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Vanuatu – Waste Data report

Analysis of waste generation and disposal data collected in November 2018

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Executive Summary

The Commonwealth Litter Programme (CLiP) is an initiative delivered by the Centre for Environment Fisheries and Aquaculture Science (Cefas) and funded by the United Kingdom's Department for Environment, Food and Rural Affairs. The initiative supports developing countries across the Commonwealth in advancing national litter action plans focused on preventing plastics entering the oceans.

In 2018, CLiP contracted Asia Pacific Waste Consultants (APWC) to study waste management practices in Vanuatu and offer best-practice solutions and training to staff who are engaged in the design and delivery of waste services. This report presents the data, analysis and recommended best practice activities that address gaps in the management of waste within Vanuatu.

The APWC team worked in Vanuatu for three weeks during November 2018, covering the islands of Efate and Espiritu Santo and the respective provincial governments for Shefa and Sanma province and the municipalities of Port Vila Municipal Council and Luganville Municipal Council. Samples were taken from the main island communities of Port Vila and Luganville and the rural community called Black Sands in Shefa province. The Black Sands is a highly affected village where communities have relocated from outer islands because of the devastating effects of tropical cyclone Pam in 2015. Four outer islands were also visited. These include Lelepa (Efate), Ifira (Efate), Tutuba (Espiritu Santo) and Mavea (Espiritu Santo).

In total, 205 samples were collected, with 105 from outer islands, and 50 urban samples collected from five different communities. In addition to the household samples, a total of 45 commercial premises were sampled, of which 30 were shops in Port Vila and 15 in Luganville. APWC's team collected and sorted 1,546 kilograms of waste from five locations and 246 premises in Vanuatu. A further 7 tonnes of green waste was weighed and assessed in Luganville.

The APWC methodology assesses the amount of waste requiring immediate management, that is, the waste being placed in bags or drums. It also assesses household behaviours based on interviews in order to understand what happens to uncollected waste or why refuse is not placed in bags, including the reason for these behaviours.

Interviews were conducted with all households where waste was collected to cross-reference socio-economic and waste behaviour data with the waste disposed. APWC was able to draw upon previous work completed by JPRISM projects (Japanese Technical Co-operation Project for Promotion of Regional Initiative on Solid Waste Management) analysing waste generation. The comparison of the two studies shows that although the introduction of the prepaid bags is largely helping with the visible waste issues, there are matters that can be further addressed.

The audit confirmed that waste generated between urban and rural areas differed. Of interest was the correlation between waste generation and the average grocery bill as opposed to a more complex model incorporating the number of people within the household, household income and a collection service rating in addition to average grocery spends. This simplification on an area, rather than

household or regional level, could assist in modelling waste generation rates outside of the sample areas. It is a finding consistent with research focussing on the variables that influence solid waste generation on a per capita basis within the south-eastern United States (Hockett, Lober and Pilgrim, 2015).

There is large variability in the volumes of waste in urban areas, with existing systems capturing 30-70 per cent. All waste generated in rural areas is being disposed of through burning, burying and dumping. Nappies appear to be a problem waste, with 27 per cent of overall waste disposed by bags comprised of nappies. This represents 61 grams per capita per day of the waste assessed through the audits. In Lelepa, where there are no disposal systems, 19% of the population throws nappies in to the ocean.

These actions will have a direct impact upon the volume of waste that enters waterways.

In rural areas, collection systems are poor, ad hoc or completely absent. As a result, all waste generated in rural areas is being disposed of through burning, burying and dumping, either on land or in nearby waterways. In these areas, beneficial reuse of household organic materials was observed and serves as a positive case study for other areas within the south pacific.

This report outlines best practice actions that range from regulatory to behavioural, with thirteen recommendation areas that can reduce the volumes of waste entering marine environments in the future, whilst also improving the social and economic prospects of communities in Vanuatu.

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Acronyms

ACRONYMS	
ANCP	Australian NGO Co-operation Program
APWC	Asia Pacific Waste Consultants
CCOA	Commonwealth Clean Oceans Alliance
CDS	Container Deposit Scheme
Cefas	Centre for Environment Fisheries and Aquaculture Science
CHOGM	Commonwealth Heads of Government Meeting
CLIP	Commonwealth Litter Programme
DEPC	Department of Environment Protection and Conservation
DEFRA	Department for Environment, Food and Rural Affairs
DPM	Department of Ports and Marine
EU	European Union
FFA/SPC	Pacific Islands Forum Fisheries Agency
GEF	Global Environment Facility
GMPII	Global Monitoring Plan on Persistent Organic Pollutant Phase II
HCC	Honiara City Council
ICC	International Coastal Cleanup
IUCN	International Union for Conservation of Nature
IMDG	International Maritime Dangerous Goods Code
IR	Inception Report
IUCB	International Union for Conservation of Nations
JICA	Japanese International Co-operation Agency
J-PRISM	Japanese Technical Co-operation Project for Promotion of Regional Initiative on Solid Waste Management
LMC	Luganville Municipal Council
LTMC	Lenakel Town Municipal Council
MARPOL 73/78	The International Convention for the Prevention of Pollution from Ships (Marine Pollution), 1973 as modified by the Protocol of 1978
MGB	Mobile Garbage Bin
MSW	Municipal Solid Waste
NBSAP	National Biodiversity Strategy and Action Plans
NEPIP	National Environment Policy and Action Plans 2030
NGO	Non-Government Organisation
NSDP	National Sustainable Development Plan 2030
NWMPCSI P	National Waste Management and Pollution Control Strategy and Investment Plan 2016-2020
NZ	New Zealand
ODA	Official Development Assistance
PET	Polyethylene terephthalate
PGF	Pango Green Force
PICS	Pacific Island Countries

ACRONYMS	
PVMC	Port Vila Municipal Council
PPE	Personal Protective Equipment
PRIF	Pacific Region Infrastructure Facility
PV	Photo voltaic
RESCCUE	Restoration of Ecosystem Services and Adaption to Climate Change 2014-2018
RFT	Request for Tender
RMI	Republic of the Marshall Islands
SAMOA	Small Islands Developing States Accelerated Modalities of Action Pathway
SID	Small Island Developing States
SPREP	Secretariat of the Pacific Regional Environment Programme
SWM	solid waste management
UNEP	United Nations Environment Program
VESS	Vanuatu Environment and Science Society
VUV	Vanuatu Vatu
WCRA	Waste Contractors and Recyclers Association of New South Wales
WMAA	Waste Management Association of Australia
WMPC	waste management and pollution control
WWC	Waste Wise Consulting

1 Introduction

1.1 Project need

Capacity building within Pacific Island communities (PICs) is a key priority to help deal with the growing problem of waste management and the prevention of land- and marine-based litter. The implications of pollution on marine ecosystems have been widely studied, however the impact on human health remains poorly characterised. Human health impacts are perceived to be an emerging problem requiring increased scrutiny and attention (Seltenrich, 2015; Ocean Conservancy and International Coastal Cleanup, 2014). There is increasing urgency among industry, government, non-governmental organisations and environmental groups to develop tools and policies to track, capture and recycle waste (particularly plastics) before it reaches the oceans.

PICs face unique and significant obstacles in the development and implementation of sustainable waste management solutions to address and combat litter in terrestrial and marine environments. Organic waste, waste oils and waste from shipping and cruise liners also produce a unique challenge for the area. Globalisation, including increased affluence and consumer-based lifestyles with a heavy reliance on imported goods, has had a substantial impact on the amount of waste generated within communities. The waste challenges for island communities are considerable, due in large part to geographic location and physical size coupled with lack of suitable land availability for waste management solutions such as transfer stations, waste treatment and disposal sites, and recycling and reuse facilities. Other obstacles, including the topography and location of some communities, as well as resourcing and infrastructure limitations, means that many communities, especially those in remote locations, have limited or no access to sustainable waste management. As a result, waste is often dumped, burned or buried, leaving it susceptible to dispersal into the environment.

Transboundary marine litter is another issue facing PICs, with many livelihoods dependent on the continuing health of the ocean. Creating a balance between satisfying the economic aspirations of increasing populations while maintaining healthy marine and terrestrial environments is of major importance in reducing risks to human health, as well as the land- and marine-based life. Major waterways are capable of transporting a substantial amount of waste and litter. Up to 90 per cent of marine litter consists of plastics originating from both land- and sea-based sources (UNEP and GRID-Arendal, 2016). Plastic debris from the land comes primarily from two sources: first, ordinary litter; and second, waste disposed of at open dumps, landfills or illegally dumped waste which then becomes airborne or washes into the ocean from inland waterways and wastewater outflows (Jambeck, J.R. et al., 2015). Marine sources of plastic debris are more nuanced but arise from shipping activities related to transport of goods, services, tourism and fishing.

It is estimated that in the Asia–Pacific region the cost of marine litter to marine industries is a minimum of €1.26 billion per year, including losses from tourism, entangled ship propellers and time lost for fishing (McIlgorm, A., et al., 2008). In the EU, it has been suggested that the cost for coastal and beach cleaning is about €630 million annually (Acoleyen, M., et al., 2013; Werner, S., et al., 2016).

Preventing pollution, especially plastics from entering the environment, requires focused efforts on behaviour change (for example, reducing reliance on single-use plastics), improvements in waste

management and developing a more sustainable life cycle for wastes such plastics. The steps to improve poor systems of waste management or mismanagement of waste rely on quantifying the scale of the problem and the sources of plastics leakage and other wastes into the system. To date, this quantification has not happened. Gaps in local capacity, as well as details of infrastructure and management systems, must be quantified and linked to the leaked waste in order to adequately deal with the issues.

1.2 The Commonwealth Litter Programme (CLiP)

The Commonwealth Litter Programme (CLiP) will support developing countries across the Commonwealth to advance national litter action plans, focusing on preventing litter (including plastics) entering the oceans. The programme is starting in the South Pacific Region, working with Vanuatu and the Solomon Islands, and this project forms a part of the programme.

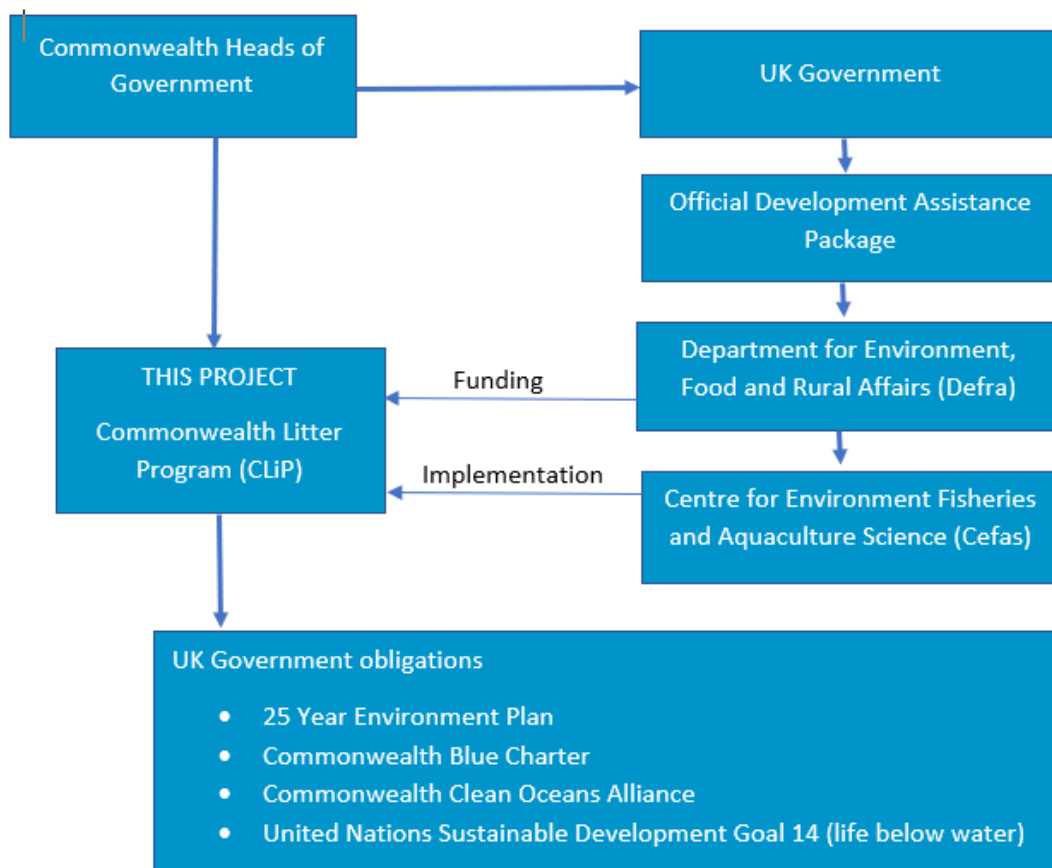


Figure 1: Project delivery organisations

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The programme contributes to the UK meeting its responsibilities under the Commonwealth Blue Charter, which calls for Commonwealth countries to drive action and share expertise on issues affecting the world’s oceans, including marine litter. CLiP will contribute delivering the objectives

under the UK- and Vanuatu-led Commonwealth Clean Oceans Alliance (CCOA), which calls on other countries to pledge action on plastics to eliminate avoidable plastic waste. CCOA also promotes actions in line with the United Nations Sustainable Development Goal 14 (life below water) to conserve and sustainably use the oceans.

1.3 This report

Asia Pacific Waste Consultants (APWC) has been engaged by Cefas to study waste management practices in Vanuatu and offer best-practice solutions and training to staff who are engaged in the design and delivery of waste services in the country (including provinces). This is a deliverable under the CLiP.

Vanuatu is the first of the two South Pacific countries where this programme will deliver direct results.

The delivery pathways for the project are listed in Figure 2.

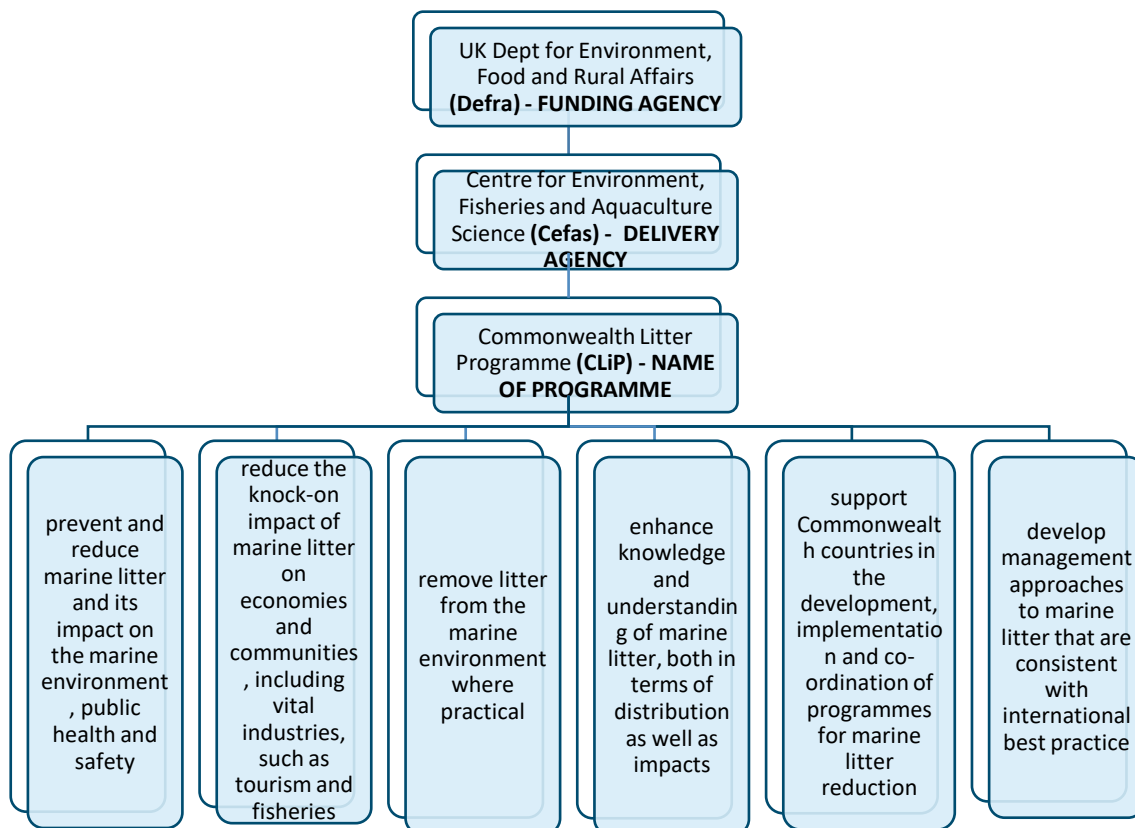


Figure 2: CLiP sponsors and objectives

APWC deliverables have three focus areas, listed below:

- Data collection on waste collection and disposal services, and disposal behaviour
- Best practice solutions to the current situation
- Provision of training for in-country staff.



This report is the final deliverable under the 'Waste data' project. The report starts with a brief literature review, summarises the current waste management practices in Vanuatu, comments on the current infrastructure available and provides an analysis of the waste being generated and disposed of in Vanuatu.

The final section of the report uses the data and information gathered in-county to suggest potential policy, legislative and infrastructure-based interventions to reduce waste from land-based sources from entering the oceans through better management at source and through state based management systems.

2 Literature review

2.1 Background

The Republic of Vanuatu is a Y-shaped string of islands running in a northwest to southwest direction in the Melanesia region of the Pacific Ocean. More than 80 islands comprise a total land area of approximately 12,189 square kilometres, with a combined coastline of 2,530 kilometres. The largest cities are the capital, Port Vila (Island of Efate) and Luganville (Espirtu Santo, the largest island). A relatively small country, Vanuatu gained independence from France and the United Kingdom on 30 July 1980. Data from the last census in 2009 highlighted a growing economy and rapid population growth in conjunction with an increase in packaged product imports. The Department of Environment and Pollution Control, provincial government and municipal councils are responsible for solid waste management and fulfilling the requirements of the national policy and legislation and international multilateral agreements and conventions.

Waste disposal methods greatly vary across Vanuatu, with large populations living on small outer islands lacking access to waste disposal services. Cruise ships bring an influx of visitors annually, with about 223,551 visitors in 2017 (SPTO 2018), adding increased pressure on current infrastructure. Solid waste is managed through a prepaid bag system in Port Vila and Luganville municipalities. In the remaining municipalities, waste is either dumped into backyard pits and burned, or dumped into waterways. There are several small-scale local recycling projects undertaken, however there is no national, provincial or municipal-run recycling scheme at present. Many donor-run projects are currently active but with little co-ordination among projects.

2.2 Socio-economic background

Vanuatu borders Fiji, New Caledonia and the Solomon Islands in the southern Pacific Ocean. It is a mountainous and volcanic archipelago of more than 80 islands, with 81% of the landmass and 76% of the population vulnerable to multiple environmental hazards such as volcanic eruptions, earthquakes, tsunamis and flooding (Ministry of Climate Change, 2018). Vanuatu has been deemed one of the world's most vulnerable nations to natural disasters: the World Risk Report 2016 highlights Vanuatu as the country most at risk, with an overall world risk of 36.45% (Schrader, 2017).

Approximately 277,500 people live within six provincial areas, with about 74% (or 205,350) living in rural areas (Knoema, 2015). More than a hundred local languages are spoken across Vanuatu, as well as the official languages of Bislama (63.2%), English (33.7%) and French (2%). The system of government is a parliamentary republic, with both a president or chief of state and a head of government, the prime minister. The country maintains strong cultural traditions.

Vanuatu's economy is based primarily on subsistence farming and small-scale agriculture, although the manufacturing sector contributes 3.71% to the economy (GlobalEDGE, 2017). The population is increasing steadily by approximately 2.4% (Asian Development Bank, 2016). This increase in population and gain in economic development has resulted in Vanuatu undergoing rapid socio-economic development, with urban society becoming more affluent.

The following table outlines the number of people living across each of the six provinces.

Table 1: Population of the islands of Vanuatu

Torba Province islands	Population	Sanma Province islands	Population
Hiw	269	Espiritu Santo, including the city of Luganville	38,303
Tegua	58	Tutuba	609
Lo	198	Mavea	196
Ureparapara	437	Aore	405
Motalava	1,399	Araki	140
Vanua Lava	2,539	Malo	4,191
Mota	666	Penama Province islands	Population
Gaua	2,471	Ambae	10,146
Merig	12	Maewo	3,556
Malampa Province islands	Population	Pentecost	16,224
Malekula	22,617	Shefa Province islands	Population
Ambrym	7,110	Epi	5,066
Paama	1,542	Tongoa	2,273
Tafea Province islands	Population	Emae	732
Erromango	1,917	Tongariki	267
Tanna	2,8734	Makira	106
Aniwa	341	Mataso	74
Futuna	481	Efate including Port Vila	64,327
Aneityum	901	Emau	602

Source: Vanuatu National Statistics Office, 2009 National Population and Housing Census, Analytical Report

Efforts to grow and develop the tourism industry have been successful. In 2016, international visitors reached 95,117, increasing 14.7% to 109,063 in 2017 (SPTO 2018). An additional 254,489 people arrived via cruise ships in 2016, with numbers falling slightly to 223,551 in 2017 (SPTO 2018). Cruise ships call into Port Vila, Luganville, Mystery Island, Pentecost, Champagne Bay and Wala. The demography, infrastructure, and economy between the municipalities differ significantly. Waste generated on the ships is disposed of in Port Vila.

A lack of infrastructure, resourcing and awareness hampers efforts to improve waste management. Internal geographical constraints also hinder progress due to distance between communities. Internationally, distance and the cost to send materials to markets reduces value of return for recycled materials.

2.3 Institutional framework

Solid waste management has traditionally been the responsibility of local governments. However, with the increasing rate of solid waste generation, various institutions have become involved in one or more aspects of the management chain, particularly in regards to awareness and regulations for recycling and recovery, and management and source reduction by intervention at production and consumption levels.

The Vanuatu government is responsible for national legislation, strategies and policy frameworks for waste, including measures that give effect to obligations under international agreements. The need for international agreements arises from the requirement to regulate the movement of hazardous waste in and out of countries and to ensure it is managed in a way that reduces the risk of harm to the environment and human health.

Local governments, in this case provincial governments and municipalities, have responsibility for waste management within their local areas as laid down by the regulatory framework of each province or municipality. Local governments play an important role in providing household waste collection and recycling services, managing and operating landfill sites, delivering education and awareness programmes, and providing and maintaining litter infrastructure. Managing waste is not just the responsibility of governments. A range of industries and businesses, as well as communities, households and individuals are involved in waste management and resource recovery.

2.3.1 International agreements

The table below highlights all multilateral agreements ratified by Vanuatu relevant to waste management. The Basel and Rotterdam Convention are the most recent agreements to come into force being ratified in 2018.

Table 2: Multilateral agreement and conventions ratified by Vanuatu

Multilateral agreements and conventions	Status
Basel Convention on Controlling Transboundary Movements of Hazardous Wastes and Their Disposal	Accession. Entry into Force 13/01/2019
Rotterdam Convention	Accession. Entry into Force 14/01/2019
Stockholm Convention on Persistent Organic Pollutants	Ratified
1995 Waigani Convention	Ratified
Montreal Protocol	Ratified
MARPOL 73/78: International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (Annexes I, II, III, IV, V, and VI)	Ratified
London Convention on the Prevention of Marine Pollution by the Dumping of Wastes and Other Matter 1972	Ratified
1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Protocol)	Ratified
Intervention on the High Seas in Cases of Oil Pollution Casualties (Intervention 1969):	Ratified
Protocol 1973	Ratified
Protocol to the International Convention on Civil Liability for Oil Pollution Damage of 29 November 1969 (1976)	Ratified
International Convention on Civil Liability for Oil Pollution Damage 1969 (renewed 1992)	Ratified
International Convention on the Protocol of 1976 to Amend the International Fund for Compensation for Oil Pollution Damage, 1971	Ratified
Protocol of 1992 to Amend the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971	Ratified

International Convention on Oil Pollution Preparedness, Response and Co-operation Convention 1990	Ratified
Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances, 2000 (OPRC/HNS) 2000	Ratified
International Convention on Civil Liability for Bunker Oil Pollution Damage (BUNKER) 2001	Ratified
International Convention on the Control of Harmful Anti-fouling Systems in Ships (AFS Convention) 2001	Ratified
Small Island Developing States Accelerated Modalities of Action (Samoa Pathway)	Ratified

Source: SPREP 2017

2.3.2 National regulation and strategy

The Republic of Vanuatu has several policies, legislations, strategies and multilateral agreements that address solid waste management and control of pollution, including:



Figure 3: Regulation and strategy

2.4 Stakeholders

There are various stakeholders responsible for management of waste in Vanuatu.

Figure 4 lists the various stakeholders responsible for management of waste and their inter-relationships.



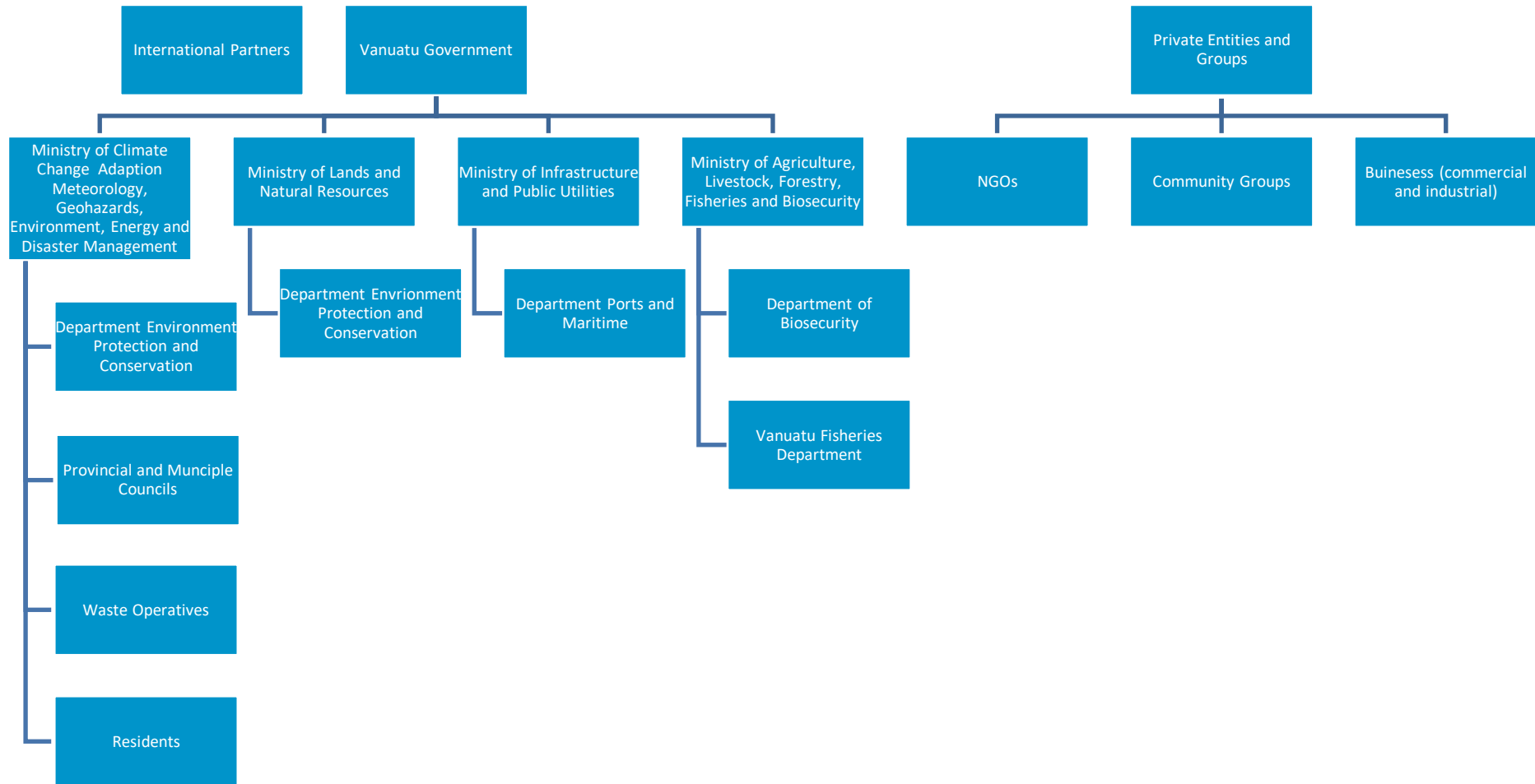


Figure 4: Vanuatu stakeholder map

2.5 Roles and responsibilities

The Department of Environment Protection and Conservation (DEPC) falls under the jurisdiction of the Ministry for Climate Change Adaptation, Meteorology and Geo-Hazard, Environment, Energy and Disaster Management and is responsible for overseeing, coordinating and implementing many of the policies discussed in this report.

The DEPC mission is to create an environmentally sustainable Vanuatu by ensuring waste is collected, reused, recycled and waste to landfill and pollution to the environment is reduced and treated by technologies suitable to location conditions. The department has developed the National Environment Policy and Implementation Plan (NEPIP) 2016–2030 that aligns with the National Sustainable Development Plan (NSDP) and the regional Cleaner Pacific 2025 strategy.

The DEPC is responsible for Vanuatu’s *Environmental Protection and Conservation Act* and National Waste Management and Pollution Control Strategy and Investment Plan 2016–2020 (NWMPCSIP). The original strategy covered the period from 2011 to 2016 and its implementation was to be coordinated by the DEPC. However, due to lack of human resources within DEPC, provinces and municipal councils, the strategy was not sufficiently implemented. The NWMPCSIP highlights that DEPC is the responsible agency to plan for the following:

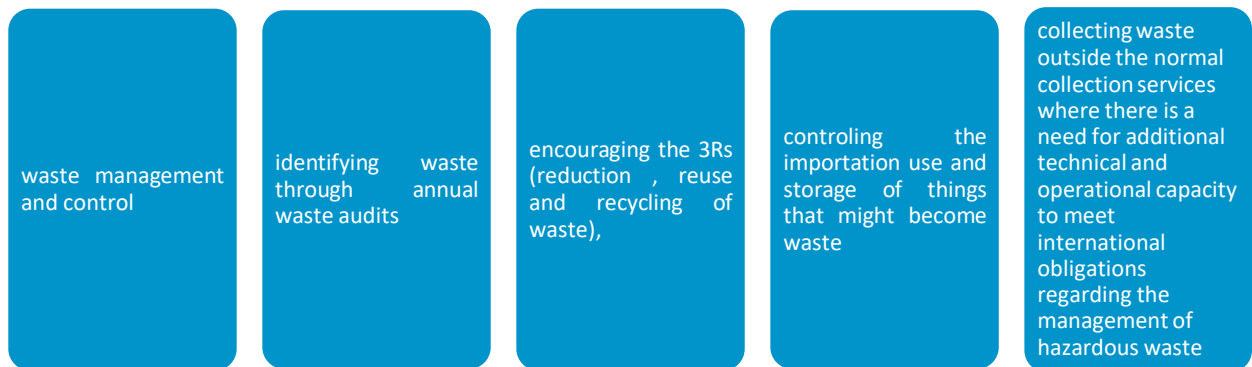


Figure 5: DEPC responsibilities under the NWMPCSIP 2016–2020

The DEPC and Department of Ports and Marine (DPM) are also responsible for compliance with the multilateral environmental agreements shown in Figure 6.

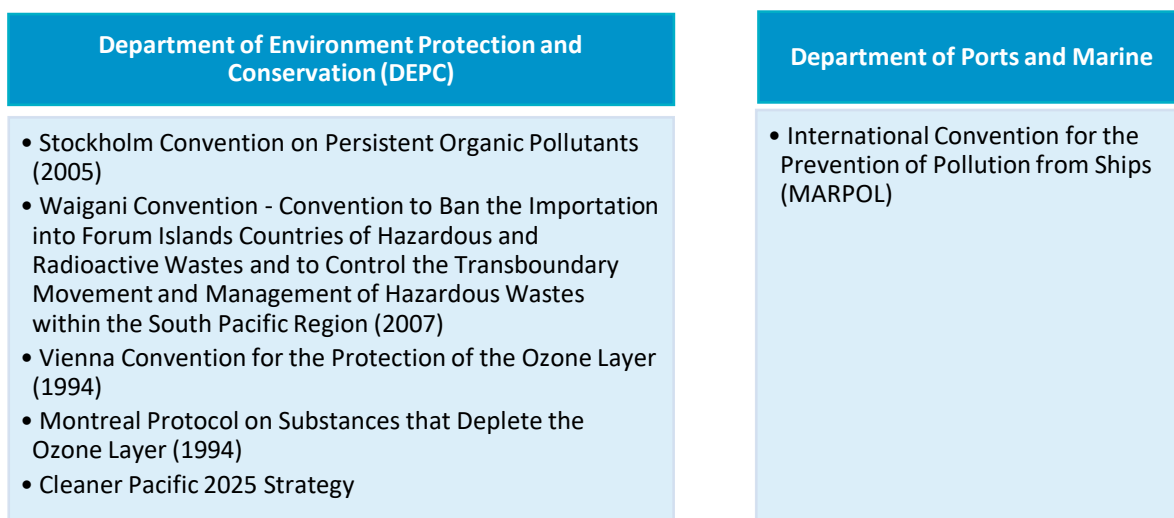


Figure 6: Responsibilities for multilateral agreements and strategies

The Acts also establish a list of penalties for non-compliance. The Waste Management Act No. 24 of 2014 stipulates that all six provinces and three municipalities should submit annual Solid Waste Management plans to the DEPC. Plans have been prepared by the municipalities of Port Vila (2008), Luganville (2013), and Lenakel (2015). Sanma Province is the only province that has developed a solid waste management plan (2013). Port Vila Municipal Council has drafted a prepaid garbage bag bylaw which is waiting to be gazetted.

The three municipal councils – Port Vila Municipal Council (PVMC), Luganville Municipal Council (LMC) and Lenakel Town Municipal Council (LTMC) – are responsible for all waste management activities undertaken within their jurisdiction. Solid waste management, including collection points and services, transport of waste, disposal at landfill and landfill management, all fall under the *Pollution Control Act No. 10 (2013)* and *Waste Management Act No. 24 (2014)*.

Details of Order 16 and 17 under the Waste Management Act No. 24 (2014) are provided at Appendix A A and Appendix B.

Table 3 below outlines responsible agencies within Vanuatu for urban and peri-urban rural areas.

Table 3: National Waste Management and Pollution Control Co-ordinating Committee Members

Organisation	Responsibility	Urban	Peri-urban/rural
Municipal council	Landfill management		✓
	Waste separation and collection points	✓	
	Market waste collection and transport	✓	
	Waste collection and transport	✓	
	Municipal solid waste management	✓	
Provincial government council	Waste collection, transport and disposal		✓
Biosecurity department	Biosecurity waste management	✓	
Pacific Petroleum Oil Company	Waste oil collection and transport	✓	
Energy department	Waste oil collection and transport	✓	

Wan Smol Bag	Waste management awareness	✓	✓
Live & Learn Vanuatu	Waste management awareness	✓	✓
Tourism department	Urban beautification	✓	✓
	Co-ordination with tourism operators and associations	✓	✓
Water Resource Department	Pollution control to water sources	✓	✓
Ministry of Infrastructure and Public Utilities	Pollution control from drainage and road constructions	✓	✓
	Vehicle emissions	✓	✓
Public Health department	Medical waste management	✓	✓
	Sanitation awareness	✓	✓
Telecommunications regulator	e-waste disposal	✓	✓
Customs department	Financial incentive schemes	✓	✓
	Extended producer responsibility	✓	✓
Ministry of Foreign Affairs and External Trade department	Facilitate ratification/amendments of multilateral environmental agreements (conventions)	✓	✓
Ports and Harbour department	Garbage record book for domestic vessels	✓	✓
	Marine pollution control	✓	✓
Agriculture department	Compost training	✓	✓
Ministry of Education	Awareness co-ordination for primary and secondary schools	✓	✓
	Waste management curriculum	✓	✓
Vanuatu Christian Council	Awareness co-ordination for churches	✓	✓
National Disaster Management Office	Disaster waste co-ordination	✓	✓
Chamber of Commerce and Industry	Private sector partnership co-ordination	✓	✓

Source: Department of Environmental Protection and Conservation, 2016

Traditional leadership remains an integral part of Vanuatu's government system. The government receives advice on Vanuatu culture and language from the National Council of Chiefs (Malvatu Mauri). Members of the Council are elected by fellow chiefs sitting on the district council of chiefs.

The Department of Energy's *Environmental Code of Practice (Used Battery Disposal) for [the] Rural Electrification Project of June 2014* relates to the management of used lead-acid and nickel-cadmium batteries. It stipulates that vendors of photovoltaic solar systems are to adhere to the appropriate collection and disposal of such end-of-life batteries. The Department of Environment is to construct storage facilities for end-of-life batteries in the outer provinces.

The *Maritime Authority Act (Amendments) 2002, 2003, and 2004; Maritime (Conventions) Act 2006; and Pollution Control Act 2013* provide for the control of marine pollution. *Public Health Act 1994*, administered by the Ministry of Health, relates to the placement of bins in public places and the prevention of littering.



The Department of Tourism created a tourism accreditation framework in 2014 for the endorsement of the Vanuatu Tourism Operators Minimum Standards for a business licence. The standards prevent negative impacts on land and marine environments and the burning of plastic, as well as encouraging the appropriate disposal of waste (PRIF, 2017).

3 Situation analysis: waste management

3.1 APWC scoping and data collection visit

In order to fulfil the requirements of the contract, current and up-to-date data was collected in-country. This data forms the basis of all best-practice recommendations as well as the training schedule for this project. APWC undertook an in-country work visit from 2 November to 24 November 2018. This time frame avoided the rainy season and the holiday period, both of which can have detrimental effects on the outcomes of waste generation and disposal data. APWC had a five-member team supported by our in-country staff in each location. The team for Vanuatu is listed in Figure 7.

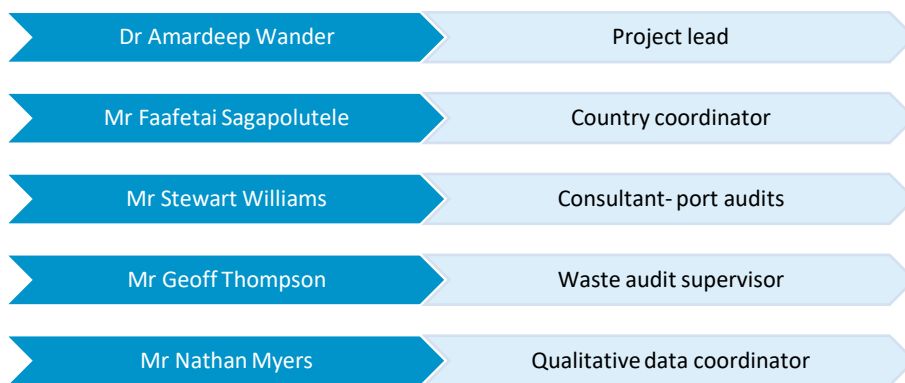


Figure 7: APWC country team for Vanuatu



Image 2: Example of waste burning, Port Vila

The work undertaken by the team included the following:

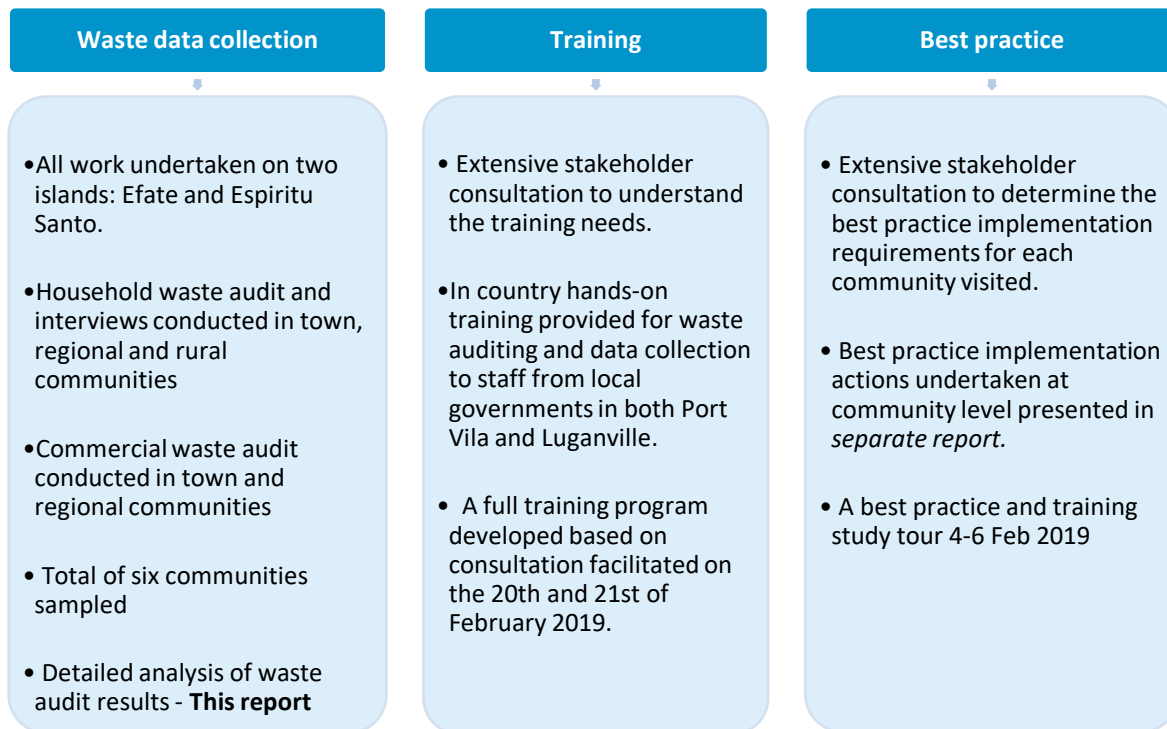


Figure 8: In-country work undertaken

Data collected from this visit is presented in sections 3 to 7 of this report. The gap analysis and recommendations are a result of both qualitative and quantitative analysis of this data.

3.2 Waste service provision

Municipal solid waste (MSW) on each of the main islands is managed by the municipal councils for the largest cities on each island. MSW for the surrounding province is the responsibility of the provincial government, except in the case of Espiritu Santo, where the provincial and municipal councils have arrived on a mutual understanding to adopt a shared services model.



The J-PRISM Project identified the amount of waste generated within each municipality by undertaking waste audits biennially. J-PRISM is a decade-long project developed to realise the commitment of the Government of Japan at the 2nd PALM (Japan-Pacific Leaders' Meeting) in 2000. JICA started assisting Pacific Island Countries in terms of solid waste management in collaboration with SPREP. Ongoing data collected through waste characterisation surveys is useful for an

organisation’s future planning to improve waste management within their respective service areas. Developing technical capacity for provinces and municipalities remains a national priority if Vanuatu is to achieve nationally sustainable waste and pollution management (Department of Environmental Protection and Conservation, 2016). Table 4 below outlines waste disposal methods across each of the six provinces and two municipalities.

Table 4: Method of waste disposal by number of households

	Province						Municipality		Total
	Shefa	Sanma	Torba	Penama	Malampa	Tefea	Port Vila	Luganville	
Authorised waste collection	6,539	1,857	49	175	26	16	5,993	1,745	16,400
Take to central place	1,565	835	409	1,558	1,421	53	400	112	6,353
Burn	6,573	5,102	423	1906	5,536	5,130	2,344	495	27,509
Recycling	31	128		163	28	5	19	36	410
Lagoon/ocean/stream	35	145	67	171	95	5	4	18	540
Bury	968	753	419	265	456	142	188	91	3,282
Composting	149	140	92	1,976	401	157	67	34	3,016
Other	70	253	307	406	28	345	39	21	1,469

Source: Government of the Republic of Vanuatu. Vanuatu Infrastructure Strategic Investment Plan 2015-2024 (VISIP 2015–2024 Infrastructure Challenges) (National Census 2009)

Both municipalities, PVMC and LMC have implemented a user-pays system for residential and commercial solid municipal waste collection. A prepaid bag system was introduced by LMC in 2012 following an extensive awareness campaign. PVMC implemented their prepaid bag system in early 2014, with full implementation in September 2015. DEPC stated the main purpose for using the prepaid bags is ‘to encourage source minimisation like home composting and aluminium can separation so the final disposal of waste at the dump site of landfill is at least minimum’ (Department of Environmental Protection and Conservation, 2016). SPREP highlights that a prepaid garbage bag system allows people to know how much they must pay for managing their own waste and may help residents to reduce the contents of the bag and thereby reduce waste to landfill. Sinclair et al. (2000) noted that the ability for the public to pay is something to be taken into consideration.

3.2.1 Efate - Port Vila Municipal Council

The Port Vila Municipal Council has introduced a prepaid bag system to improve its collection services. PVMC offer two different sizes of yellow bags for residential and commercial areas and buildings. PMVC negotiated a more favourable contract for their bags and therefore receive a higher commission than LMC.

Table 5: Size and price of the prepaid bags used by PVMC

Municipal council	Bag colour	Size of bag	Price/bag (VUV)	Price/roll (VUV)
PVMC	Yellow	100 kg	100	1,500
		70 kg	80	850

Source: Department of Environmental Protection and Conservation, 2016



Image 3: Waste collection from litter bins and yellow bags placed outside households for collection

Waste Wise Consulting (2018) found that the PVMC originally introduced a prepaid bag in 2010 with limited success, and it was later reintroduced in 2014 via newspaper articles, radio and a TV campaign. However, the campaign faced several logistical challenges, including incorrect prices printed, insufficient stock and stock depletion. In a request for tender, local grocery store Au Bon Marche won the contract to supply and distribute the prepaid yellow bags. The contract was due to be reviewed in December 2018. Either a large (70 litre) or small (45 litre) yellow bag can be purchased as a single bag or as a pack of 12. The cost per bag is 100 VUV (large) or 75 VUV (small), with no discounts offered for buying in bulk.

The PVMC receives 40 VUV for each large bag sold and 30 VUV for each small bag sold. Wholesalers can also make a marginal profit from the bags by purchasing the large bags for 80 VUV and the small bags for 60 VUV, making a 20 VUV and 10 VUV profit respectively. WWC suggests most households in PV place a yellow bag out for collection on a weekly basis, and therefore assume the yellow bag scheme participation rate is close to 100%.

Table 6: Yellow bag sales figures: Port Vila

Bag type	Unit	2016	2017	2018**
Large yellow bag sales	Number	276,731	374,056	416,946
Small yellow bag sales	Number	92,165	131,212	150,812
Total yellow bag sales	Number	368,896	505,268	567,758
Yellow bag	Number per household* per year	33.5	45.9	51.6
Yellow bag	Number per household* per month	2.8	3.8	4.3
Yellow bag	Number per household* per week	0.7	0.9	1
Participation rate	%	70%	90%	100%

*Based on household number = 10,992 for each year **Extrapolated out for 12 months based on 6 months data

Source: Waste Wise Consulting, 2018

PVMC has divided the city into five wards, with each ward having a ward secretary. All households and businesses place their waste in yellow plastic bags in front of their premises on raised platforms, on the ground at front doors and sometimes in cages. Collections are undertaken once a week from each ward and a final sweep of all areas is done on Fridays to ensure a comprehensive collection service. Commercial collections are undertaken everyday along with the roadside litter bins. Commercial premises use any bags and the litter bins are lined using black bags.

The collection schedule is as follows:

Table 7: Collection schedule for PMC

Day of week	Area serviced
Monday and Wednesday	Central and southern wards
Tuesday and Thursday	Freshwater, Northern and Anamburu ward
Friday	Sweep of all areas
Saturday (half day)	Main streets
Every day	Commercial collections

PVMC operates 10 trucks in total. Of these, seven were working at the time of APWC visit. Of the 10 trucks, six are flatbeds and four are compactors. Compactors seem to break down more frequently (of the four trucks not operating at the time of the visit, three were compactors). Work hours for collection staff are 7.30 am to 2 pm for those undertaking household collections. The staff carrying out commercial collection work from 4 am to 11 am.



Image 4: PVMC staff undertaking yellow bag collections

There are 19 waste collection staff including the waste collection supervisor and one staff member (Waste Management Officer) based at the council office. At the time of APWC’s visit, a JICA (Japan International Co-operation Agency) volunteer was also based in Port Vila.



Image 5: PMVC compactor truck for commercial collections

The staff on the waste collection vehicles are provided with some personal protective equipment (PPE), which they were seen to be using during the visit.

PVMC does not currently have a collection area map.

There are approximately 15 private contractors in Port Vila, as well as an NGO undertaking collections from certain communities and villages, including the greater Port Vila area. The licence for operation of a waste collection business must be issued through DEPC and only 10 such licences have been issued.

Contractors appear to advertise their services through Facebook and the Yellow Pages, and in most cases these services are on par with or slightly more expensive than using the yellow bag. It is estimated that private waste collectors account for less than 10% of the waste collected. APWC encountered two that are listed below:

3.2.1.1 *Pango Green Force*

Pango Green Force (PGF) is a registered youth project set up to promote a healthier environment, give employment opportunities to young people and to help improve livelihood of PGF members. PGF aims to provide equal employment opportunities for members without prejudice to promote stronger participation and decision making within Pango village. The business is projected to reach at least 500 youths, 20 community groups and six resorts by end of 2020.



PGF provides the following services:

- a) Household waste collection service: PGF offers general household garbage collection services to all residents, resorts and villages residing in and around the boundaries of Pango
- b) Sale of plastic bags at 150 VUV and 200 VUV
- c) Charter pickups at 2,500 VUV
- d) Monthly contracts, starting at 2,000 VUV per month with weekly pickups.

3.2.1.2 *CK's Rubbish Removals*

CK's Rubbish Removals is a private waste collection business run by Chris Kaltabang. He has been involved in the waste sector in Port Vila for about 12 years. Chris belongs to Ifira Island and therefore provides a prepaid bag service to the community. The colour of bag provided to the Ifira community is white and it works in the same manner as the yellow bag.

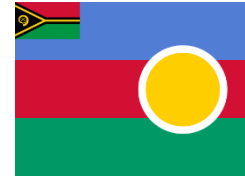


The difference is that waste is collected weekly by the community and then picked up by CK's staff in a boat, brought back to Port Vila where it is loaded onto a truck to be disposed of at the Bouffa landfill. CK's also services a number of large resorts and commercial premises in Port Vila.

The community of Lelepa (visited as part of this project) is without a rubbish collection and disposal system.

3.2.2 Efate - Shefa province

Located in the centre of the country, Shefa is one of the six provinces of Vanuatu. The province's name is derived from the initial letters of Shepherd Islands, Epi, and Efate which make up the province. With a population of 78,723 and an area of 1,455 square kilometres, it is home to the nation's capital city Port Vila, which is located on mainland Efate.



Efate is the most densely populated of the 27 islands that make up Shefa. Efate is surrounded by several smaller islands: Iririki, Ifira, Eratap, Erakor, Erueti Lep, Eratoka (Hat), Lelepa, Moso, Nguna, Pele, Kakuhla, and Emao. To the north are the Shepherd Islands, which includes Naore, Etarik, Matasao, Makura, Emae, Buninga, Tongariki, Tongoa, Ewose, and Laika. Beyond Shepherd islands lies Epi, Tefala, Namuka and Lamén. Some of these islands are uninhabited. The APWC team visited and assessed Iririki, Ifira and Lelepa islands for this study as well as undertaking waste assessments in the rural area of Black Sands on Efate.

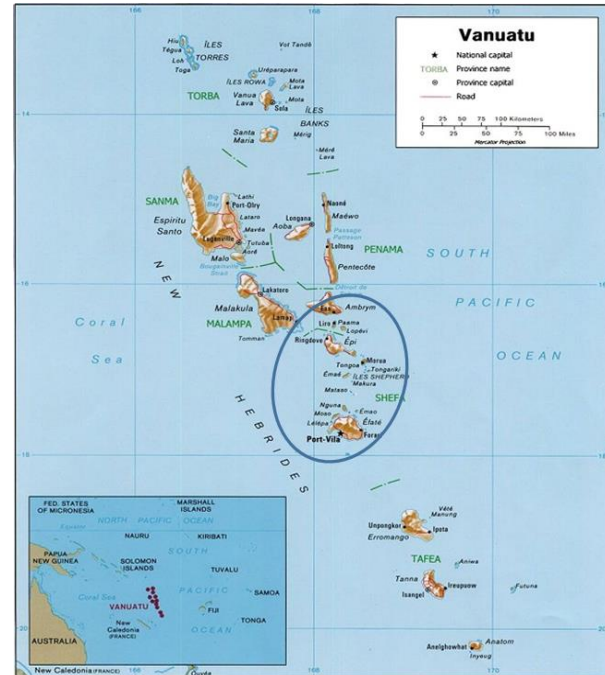


Image 6: Map showing Shefa province

The Shefa provincial government is responsible for waste management in the province. When the yellow bag was introduced in Port Vila, the surrounding population in Shefa also started using the bags. However, PVMC does not collect yellow bags from outside its boundary. Therefore, Shefa provincial government pays six contractors to undertake collection of yellow bags (or waste placed in any other bags) within the province. The bags are placed on platforms in front of homes in the same way as Port Vila or at designated collection points. Contractors provide trucks and workers and are paid on a monthly basis. The provincial government's source of income is a property tax, which does not specify the provision of a waste service. Only a 50% recovery rate is achieved for property tax, which results in a restricted revenue stream. APWC consultation revealed that often contractors cannot be paid by the government due to lack of funds.

There are approximately three private contractors active in the waste management that are not employed by the Shefa province. These contractors are mostly responsible for servicing large resorts and some commercial properties using black bags.

The Shefa provincial government does not currently own a landfill. All waste goes to the Bouffa landfill, with each trip costing approximately 2000 VUV to the contractor.

The government has plans to introduce a prepaid pink bag in an attempt to claw back revenue that is currently going to PVMC through the yellow bag sales. The government is also aware that it will need to review the tax system if it introduces the pink prepaid bag in order to ring fence the money.

There are also plans to build a landfill in the Shefa province with the support of a French investor, but this venture is in the preliminary stages of investigation.

The collection areas in Shefa province and the collectors responsible are provided in Table 8.



Image 7: Any type of bags can be placed on stands for collection in Shefa province

Table 8: Collection schedule for Shefa province

Name of contractor	Area serviced
Roy Neil	Beverly Hills subdivision
Rory Chilia	Mele area
Roro Sambo	Tanvasoko Area
James Kalkawa	North Efate
Kattakel Ayeng	Evatap Area
Express Rubbish Removal	Evakor Area
Pango Green Force	Pango Area

3.2.3 Espiritu Santo – Luganville Municipal Council

Luganville, the second largest city in Vanuatu, is located within the Sanma province on the island of Espiritu Santo. The mini-census, completed in 2016 after Cyclone Pam, states the population was at 16,312 and the number of households at 3,056. According to Luganville Municipal Council (LMC), the population is estimated to exceed 18,000 in 2018. This is primarily due to the influx of residents from Ambae that are now permanently residing in Espiritu Santo after evacuation during the eruption of Manaro Voui volcano in September 2017.

Table 9: Population of Luganville

	1990	2009	2018 (estimated)
Sanma province	36,084	45,855	54,184
Luganville township	11,388	14,081	18,890
Municipal Luganville	10,738	12,089	15,951
Peri-urban Luganville	1,368	1,992	2,939

Source: LMC

The waste management challenge for LMC is its limited ability to expand the waste collection service as a result of the lack of vehicles and the prepaid bag revenue not being set aside for expenditure on waste only.

Many of the new Ambae residents are settling outside the LMC boundary, increasing the pressure for LMC and Sanma province to co-ordinate an extension of the collection service area. Added to this, those settling within the LMC boundary are not aware of how the red bag system works and therefore a new awareness/education programme will be necessary.



Image 8: Red bag placed on a platform for collection in Luganville

Further, a recent study conducted in 2018 indicates that even with the presence of a highly successful and reliable waste collection system, the number of people burning their yard waste has increased from 46% in 2014 to 60% in 2018, a side-effect of the introduction of a user-pays system.

Presently, there is a limited number of stakeholders involved in the waste management sector in Luganville, which makes it easier for improvements to be suggested for the council area and the province as a whole.

The major stakeholders in the LMC waste management are:

- Food vendor buyers – purchase small amounts of PET bottles (approximately 20)
- Kava bar owners – buy small amount of beer bottles (approximately 30)
- Dumpsite waste-pickers – collect different kinds of materials at the Luganville Municipal dumpsite
- Street-pickers – collect PET bottles, Tusker beer bottles, aluminium cans
- Local factories – collect recoverable materials from the dumpsite
- Council waste collectors – collect materials from collection sources and dumpsite
- Church groups, youth groups, schools and communities (street and coastal clean-up)
- Recycle Corp – hasn't been in Luganville consistently and therefore unreliable.

LMC have introduced a prepaid bag system to improve their collection services in 2012 after a long awareness campaign and introduction of a by-law (Waste Management By-law (No. 38) of 2013). In 2014 LMC gazetted the PrePaid Garbage Bag for Waste Collection By-law, (No. 70) of 2014. The bags are offered in one size only. LMC were not able to negotiate a favourable contract for their bags and only receive 20 VUV per 80 VUV bag sold to the public.

Table 10: Size and price of the prepaid bags used by LMC

Municipal council	Bag colour	Size of bag	Price/bag (VUV)	Price/roll (VUV)
LMC	Red	15 kg	80	1,200
			70	1,400 (20 bags)
			60	30,000 (500 bags/carton)

Source: Department of Environmental Protection and Conservation, 2016.

According to research conducted by Waste Wise Consulting (2018), in 2015 a request for tender (RFT) to import, store, supply and distribute the prepaid red bags was won by a local hardware store, Santo Hardware. It was originally a three-year contract now in its second term and due to expire 2020. Red bags can be purchased as a single bag or as a roll of 20. The cost per bag is 80 VUV (single), 1,400 VUV (roll of 20) or 30,000 (box 500). A discount is in place for a purchase of a roll (70 VUV each) or box (60 VUV each).

The LMC receives 20 VUV for each bag sold. To reflect a VAT increase in 1 January 2018 from 12.5% to 15%, LMC and Santo Hardware have agreed to increase the cost of future bags to 85 VUV.

Table 11: LMC red bag sales figures

	2015	2016	2017	2018**
Total sales	30,380	55,555	59,250	63,977
Red bag/household*/year	9.9	18.1	19.3	20.9
Red bag/household*/month	0.8	1.5	1.6	1.7
Red bag/household*/week	0.22	0.4	0.4	0.4
Participation rate	20%	40%	40%	40%

*Based on household number = 3,056, **Extrapolated out for 12 months based on 8 months' data.

Source: Waste Wise Consulting, 2018



The red bags are collected by LMC using a flatbed truck as well as a compactor. The compactor was donated by JICA. The availability of trucks is the limiting factor for LMC expanding its collection services to the surrounding Sanma province.

The joint Luganville Municipal Council and Sanma Provincial Government Waste Management Plan 2013–2016 was adopted by both authorities. No further waste management plans have been written since 2016 but an updated versions of the original action plan were completed in 2016 and 2018 to ensure continued progress is made. Both LMC and Sanma provincial governments are supportive of the shared services model whereby LMC would expand its waste management services to the province and the province would in return pay LMC for the provision of this service. The service would be expanded using the yellow bag system.

The current collection service provides a 48% to 52% coverage for waste collection based on a JICA study undertaken in early 2018. Luganville has a population of approximately 17,000, representing about 3,000 households. Based on these figures, approximately 1,500 households are serviced once a week with a single council-owned compactor truck. The collection schedule is provided at Appendix C.

The Waste Management By-law stipulates that everyone use the red bag system. The fine for not using the red bag is 20,000 VUV. There are plans to expand the by-law that would in turn make burning of waste illegal in Luganville. Council hopes that this would lead to a higher uptake of the red bags.

Commercial premises pay the cost of waste management in two instalments per year. The costs are below (in VUV):

- Small business: 13,500 per year
- Medium business: 52,000 per year
- Large business: 78,000 per year

LMC has also initiated the collection of cardboard from businesses every Friday. APWC witnessed very successful source segregation of cardboard. Quantification of the amounts being recycled was also undertaken.

The islands of Tutuba and Mavea do not have a waste collection system in place. Neither community has an appropriate mode of disposal for generated waste.

3.3 Current financial mechanisms

3.3.1 Port Vila Municipal Council

Funding for waste collections conducted by PVMC was derived directly from half-yearly waste collection fees, annual property taxes and tipping fees at Bouffa landfill. According to PVMC, property tax is calculated at 5.5% of the rateable value of the property. Factors, such as size of property, location, the quality of building and materials used all play a factor in the rateable value¹.

Asian Development Bank (ADB) found in 2014 that PVMC invoiced a small percentage of properties, however approximately 60% of properties billed paid the invoice. At the same time, waste collection fees were invoiced half yearly to residential, commercial and government properties registered within the municipality. The charge issued was a flat fee of 7,500 VUV. Hotels, however, were charged as multiple units, making the fee more expensive. Although recent census data stated 10,300 households existed and ADB assumed approximately another 1,000 unregistered commercial and government properties existed in Port Vi, only 4,000 invoices were sent to registered properties, highlighting a large percentage of properties were not paying the waste collection fee.

In 2014 the ADB found that there was no solid waste management budget at the national or provincial level. The municipal councils of PVMC and LMC had a number of review streams from waste management as per the table below, however, there was no budget established for improvements or awareness education. During the 2018 APWC visit, both councils seemed aware of this issue and recognised the need to remedy it.

¹ Port Vila Municipal Council. Process of Valuing and Determining Property Tax [accessed: <http://www.pvmc.gov.vu/en/property-tax/valuing-property-tax-27/11/2018>]

Table 12: PVMC waste management finances

	2014	2015	2016	2017
Expenditure				
Collection expenses				
Waste collection truck maintenance (repairs)	300,000	100,000	1,000,000	2,428,211
Waste collection truck fuel	4,752,000	4,752,000	4,752,000	9,343,591
Landfill site				
Landfill maintenance	0	0	500,000	145,058
Landfill equipment/vehicle maintenance (repairs)				1,196,279
Hire landfill equipment	0	0	0	7,239,187
Landfill equipment/vehicle fuel	0	0	0	3,361,992
Solid waste management education				
Education/awareness	100,000	100,000	100,000	0
Total expenditure	5,152,000	4,952,000	6,552,000	23,714,318
Income				
Yellow bags large	0	15,000,000	11,069,240	14,962,240
Yellow bags small	0	0	2,764,950	3,936,360
Business house fee	0	200,000	0	0
Landfill gate fees	10,000,000	10,000,000	10,000,000	10,018,913
Fines illegal burning	0	0	0	2,413,361
Total income	10,000,000	10,200,000	23,834,190	31,330,874

Source: Waste Wise Consulting, 2018

The following is of interest, however:

- The data collection for PVMC is reasonably poor and all revenue from the sale of yellow bags goes directly to a consolidated account. This makes it difficult for the waste department to make decisions. This is also the case with LMC which is now in the process of creating a separate waste management account. It is difficult to ascertain how long it would take to achieve this without some support.
- The Waste Management Department has made a profit and was therefore sustainable from 2014–2016. However, in 2017 there was a net loss of more than 4 million VUV due to the hire of landfill equipment at a cost 7 million VUV. This substantial expenditure needs to be investigated and reduced if possible.
- There are anomalies in the budget and expenditure of waste collection vehicle fuel. Actuals for 2014–2016 vary greatly from that allocated in 2017, and from a 12 month extrapolation based on a one-month fuel record for eight working vehicles in 2018.

3.3.2 Luganville Municipal Council

LMC has a number of revenue streams as listed in Table 13.

Table 13: LMC waste management finances

	2015	2016	2017	2018
Expenditure				
Collection expenses				
Vehicle running expenses	1,000,000	1,000,000	1,000,000	554,846
Staff uniforms			108,000	205,000
Landfill site				
Maintenance	100,000	100,000	100,000	
Bulldozer hire	1,000,000	1,000,000	100,000	181,913
Total expenditure	2,100,000	2,100,000	1,308,000	941,759
Income				
Red bags	607,608	1,111,111	1,185,000	959,667
Business house fee	1,201,006	1,398,308	684,000	2,887,022
Landfill gate fees	926,097	665,084	2,304,000	1,437,221
Compost	11,398	26,200	13,688	45,217
Fines	20,000	26,200	20,000	0
Total income	2,766,109	3,226,903	4,206,688	5,329,127
Net profit/(loss)	666,109	1,126,903	2,898,699	4,387,368

Source: Waste Wise Consulting, 2018

Matters of interest at LMC are:

- The data collection for LMC has been reasonably effective over the past four years and all incoming and outgoing costs are inputted into a MYOB accounting package under separate line items.
- All revenue from the sale of yellow bags goes directly to a consolidated account. LMC is now in the process of trying to create a separate waste management account.
- LMC needs to keep more effective records of income from landfill. Currently, the records are kept sporadically and are dependent on the availability of a waste management officer.
- The Waste Management Department is making an annual profit but not enough to purchase more equipment.
- The cost of the equipment hire for moving waste at landfill remains high and one which could be mitigated through the provision of an excavator.
- The red bag sales have continued to increase, but at a much slower rate than expected. A better deal needs to be negotiated for the split of income from the red bags.
- The compliance to waste management fees is quite low (at about 30%) and can be improved.
- The compost sales have increased due to a better pricing system.

3.4 Recycling in Vanuatu

The NWMPSCIP adopted by the government involves working towards the sustainable financing of waste management and pollution control from internal sources. It also aims to create revenue streams from waste, such as a container deposit scheme (CDS).

Recycling is currently undertaken by a private company, RecycleCorp. RecycleCorp is active in collecting aluminium cans, glass, scrap metal and batteries and even some e-waste for recycling.



Image 10: RecycleCorp yard in Port Vila

Table 14 below highlights the value of some products currently recycled. However, RecycleCorp has faced challenges in the last few years in their ability to export their consolidated recycled materials. The signing of the Basal Convention by Vanuatu will solve some of these issues but a substantial amount of support is required to ensure Vanuatu has a thriving recycling sector.

Table 14: Price of collected recyclable materials

Name of recycling company	Recycling item	Value (Vatu)* 2015	Value (Vatu)* 2018
RecycleCorp Vanuatu	Copper	200 VUV/kg	
	Brass	120 VUV/kg	
	Aluminum (Al)	40 VUV/kg	2 VUV/kg
	Gear Box	10 VUV/kg	
	Lead-acid batteries	10 VUV/kg	
	Stainless steel	40 VUV/kg	5 VUV/kg
	Compressors	10 VUV/kg	
	Brass radiators	120 VUV/kg	
	Aluminum radiators	100 VUV/kg	
	Electric motors	10 VUV/kg	
Kava bars/markets/ Azure pure water	PET bottles		10–20 VUV/bottle
	Beer bottles (glass)		10VUV/bottle
	Paper/cardboard	N/A	20–30 VUV/kg

Source: Department of Environmental Protection and Conservation, 2016

*APWC stakeholder consultation in November 2018. Please note collection of certain items is limited due to the crash in the international export market for recycled goods.

RecycleCorp also owns a scrap yard in Luganville and has previously collected scrap metal and aluminium from Santo. However, its activity beyond Port Vila has been limited in the recent years. RecycleCorp collects directly from pickers at the landfill and provides 240-litre mobile garbage bins (MGBs) to commercial premises (for a cost) in Port Vila.

There are numerous community-level recycling and clean-up projects in both Port Vila and Luganville. These are summarised in Section 5.

None of the islands visited in Sanma or Shefa provinces had access to any recycling services.

3.5 Waste management infrastructure

The Department of Environmental Protection and Conservation (2016) highlights that ‘due to a lack of proper waste management and pollution control strategy, our environment has become constantly strewn with litter and uncollected garbage. Rubbish has been dumped in rivers, lakes, waterways, bushes, roads and public areas.’

Eighty-two per cent of households outside urban areas either burn, bury or throw waste into bodies of water. This is a public health problem and an environmental issue as such actions increase the amount of pollutants discharged. This revised strategy is based on best-practice approaches to ensure the major negative aspects of waste disposal are addressed in both urban and rural communities of Vanuatu. Implementation of this strategy and enforcement of regulations under the Waste Management Act and the Pollution Control Act will result in greater volumes of final residual wastes disposed at the landfills significantly reduced (Department of Environmental Protection and Conservation, 2016).

The PVMC does not undertake any formal recycling collection systems. Recycling is led by private companies and NGOs. A number of trials and small-scale projects are currently underway.

3.5.1 Bouffa semi-aerobic landfill – Port Vila

Bouffa semi-aerobic landfill is located on the island of Efate, 8.5 kilometres from Port Vila. Servicing the largest population centre in Vanuatu, Bouffa commenced operation in 1995 and provides a disposal point for domestic, commercial and industrial waste collected by the municipal council as well as waste dumped by the general public.

In 2000, SPREP noted the site was approximately 15 hectares in size, had a capacity of 525,000 cubic metres and was designed with a lifespan of 15 to 20 years.



Image 11: Bouffa landfill

Operating hours	Staffing	Gate fees	Equipment
<ul style="list-style-type: none"> • Mon to Fri: 7:30am -11:30am and 1:30pm -4:00pm • Saturday: 7:30am - 11am 	<ul style="list-style-type: none"> • one person at the gate each day 	<ul style="list-style-type: none"> • camino: 1,800VUV • ute: 1,200 VUV • car: 600VUV • bags excluding red bags: 60VUV each • Yellow bags: free 	<ul style="list-style-type: none"> • 2 excavators. Only one was working at the time fo the visit. • 1 bulldozer funded by JICA in 1998 during the building of the cell. It is now not working

Figure 9: Operating conditions at Bouffa landfill

SPREP also highlighted that although a leachate control system was designed for the site, it had not been installed and monitoring devices had been lost. Ponds designed to capture stormwater and leachate had been used instead for hazardous waste.

In 2008 JICA reported that the municipal council had recorded an average discharge rate at landfill of 51.8 tonnes per day (JICA, 2008). According to the latest JICA report from 2016–17 this discharge rate has increased to almost 57 tonnes a day.

A large number of donor-funded works have been undertaken at the Bouffa landfill. These include the following:

1. **2006–2008 JICA:** In 2006 approximately 100 million VUV was injected into the site by JICA under ‘Project on Improvement of Bouffa Landfill in the Republic of Vanuatu’ to rehabilitate and build capacity. On the completion of the project in 2008, PVMC confirmed that the site would effectively have an operational life of seven years with opportunity to extend towards the northern end of the landfill site. The leachate pond became operational in 2008 and all fill was covered. JICA also supplied equipment, including a tipper truck, excavator and bulldozer. None of this equipment was operational in 2018 during APWC visit.



Image 12: Access road for trucks



Image 13: Tip face Bouffa landfill



Image 14: Sloping back face of Bouffa landfill

2. **July 2012: Regional training on waste landfill maintenance operations:** This initiative was funded by J-PRISM I and attended by Samoa, Tonga, Papua New Guinea, Fiji and Solomon Islands waste landfill staff. Faafetai Sagapolutele conducted the training on the construction of perforated concrete leachate pipes (60 cm diameter), setting up of a trickling filter for leachate treatment, rehabilitation of broken gas ventilation pipes and general daily maintenance operations (for example, setting up of daily unloading areas, waste pushing and compaction, soil cover).

3. **2013–2014: Improving data management and introduction of the current tipping fee system:** Data capture commenced on 21 June 2014, consisting of manually recording vehicle type and capacity, type of waste and the location waste was collected. Mr Berry Mahau, assistant landfill manager was trained by Faafetai Sagapolutele to enter the data from the filled forms on the

incoming waste to the site and to provide monthly reports on the incoming waste, collected gate fees, and other relevant details. However, management change has led to the transfer of Mr Berry to the landfill and therefore the important task of data collection is not being carried out. The NWMPCIS aims to install a weighbridge on the site to capture waste data by 2019.

- 4. November 2016: Rehabilitation of the site funded by PacWaste Project:** PacWaste is a EU-funded initiative. This project consisted of repairing the underground main leachate pipe, replacing damaged vertical gas facilities, clearance of waste along the main access, creating a new access on the disposed waste for direct entry to the available space at the back, and building a disposal cell for asbestos. As part of the report, some follow-up actions were also included, but some have only been partially implemented.



Image 15: Tyres and other bulky waste at Bouffa landfill



Image 16: Damaged sign at Bouffa landfill

During APWC’s visit to the landfill in November 2018, we noted that the access road is still available, the leachate pipes and vertical gas facilities are also operational. It appears some initial segregation of waste took place onsite but this has now been abandoned. The active face of the landfill was piled high because of the lack of availability of an excavator (currently not operational) to push the waste back.

The APWC team witnessed extensive scavenging activity at the Bouffa landfill. The waste pickers range in age from six to 60 years and sometimes include entire families. The pickers are removing everything from food scraps for their animals to scrap metal, plastic bottles, copper, brass, aluminium, glass bottles, paper and cardboard. Some work by themselves while others work in groups. Each scavenger interviewed picks about one to two 240-litre MGBs full of materials each day. The materials (mostly scrap metal and aluminium cans) are stored in bulk bags stashed all over the landfill.



Image 17: Bulka bags full of scrap metal at Bouffa landfill



Image 18: Pile of aluminium cans ready for sale

Waste picker interviews also revealed that there are between 20 to 100 scavengers at the landfill, but it is not an organised or legal activity. They usually always have to wash everything that they collect before selling to RecycleCorp.

Given the waste pickers are responsible for the only recycling activity in Vanuatu, formalising the system so that their livelihoods are not threatened should be considered when any policy or plan is proposed. Please note APWC provides a list of recommendations to improve the conditions for pickers at the landfill as part of the best-practice recommendations.

3.5.2 Luganville waste disposal site

Luganville waste disposal site is located approximately 6 kilometres from the town centre (Toland, 2014). The site has been operational since the end of World War 2 when the site was initially opened as a limestone quarry. Toland (2014) reported that burning waste was the primary waste management tool. Scavengers collecting aluminium cans to be on sold to recycling companies were present on a daily basis. In 2017, the landfill was extended, and the site is now approximately 48 hectares with capacity to last an additional 20 years.

Operating hours	Staffing	Gate fees	Equipment
<ul style="list-style-type: none"> • Mon to Sat: 7.30am- 4pm • Sunday closed 	<ul style="list-style-type: none"> • one person at the gate each day 	<ul style="list-style-type: none"> • Flatbed truck 1800VUV • Pickup truck 1200 VUV • Small load 600 VUV 	<ul style="list-style-type: none"> • No equipment available. • Bulldozer is hired once every three months to move waste and burn.

Figure 10: Operating conditions at Luganville Municipal landfill

The signage at the gatekeeper’s hut outlines the hours, fees and where to deposit each waste type. There is no weighbridge and no machinery on site. Waste is left uncovered. LMC hire a local contractor to push up waste, burn and cover the active face every four to five months.

The council informally collects cardboard from the businesses every Friday. There is a separate area dedicated for the disposal of cardboard. However, it is an open-air space with no shelter from the elements. A fire was recently reported at the segregated cardboard area. The cardboard is not currently being recycled.

LMC is trying to segregate waste as much as possible. In July 2018, signs were commissioned to direct customers to where they should unload their waste. Only some of the signs had been installed at the time of the visit in November 2018.

APWC interviewed three active scavengers at the Luganville municipal landfill (including children).

The waste pickers are most interested in PET bottles as they are able to sell them for 10 to 20 VUV at kava bars and to market vendors.

The next most popular item is beer bottles that can also be returned for 10 VUV. Pickers were not interested in scrap steel at this time but were actively looking for brass and copper as they are able to sell those to some auto-repair shops and electrical businesses in town.

One picker noted that they used to collect aluminium cans when RecycleCorp was active but have since decided that it is not viable.

Almost all pickers have other jobs and were using the scavenging activity as an additional source of income. This was not the case for children, however.



Image 19: Sign at the entrance of Luganville landfill



Image 20: Signage at the Luganville municipal landfill



Image 21: Signage at the landfill gatekeeper’s hut

It is estimated by council staff that there are between 20 to 50 scavengers that frequent the landfill and pick from streets.

A large amount of green waste was seen at the landfill at the time of APWC's visit. The council staff mentioned that there are six markets delivering food and organic waste to the landfill. APWC therefore added a survey of market waste to its list of activities in Vanuatu.



Image 22: Waste pickers at LMC landfill and tip face of LMC landfill

4 Current waste management initiatives

4.1 Government initiatives

Vanuatu's government (Waste Management Regulation Order 15) recently made several commitments towards achieving this mission, most notably to reduce plastic waste and prevent plastics entering the litter stream. From 1 July 2018 the Department of Environmental Protection and Conservation banned single-use plastic shopping bags made in whole or in part from polyethylene less than 35 microns thick; polystyrene takeaway boxes less than 30 centimetres long; and plastic straws. Exceptions to the ban include plastic bags to wrap fish or meat at point of sale and plastic straws that are an integral part of a product's packaging, such as a juice box (Department of Environmental Protection and Conservation, 2018). Fines range from 50,000 VUV up to 1,000,000 VUV or three months' imprisonment may be imposed on individuals or corporations caught manufacturing or selling the banned items².

On Friday 10 August 2018, the PVMC, in collaboration with Department of Environmental Protection and Conservation and J-PRISM, conducted a waste audit survey to ascertain the current garbage disposal situation of single-use plastic bags, plastic straws and polystyrene takeaway boxes. The audit highlighted that 12% of Port Vila's waste consisted of plastic material, which represents 2% overall of plastics now prohibited by the plastic ban³.

The government has also made a commitment to create environmental awareness and enhance behavior change via educational materials to create awareness of plastic pollution and waste⁴. As of 1 February 2018, the government introduced a polluter-pays penalty for persons caught depositing litter or waste in a public place. Fines range from 5,000 VUV for an individual's first offence, increasing to 10,000 VUV for any additional offences. The court can impose penalties from 500,000 VUV for individuals or 1,000,000 VUV for corporations.

In addition, the DEPC have also placed legislative requirements on waste operators and service providers. Operators who provide landfill, controlled waste dumps, waste transfer stations (capacity of 5 litres liquid waste or 1 tonne solid waste), recycling centres, waste treatment plants, composting plants (capacity to process 5 or more tonnes per day), waste incineration (other than those operated by the Ministry of Health or Biosecurity Vanuatu), or waste collection and transport services must all obtain a private waste operator's licence at the cost of 10,000 VUV. Operators must prove technical competence and notify of any previous Department convictions or compliance issues before a licence is issued.

² 'Plastic Ban' Available: <https://depc.gov.vu/index.php/environmental-protection/plastic-ban>

³ 'Waste Audit says Single Use Plastic Bags are still discharged from Household' Available: <https://environment.gov.vu/index.php/news-events/183-waste-audit-says-single-use-plastic-bags-are-still-discharged-from-household>

⁴ 'Plastic Ban' Retrieved from <https://depc.gov.vu/index.php/environmental-protection/plastic-ban>

4.2 International and regional projects

Several international and regional projects are being undertaken in the waste management space in the Pacific, including Vanuatu and Solomon Islands. There is a great need to co-ordinate all work in the Pacific so that the best outcomes are achieved for all countries. Please note that the information on current projects has been collated and provided by the PRIF secretariat.

Table 15: International and regional waste management projects

Project	Description
J-PRISM	<p>JICA funded project of USD \$15 million over five years covering nine PICs. Four focal areas are:</p> <ul style="list-style-type: none"> • Human capacity for solid waste management is strengthened through capacity-needs assessment and training • Monitoring and evaluation process well defined • Resource recovery through enhanced recycling processes • Disaster waste management capacity enhanced <p>J-PRISM Project identified the amount and composition of waste generated and found that the majority of waste produced domestically was food waste followed by plastics, aluminum and tin containers. The data also suggests that a strong recycling programme focusing on the traditional recyclables (paper, plastics and glass) would go a long way to reducing the amount of waste ending up in landfill. Encouraging the separation of kitchen and yard waste at the household level to feed animals or composting would further reducing waste to landfill. The second phase of the Promotion of Regional Initiative Solid Waste Management (J-PRISM II) project, implemented by JICA in early December 2016, supports capacity-building in waste management. Target initiatives include improved governance and human resource development, focusing on Port Vila, Luganville, and Lenakel.</p>
PacWaste (2014–2017)	<p>A project implemented by Secretariat of the Pacific Regional Environment Programme. Its objectives are to improve the management of e-waste by establishing a pilot project for the safe dismantling and export of e-waste and creating a public awareness campaign (SPREP, 2017). PacWaste is expected to increase the amount of materials recovered as part of PacWaste 2. Although PacWaste delivered an e-waste collection programme in Vanuatu, a number of projects were undertaken under PacWaste including the provision of medical waste incinerators to most Pacific countries.</p>
GMPII	<p>Global Monitoring Plan on Persistent Organic Pollutant Phase II</p>
Restoration of Ecosystem Services and Adaption to Climate Change (RESCCUE) 2014–2018	<p>A regional programme of the Pacific Community. Thirteen million euros has been provided in funding primarily by the French Development Agency and the Global Environment Facility, as well as the tourism sector.</p> <p>The project addresses household waste issues in North Efate by packaging waste, such as aluminum cans, from the more remote areas. The programme will also support and implement infrastructure such as bins and the development of return logistics, using private supply vehicles to transfer the waste to the recycler in Port Vila (PRIF 2017).</p>
LMC Municipal Waste Management Awareness	<p>In conjunction with a JICA volunteer, the waste management officer at LMC has delivered numerous waste management awareness programmes, including five composting and 12 plastic workshops, 50 school visits, and an extension of the red bag collection service has been conducted within the last 18 months.</p>

Project	Description
LMC organic waste	Organic waste from the main market house in LMC is now collected in a central, large-scale organics waste bin for compost. One kilogram bags of the compost product is available for community members to purchase at 50 VUV. JICA funding provided a shredder, which is in full-time use at the compost bin.
RecycleCorp	Collects, processes and exports all scrap metal including heavy steel, car bodies, copper, brass, aluminum and e-waste. It also collects car, truck and solar batteries. As of 28 September 2018, RecycleCorp commenced glass recycling within country. RecycleCorp also has machinery for hire including a 22-tonne Doosan excavator, two 2.9-tonne capacity crane trucks with drivers, a tipper truck with driver and a generator.
Australia	<p>Australian Department of Industry Innovation and Science (DIIS) participates in the Marine Resources Conservation Working Group of Asia Pacific Economic Cooperation (APEC), which is currently examining waste management infrastructure development experiences in the region. Australia also leads an APEC project Understanding the Economic Benefits and Costs of Controlling Marine Debris in the APEC Region.</p> <p>Australia is developing a proposal with SPREP for an investment over four years to support co-ordination and implementation of the Pacific Marine Litter Action Plan. The investment aims to reduce the availability of single-use plastics and change the behaviour of industry and consumers to reduce, reuse and recycle. The project would complement existing projects and support SPREP in co-ordinating marine plastic pollution work in a holistic manner, including, for example, enabling linkages with broader waste management programmes and other anti-pollution initiatives.</p>
New Zealand	<p>LGNZ (Local Government New Zealand) is contracted to NZMFAT to provide technical assistance to Pacific Island countries. This programme provides technical assistance to institutions that are engaged in the same activities as local government, hence the name 'PacificTA'. PacificTA helps local Pacific Island managers to run public services such as environmental management (e.g. water and air quality) infrastructure and asset management, town planning, transport planning, and public health and safety programmes such as dog control and disaster management.</p> <p>Current activities include working with the councils and central government agencies in Kiribati on waste management services (including Betio Town council and Teinainano Urban Council). In Cook Islands, support is provided on landfill management in Rarotonga, including advice on the need for compaction to extend landfill life. Pacific TA also provides support for Port Vila Municipal Council (Vanuatu) on HR, financial management, IT, waterfront maintenance, library support and other institutional support in Kiribati, e.g. HR, financial management, dog control (Kiribati).</p> <p>The Cook Islands and Tarawa landfills are creating particular challenges. Rarotonga is near end of life with significant challenges in getting land for another landfill and Tarawa has three landfills that are climate exposed. MFAT is interested in any alternatives. PRIF is investigating to address landfill sustainability in the Pacific. www.lgnz.co.nz/pacificta</p> <p>There are further projects being undertaken in Niue and Kiribati.</p>
EU – PacWastePlus	SPREP is the implementing agency for this EU-funded project. The 16.5 million euro funding builds on the work undertaken by PacWaste, to focus on asbestos, healthcare waste, e-waste and other aspects of solid waste management and waste water. PacWaste Plus covers 14 PICs and Timor Leste.
IUCN	<p>The IUCN 'Plastic Waste Free Islands' project "STOPP Plastics" (Source-to-Ocean Plastic Pollution) project.</p> <p>Objective: Driving islands' circular economy and eliminating plastic leakage from islands and small island developing states (SIDS). IUCN is seeking waste data in three countries in the Pacific (from</p>

Project	Description
	among Fiji, Kiribati, Palau, RMI, Samoa, and Vanuatu), for material-flow analysis and quantification of leakage. Formal documentation has yet to be signed. To involve addressing plastics leakage into ecosystems through the waste management, tourism, and fisheries sectors through three prospective PICs. Will co-ordinate with South Pacific Tourism Organisation (SPTO) and the Forum Fisheries Agency (FFA) in the tourism and fisheries sectors.
UNEP and GEF GEF 7 Programme	<p>Planning a regional GEF 7 project with SPREP, expected to commence in 2019. Looking at hazardous waste management, such as used oil, POPs, e-waste and mercury, in the 14 Pacific SIDS.</p> <ul style="list-style-type: none"> • The new GEF7 replenishment cycle is expected to help transform SIDS management of chemicals and waste over the next five years • Funding falls under the Chemicals and Waste focal area • Top priority – an integrated (regional) programme on waste management linked to Stockholm and Minamata Conventions in SIDS • \$US20–25 million expected to be available to 14 PICs, commencing 2019
Global Green Growth Institute	Francis Mani, who is based at USP, is currently engaged by GGGI on behalf of the Fiji Ministry of Economy (Climate Change Division) to address the Low Emission Development Strategy drafting process for the waste sector.

4.3 Community-based waste and recycling initiatives

4.3.1 Wan Smol Bag

Wan Smol Bag (One Small Bag), established in 1989, is a grass roots NGO using theatre performances, community workshops and engagement programmes as a tool to educate and create awareness in health and environmental issues. Wan Smol Bag (WSB) aims to promote waste management, recycling and composting and advocate community-based opportunities and solutions to create income streams through recycling and reuse, diverting waste to landfill and reducing the cost of landfill fees. WSB highlighted in its Annual Report (2017) 388 community members and school children engaged in waste management workshops, increasing awareness of sanitation and waste management practices. WSB also noted that following the workshops, attendees and community members continued to separate waste at source, seek additional waste management advice and conducted community clean-up days.

WSB conducts weekly rubbish collections and clean-ups along the Tagabe River, rostering unemployed youth to assist servicing communities outside the municipal collection zone to minimise waste ending up in the river. Approximately 20,500 plastic bags of rubbish were collected during the community collections and riverside clean-ups in 2017. Five compost bins were installed within Efate schools and school workshops were conducted by waste officers in Efate and Santo. It was noted that many schools had recycling cages for aluminium tins but there was uncertainty about what to do with the tins as there was no longer a branch of RecycleCorp in Santo.

4.3.2 Composting

PVMC, in conjunction with Vanuatu Direct, implemented a composting programme, transporting organic waste material from the main market house to a central compost pile to be used for agricultural activities. Unfortunately, due to high contamination rates, the programme ceased after 12 months.

Organic waste from the main market house in LMC is collected in a central, large-scale organics waste bin for compost. One kilogram bags of the compost product are available for community members to purchase at 50 VUV. JICA funding provided a shredder, which is in full-time use at the compost bin. There is, however, a need to recover a large amount of organics being generated at the markets in both LMC and PVMC. APWC undertook an assessment of the amount of waste.

4.3.3 Live & Learn Vanuatu

Live & Learn started as an Australian project with local teachers providing environmental education programmes on rainforest and reef conservation to school children. The volunteers assessed their work and found that biological education alone was not leading to better community conservation. The project has moved to Vanuatu since 2001 as part of regional offices for Melanesia. Live & Learn contributes to policy development as well as public awareness and education initiatives alongside government projects. Live & Learn often undertakes work where the Vanuatu Government lacks the resources to do so. It has a strong ethos of information-sharing to complement other sector-based development programmes. Waste management is one of the key areas of interest for Live & Learn. They are well known to the communities in Vanuatu and have a wide reach.

4.3.4 World Vision Vanuatu

In June 2016, through funding from the Australian government through the Australian NGO Co-operation Program (ANCP), World Vision partnered with Pango Green Force and Azure Pure Water to change public perception by encouraging a reframing of thinking towards all waste, including plastic being an opportunity for revenue generation in small communities. The first year of the project was spent undertaking extensive research into what is required in the urban communities of Port Vila and Luganville.

World Vision is just about to launch into the first implementation phase. The plan involves helping communities set up small businesses in waste management. The three options chosen are composting, recycling and rubbish collection. Three communities in Port Vila and five in Luganville have been chosen. The three communities chosen in Port Vila are Etas, Anaburu and Olen. The programme aims to build on its highly successful community savings project in Vanuatu. The project supports four staff in Port Vila and four in Luganville.

4.3.5 Green Wave Pacific and Erakor Bridge Community

Officially installed as a registered organisation in July 2018, Green Wave Pacific is a highly prolific community organisation supported by Alliance Française in Vanuatu. The organisation currently has four members as well as the support of the 'mamas' at the local market. Green Wave Pacific ran the highly successful 'No plastic bag, plis' campaign which was able to get more than 2,300 online and a 1,000 on-paper signatures. Following this campaign, plastic bags were banned in 2017. The organisation is also interested in effluent from hospitals and cleaning up the lagoon.



Green Wave Pacific also supports the Erakor Bridge Project, which through engagement with the community, has managed to clean lagoon number 2. Their work is showcased on the YouTube channel [preserVanuatu](#).

4.3.6 Vanuatu Environment and Science Society (VESS)

VESS started in Vanuatu in 2015 with a focus on environmental conservation. VESS's purpose is to promote science in the fields of conservation, environmental protection and sustainable development within Vanuatu. VESS has been involved in clean-ups and waste data collection in collaboration with the Department of Environment. It has since collected litter data twice a year in 2015, 2017, 2018 and once in 2016. All data is uploaded to the International Coastal Cleanup database (ICC). VESS was party to the ban on plastic bags and is represented on the committee that is a part of the decision-making process. VESS also supports the Big Blue Dive Against Debris as part of a global project known as Project Aware. Most importantly, the waste collected through this project is recorded into the Project Aware database. As such, VESS has the most extensive citizen-science litter and marine database in Vanuatu.



5 Waste data – data collection methodology

5.1 Samples collected

5.1.1 Household sampling distribution

This section provides the outcomes for waste data collection work undertaken in November 2018. Advice was sought from the APWC statistician to determine the sample size required to provide reliable and robust data. The minimum and maximum number of household samples required are shown in Table 16.

Table 16: Households sample to be collected

Confidence level	0.95			0.9		
Error	5%	10%	15%	5%	10%	15%
Sample size	781	196	87	550	138	62

Using the calculations provided above, it was assumed that the minimum number of samples required is 140 and the maximum number is 200. However, rather than undertake all sampling from Port Vila and Luganville where all previous sampling efforts have been focussed, APWC decided to split the sampling based on the population distribution within different islands in Vanuatu to gain a sample that is representative of all waste generation in Vanuatu. The two most populous cities are Port Vila and Luganville where 23% and 14% of the total population of Vanuatu reside, respectively. The remaining 63% of the population live on outer islands and rural communities of Efate and Espiritu Santo. The proposed sample split and actual sample distribution achieved is shown in Table 17.

Table 17: Population distribution vs. sample distribution

Vanuatu	Population	Percent	Samples required	Samples achieved
Port Vila/island of Efate,	64,327	23%	46	50
Luganville/island of Espiritu Santo	38,303	14%	28	50
Outer Islands	174,870	63%	126	105 (60+35+10)
Total			200	205

The APWC team worked in Vanuatu for three weeks, covering the islands of Efate and Espiritu Santo and the respective provincial governments for Shefa and Sanma province and the municipalities of PVMC and LMCC. Samples were taken from the main island communities of Port Vila and Luganville and the rural community called Black Sands in Shefa province. The Black Sands is a highly affected village where communities have relocated from outer islands because of the devastating effects of tropical cyclone Pam in 2015. Four outer islands were also visited. These include Lelepa (Efate), Ifira (Efate), Tutuba (Espiritu Santo) and Mavea (Espiritu Santo).

The sample collection from each island was limited by the ease of collection of samples, the ability to transport samples as well as the presence and absence of collection systems. The figure below shows the number of samples collected from each site as well as the collection system available.

Location	Number of samples	Collection system in place	Collection frequency
Port Vila	50	Yes- pre paid bags- Yellow	Once a week + Friday any remaining bags
Luganville	50	Yes- pre paid bags- Red	Once a week
Ifira	10	Yes- pre paid bags - White	Once a week- Wednesday
Black Sands	35	Partial - paid through property tax	Once a week private contractor
Lelepa	60	None	N/A

Figure 11: Samples collected and collection system in place

The household samples collected are shown on the map below which details samples from Port Vila, collected from four different wards within the town boundary. A further 35 samples were collected from the highly impacted community of Black Sands that falls within the Shefa provincial boundary. Ten samples were collected from Ifira island, which has a private collection system run by CK removals using prepaid white bags. Lelepa island, which represents the rural sample for Vanuatu, is not shown on the map below.

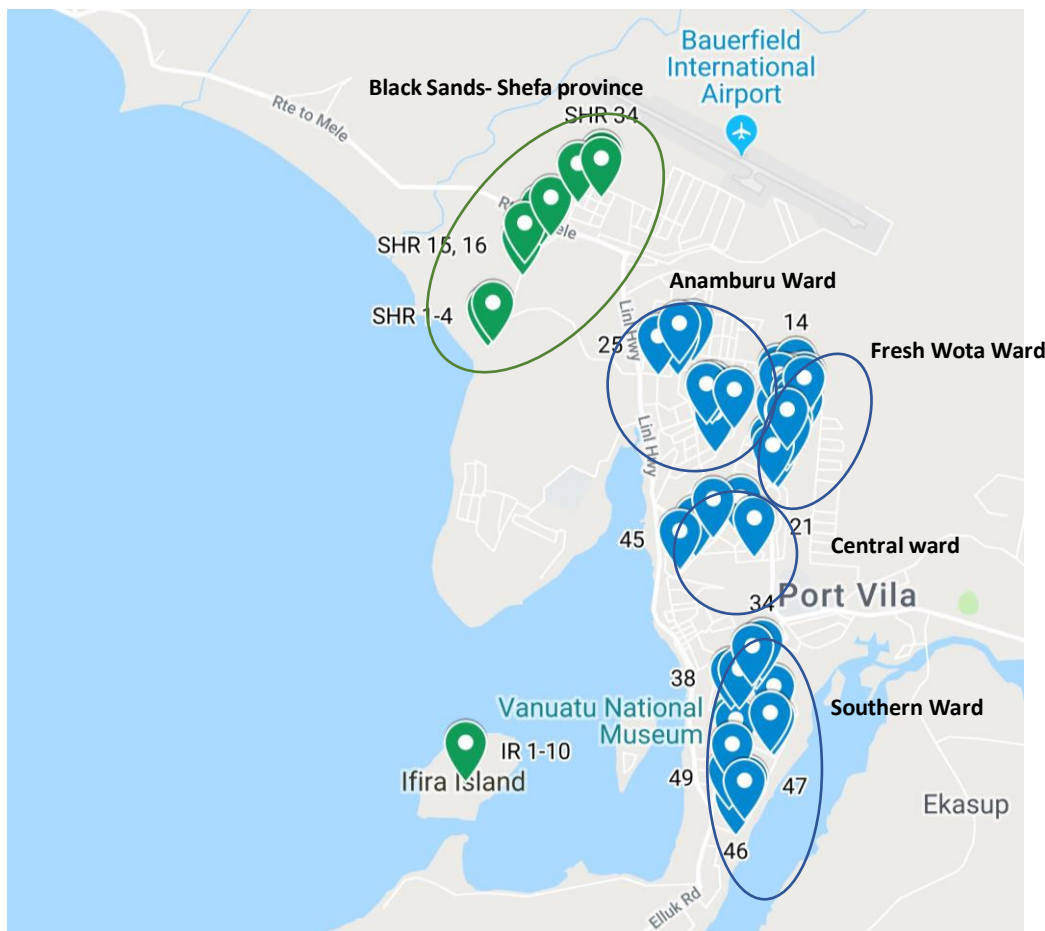


Figure 12: Household sample distribution in Efate

Vilain Espiritu Santo samples were similarly distributed to ensure coverage of the entire town area:



Figure 13: Household sample distribution in Luganville

5.1.2 Commercial sampling distribution

A total of 45 commercial premises were sampled of which 30 were from shops in Port Vila and 15 in Luganville. Commercial premises were divided into four major categories, as shown in Table 18.

Table 18: Commercial samples collected in Port Vila

	6	Daily	5
	11	Daily	5

5.1.3 Sample collection methodology

Domestic waste samples were collected household by household to determine the waste generation and disposal rate per household.

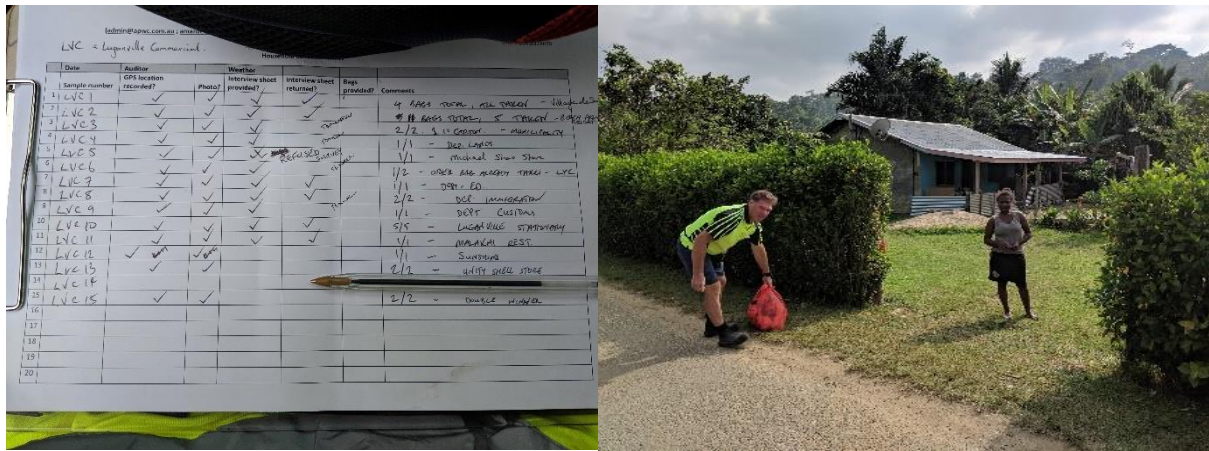
Waste collection methods had to be modified based on the area that was being assessed.

5.1.4 Collections from areas with house-to-house collection system

APWC approached the respective collection service provider to assist with the collection of waste just before it was being picked up by the waste trucks. In Port Vila and Luganville, APWC used a utility vehicle and started collections one hour prior to the commencement of council collection services. Each collection team required the following staff:

- APWC collection supervisor
- APWC collection runner
- A local staff member to ensure smooth running of collections

Random streets were selected from each ward and a sample was collected from every third to fifth house in each street. No more than five samples were collected from the same street.



The APWC collection supervisor collected the following data for each house sampled:

- GPS location
- Number of bags per household
- Interview tag provided
- Photo

A template of the sample collection sheet is provided in Appendix D. At the end of each day, the sample collection sheet was scanned and sent to the APWC office in Sydney for data entry. The methodology remained the same for both households and commercial premises.



Image 24: Collection staff tying a thread to mark the sample collection site.

The major challenge in collecting waste that had been placed outside at premises for collection was ensuring that the household or commercial premises could be identified readily by the interviewers later that day. On the first day, taking a photo of each house along with the GPS point was trialed. This method proved to be logistically challenging, however, as all information had to be made available to

the interviewers before they returned to undertake interviews the same day. Therefore, from the second day onwards, the house where the sample was collected was tagged using a coloured thread or ribbon. The collection supervisor also had a conversation with the residents of the house to ensure that the house wasn't subdivided and that the correct house was being tagged.

5.1.5 Collections from areas with a collection point

Areas such as Ifira and Black Sands have a collection point where locals bring their waste prior to the collection day. For Ifira, the residents place their bags at the jetty every Wednesday morning and a boat picks up the bags. The bags are brought over to the mainland where they are loaded on to a flatbed truck for transport to the landfill. In order to collect our sample, the truck was intercepted, and 10 bags were taken as a sample.

At Black Sands, the APWC collection crew arrived at the village the night prior to the collection service and approached each household for their bag. Where the household still had the bag, it was collected, and the house was tagged for a future interview. Half of the samples were collected in this manner. However, for the remainder of the sample, the requisite number of bags was taken from a collection point and the interviews were conducted randomly.



Image 25: Black Sands collection point collection and house-to-house approach

5.1.6 Collections from areas with no collection service

In Vanuatu, Lelepa village was the area sampled as a representative of no collection system. In this case, three separate visits were required to ensure that the collection could take place.

- a) On day one, APWC staff approached the village chief and sought permission to undertake waste data collection in the village. The chief gave his permission and provided background information. We were advised that meeting with the women of the village to discuss waste practices was highly desirable. Women meet each Monday and Wednesday after church services.
- b) APWC returned on the day of the women's meeting and provided each woman with a bag to use to dispose of their waste from that day onwards. Sixty-four (64) bags were distributed and information on which wastes were acceptable and not acceptable was provided. It was expressly forbidden to dispose of any bulky waste or problem wastes into the black bags.

- c) The village chief was requested to make an announcement the next day at church and asked to reinforce the message regarding disposing of all wastes from that day onwards into the plastic bags being distributed throughout the village.
- d) The APWC team returned after three days to retrieve the bags from each household. As each household brought their waste bag, the bag was labelled and provided to the sorting team. An interview was conducted with the member of the household depositing the bag. Refreshments were provided to all members of the village during the interview stage.
- e) The tagged bags were sorted at the community centre in the village rather than bringing them back to the sorting site in Port Vila.



5.2 Household interviews

Interviews were conducted with all households where waste was collected during the collection stage. The interviews were conducted using the interview sheet provided at Appendix E. As noted in section 4.2, each household location was captured using GPS, a photograph and tagged with a coloured ribbon or piece of coloured string.

APWC notes that interviews were challenging because people are at work during the day. Therefore, most of the interviewing was undertaken in the evenings and early mornings or weekends.

The standard APWC procedure is to not push for an interview if the household decides not to participate. Of the 205 samples collected from Vanuatu, only four households declined to participate in the interview process. APWC achieved a 99% participation rate.



Image 27: Lelepa interviews

All interview sheets were translated to Bislama but found it was easier to train a local staff member to undertake the interview rather than using the translated interview sheet and notes. All interviews were undertaken in groups of two led by a local staff accompanied by APWC employee. The household interviews were the most time-consuming part of the data collection process, with each interview taking approximately 20 minutes to half an hour. APWC deployed up to four teams with sometimes eight staff to ensure that all interviews were completed on time.



Image 28: Household interviews being conducted by APWC staff

5.3 Sample sorting

All waste in Port Vila, Black Sands, Ifira and Luganville is disposed of in plastic bags. Once collected, the bags were labelled and brought to the local sorting facility. The municipal council provided APWC with a space for waste sorting at all locations upon request. The sorting locations are listed below:

Sample collection location	Sample sorting location
Port Villa	PVMC workshop
Ifira	PVMC workshop
Black Sands	PVMC workshop
Luganville	LMCC workshop
Lelepa	Lelepa community shed

Figure 14: Sorting location for Vanuatu samples

Bag tags were used to identify all samples. The samples were lined up to ensure none were missing. All samples were cross-referenced with the collection sheet to ensure consistency between sample collection and sorting.



After checking all samples were present and in order, the collection supervisor scanned the collection sheets and emailed them to APWC headquarters. The physical sheets were handed over to the sorting supervisor to ensure all data was kept at the same place.

Material from each bag was sorted separately into the 49 categories listed below in Table 19.

Table 19: Household sorting categories

Consolidation	Category	Consolidation	Category			
Metal	Aluminium cans	Hygiene	Feminine hygiene			
	Aluminium recyclable		Pharmaceutical			
	Steel cans		Nappies			
	Metal other		Medical waste			
Fishing	Fishing/seafood metal		Other sanitary waste			
	Fishing/seafood plastic	Organics	Food			
	Fishing/seafood wood		Wood/timber			
Paper and Cardboard	Cardboard		Other	Other organics		
	Cigarette butts	Hazardous				
	LPB	Textiles				
	Paper	White goods				
Plastic	PET bottles	Other		Ceramics		
	HDPE bottles			Dog poo		
	EPS			Containerised used oil (volume and weight)		
	Plastic bags			EOL renewable energy equip		
	Plastic oil containers			End-of-life vehicles		
	PP			Tyres		
	Flexibles/film			Other		
	Other plastic			Other plastic	Glass	Glass bottles CDS

Consolidation	Category	Consolidation	Category
Batteries	Lithium Batteries		Glass bottles wine and spirit
	Used lead-acid batteries		Glass fines
	Other batteries		Glass jars
E-Waste	Computer equipment		Glass other
	Mobile phones		
	Electrical items and peripherals (including TVs)		
	Toner cartridges		

Typically, the sorting area consisted of a raised table covered with a tarpaulin or plastic sheets. The bagged waste was opened and the contents sorted by the categories above. Each bag was handled separately and material from only one bag placed on the table at any one time.



Image 30: Sorting at PVMC, LMCC and a sorted sample

Separated materials were placed in appropriate containers, weighed on a set of electronic scales and the weight recorded. APWC brought its own pre-calibrated electronic scales from Australia to ensure accuracy.

A separate count of beverage containers for all general waste samples was also undertaken. Beverage containers from the samples were stored and counted separately. Containers were stored and labelled to ensure no cross-contamination took place. Containers were sorted by size, material (e.g. plastic, aluminium) and product type (e.g. milk, juice).

Further, all plastic bags were sorted into different types of bags and all containers were further sorted by size, material type and product type. Cigarette butts, coffee cups and takeaway containers were also segregated. This further sort was undertaken to 294 categories. The sorting sheet is provided at Appendix F. All sorting sheets were scanned and emailed to the APWC headquarters at the end of each day.

5.3.1 Green waste sorting at LMC

During APWC’s visit to the landfill site at Luganville, a large amount of green waste was observed at the landfill. An assessment of the amount of green waste being produced was added to the list of assessment activities at LMC. Each day while the collection team undertook waste collection from

households, APWC sorting and stakeholder consultation staff weighed the green waste being generated at the landfill as well as the amount being currently sent to landfill.



Image 31: Green waste weighing at LMC and low contamination rates for green waste

5.3.2 Work Health and Safety

APWC’s parent company has an integrated management system used during these audits that covers quality, health, safety and environment (QHSE). The system has been developed to be consistent with the requirements of the international standards ISO9001 (Quality), ISO14001 (Environment) and AS4801 (Occupational Health and Safety).

We are very proud of our excellent work health and safety record and our commitment to quality, environmental protection and sustainability. Therefore, the following steps were undertaken to ensure that APWC staff, as well as those being trained to undertake the work, are safe at all times.

- Site-specific safe work method statements (SWMS) were developed
- A pre- and post-work commencement risk assessment was undertaken
- APWC collection and sorting supervisor undertook QHSE inductions for project staff
- All staff were trained in the waste audit code of conduct developed by APWC, which includes a requirement to sign a confidentiality agreement prohibiting staff from removing anything from the material they sort or from revealing any information they might obtain while sorting or auditing.

Adjustments were made to ensure safety of staff based on local conditions. APWC’s collection and sorting supervisor had full control over local safety requirements to ensure all work was being conducted in a manner that protects the health and safety of the staff.

6 Waste data - study limitations

The data for this study was collected and analysed using the best and most accurate methods available within the constraints of available time and budget. This study is a survey, which means that a relatively small amount of data has been collected and then treated as representative of the total. As in any survey, there are limitations to the accuracy of the data, as described below.

<p>Time frame</p>	<ul style="list-style-type: none"> • These audits were carried out to cover one week's waste from selected areas. The data was then extrapolated using mathematical models to obtain the generation rate for the whole of Vanuatu. • Seasonal trends (e.g. warmer weather leading to increased consumption of beverages; Easter, Christmas) and weather events (e.g. high rainfall leading to grass growth) may change waste generation over time. • The results of this audit should be treated with caution when comparing the results with reports based on data taken at different times of year.
<p>Representative sample</p>	<ul style="list-style-type: none"> • The sample for this audit is necessarily small due to the high per-capita cost and resource-intensive nature of waste auditing. • There is always a small probability of inadvertently collecting waste from atypical households, resulting in non-representative data. • APWC audits are carried out using strict random sampling, stratified by geographic area, to minimise the chance of this situation occurring. • We found substantial variation between disposal rates different rural and different urban areas even after accounting for factors like income and consumption. This adds additional uncertainty when using the data we collected to estimate disposal rates for regions we were unable to cover.
<p>Sample size limitations</p>	<ul style="list-style-type: none"> • All surveys carry an element of sampling error, which is the mathematical error associated with using a sample to represent a total population. • Sampling error can be reduced by taking larger samples. The sampling error involved in waste audits is usually small and can be tabulated by producing estimates augmented by upper and lower confidence intervals. • For household disposal rates within a particular region, sampling uncertainty was around 20% of the household disposal rate • For commercial disposal rates within a particular region, sampling uncertainty was around 40% of the business disposal rate
<p>Weight-based analysis</p>	<ul style="list-style-type: none"> • The collection of data for this audit was recorded by weight. • This type of collection may cause some materials to appear to be present in quite small proportions due to their comparatively low densities (e.g. plastic beverage containers). They can, however, consume large amounts of volume. • Weight-based analysis has been used in this audit because it is a standard procedure and is the most accurate way to collect data on a number of different types of materials.
<p>Collection Methodology</p>	<ul style="list-style-type: none"> • For areas with collection services, a household's regular rubbish load was picked up. If households were disposing of any rubbish via other means, this was not picked up in the survey. The numbers collected may be a reasonable estimate of waste going to landfill, but are unlikely to be a reasonable estimate of waste generation rates. • For areas without collection services, the households were given a bag into which to put three days worth of rubbish. Some households may have taken this opportunity have disposed of extra rubbish, with nappies being a particular concern. • We noticed a general trend of waste quantities in this sample being lower than in previous samples of sites with disposal services. This could be due to the methodology that covers disposal rates rather than generation rates
<p>Model Assumptions</p>	<ul style="list-style-type: none"> • While we did not assume we knew the disposal rates for sites we did not sample, we assumed that they displayed a similar pattern of variation to sites we did sample • Relationships between variables were assumed to be linear. This reduces the chance that the model fits

7 Waste Data – results

All data in this section is weight-based unless otherwise stated. Some percentages have been rounded to the nearest whole number and therefore some figures and descriptions may not add up to 100%.

APWC’s team collected and sorted 1,546 kilograms of waste from five locations and 246 premises in Vanuatu. A further 7 tonnes of green waste was weighed and assessed in Luganville. This section presents the results of these activities.

7.1 Waste generation, household management and disposal rates

In Australia and around the world, the waste generation rate and waste disposal rate are often used interchangeably. However, the results presented below represent the ‘waste disposal rates’ only for Vanuatu. We make this distinction because of the data available to us from previous JICA audits as well as the interviews conducted as part of the data collection process.

Table 20: Waste disposal rate Vanuatu

Area	Average waste disposal (g/capita/day)	95% CI (g/capita/day)	Pickup frequency	Average number of householders*
Port Vila (urban Efate)	465	382–548	2/week	5.8
Shefa (rural Efate)	205	145–265	1/week	6.4
Luganville (rural)	151	121–181	1/week	5.1
Lelepa (remote)	68	50–76	2/week	4.9

*Please note that the number of people per household is based on the data collected from household interviews and is not the average number of households overall as per the bureau of statistics

The waste disposal rate for Port Vila falls within that previously estimated for the East Asian and Pacific region according to the World Bank (2012). World Bank global review states that ‘the annual waste generation in East Asia and the Pacific Region is approximately 270 million tonnes per year. This quantity is mainly influenced by waste generation in China, which makes up 70% of the regional total. Per-capita waste generation ranges from 440 to 4300 grams per person per day the region, with an average of 950 g/capita/day (Hoornweg et al. 2005).’ In this case the mean includes the waste generation rate in China, which is one of the greatest in the region. However, previous studies done using the JICA methodology estimate a much higher waste generation rate (Table 21 below). It is important to make a distinction between the generation rate and disposal rate because of the methodology used by the two studies.

Table 21: Comparison of Disposal and Generation Rates Vanuatu

Area	Present Disposal Estimate	Previous Generation Estimate
Port Vila	465 g/capita/day	910 g/capita/day ⁵
Luganville	151 g/capita/day	900 g/capita/day ⁶

*In PVMC, the total waste generation has risen from 430 g/capita/day in 2011 to 910 g/capita/day in 2017

⁵ PVM Survey, 2017

⁶ Luganville Waste Characterization report, 2013

The APWC methodology assesses the amount of waste requiring immediate management, that is, the waste being placed in prepaid bags. It also assesses household behaviors based on interviews in order to understand what happens to uncollected waste and why refuse is not being placed in bags, including the reason for these behaviours.

The JICA methodology allows for all waste to be placed in specially provided bags that are assessed for their content. Therefore, JICA studies are estimating the total amount of waste generated at the source rather than the amount that people are willing to place in a bag.

The comparison of the two studies shows that although the introduction of the prepaid bags is largely helping with the visible waste issues, there are matters that can be further addressed. These are addressed in the following sections.

Regardless, the most interesting outcomes of the waste generation rates are the differences in the amount of waste generated between urban and rural areas. This is addressed in detail in section 6.3 and 6.4 and modelling suggests that waste generation is linked to the average grocery bill for an area.

7.2 Waste burning, burying and dumping in waterways

The graphs (Figure 15, Figure 16 and Figure 17) present data from the household interviews undertaken for the same households from which the waste was collected. Based on comparative data from JICA and APWC, we can assume that only 30 to 70% of the waste generated is being captured through the waste management systems currently in place in the urban areas. In the rural areas, all waste being generated is being disposed of through burning, burying and dumping.

Figure 15 shows that for areas with collection systems, waste burning is the most common means of disposing of waste not placed in bags for collection. Of the waste that is burned, the most common is green waste. This can be confirmed anecdotally based on the observed burn piles.

For areas without collection systems, burning of all waste is quite common (as well as other methods). General waste and green waste are most likely to be burned.

After burning, burying or dumping on land is the most common practice with nappies. Bulky waste is most commonly buried or dumped on land. It should be noted, however, that places with collection systems in place have very low or no reported instances of burying or illegal dumping. Data shows that where there are collection systems in place, nappies are largely being placed in the bags to be collected.

Very small numbers of people are dumping rubbish in waterways and most reported instances of dumping in waterways came from areas with no collection systems in place.

Port Vila reported absolutely no dumping in waterways, which indicates a high level of awareness among residents regarding the impact of waste on waterways. Although anecdotally waste continues to be dumped in waterways, residents are aware that this is not the right thing to do. Further community education is required to ensure awareness is translated into action.

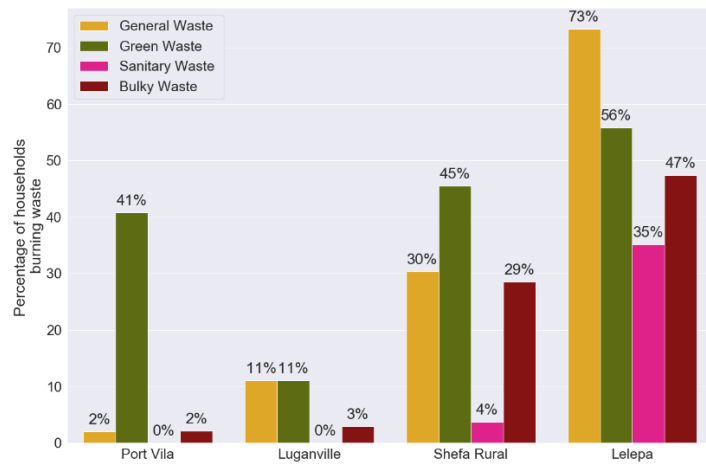


Figure 15: Waste burning rates in Vanuatu

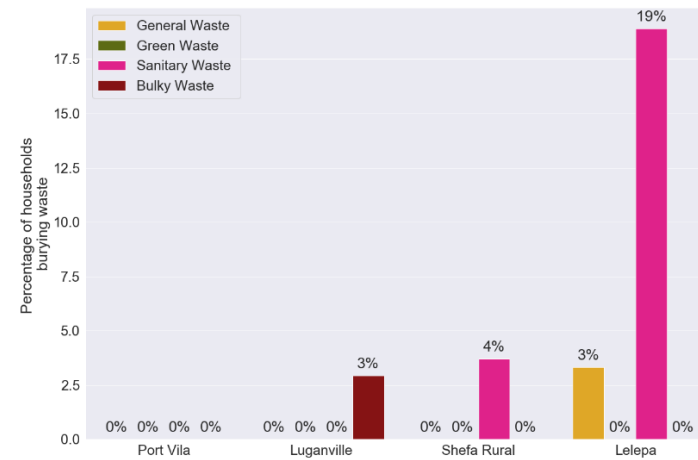


Figure 16: Waste burying rates in Vanuatu

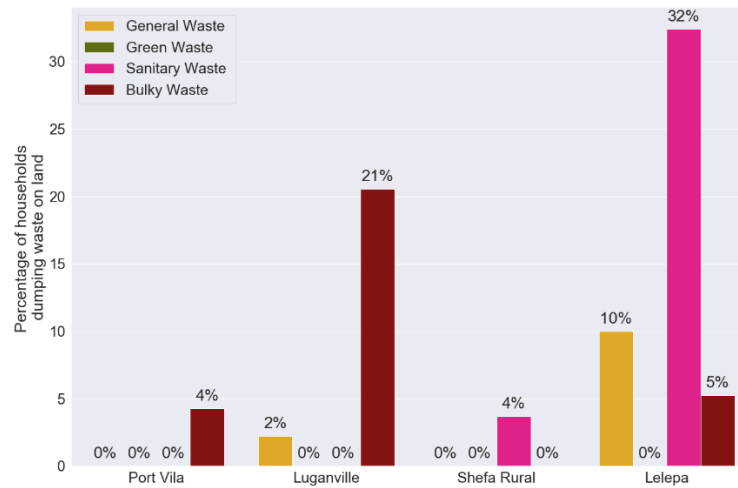


Figure 17: Waste dumping rates on the land

Based on this data, the following improvements are proposed:

- Increase participation rate in the use of the yellow bag system through community education
- Improve the use of the yellow bag to ensure that all waste is being disposed of correctly.
- Review the yellow bag pricing to make it more affordable for people of all income levels.

7.3 National Waste Disposal Rate – households only

Households were given surveys reporting on several factors that might be associated with the household waste disposal rate. Initially, the household disposal rate was modelled as being determined by the following:

- number of people in the house
- the household income
- the household grocery spending
- the collection service rating (which we theorised might be related to how often the house makes use of the collection service).

Because the disposal rates varied by region, and even after accounting for these factors, we also modelled the site disposal rate for each area (e.g. Port Vila, Luganville, Lelepa) as being determined by that area's:

- average collection service rating
- its distance from an urban centre
- its average grocery spending
- its average income.

The household disposal rate was then determined by the site disposal rate and the factors previously mentioned. This model is shown in **Error! Reference source not found..**

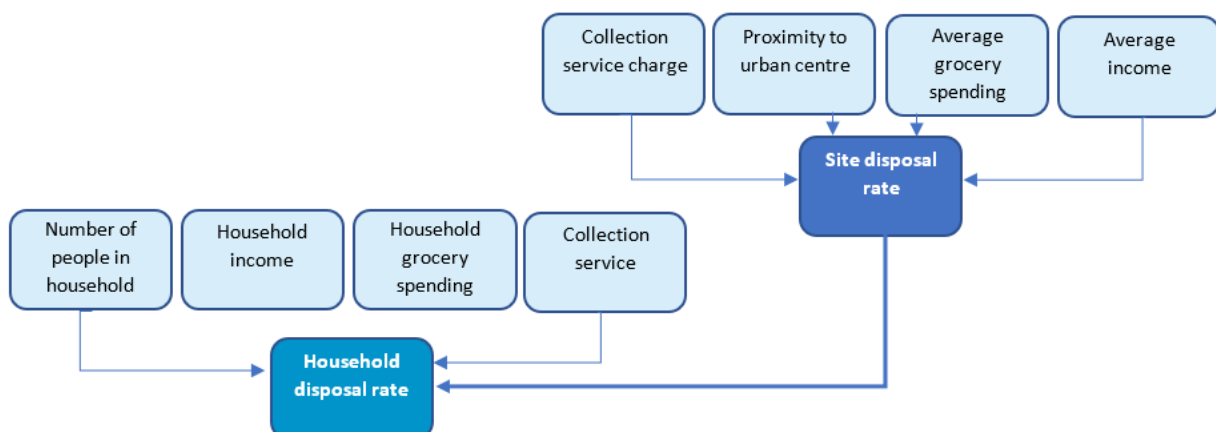


Figure 18: Initial model for disposal rate

We found that a simpler model fits the data more robustly (Figure 19).

This model incorporated only the effect of the site average grocery spending on the site disposal rate, and the household disposal rate was determined by the site disposal rate and the number of people in the household.

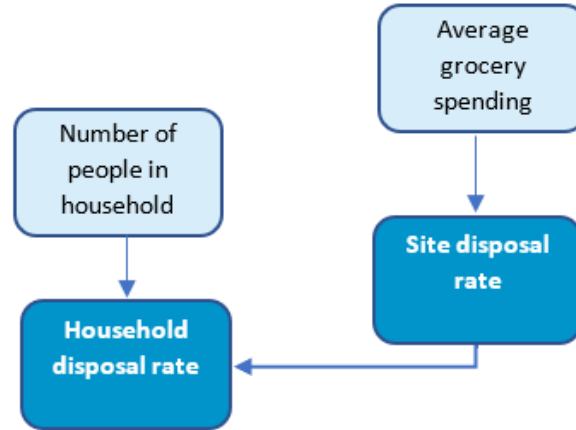


Figure 19: Final model for disposal rate

Previous work on municipal waste generation in the United States found that average retail sales were a better predictor of waste generation than household income (Hockett, Lober and Pilgrim, 1995). It is interesting that even in the different cultural and socio-economic context of Vanuatu and the Solomon Islands, we find what appears to be a similar pattern.

Using the model, we could estimate disposal rates in areas that weren't directly sampled. Modelled disposal rates are more uncertain than measured disposal rates, but the model also provided an estimate of this uncertainty. This allowed us to estimate a range of plausible waste disposal rates nationally. The 95% Bayesian credible interval (BCI) is the range in which 95% of the samples from the model fell.

Table 22: Vanuatu national disposal rate*

Estimated disposal rate (g/capita/day)	Estimated overall disposal (tonnes/day)
198 (95% BCI 136–276)	55.4 (95% BCI 37–76)

*Note: these are figures are for household disposal rates only. In Luganville, the commercial sector was estimated to make up 25% of overall waste disposal, but this estimate was unavailable for other sites.

Please note that these calculations are for the household waste only. Based on this model, we attempted to estimate how much of this overall waste came from the urban and rural areas.

7.4 Urban and Rural Waste Disposal Rate – households only

Estimated urban and rural contributions for Vanuatu are given in Table 23. Percentages are of the median total estimate of 55 tonnes/day. The model allowed a range of waste disposal rates to be estimated for each area. In order to assess how much waste came from urban areas compared with rural areas, three scenarios were considered:

- First, when the waste volumes from both areas came from the middle of the range
- Second, we considered a scenario when the waste from the rural areas was at the upper end of the range while the waste for the urban areas was at the lower end. This gives an estimate of the upper bound on the proportion of waste from rural areas.
- Finally, we considered a scenario where the urban waste was at the high end of the range and the rural waste was at the low end. This gives an estimate of the lower bound on the proportion of waste from rural areas.

The data were sampled from a hierarchical Bayesian model, so there might be slight variation to other estimates of household waste generation.

Table 23: Overall waste contributions, urban and rural – Vanuatu

	Best estimate (tonnes/day)	High rural waste scenario (tonnes/day)	High urban waste scenario (tonnes/day)
Port Vila	21.7 (39%)	19.0 (24%)	23.7 (54%)
Luganville	2.2 (3%)	1.6 (2%)	2.9 (6%)
All rural areas	31.7 (58%)	57.1 (74%)	17.2 (39%)

The J-PRISM PVMC waste management strategy states that the total amount of waste from households arriving at Bouffa landfill is 23.9 tonnes/day (2016–2017). This is similar to the high urban waste scenario modelled above. If this data model was to be used for the estimation of amounts of material generated by urban versus rural Vanuatu, a cross-referencing with available data on landfill disposal rates seems to be the most logical step. AWPC therefore proposes that the rapid assessment method in the field followed by the use of the proposed model allows for a reasonable estimation of the scale of waste generated in country.

The waste disposal to landfill amounts were reported by J-PRISM II (2017). Note that of the overall waste being disposed of at Bouffa, 50.3% (or 23.9 tonnes/day) is household waste, 34.8% is from commercial sources and 2.9% is market waste.

7.5 Income and purchasing habits

While average grocery expenses for a region were found to be correlated with disposal rates, neither income nor grocery expenses for a particular household were found to have a significant relationship.

Income and spending figures found in the household surveys were smaller than those detailed in the 2010 Vanuatu Household Income and Expenditure Survey (HIES).

In Luganville reported incomes were 25% lower and Port Vila’s were 33% lower.

Rural Shefa was particularly understated, with reported incomes 57% lower than the 2010 HIES. The Shefa province has changed substantially since the 2010 survey with a large influx of refugees due to Cyclone Pam in 2015, and this could partly explain the difference.

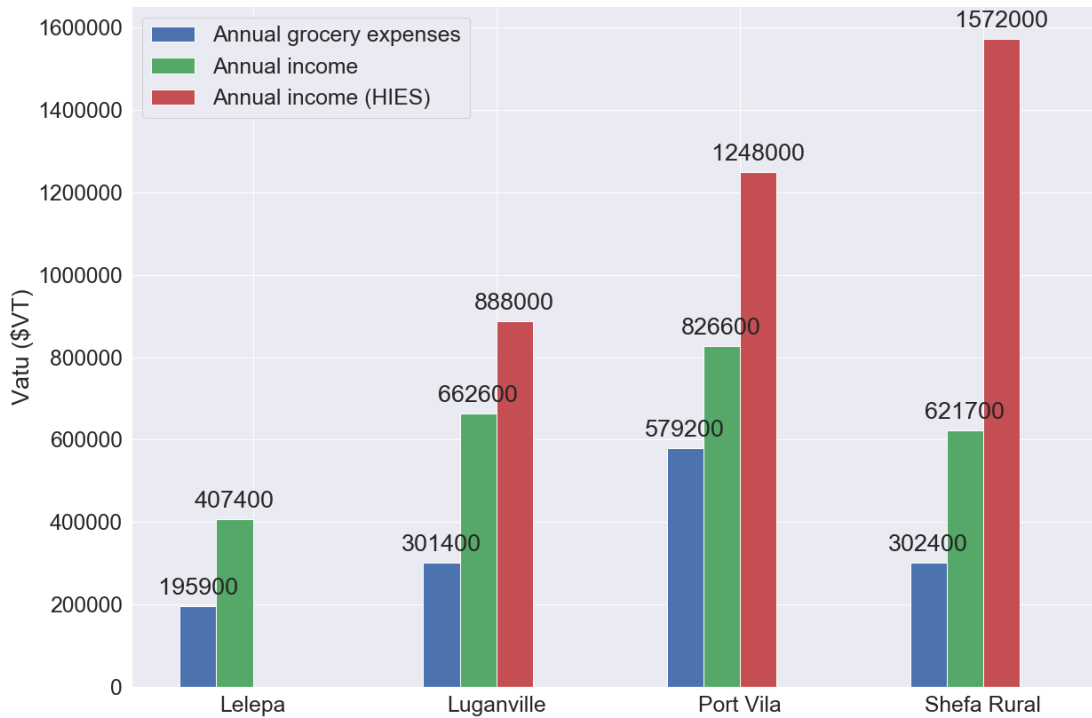


Figure 20: Vanuatu income and grocery expenses

Based on the interview process followed in Vanuatu and Solomon Islands, we note that estimating income in households is difficult, with discrepancies between the reported income and that found in this survey are all too real. APWC experienced that given a large number of people rely on subsistence farming and fishing, they don't consider selling their vegetables at the market as a source of income. One lesson learned from this process is to be specific about the questions asked to estimate household income. We had more success with expenditure on groceries because the survey guidelines developed listed the various types of items a grocery expense includes.

7.6 Waste composition

While organics made up the largest overall category, nappies were the most prevalent single item in waste samples from Vanuatu. Given households encounter notable difficulty in disposing of nappies, it is possible that this number is inflated by rural households taking the sample as an opportunity to offload excess nappies.

As shown in

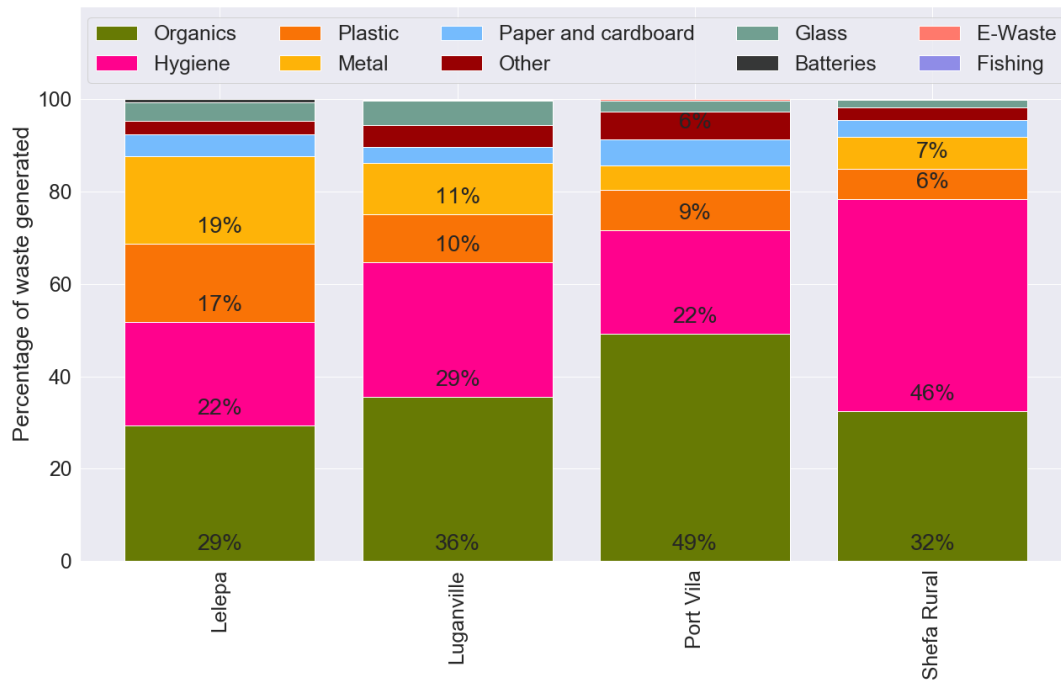


Figure 21, organics forms the highest component of waste being disposed of using the red or yellow bag system (29–49%). Interestingly, the rural community of Lelepa also reported a high level of organic waste although it does not have a disposal system. This is followed by hygiene items, namely nappies and feminine hygiene (22–46%).

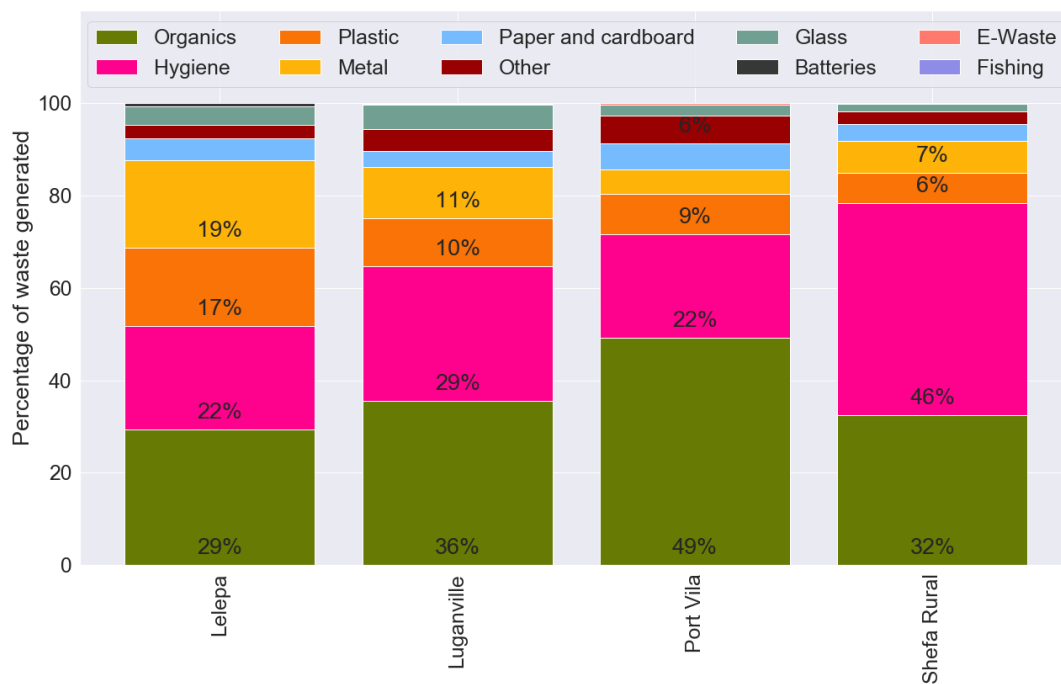


Figure 21: Breakdown of waste types compared between sites – Vanuatu

Figure 22 lists the top ten individual items disposed of in Vanuatu and proposed best practice actions to manage these items.

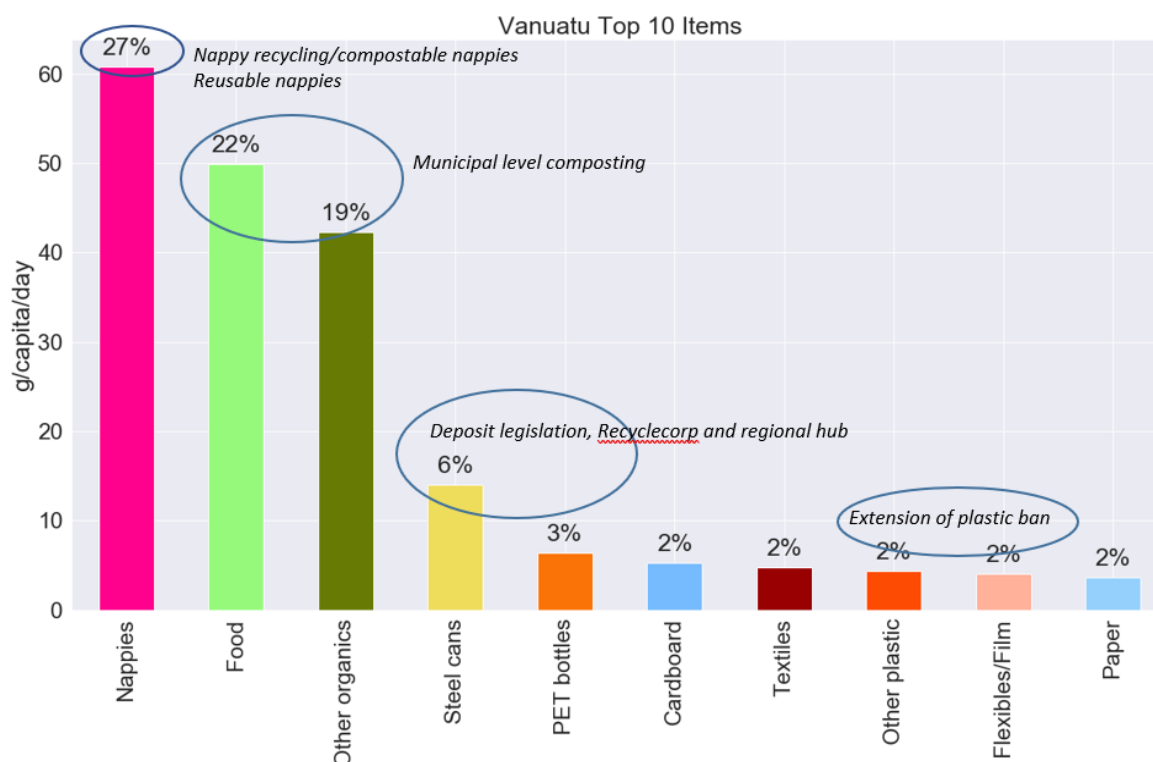


Figure 22: Vanuatu top 10 waste items and proposed solutions

Based on the data above, best practice solutions are proposed in section 8.2.

7.7 Commercial waste – generation rate

The average rate of waste disposal for commercial premises in Luganville was 4.5 kg/business/day (95% CI 1.5–7.6 kg/business/day). The 2018 business house survey counts 191 businesses in Luganville, which allows for a crude estimate of 860 kg/day of waste disposed of by businesses in Luganville (95% CI 286–1,451 kg/day). This compares to an estimate of 2,440 kg/day disposed of by households (95% CI 1,800–3,080 kg/day). Commercial waste in Luganville accounted for approximately 25% of household and commercial waste (though this figure could be between 8 and 40%).

The average disposal rate in Port Vila was 11.8 kg/business/day (95% CI 6.5–17.6), but a count of businesses for Port Vila is not available.

Accommodation providers were the largest contributors to the waste stream in Luganville, and close to the largest in Port Vila. Restaurants were the largest contributors in Port Vila (see Figure 23 and

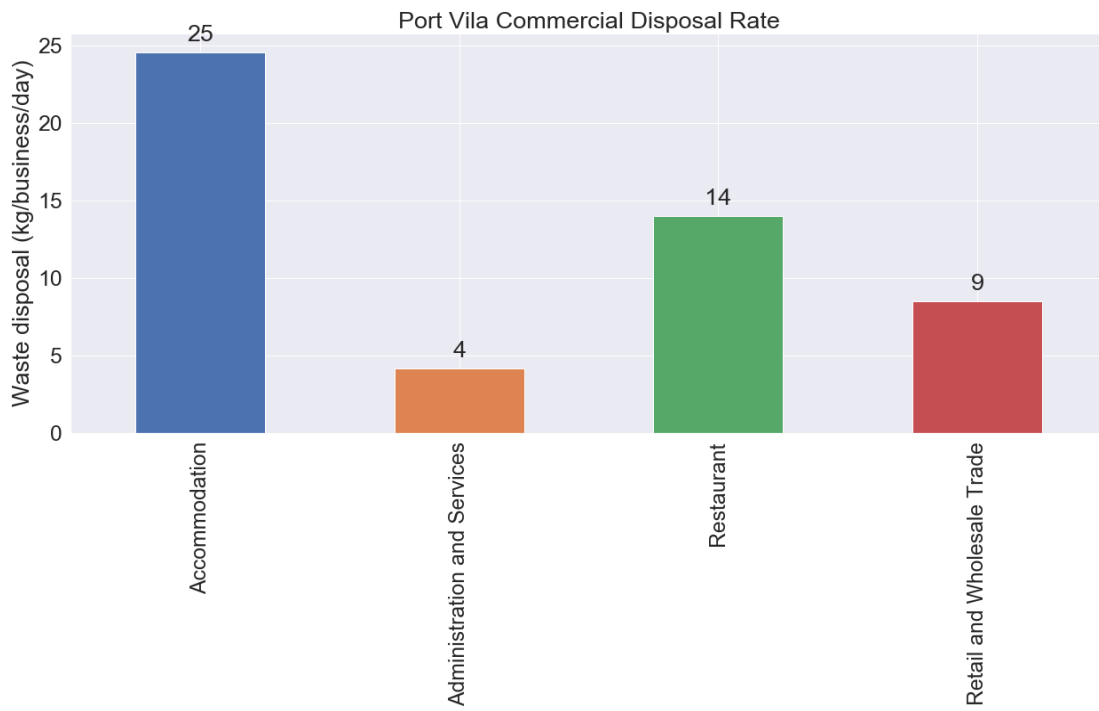


Figure 24).

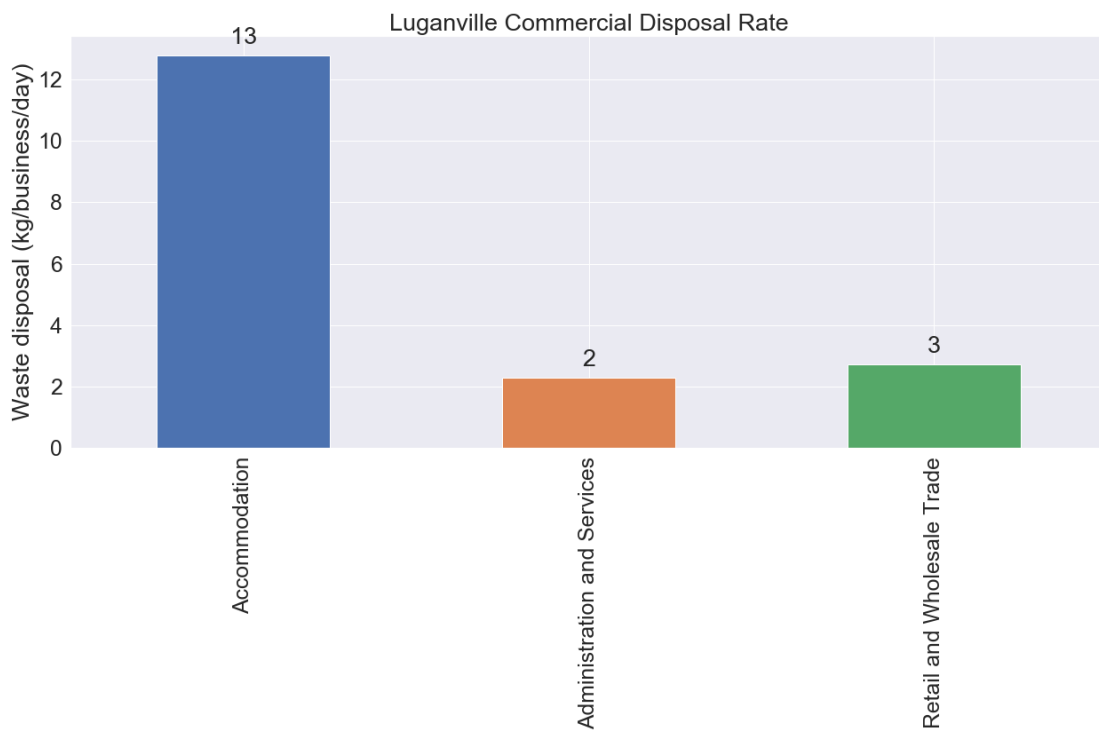


Figure 23: Luganville commercial disposal rate

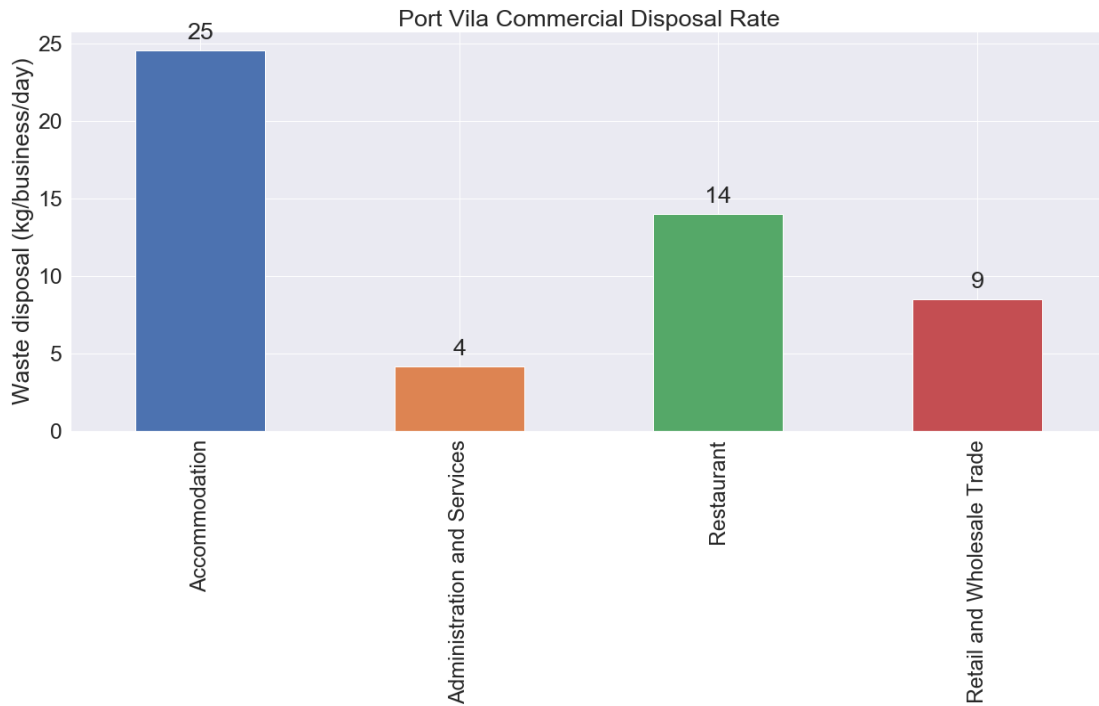


Figure 24: Port Vila commercial disposal rate

Commercial sources had comparatively more paper and e-waste and less hygiene and metal waste than household sources. Both had similar quantities of organic waste (see Figure 25 and

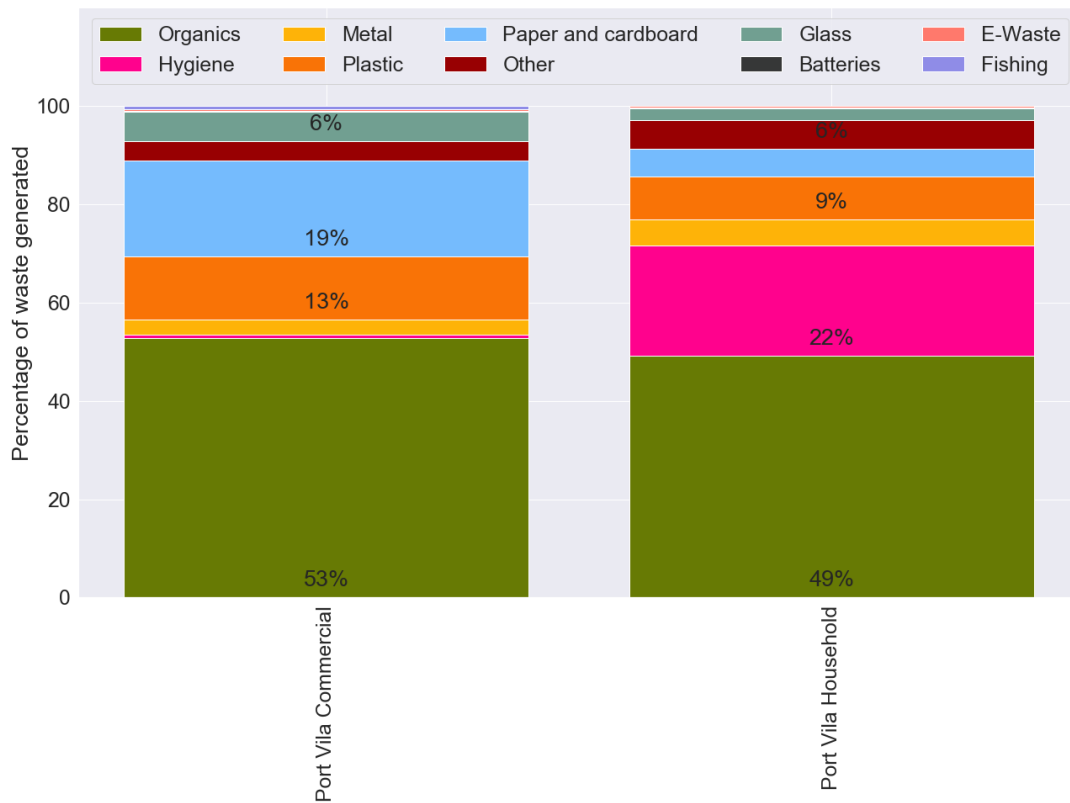


Figure 26).

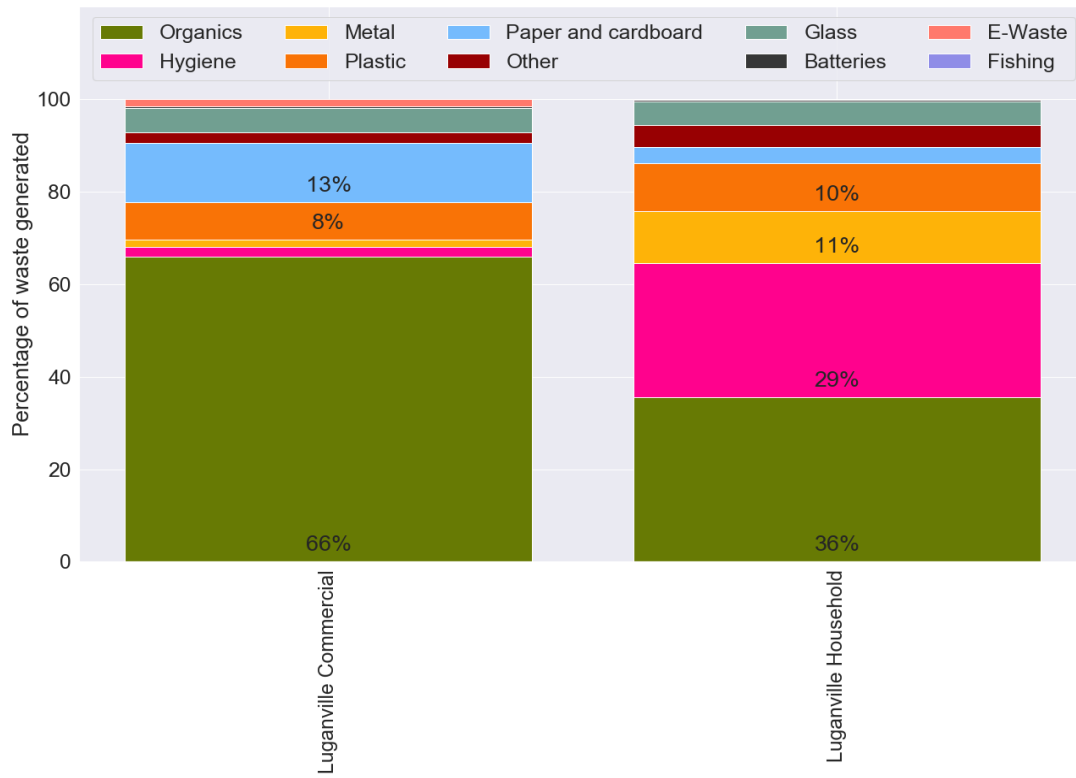


Figure 25: Luganville commercial waste breakdown

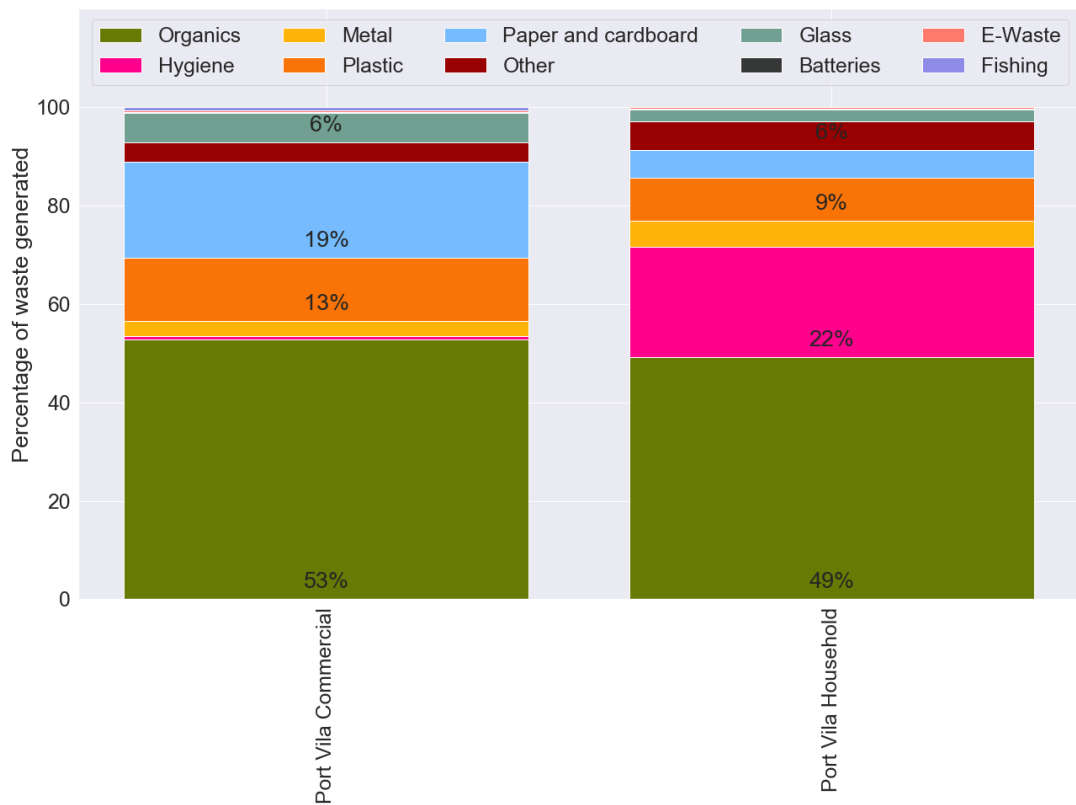


Figure 26: Port Vila commercial waste breakdown



A solution for organic waste and containers (as proposed in section 8.2) would lend itself to a solution for more than 70% of commercial waste generated in both Port Vila and Luganville. Batteries, metal and e-waste, which are more common in business waste than household waste, are included in the scope of the PRIF regional hub.

JICA is supportive of a recycling association for Vanuatu. An association co-ordinating all future recycling activities, including plastics, metal and organics, would be important for the ongoing sustainability of recycling in Vanuatu.

8 Service gaps and proposed actions

8.1 Service gaps identified

The following gaps have been identified in the provision of waste management services in Vanuatu:

Table 24: Gaps in provision of waste management services

Theme	Gaps
Policy/legislation	<ul style="list-style-type: none"> • SWM by-law has not yet been passed. PVMC has no legal basis to collect waste fees (This is not true for LMC.) • The new solid waste management plan for PVMC has to be adopted in 2019. There is no current plan. • There is no clarity around who is accountable for waste management and implementation of plans both within PVMC as well as within the Department of Environment. • There is no waste unit or team within the Department of Environment. • Provinces are lagging and there is no clear policy or plan in place around waste management. • The ban on plastic bags has led to the introduction of other materials, such as mesh bags, which pose similar if not worse environmental risks. • The plastic bag ban has the potential to be more extensive. • Both municipal councils and provinces need to have action plans with specific targets to work towards.
Data collection and decision making	<ul style="list-style-type: none"> • All waste data is collected with the help of JICA volunteers. • There is no internal capacity within local councils or provincial staff to use data for decision-making processes. • While most international waste data collection is focused on household waste management, there is no clarity on who should collect litter data and then use it to make decisions around litter reduction. • Data for incoming waste is collected at the Bouffa landfill in registers but it is not being entered to the computer or used for any decision making • Luganville landfill records are limited to data collected by the JICA volunteer • Most provinces don't have landfills or even managed dumping spaces • Most islands don't have any waste disposal facilities or any accounting for what is happening with their waste.
Economic instruments	<ul style="list-style-type: none"> • All income from yellow bags/red bags goes to a central account. • All expenditure on solid waste management cannot be clearly accounted for in either PVMC or LMC. • The budget for solid waste management is limited. • The provinces are behind in developing economic instruments. • Although provinces are thinking about having financial mechanisms in place, it is not currently the case.
Collection services	<ul style="list-style-type: none"> • Collection services are only provided by PVMC, LMC and in LTMC.

Theme	Gaps
	<ul style="list-style-type: none"> No provinces or islands are covered by a collection service or have plans to do so. The collection services in PVMC and LMC are also limited to the urban areas and expansion to the peri-urban areas, although required, will require substantial support.
Equipment and maintenance	<ul style="list-style-type: none"> There is limited stock of spare parts. Maintenance capacity is limited. There were broken-down collection trucks in each of the municipal councils visited. Both PVMC and LMC need more collection trucks.
Contracts and tenders	<ul style="list-style-type: none"> Waste collection contractors are not being used by either of the councils, but this option should be explored. Tender and contract management capacity is limited in each of the councils and the provincial governments assessed.
Landfill design and management	<ul style="list-style-type: none"> Lifespan of landfill is limited for Bouffa and Luganville. Landfill is not sanitary and there was no soil cover seen in either of the landfills. Lack of equipment at landfill for daily, weekly or monthly activities. Heavy equipment is not available (LMC) or broken down (PVMC). Both municipalities are dependent on hired equipment to undertake landfill activities work. Both landfills have waste pickers of all ages and genders working in unsanitary conditions. In both landfills, waste picker activity is not regulated or formalised.
Education and engagement	<ul style="list-style-type: none"> There is no formal environment education/awareness programme, although awareness activities are undertaken by both councils. Waste education/awareness is missing in provinces and outer islands. There is no co-ordination between the plethora of national and international projects being undertaken in the waste space. There is no staff capacity within either the Department of Environment or within councils to undertake this co-ordination. There are no staff currently undertaking or responsible for waste education or awareness activities.
Recycling	<ul style="list-style-type: none"> The only recycling currently happening in Vanuatu is due to waste picker and scavenger activity plus the bottle buy-back scheme. Organics are not being composted or even source-separated. 30–50% of household waste being brought to landfills is organic nature and composting or processing of organics provides great opportunity to save on landfill space and achieve good environmental outcomes. There has been no push for better source separation. In communities where it has been trialled, there is real disillusionment due to lack of follow-up and in some cases pick-up when the materials were separated. 10-20% of material in households and 20-40% in commercial premises is recyclable including plastic, paper, aluminium etc. However, recycling capacity in Vanuatu is very limited. Shipping cost is expensive, which makes harder to export materials for recycle.

Theme	Gaps
Monitoring	<ul style="list-style-type: none"> • There is no monitoring and evaluation being undertaken for the NWMPCS or for the local solid waste management plans. • There is no internal capacity within either the department or local councils to do so.
Training	<ul style="list-style-type: none"> • Some staff have had extensive training under the JICA, EU and other regional projects whereas others have had none. • There is a disparity between waste management capacity in councils in urban areas and staff in provinces.

8.2 Proposed best-practice actions

The following best-practice actions are proposed based on the most common types of waste found in households that are then disposed of at all available landfills in Vanuatu.

8.2.1 Management of nappies

Nappies as a separate product have not been counted in any of the previous audits conducted in Vanuatu. Therefore, it is difficult to determine the scale of the problem prior to this visit. Clearly, however, the residents of Vanuatu find it hard to find appropriate disposal methods for nappies. Therefore, yellow and red bags are seen as an appropriate means of disposal of nappies due to the high incidence of nappies in the bags assessed, with 27% or 61 grams per capita per day of the overall waste assessed represented by nappies.

Data also shows that in Lelepa, where there are no disposal systems available, 35% burn the nappies, 19% throw them in the ocean and 46% bury them in the backyard.

APWC's team encouraged the practice of burial during our visit to the island, but we believe that would be a problem waste in most if not all remote islands of Vanuatu. We note that on the island of Mavea, off the coast of Santo, with no local shops and 100% of the families living off subsistence farming, only re-usable nappies were being used and the residents had not heard of disposable nappies. This leads us to the conclusion that with increased purchasing power and access to shops, the problem of nappies is bound to be exacerbated.

APWC believes that the solution to the growing problem of nappy disposal is the introduction of small, community-scale nappy composting systems, especially on islands where there are no collection systems available.

For such systems to be viable, compostable nappies have to be made available to the community at an affordable price point that is cost competitive with the traditional plastic-containing nappy. The means to ensure this is to extend the plastic ban to include nappies containing plastic. Instead of banning these nappies outright, there could be a provision of higher tax on nappies, including plastic.

The introduction of composting for nappies should be aligned with a community-level education campaign focussed on reusable nappies. This would assist the thinking process within the communities in regards to the available choices.

8.2.2 The plastic bag ban

Vanuatu’s plastic bag ban is working. On average, plastic bags formed only 0.8% of the overall household waste in Vanuatu. Of these, a majority were the glossy bags that are not banned. In comparison, approximately 4.4% of the overall waste collected from households in Solomon Islands was plastic bags, where no such ban currently exists.

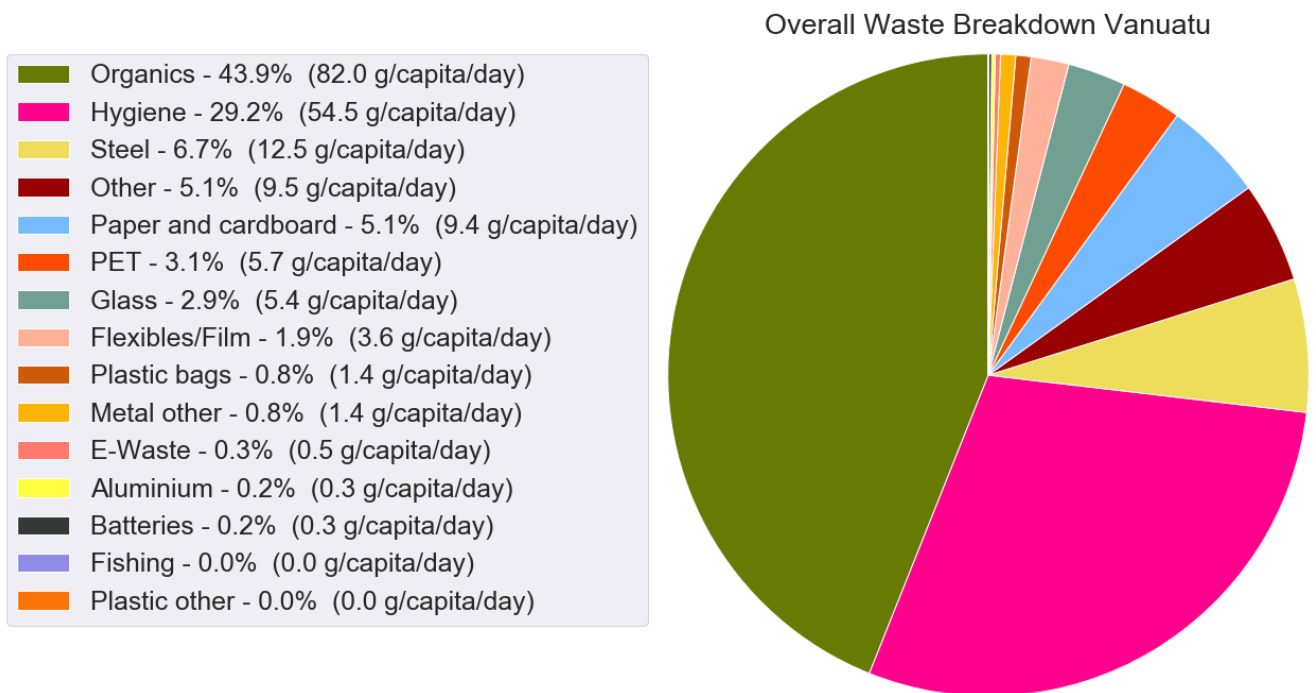


Figure 27: Detailed breakdown of waste in Vanuatu

The plastic bag ban has been effective in reducing the amount of soft plastic going to landfill as evidenced by the difference in Vanuatu and Solomon Islands data. An audit conducted in August 2018 by JICA reported that 2% of the overall waste disposed of at Bouffa landfill was comprised of plastic bags. The data is not directly comparable because the landfill receives waste from both households and commercial premises as well as self-disposal. However, the PVMC staff have now been trained to undertake waste audit as per APWC methodology and should be able to conduct ongoing monitoring audits as required.



Image 32: Mesh bags being used extensively at the market for selling produce

APWC also notes that the ban on plastic bags has led to the introduction of other materials such as mesh bags that were found in large quantities in the household audits.

8.2.3 Containers deposit legislation

Container deposit schemes (CDS) encourage recycling in the community while reducing litter and the number of containers going to landfill. Under such schemes, eligible empty containers can be returned at return points in the community for a refund. The best schemes have different refund amounts for different containers or materials depending on the value of the recyclable material.

In Vanuatu, two private companies – Azure Pure Water and Vanuatu Brew – currently offer a 5 VUV to 10 VUV redemption when their bottles are returned. APWC understands that the glass bottles are reused. It has not been ascertained how the PET bottles are being recycled.

Table 25: Container deposit schemes currently in Vanuatu

Proponent	Scheme
Azure Pure Water	Opened Vanuatu’s first plastic bottle buy-back and recycling programme on 1 August 2017, offering a 5 VUV rebate for any of their branded plastic bottles to be returned clean at their factory by Bauefield Airport. Azure states ‘for a long time we have recognised that waste management and plastic bottle disposal in Vanuatu is a challenge, and we recognise our responsibility as a manufacturer to be providing viable and sustainable solutions for the management of the waste which we produce so as to keep our county clean’ ⁷ . Azure are working in partnership with RecycleCorp Vanuatu, Australian packaging supplier VISY and Department of Industry Vanuatu to deliver the programme. Bottles are stripped down into individual plastic components, baled and shipped to Australia for recycling. It is the first scheme of its kind in Vanuatu. Azure hope to add additional collection points for consumers to drop off bottles for recycling.
Vanuatu Brewing and Vanuatu Beverage Ltd	Provide a CDS for glass bottles at the point of sale. The deposit is refunded on return of the bottle in order to adhere to environmental correct practices

As part of the APWC audit, all containers (plastic, aluminum, steel, LPB and glass) were sorted by size, material type and product type. Each household on average produced 7.7 containers per day. Figure 28 show the counts of the most common containers in Vanuatu.

There were some common trends – aluminium soft drink cans 150–500 ml were common everywhere, but particularly in urban Vanuatu. This was also true of PET 500 ml–1 litre plain water bottles. Both these trends could be due to the impact of tourism on urban centres. We already know that the landfill pickers on Bouffa and the LMC landfill site collect PET bottles and sell them to local Kava bars and ladies at the market stalls. Aluminium beer containers were very common in Luganville but rare elsewhere in Vanuatu.

⁷ Azure Pure Water. Give Me 5 – Recycling Program <http://azure.vu/recycling>

Based on an extensive number of deposit legislations, APWC modelled the eligibility criteria for container legislation to be most effective in Vanuatu. The analysis is based on the inclusions and exclusions listed at Appendix G. These inclusions and exclusions are only proposed based on the data available to us and would encompass more than 90 per cent of the containers in the waste stream for most communities. They would allow for any Pacific country to become an extension of the CDS schemes working in Australia, thereby reducing the amount of new research required to be conducted.

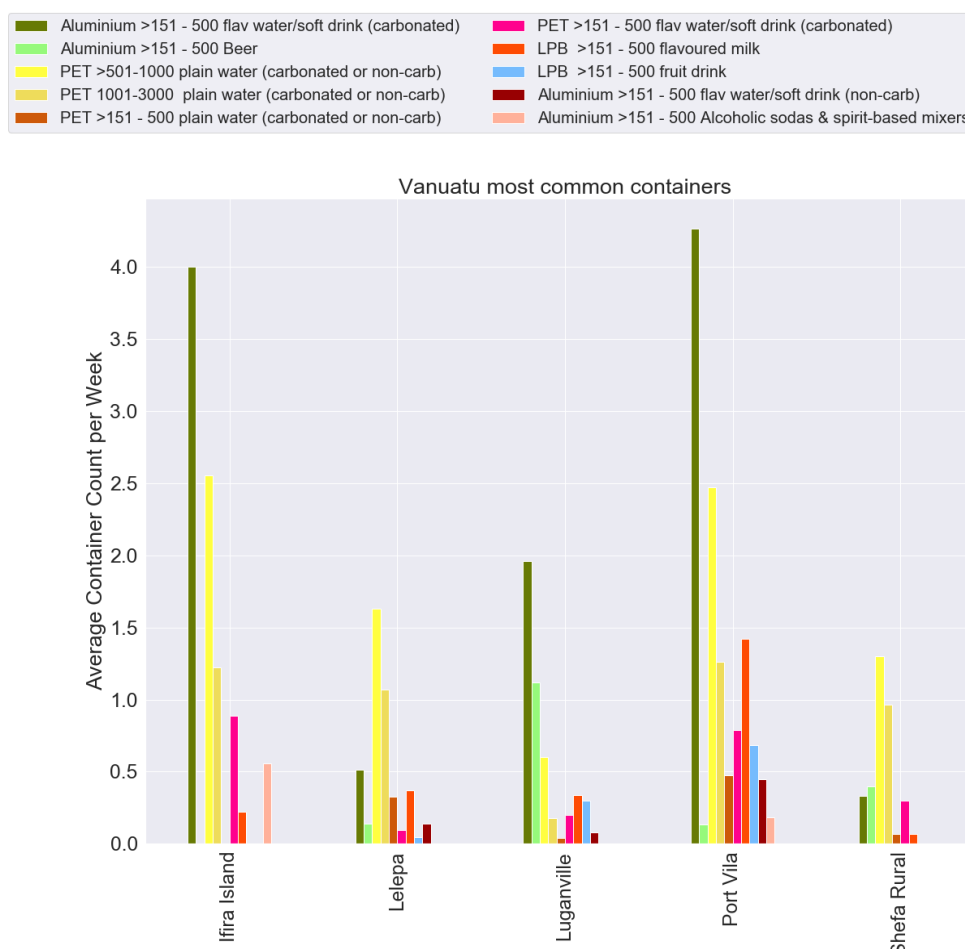


Figure 28: Vanuatu most common containers

Many bottles and cans are also currently in circulation within Vanuatu communities as they are re-used within communities for water and kava. These containers often end up buried, burned or in the environment once they cannot be reused. If a deposit is put on these containers, it would increase the likelihood of them being returned when they can no longer be reused.

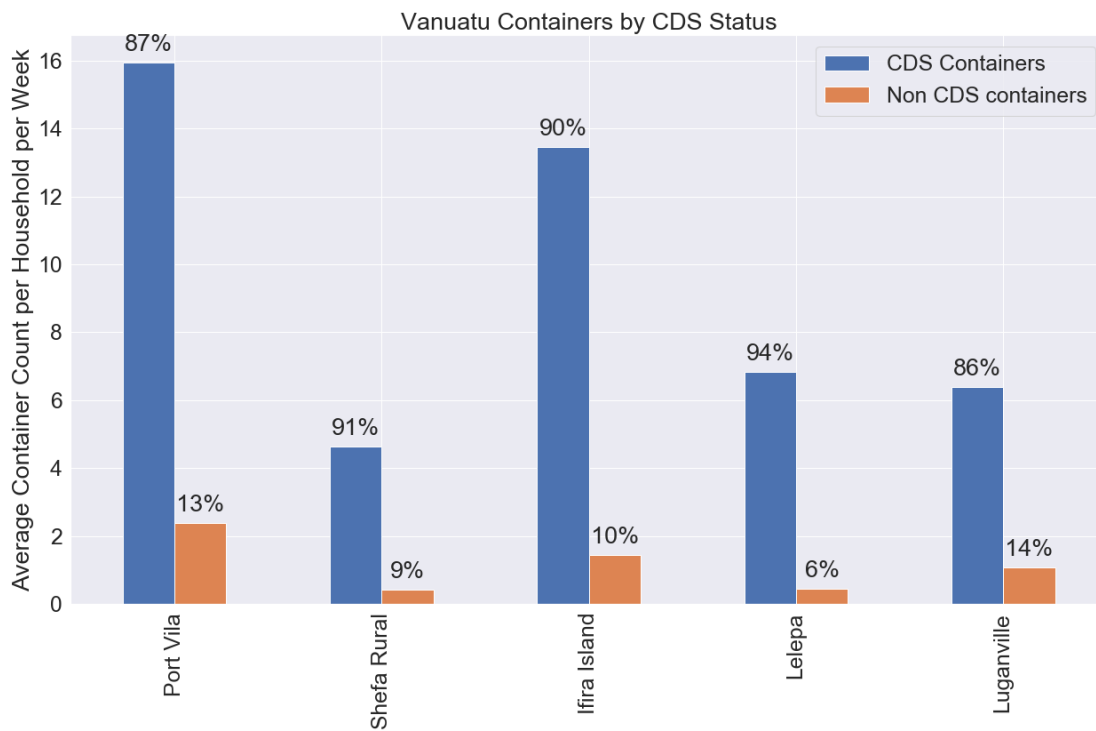


Figure 29: Vanuatu containers by CDS status

Traditionally, the biggest challenge for Vanuatu has not been the collection but the sale and recycling of materials once they have been collected. The cost of shipping materials from Vanuatu to market is prohibitively high compared with the relatively small amount of material being generated in the country. Further, the additional cost of shipping materials from outer islands to the main islands must be borne by the recycler.

Although the Moana Taka partnership currently exists for the movement of materials within the Pacific, it is restricted in the materials of no commercial value. The proposed Pacific Regional Recycling Hub currently under investigation, led by the Pacific Regional Infrastructure Facility (PRIF) with the support of all donors and SPERP, is on the horizon and will allow Pacific countries to ship recyclable materials to a hub for consolidation and local value-adding. The feasibility study to undertake this project is proposed to be carried out in 2019–2020 and Vanuatu will be invited to participate. Used beverage containers, paper and cardboard, scrap metal, batteries, e-waste and end-of-life renewables are also included in the scope for the PRIF regional recycling hub.

9 Recommendations

Based on APWC’s assessment of the current situation, a set of recommendations and future actions has been prepared. Areas for Cefas collaboration with other projects in the region have also been identified. We note that the data is yet to be analysed, therefore these recommendations are based solely on our in-country assessments and stakeholder consultation. In many cases, the recommendations would not be changed after the analysis of data.

Table 26: Overall recommendations

DETAILS	VANUATU	POTENTIAL ACTIONS
INSTITUTIONAL ARRANGEMENT AND SUPPORT		
Staff	<p>In the absence of sustainable budget support to employ permanent staff to support waste management in Vanuatu, all effort must be made to secure volunteers from the available donor-supported programmes to provide the needed human resources through the:</p> <ul style="list-style-type: none"> • JICA Volunteer Programme (Senior and Junior Volunteer provisions) • Australia, New Zealand and USA volunteer programmes • Others. <p>(Example: There is only one employee at the Environment Department responsible for waste management)</p>	<p>Facilitate and conduct a donors’ dialogue (meeting) to bring together the donors (UK, USA, New Zealand, Australia, UK and Japan) for discussion of their existing volunteer programmes. This meeting should be attended by representatives from the provinces and municipalities to give them the chance to directly inform the donors of their human resources needs.</p> <p>Support can be provided through the funding of volunteers for specific projects through local organisations active in the space like VESS, Pango Green Force, Wan Smol Bag and World Vision</p>
Waste management financing	<p>To introduce applicable waste financing mechanisms to generate sustainable funding support for the provision of waste services (currently J-PRISM II will conduct a preliminary assessment for CDL next year 2019). There is also some proposed collaboration with outer areas in Port Vila such as Shefa Province for the application of the prepaid bags as part of Vanuatu Plan of Operations.</p>	<p>a) Collaborate with J-PRISM II and PacWaste Plus in extending the prepaid rubbish bag system to areas of Cefas interest:</p> <ul style="list-style-type: none"> • Shefa Province (Ifira, Lelepa and Moso Islands) • Sanma Province (Mavea, Tutuba)



DETAILS		

DETAILS	VANUATU	POTENTIAL ACTIONS
	<p>To promote the transfer of skills from current trained and experienced staff to new staff and workers</p> <p>Use of current PMVC and HCC staff and workers to provide technical assistance and training to other areas of Vanuatu and Solomon Islands on different aspects of waste management.</p> <p>e.g. Andrew and Berry of PMVC on Waste Landfill Construction and Operation.</p> <p>Ray and Berry of Vanuatu for Waste Audits, etc.</p>	<p>Supporting and financing a number of in-country workshops to bring together all the staff involved in waste management in the provinces and councils in Vanuatu, for waste management staff in the Ministry of Environment and PVMC to train in different areas of waste management.</p> <ul style="list-style-type: none"> • Waste assessment methodologies • How the information is used to develop waste management plans at the provincial level • Assisting the provinces in the development of their waste management plans <p>APWC aim to cover the first training through the APWC training schedule</p>
Co-ordination	<p>To strengthen the national co-ordination capacity of the responsible agencies in Vanuatu in the co-ordination of waste management activities throughout.</p>	<p>In collaboration with J-PRISM II and PacWaste Plus to support the establishment of a National Waste Management Committee (similar to JCC for J-PRISM II) which includes representatives of all provinces in Vanuatu and supports the financing of six meetings (two in 2019, two in 2020 and two in 2021). This can be the platform in the future to promote better co-ordination of the National Waste Management Strategy throughout the countries. This type of co-ordination mechanism is needed to promote and help other provinces in the improvement of their waste management.</p>
Waste management plans	<p>The development of waste management plan at the provincial and council levels is a requirement under the current National Waste Management Strategies of Vanuatu and Solomon Islands. The provinces and councils are ill-equipped to develop such waste plans on their own and through the co-ordination mechanism at 1.4.1, this shall promote the</p>	<p>In collaboration with JICA and SPREP to support the development of waste management plans in other provinces.</p>

DETAILS	VANUATU	POTENTIAL ACTIONS
	development of waste plans if the actual situations are discussed during the National Waste Management Committees meetings.	
Legislation	For enforcement of waste management, existing laws relating to littering, illegal dumping, burning, etc., throughout the countries, by-laws must be developed at the provincial, council or community level.	Support the development of the waste by-laws for the provinces
INFRASTRUCTURE		
Collection service	<ul style="list-style-type: none"> Improve the collection system by reducing the areas covered under the PVMC existing collection services and promote the participation of private contractors Improvement of collection services in rural and outer areas including remote islands using the prepaid bag system. There is a proposed collaboration under J-PRISM II with Shefa Province under the Plan of Operation for Vanuatu. Proper rubbish compactors are expensive and difficult to maintain in the long run. Open dump trucks can be converted to rubbish trucks by installing cages at the sides (similar to some of the trucks used by PVMC). Conduct public awareness activities to promote the use of the prepaid bags in the above proposed areas in Vanuatu. 	<p>Support a preliminary assessment and a pilot collection service in 2019 for the outer islands of Ifira, Lelepa, Sanma and Moso for the use of a special prepaid bag.</p> <p>Provision of medium, open dump trucks to support the pilot project at the above areas outside of PVMC (Port Vila, Vanuatu). It was also demonstrated during the Best Practice Showcase in Sydney that there is potential for utes to be converted to rubbish trucks to allow their use in areas that are difficult to access.</p> <p>For gaining maximum attention, awareness and support from the targeted communities in Vanuatu, the trucks can have the name of the Cefas project painted on the truck sides with phone numbers of the responsible provincial offices (Shefa, Sanma). It is important for such an initiative to have a good launch and beginning for active participation from the communities. The trucks can collect the proposed prepaid bags</p>

DETAILS	VANUATU	POTENTIAL ACTIONS
		<p>for the beginning of the programme and provide services in collaboration with existing private contractors. Discussions can be made with existing contractors for their awareness and input to this initiative for successful implementation. These can all be assessed during a Preliminary Assessment proposed above.</p> <p>Propose collaboration with current programmes like Pango Green Force, VESS and World Vision</p>
<p>Disposal services</p>	<p>Improvement of waste disposal site operations in Honiara and Port Vila (Ranadi, Gizo and Bouffa) – Under J-PRISM II 2017–2021 – with no plan for capital investment on heavy equipment.</p>	<p>Providing heavy equipment support to Vanuatu existing main waste landfills</p> <p>20-tonne excavator & D7 bulldozer for Bouffa landfill, Port Vila. The provision of this heavy equipment will solve the on-going problems on the daily maintenance of the site because of the existing faulty equipment.</p> <p>As part of any supply of heavy equipment, it should cover training for operators, spare parts and on-going contact information for future communication, e.g. an NZ or Australia supplier closer to Vanuatu.</p> <p>Providing manual weighing bridge to assist with data collection at the current main waste landfills in Vanuatu because of the difficulty in the installation of electronic weighing bridge.</p> <p>Any deal for the supply of these weighing bridges must include some training programmes for the waste landfill staff and operators including securing of spare parts and establishment of contacts for future communication.</p>

DETAILS	VANUATU	POTENTIAL ACTIONS
Recycling	<p>To support the Recyclers Association in Vanuatu by providing some equipment and facilities to improve and promote their recycling operations.</p>	<p>Funding of a 10-tonne flat-deck truck with a hiab lifter for collection and movement of recyclable waste materials in Honiara area and Port Vila. This truck can be leased by the Association to its members at a lower rate compared with the rental daily rates. This will assist recyclers' individual operations and at the same time generate some revenues for the Association through the daily rental fees. This can reduce the existing piles of scrap metals at Bouffa landfill. The available bulky wastes can be recycled but the removal and transportation to the existing recycling operators is an issue. This will also benefit the waste pickers at these waste landfills for the removal of their wastes.</p> <p>Assist in the setting up of some waste recycling operations within or close to the existing waste landfills especially at Bouffa to promote the collaboration between the recycling operators and the waste pickers (refer to the Conceptual Development Plan 2014, which was discussed and supported by the previous PVMC).</p> <p>Assist in setting up the constitution and action plans for recycling association.</p> <p>Financing composting projects for nappies and green wastes and recyclable waste collection in collaboration with existing waste recyclers</p>
Litter Control	<p>Installation of river booms at key rivers/lagoons in Vanuatu</p>	<p>Financing of the purchase of river booms and a pilot project in collaboration with existing provinces and councils for the removal and disposal of the captured litter from the booms.</p> <p>Financing of a waste management pilot for communal bins to be stationed within the communities along the river banks in collaboration with the</p>

DETAILS	VANUATU	POTENTIAL ACTIONS
		responsible provinces and councils to control litter input to the river and sea.
EDUCATION AND AWARENESS		
Educational Materials	To support the development of educational materials in both English and the local languages for public awareness programmes and activities to promote awareness on the impacts of poor waste management and how to address it.	Financing the production of videos, posters and calendars with photos showing plastics in stomachs of fish, turtles, whales, etc. Financing the production of the following educational materials for awareness programmes in the communities. <ul style="list-style-type: none"> • How to dispose of green wastes using the traditional home garden methodology • How to set up simple composts at the base of your agriculture crops or fruit trees • How to set up a compost unit using an empty steel or plastic drum • Nappy compost method • How to dispose of other waste steams using backyard ditches or holes.
OTHERS		
Waste Pickers	To improve the working conditions of waste pickers at the main Vanuatu and Solomon Islands waste landfills (Bouffa Waste Landfill and Ranadi Waste Landfill).	In collaboration with other projects currently working in the space to set up a registration and recording system for waste picking operations at Ranadi and Bouffa landfills. Such a system should enforce the following conditions, which are vital in the management of the waste landfills: <ul style="list-style-type: none"> • All waste pickers must become a member of the Waste Pickers Group (can be a formal organisation later for access to funding to improve

DETAILS	VANUATU	POTENTIAL ACTIONS
		<p>their operations and working conditions through available funding schemes for Civil and Society Funding).</p> <ul style="list-style-type: none"> • Must wear personal protection equipment before entering the site (Cefas can help in the provision of PPE). • Must wear an ID Card (issued by the councils and management of the waste landfills). <p>Assist in the setting up of some shelters for waste pickers to use on a daily basis for their activities. The centre must have a toilet and water supply in line with occupational health and safety aspects. The office is an open house with a toilet and shower block and a block for storage of equipment to be used by the waste pickers. This equipment can be kept by the waste landfill offices and leased to the waste pickers at a lower price to help them with their daily tasks. Examples of equipment are:</p> <ul style="list-style-type: none"> • Wire strippers • Wheel barrows • Metals cutters • Others <p>Provision of training for the waste pickers to improve their operations and safety.</p> <p>This can promote the image of waste picking operations as a professional but not as the last hope.</p> <p>Such waste pickers proposed developments can fit well with the proposed recycling developments at both waste landfills at Bouffa (refer 2.3) and Ranadi. With the availability of some recycling facilities within or close to</p>

DETAILS	VANUATU	POTENTIAL ACTIONS
IMPLEMENTING AGENCY FOR CEFAS PROJECT	<p>To continue the current momentum of waste management developments in Vanuatu, the role of the Ministry of Environment and Ministry of Health is vital, with support from the same stakeholders under the established J-PRISM II JCC Committee. The Ministry of Health has the national network, which the project and the Ministry of Environment can use to promote waste-related developments throughout the countries as highlighted above.</p>	<p>the waste landfill area, it can improve the recovery and capture of waste materials from the landfill for recycling purposes.</p> <p>The project must use the proposed co-ordinating mechanism highlighted above for a National Waste Committee to consist of all provinces to ensure the promotion of the project nationwide.</p> <p>The same co-ordinating mechanism can be used as a monitoring platform to monitor the progress of the project through annual meetings.</p> <p>There is a potential for continuity if every waste project is channelled through the same co-ordinating mechanism in the future to ensure the continuation of this national co-ordination effect for future progression in other parts of the countries. This will also prevent any duplication of efforts and resources in the future from upcoming or different waste-related programmes and projects.</p>

9.1.1 Management of organics

Any future policy or plan for Vanuatu, even in regional areas, must consider a proposal to manage organic waste. With landfill space being at a premium in every location visited during the APWC visit, the removal of organics from the incoming waste stream to the landfill not only solves an environmental issue, it has the potential to reduce requirement of landfill space resulting in a substantial monetary saving.

A 2016–17 JICA study recorded that 50% or 23.9 tonnes of waste per day coming to the Bouffa landfill is household waste. Of this, 49% or 11.7 tonnes is organic in nature (APWC disposal-based audit). Assuming a minimum of 60% of this waste can be successfully recovered for composting or processing, that equates to 1,826 tonnes of organic waste recovered per year and almost 3,000 cubic metres of saved space in landfill (51% food and 49% vegetation as per audit, density conversion based on EPA Victoria guidelines⁸).

APWC research shows that in Luganville, the central market generates an average of 1.1 tonnes of pure green and food waste every day, which was being sent to landfill prior to APWC's visit. In addition, an average of 250 kilograms per day is being composted on site using a small-scale composting system. APWC started a trial of green waste composting from the central markets which would lead to a saving of almost 350 tonnes of organics from entering the landfill each year and save 550 cubic metres of landfill space. If this trial is successfully managed by LMC, it can be rolled out to the remaining five markets in Luganville as well.

With a large amount of organic waste being generated, a market study will have to be performed to ensure that any organic product generated as a result can be sold back to the community.

However, any future business plan should consider the segregation of organic matter, composting it and using it merely as landfill cover. None of the landfill sites visited during the APWC visit were using a landfill cover. Using a volume-reduced and composted organic product reduces requirement of landfill space, reduces greenhouse gas emission and methane production and improves landfill management through the availability of cover material.

APWC understands that acquisition of land is a challenge, however, Bouffa landfill has enough space to start a composting trial. A composting trial from market waste was already started at LMCC as part of APWC scoping and data collection visit.

⁸<https://www.epa.vic.gov.au/business-and-industry/lower-your-impact/~media/Files/bus/EREP/docs/wastematerials-densities-data.pdf>

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Appendix A Private waste operators' licence fees order no. 16 of 2018

Table 27: Private waste operators' licence fees

Type of Application	Fee (VUV)
Application for a private waste operator's licence	10,000
Application to amend a private waste operator's licence	5,000
Application to renew a private waste operator's licence	5,000

Source: Waste Management Act no.24 of 2014: Private Waste Operator's Licence Fees Order No.16 of 2018

Appendix B Waste management (penalty notice) regulation order no. 17 of 2018

Table 28: Waste Management (Penalty Notice) Regulation Order No 17 of 2018: Penalty Notices

Provision of the Act	Prescribed amount for first offence by individual (VUV)	Prescribed amount for any subsequent offence by individual (VUV)	Prescribed amount for any first offence by body corporate (VUV)	Prescribed amount for any subsequent offence by body corporate (VUV)
Subsection 15(8) of the Act: Operation of a landfill site without a licence	50,000	80,000	100,000	200,000
Subsection 15 (8) of the Act: Operation of a waste dump without a licence	50,000	80,000	100,000	200,000
Subsection 15 (8) of the Act: Operation of a waste transfer station without a licence	20,000	30,000	40,000	60,000
Subsection 15 (8) of the Act: Operation of a recycling centre without a licence	20,000	30,000	40,000	40,000
Subclause 2(2) of the Waste Management Regulations: Manufacture of disposable containers, single use plastic bags or straws	50,000	80,000	100,000	200,000
Subclause 3(3) of the Waste Management Regulations: Sell, give or otherwise provide disposable containers, single use plastic bags or straws	20,000	50,000	50,000	100,000
Subsection 15(8) and Paragraph 6(a) of the Waste Management Regulations: Operation of a composting plant without a licence	20,000	30,000	40,000	60,000
Subsection 15(8) of the Act and paragraph 6(b) of the Waste Management Regulations: Operation of was waste incinerator without a licence	50,000	80,000	100,000	200,000
Subsection 15(8) of the Act and paragraph 6(c) of the Waste Management Regulations: Collection and transport of waste without a licence	20,000	30,000	40,000	60,000
Subclause 13(2) of the Waste Management Regulations: Operating a waste dump or waste disposal facility or undertaking any waste management	60,000	100,000	120,000	200,000

Provision of the Act	Prescribed amount for first offence by individual (VUV)	Prescribed amount for any subsequent offence by individual (VUV)	Prescribed amount for any first offence by body corporate (VUV)	Prescribed amount for any subsequent offence by body corporate (VUV)
operation or service while a licence is suspended.				
Subclause 4(3) of the Waste Management Regulations: Deposit litter or waste in a public place	5,000	10,000	50,000	100,000

Source: Republic of Vanuatu. Waste Management Act No.24 or 2014. Waste Management (Penalty Notice) Regulation Order no17 of 2018 retrieved from: <https://environment.gov.vu/images/Environmental.Protection/Official-Gazette-No.-10-of-2018-dated-2-February-2018.pdf>

Appendix C: Waste Collection Schedule LMC

LUGANVILLE MUNICIPAL COUNCIL COMPACTOR TRUCK WASTE COLLECTION SCHEDULE – 2018

DRIVER: Allan Felton (contact: 7500077)

Prepared by: Ray VILVIL (contact: 7500078)

Monday		Tuesday		Wednesday	
08:00	Luganville Market Sarakata CBD Business Houses Natural Area Agent Court Area VMF Barracks Palm Estate Area Airport Area	08:00	Luganville Market Lavusvatu Area Pump station Area Solway Area Tangara Area	08:30	Luganville Market Side River Area Red Corner Area Melcoffe Area BP Burn Area Radio Station Area St. Michel
12:00	Airport Area Airport CCECC waste	10:30	Airport CCECC waste	11:30	CBD Business Houses Airport CCECC waste
Thursday		Friday		Saturday	
08:30	Luganville Market Sarakata Area Pepsi Area 2 nd Canal Area Fresh Wind Area	08:00	Luganville Market Solomon's Hill Area Chapuis Area St. Louis Area Mango station 1& 2 CBD Business Houses	08:00	Luganville Market CBD Business Houses
12:00	Airport CCECC waste	12:00	Airport CCECC waste	10:00	Airport CCECC waste

Appendix D: Household Sample collection sheet

Household collection sheet

	Date	Auditor		Weather			
	Sample number	GPS location recorded?	Photo?	Interview sheet provided?	Interview sheet returned?	Bags provided?	Comments
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Appendix E: Household interview sheet

Area or Island Name: Date:..... Sample number (H1 to H200)_____

Weather(Sunny/Windy/Raining)

1. CONTACT INFORMATION

Household name/number	
Total number of people in the household	
No. of adults in the household	
No. of children in the household	
Location	
House type	
House ownership	

2. NATURE OF THE WASTE GENERATED

Daily Diet:

Preference 1P or Buy

Preference 2.....P or Buy

Preference 3.....P or Buy

Weekly number of soft drink cans consumed

Weekly number of water bottle consumed

Weekly expense on groceries: **VUV**.....**Per**..... **OR**.....
(Total)

Weekly expense on transportation: **VUV**.....**Per**.....**OR**.....
(Total)

Weekly expense on electricity: **VUV**.....**Per**..... **OR**.....
(Total)

3. MEASURE OF INCOME

Source of Income	
No. of people employed in the family	
Estimated monthly income	

4. WASTE MANAGEMENT

No of bins in the house	
What is the waste level in your house when the collection comes	
Do you burn any waste	
Choose one. Do you	
<ul style="list-style-type: none"> Take your bin out to a collection point 	
<ul style="list-style-type: none"> Throw it along the road/creek/ocean 	
<ul style="list-style-type: none"> Bin gets collected from your house 	

<ul style="list-style-type: none"> Other (describe how you dispose of your waste and where) 	
How do you dispose of the following:	
<ul style="list-style-type: none"> Green waste 	
<ul style="list-style-type: none"> General waste 	
<ul style="list-style-type: none"> Bulky waste 	
<ul style="list-style-type: none"> Nappies 	

5 AWARENESS LEVEL

Are you aware of the waste collection/recycling services available? (Y/n) if yes, how many?	
Did you get any information about the collection services	
How did you get this information or where did you hear about it from?	
Do you have a radio?	

6. APPRECIATION OF THE COLLECTION SERVICE

Rate your collection service from 1 to 10. 1 is really bad.	
What's the reason for the score?	
Do you have any suggestions for improvement?	

7. WILLINGNESS TO PAY FOR THE SERVICE

How much you are willing to pay if the waste collection is charged (monthly)?	
Do you support an idea of introducing a rubbish bag for people to put in their waste like in NZ, Australia, Kiribati and Vanuatu	
These rubbish bags cost between 20 cent to 1 dollar. How much you can afford if we sell the rubbish bag?	

8. CDL & RECYCLING

In order for cans, plastic bottles, and bulky waste to be recycled and sent overseas, we need to support the cost by introducing a waste levy like other countries, e.g. 10 cent for soft drinks, \$100 for import cars, \$50 for washing machines and refrigerators. Do you support this plan?

Appendix F: Further sort sheet

Beverage containers	Cigarette Butts	Cigarette Packets	Straws	Coffee Cups	
Bags - heavy glossy typically branded carry bags	Bags - supermarket type light weight carry bags	Takeaway containers (plastic and paper)	Takeaway container lids		
BEVERAGE CONTAINER ONLY FURTHER SORT					
	<150	>151 - 500	>501-1000	1001-3000	>3001
Aluminium					
Alcoholic sodas & spirit-based mixers					
Beer					
cider/fruit based etc					
flav water/soft drink (carbonated)					
flav water/soft drink (non-carb)					
Other					
Steel					
Alcoholic sodas & spirit-based mixers					
Beer					
cider/fruit based etc					
flav water/soft drink (carbonated)					
flav water/soft drink (non-carb)					
Other					
LPB					
milk					
flavoured milk					
fruit juice (>90% fruit &/or Veg juice)					
fruit drink					
flav water/sports drink, non-carb					
Other					
PET					
milk					
drink pouches					
flav. Milk					
flav water/ sports drink etc (non-carb)					
flav water/soft drink (carbonated)					
plain water (carbonated or non-carb)					
fruit juice (>90% fruit &/or Veg juice)					
fruit drink					
Other					
HDPE					
milk					
drink pouches					
flav. Milk					
flav water/ sports drink etc (non-carb)					
flav water/soft drink (carbonated)					
plain water (carbonated or non-carb)					
fruit juice (>90% fruit &/or Veg juice)					
fruit drink					
Other					
Other Plastic					
milk					
drink pouches					
flav. Milk					
flav water/ sports drink etc (non-carb)					
flav water/soft drink (carbonated)					
plain water (carbonated or non-carb)					
fruit juice (>90% fruit &/or Veg juice)					
fruit drink					
wine bladders					
Other					
Glass					
Alcoholic sodas/spirit-based mixers					
Beer					
Cider/fruit based etc					
Flav water/soft drink (carbonated)					
Plain water (carbonated or non-carb)					
fruit juice (>90% fruit &/or Veg juice)					
fruit drink					
Wine (glass only)					
Wine cooler					
Spirit					
Other					

Appendix G: Inclusions and exclusions in CDL

MATERIAL CATEGORY	0 - 150ml	>150 - 500ml	>500ml - 1lt	>1L - 1.5lt	>1.5lt - 2lt	>2 - 2.5lt	>2.5lt - 3lt	>3L
Aluminium	EXCL							EXCL
Alcoholic sodas & spirit-based mixers	EXCL							EXCL
Beer	EXCL							EXCL
cider/fruit based etc	EXCL							EXCL
flav water/soft drink (carbonated)	EXCL							EXCL
flav water/soft drink (non-carb)	EXCL							EXCL
Other	EXCL							EXCL
Steel	EXCL							EXCL
Alcoholic sodas & spirit-based mixers	EXCL							EXCL
Beer	EXCL							EXCL
cider/fruit based etc	EXCL							EXCL
flav water/soft drink (carbonated)	EXCL							EXCL
flav water/soft drink (non-carb)	EXCL							EXCL
Other	EXCL							EXCL
LPB	EXCL							EXCL
milk	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL
flavoured milk	EXCL			EXCL	EXCL	EXCL	EXCL	EXCL
fruit juice (>90% fruit &/or Veg juice)	EXCL			EXCL	EXCL	EXCL	EXCL	EXCL
fruit drink	EXCL							EXCL
flav water/sports drink, non-carb	EXCL							EXCL
Other	EXCL							EXCL
HDPE	EXCL							EXCL
milk	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL
drink pouches	EXCL							EXCL
flav. Milk	EXCL			EXCL	EXCL	EXCL	EXCL	EXCL
flav water/ sports drink etc (non-carb)	EXCL							EXCL
flav water/soft drink (carbonated)	EXCL							EXCL
plain water (carbonated or non-carb)	EXCL							EXCL
fruit juice (>90% fruit &/or Veg juice)	EXCL			EXCL	EXCL	EXCL	EXCL	EXCL
fruit drink	EXCL							EXCL
Other	EXCL							EXCL
PET	EXCL							EXCL
milk	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL
drink pouches	EXCL							EXCL
flav. Milk	EXCL			EXCL	EXCL	EXCL	EXCL	EXCL
flav water/ sports drink etc (non-carb)	EXCL							EXCL
flav water/soft drink (carbonated)	EXCL							EXCL
plain water (carbonated or non-carb)	EXCL							EXCL
fruit juice (>90% fruit &/or Veg juice)	EXCL			EXCL	EXCL	EXCL	EXCL	EXCL
fruit drink	EXCL							EXCL
Other	EXCL							EXCL
plastic other	EXCL							EXCL
milk	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL
drink pouches	EXCL							EXCL
flav. Milk	EXCL			EXCL	EXCL	EXCL	EXCL	EXCL
flav water/ sports drink etc (non-carb)	EXCL							EXCL
flav water/soft drink (carbonated)	EXCL							EXCL
plain water (carbonated or non-carb)	EXCL							EXCL
fruit juice (>90% fruit &/or Veg juice)	EXCL			EXCL	EXCL	EXCL	EXCL	EXCL
fruit drink	EXCL							EXCL
wine bladders	EXCL			EXCL	EXCL	EXCL	EXCL	EXCL
Other	EXCL							EXCL
Glass	EXCL							EXCL
Alcoholic sodas/spirit-based mixers	EXCL							EXCL
Beer	EXCL							EXCL
Cider/fruit based etc	EXCL							EXCL
Flav water/soft drink (carbonated)	EXCL							EXCL
Plain water (carbonated or non-carb)	EXCL							EXCL
fruit juice (>90% fruit &/or Veg juice)	EXCL			EXCL	EXCL	EXCL	EXCL	EXCL
fruit drink	EXCL							EXCL
Wine	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL
Wine cooler	EXCL							EXCL
Spirit	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL	EXCL
Other	EXCL							EXCL



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