu Landfill with 6–8 days for the sort and weigh.

A1.3.5.2 Sorting Categories

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

Table A1.3: Primary Categories

Category 1	Examples
Metal	Aluminum cans, Aluminum recyclable, Steel containers, White goods, End of life vehicles, Corrugated iron sheets, 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, Polypropylene, Expanded Polystyrene, Polystyrene Flexibles/film, Other plastic
Batteries	Nonrechargeable, Rechargeable, Lead acid batteries, Mobile phone, Power tool batteries, Lithium Batteries, Lithium ion batteries, Other batteries
E-waste	Televisions, Mobile phones, Electrical Items & Toner Cartridges, radios/speakers End of Life renewable energy equipment
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, Tyres Rubble/concrete (including ceramics), End of Life Furniture

EOL = end of life, HDPE = high-density polyethylene, LDPE = low-density polyethylene, LPB = liquid paperboard, PET = polyethylene terephthalate, PVC = Polyvinyl chloride.

Table A1.4: Specific Materials Type Categories

Category 1	Examples
Fishing/seafood	Metal, Plastic, wood that are sourced from fishing/seafood processing activities.
Single use items	Beverage containers, Cigarette butts, Cigarette packets, Straws, Styrofoam or Paper Coffee cups, Bags - heavy glossy typically branded carry bags, - supermarket type light weight carry bags, Takeaway containers - plastic, other EPS/Styrofoam, paper and bottle lids

A1.3.6 Household and/or 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, largely in parallel with sample collection. This translates to:

- 6–8 days sample collection across Labasa District
- 6–8 days sample collection across Ba District

A1.3.7 Landfill Audits

Audits will be completed at Namara and Maururu Landfills. 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 A1.5: 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, Polypropylene, Expanded Polystyrene, Polystyrene, Flexibles/film, Other plastic
E-Waste	Non-rechargeable, Rechargeable, Lead acid batteries, Mobile phone, Power tool batteries, Lithium Batteries, Lithium ion batteries, Other batteries Televisions, Mobile phones, Electrical Items, Toner Cartridges
Glass	Glass bottles, Glass jars, Glass fines, Glass other
Hygiene	Feminine Hygiene, Pharmaceutical, Medical waste, Nappies, Other sanitary waste
Organics	Food, Wood/timber, Garden organics, Other organics
Hazardous	Paint, Fluorescent tubes, Household chemicals, Asbestos, Clinical (medical), Gas bottles, Mercury, Containerized used oil, Hazardous (other)
Other	Textiles, End of life renewable energy equipment, Tires, Rubble /concrete incl Ceramics, End of life furniture

EPS = expanded polystyrene, EOL = end of life, HDPE = high-density polyethylene, LDPE = low-density polyethylene, LPB = liquid paperboard, PET = polyethylene terephthalate, PVC = Polyvinyl chloride.

A1.3.8 Stockpile Audits

Stockpile audits will be completed based on information provided by the Ministry for Local Government, Department for the Environment and municipal authorities for Labasa and Ba. Materials characteristics and quantity will be estimated. Each stockpile will be recorded including photographs and estimated composition and quantity.

A1.3.9 Customs (Import, Export)

The data from customs is one of the most crucial elements of this audit. The import and/or export data will be collected directly from the customs department as well as relevant companies where possible. Examples include companies exporting recyclable materials and hazardous wastes.

Table A1.6: Import Data

Category 1	Examples
Metal	Aluminum cans, Steel containers, White goods, Vehicles
Beverages	Beverages (including concentrated drinks) packed in glass, plastic, aluminum cans
Construction Materials	Corrugate Iron, Cement, dry wall, construction material others
Fire Fighting Agents	Fire extinguishers, fire retardant/ proofing, Building Insulation Agents (e.g., Zonolite)
Plastic	Single Use plastics, Autoclaving bags, Shrink Wraps, Micro films, Plastic Packing bags, PET containers, HDPE containers, LDPE containers, PVC containers, Polypropylene, Expanded Polystyrene, Polystyrene, Flexibles/film, Other plastic
Electronics	Mobile phone, Televisions, Other Home Appliances, Mobile phones, Electrical Items & Toner Cartridges
Batteries	Non-rechargeable, Rechargeable, Lead acid batteries, Power tool batteries, Lithium Batteries, Lithium ion batteries, Other batteries
Hygiene	Feminine Hygiene, Pharmaceutical, Medical waste, Nappies, Other sanitary waste
Hazardous	Paint, Fluorescent tubes, pesticides, Fertilizers, Clinical Products (Medical), Mercury Containing Materials, Containerized Used Oil, Fuel,
Other	Textiles, Renewable energy equipment, Tires, Furnitures

EPS = expanded polystyrene, EOL = end of life, HDPE = high-density polyethylene, LDPE = low-density polyethylene, LPB = liquid paperboard, PET = polyethylene terephthalate, PVC = Polyvinyl chloride.

Table A1.7: Export Data

Category 1	Examples
Metal	Aluminum cans, Aluminum recyclable, Steel containers, White goods, End of life vehicles and/or parts, 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, Polypropylene, Expanded Polystyrene, Polystyrene, Flexibles/film, Other plastic
E-Waste	Non-rechargeable, Rechargeable, Lead acid batteries, Mobile phone, Power tool batteries, Lithium Batteries, Lithium ion batteries, Other batteries, End of Life renewable energy equipment, TVs, Mobile phones, Electrical Items, Toner Cartridges
Glass	Glass bottles, Glass jars, Glass fines, Glass other
Hygiene	Feminine Hygiene, Pharmaceutical, Medical waste, Nappies, Other sanitary waste
Organics	Food, Wood/timber, Garden organics, Other organics
Hazardous	Paint, Fluorescent tubes, Household chemicals, Asbestos, Clinical (medical), Gas bottles, Mercury, Containerized used oil, Hazardous (other)
Bulky	Tires

A1.3.10 Data Sources

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

- National statistics (households, demographics, businesses)
- Customs import and/or output data
- Household and/or business sampling data entry sheet
- Household and/or business waste audit data entry sheet
- Landfill audit data entry sheet
- Stockpile audit data entry sheet
- Stakeholder interview records

A1.3.11 Reporting

Once the audits are completed the Consultant will draft an Audit Report based on the reporting format and suggested content provided by PRIF Appendix A1.7.

A1.4 Project Monitoring and Coordination

The waste audit project for Labasa and Ba will delivered by the Audit team. The Consultant Team Leader will be accountable for the project delivery including audit Design, data collection, analysis and reporting.

The Team Leader will also be responsible for the effective communication of progress for the waste audit, and shall provide regular reporting and updates to the PRIF Project Manager and Fiji Focal Point.

Progress reporting will detail the:

- Progress against the time lined actions and any milestones identified in the Labasa National Audit Plan;
- Actions scheduled for the coming fortnight;
- Recommended approaches to managing emerging issues and risks;
- Specific information or additional assistance required.

A1.5 Audit Plan Annexes

- A1.5.1 Project Personnel
- A1.5.2 Risk Register
- A1.5.3 Report Outline
- A1.5.4 Waste Audit Schedule

A1.5.1 Project personnel

A range of personnel will be involved in the audit design and delivery. These include:

Role	Nominate person	Tasks
PRIF Project team		
Audit programme lead	Lorena Estigarribia	Programme Manager / review of deliverables
PacWaste Plus programme	Sainimili Bulai Bradley Nolan	Links to other audit activity and SPREP/PacWaste Plus staff in Fiji
Audit team		
Consultant Team Leader	Chris Purchas (T+TI)	Audit Design (with Country Audit Lead) Audit Lead training Audit team training Audit supervision Audit analysis and report Quality control and review
Consultant Waste Auditor(s)	Anna Ainsworth (Country specific)	Audit Design (with Country Audit Lead) Audit supervision Audit analysis and reporting
Consultant Country coordinator	Tekao Hermann (Country specific)	Audit Supervision
Fiji Waste focal point	Dimity Fifer (Private Secretary for Local Government) Sandeep Singh (Department of the Environment	Liaison with PRIF, Consultant and Audit Lead Set Country audit objectives
Fiji Audit Lead	TBC	Audit Design (with Consultants) Audit Team Training (with Consultants) Audit Supervision (with consultants) Audit analysis and reporting (with Consultants)
Fiji Audit team	TBC, typically from relevant agencies.	Data collection

A1.5.2 Risk Register

Job Number	1013726	**Revision Number**	1.0
Job Name	PRIF Waste Audits	**Revision Date**	1 December 2020
Consultant Team Leader	Chris Purchas (T+TI)	**Consultant Project Director**	Chris Freer (T+TI)

ID	Entry date	Risk and Opportunity	Consequences	Mitigation/Action
	25 Aug 2020	Disruption to Project schedule caused by delays in attaining data and information	Late delivery of Audit Report(s) Incomplete data in the Audit Report (s)	The Audit Plan goes through the detail of how all data required to undertake the analysis will be collected. The Consultant anticipates that the only data that might not be forthcoming within the time period for the delivery of the analysis might be the customs data as it has to be directly obtained from the customs department. Fortnightly Project status reports and escalation reports as necessary will enable timely elevation of critical issues likely to impact Project schedule. A meeting will be conducted with the relevant Customs agency when the Consultant team arrives or as part of the Project planning phase (by phone/video). Detailed information will be given (specific Tariff Code References, etc.) for Custom officials to make their work easier.
	25 Aug 2020	Disruption to Project schedule caused by unanticipated changes in the travel schedule	Late delivery of the Audit Report (s)	Any change to the flight schedules to/from each country and in-country may affect the progress. Current plans are to deliver training & supervision for audits remotely with travel restrictions preventing travel to Fiji].
	25 Aug 2020	Disruption to project schedule caused by severe weather	Late delivery of the Audit Report (s) Incomplete or inaccurate audit data	Severe weather for days or weeks during the mission/audit process can affect the audit progress and its outcome. The moisture content of the waste can be affected by rain and strong wind. Rubbish bags will be distributed to households and businesses to store their waste and keep in their houses for the Audit team to collect to avoid such situation
	25 Aug 2020	Disruption to Project budget caused through extension to Project scope and Project activities	Late delivery of the Audit Report (s) Insufficient budget to deliver agreed scope	Well defined scope (in ToR and Inception Report) Outcomes based payment Smart project delivery tools and tracking
	25 Aug 2020	Changes to project resourcing caused by illness, emergencies involving families of the Consultants or other matters		All Consultants for this Project work for T+TI, additional resources can be drawn on if the illness will be protracted, with the SPREP Project Manager's approval.
	25 Aug 2020	Delays to project delivery as a result of remote audit design and delivery support	Late delivery of the Audit Report(s)	Well defined scope for remote design and audit supervision Remote audit data collection and supervision tools Invest heavily in audit design and logistics planning with local Audit Lead
	25 Aug 2020	Insufficient data completeness or quality	Audit Report(s) not of sufficient quality to inform subsequent activity	Invest heavily in audit design and logistics planning with local Audit Lead Remote audit data collection and supervision tools T+TI team to actively supervise audit process with start up meetings, daily check in and data review throughout the audit process.

Appendix A1.5.2: Risk Register (continued)

	25 Aug 2020	Audit data is not 'typical' due to COVID-19 changes to economic activity.	Audit data is not reflective of typical conditions	Use national statistics to identify current state (economic activity, tourism numbers, …) vs typical conditions.
	25 Aug 2020	Disruptions to audit process through staff changes, unavailability of staff or other unexpected factors	Incomplete data Audit Report(s) not of sufficient quality to inform subsequent activity	Audit planning accounts for disruptions i.e. 'spare' sample collection/analysis days, additional samples in sampling plan, … Specify additional staff requirements to account for staff absence or disruption.
	25 Aug 2020	Communications are disrupted or problematic	Difficulty with remote of training Difficulty with remote supervision of audit activity and review of audit data	Provide training material in static form (videos, documents) so consultant team don't need to participate in training. Schedule regular catch-ups with alternative means of communication (Skype/Zoom, telephone, messaging via WhatsApp, …)
	15 Sept 2020	Summer (cyclone) season - heavy rain, high wind	Weather disrupts data collection Impacts on the representativeness of the data collected	Progress planning and audit implementation as rapidly as feasible. Ensure reporting explains the context for data collection Include sufficient contingency time for data collection
	15 Sept 2020	Coordination with 'other' audit activity (being completed by IUCN and JICA	Duplication of effort Potential gaps in national dataset Inconsistent methodology	Coordination meetings with other audit teams Common methodology where possible (IUCN/PRIF) Shared underlying datasets e.g. import/export
	Consider the following risk: Health & Safety, Financial, Reputation, Environment, Technical, Unknown, Legal, Contractual, Communication			

A1.5.3 Report outline

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

Section 1: Literature Review/ Country Profile:

- Background
- Socio Economic Background
- Stakeholders – Roles & Responsibilities
- Waste Service Provision

Section 2: Methodology

- Training of in-country government officials
- Identification of Waste Audit sites
- Samples collected
- Interviews

Section 3: Validation Procedures

Section 4: Audit Findings

4.1 Household

- Comparison of household waste composition 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 Commercial

- Types of commercial facilities audited incl retailers, manufacturers.
- Assessment on types of wastes generated by different facilities
- Presence of banned single use plastics
- 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:

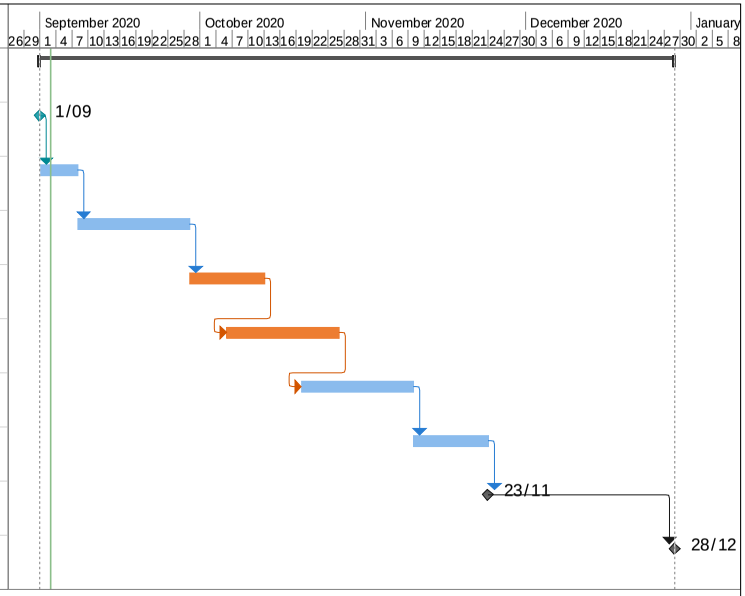
- Name of landfill(s) audited
- The nature of the landfill – design, waste 'catchment, location.
- Key characteristics - gate fee charged, percentage of funding received from government and the average Annual maintenance cost for the landfill.
- Segregation undertaken on site, allocation of cells for special wastes
- Assessment of the long-term use of the site should current waste trends continue.

4.4 Customs

- Assessment of Import / 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 – including any legal requirement for all wastes to be incinerated.
- Single Use Plastics

A1.5.4 Waste Audit Schedule

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**Fiji**	**85 days**	**Tue 1/09/20**	**Mon 28/12/20**	
2		Inception meeting	0 days	Tue 1/09/20	Tue 1/09/20	
3		Review background and contact with Country lead	5 days	Tue 1/09/20	Mon 7/09/20	2
4		Country audit design	15 days	Tue 8/09/20	Mon 28/09/20	3
5		Pre-audit liaison	10 days	Tue 29/09/20	Mon 12/10/20	4
6		Audit (2 - 3 weeks)	15 days	Tue 6/10/20	Mon 26/10/20	5FS-5 days
7		Analysis	15 days	Tue 20/10/20	Mon 9/11/20	6FS-5 days
8		Reporting	10 days	Tue 10/11/20	Mon 23/11/20	7
9		Draft Report for TIC Review	0 days	Mon 23/11/20	Mon 23/11/20	8
10		Final Report following TIC Review	0 days	Mon 28/12/20	Mon 28/12/20	9FS+25 days



Project: Project2
Date: Thu 3/09/20

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone	

Appendix 2:
Waste Sort Categories

Table A2.1: Primary Categories of Waste

Category 1	Examples
Metal	Aluminum cans, Aluminum recyclable, Steel containers, White goods, EOL 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, Polypropylene, Expanded Polystyrene, Polystyrene, Flexibles/film, Other plastic
Batteries	Nonrechargeable, Rechargeable, Lead acid batteries, Mobile phone, Power tool batteries, Lithium Batteries, Lithium ion batteries, Other batteries
e-waste	Televisions, Mobile phones, Electrical Items, Toner Cartridges
Glass	Glass bottles, Glass jars, Glass fines, Glass other
Hygiene	Feminine Hygiene, Pharmaceutical, Medical waste, Nappies, Other sanitary waste
Organics	Food, Wood/timber, Garden organics, Other organics
Hazardous	Paint, Fluorescent tubes, Household chemicals, Asbestos, Clinical (medical), Gas bottles, Mercury, Containerized used oil, Hazardous (other)
Other	Textiles, EOL renewable energy equipment, Tires, Rubble/concrete including Ceramics

EPS = expanded polystyrene, EOL = end of life, HDPE = high-density polyethylene, LDPE = low-density polyethylene, LPB = liquid paperboard, PET = polyethylene terephthalate, PVC = Polyvinyl chloride.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Table A2.2: 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

EPS = expanded polystyrene
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Appendix 3:
Stockpile Assessment

Table A3.1: Assumptions for Stockpile Assessment Quantities

Item	Quantity	Unit
Buses/trucks	6500	kg
Cars	1500	kg
Vans	2000	kg
Asbestos roofing	9.2	kg
Other metal	63	kg/m3
Tires	8	kg
Waste oil	1000	L/m3

kg = kilogram, L = liter, m3 = cubic meter.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

Appendix 4:
Harmonization System Codes

Table A4.1: Harmonization System Codes Used in Waste Assessment

Category	Priority	HS Codes
Aluminum packaging	M	7611,7612,7613
Asbestos	M	2524,6811.40,6812
Bottle lids	M	3923.50
Cardboard	L	4819
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
EOL vehicles	H	8427,8428,8429,8430,8701,8702,8703,8704,8705,8706,8707,8708,8709,8710,8711,8712,8714,8715,8716
EOL vehicles air	H	88
EOL renewable energy equipment	L	Not provided
EOL 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
Fishing/seafood metal and plastic	L	9507
Fishing/seafood textiles	L	5608
Fishing/seafood wood	L	Not provided
Flexibles/Film	H	3919,3920
Flexibles/Film packaging	H	1905
Fluorescent tubes	M	8539.31
Food	L	2,3,4,5,7,8,9,10,11,12,13,15,16,17,18,19,20,21,23
Footwear	M	64
Fuel	M	2710.12,2710.19,2710.20,2711.12,2711.13
Garden organics		6, 14
Gas bottles	M	7311,7613
Glass bottles	L	2204,2205,2206,2208,2209

Category	Priority	HS Codes
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
Hazardous other	L	Not provided
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
Lithium batteries	L	Not provided
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
Mercury	L	Not provided
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
Nonrechargeable batteries	M	8506
Other batteries	L	8548,8545
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
Power tool batteries	L	Not provided
Polypropylene containers	H	3902.10,3917.22,3920.20
Polystyrene 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

Category	Priority	HS Codes
Surveying (including photogrammetrical surveying)	L	9015.80,9015.90
Takeaway containers, takeaway container lids	L	
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
Televisions	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

EPS = expanded polystyrene, EOL = end of life, H = high, HDPE = high-density polyethylene , HS = Harmonization System, LDPE = low-density polyethylene, L = low, LPB = liquid paperboard, M = medium, NiCD = nickel–cadmium, NiMH = nickel metal hydride, PET = polyethylene terephthalate, PVC = Polyvinyl chloride.
Source: Compiled by waste management consultants from Tonkin & Taylor International Ltd. August 2021.

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