

PORT VILA CITY COUNCIL AND SHEFA PROVINCE SOLID WASTE MANAGEMENT PLAN (2021-2030)







Port Vila City Council and Shefa Province Solid Waste Management Plan 2021-2030

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Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management in Pacific Island Countries Port Vila City Council

And Shefa Province

Solid Waste Management Plan

(2021-2030)

December 2020

Port Vila City Council Shefa Province JICA Expert Team, J-PRISM II

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Forward

Honorable Mayor's Message

As Port Vila City and its outer suburbs grows, so too does its waste problem. If we keep going as we are, the amount of waste we send to landfill will continue to increase. We know we can do better. This Solid Waste Management Plan has identified where we need to make changes, where we need to invest money and where we need to increase education and awareness about both the harms of waste but also the ways in which we can reduce how much we create and dispose of.

The Plan outlines how the Council and the residents of Port Vila can work together to reduce waste. It identifies key areas that we will focus on in the next 10 years to ensure that we provide an efficient yellow bag collection service to our communities, that the landfill is safe and that it continues to be operational for the life of this plan and longer. This Plan is an opportunity; to make the most of the resources we have, create jobs, stimulate economic development, and protect our communities and our environment.

My work in the communities has shown me that there is a real willingness from our residents to do the right thing. If we continue to work collaboratively with our communities and our businesses, increase education and awareness, I believe we have a chance to reduce the amount of waste that is generated each year.

By doing the right thing with waste, we'll be a step closer to solving other challenges too. Marine pollution, climate change, and social inequity are all issues where waste is part of the problem, and where the Waste Management Plan can be part of the solution. I and my fellow Councillors fully support this Waste Management Plan and we look forward to seeing the results.

Eric Puyo-Festa LORD MAYOR Lord Mayor

Port Vila City Council

Town Clerk's Message

The waste management landscape in Vanuatu has changed significantly in the last few years. Of particular note was the introduction in 2014 of the Waste Management and Pollution Control Act which provides legal support to all the initiatives that have been introduced and will be introduced in the future. In 2018 plastic bags were banned and in 2019 additional plastic products were added to the legislation. Since then with the support of the JICA Expert Team and the hard-working staff in the Waste Management Department there has been significant progress made and I am proud to stand behind this 10-year Solid Waste Management Plan for Port Vila City Council.

This Plan sets out a practical framework for the Port Vila City Council to not only improve waste collection services to our residents and ensure all waste is disposed of safely at our landfill, but our Waste Management Department will focus on the future generations, by introducing a Clean School Programme and increasing environmental education in our school curriculum in partnership with the Department of Environmental Protection and Conservation (DEPC).

The next 10 years will see the yellow bag collection service being expanded to peri urban areas, a weighbridge installed at the landfill, better management of waste management vehicles, increased transparency and accountability of waste management finances, increased staff in the Waste Management Department and an increase in the number of residents composting their organic waste.

There will also be a focus on ensuring we have appropriate Waste Management By-Laws to support the work we do and where necessary ensure we have enforcement powers. The aim is that year on year we will begin to see a reduction in the amount of waste generated by both households and businesses, resulting a cleaner city for all its residents and tourists.



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Acknowledgement

The Waste Management Department would like to acknowledge those who provided technical and financial support to the development of "Port Vila City Council and Shefa Province Solid Waste Management Plan (2021-2030)", namely the Embassy of Japan, the Japanese International Cooperation Agency (JICA) and the consultant team of the J-PRISM II Project.

In addition, the support we have received from the Department of Environment Protection and Conservation and Shefa Provincial Government has been crucial.

Lastly we would like to acknowledge the role of the community in the development of this Plan, without their participation in consultation processes, providing us with feedback on our services and informing us of what they expect from the Waste Management Department, we wouldn't be able to set such ambitious goals for the next 10 years.

With this Port Vila City Council and Shefa Province Solid Waste Management Plan (2021-2030) on hand, the Port Vila City Council (PVCC) appreciates the support of all its development partners in providing assistance to this huge milestone. It is our expectation that this plan will allow citizens to maintain a sound, practical and sustainable leading role in waste management in protecting our beautiful environment.



Photo

PHOTO 1 : Each family set waste stand in front of their home, and put discharge waste in a prepaid yellow bag.
PHOTO 2 : Green waste discharged from the central market is loaded into a truck.
PHOTO 3 : Waste in the yellow bag is collected and transported by truck.



	PHOTO 7 : Daily maintenance of waste collection vehicles is implemented by drivers.
<image/>	PHOTO 8 : Pilot project of solid waste management education.
<image/>	PHOTO 9 : Waste Amount and Composition Survey (WACS) was conducted.

Glossary Definition

Time and Motion survey

Survey which is conducted in order to evaluate the collection route design, number of trips implemented, amount of waste transported, the waste generators discharge practices and the working conditions of the collection crews.

Infectious medical waste

Infectious medical waste is waste generated in the diagnosis, treatment or immunization of human beings or animals which has been or is likely to have been contaminated by an organism capable of causing disease in healthy humans. (IMW Fact Sheet Oct 2011)

Hazardous industrial waste

The waste from a factory, or from any premises used for, or in connection with provision of public transport; public supply of gas, water, electricity or sewerage services; or provision to the public of postal or communication services, which may be in solid, liquid or gaseous form, may cause danger to health or environment, either alone or when in contact with other wastes. (The Environmental Protection Act, 1990)

Greater Port Vila

A suburb area surrounding Port Vila

Waste Flow

The flow from generation of waste to disposal, showing all treatment processes and the amount of waste treated in those processes.

Tipping fee collection

A Tipping Fee or a gate fee is a fee paid by anyone who disposes of Waste in a Landfill.

Community consultation

Meeting between city council and civilization to work on a solid waste management actively together.

Green wastes

Waste that decays naturally and in a way that is not harmful to the environment, such as row garbage from a market.

Grassroots activity

Activities conducted by the lowest or most basic level of an organization or movement

The Tropical Cyclone PAM

Severe Tropical Cyclone which struck Vanuatu as an extremely destructive category 5 cyclone on the evening of 13 Mar 2015, causing serious damage to infrastructure and leaving debris strewn across the capital. (OCHA, 15 Mar 2015)

PACWASTE

PacWaste (Pacific Hazardous Waste) is €7.85 million, a four year project funded by the European Union and implemented by SPREP to improve regional hazardous waste management across the Pacific in the priority areas of asbestos, healthcare waste, E-waste and integrated atoll solid waste management.

Fukuoka method

A semi-aerobic landfill disposal technology for solid waste. Under an anaerobic condition in a landfill, the method creates conditions in which air is easily introduced to the bottom of the landfill layer, and secures ease of respiration through installation of pipes for quick drainage of contaminated water.

National Environmental Week

The Government of Vanuatu (GoV) declares to celebrate the National Environmental Week before and after the World Environment Day (WED) on 5 June every year for encouraging awareness and action for the protection of the environment.

World Clean-up Day

A global social action program that addresses global waste problems.

Station collection

A collection method, which multiple households drop off their waste at a designated collection station and collection vehicle goes around stations to collect waste.

Trench method

The trench method consists of an excavated trench into which the solid wastes are spread, compacted and covered. The trench method is best suited for nearly level land where the water table is not near the surface. Usually the soil excavated from the trench is used for cover material.

Weighbridge

A machine that vehicles drive onto so that they can be weighed. In particular, this machine is installed to measure weight of waste in transported vehicle.

Earth drains

Trench beside a road to make the water or liquid in something flow away.

Clean School Program

The Clean School Program was initiated in Fiji from 2010, and has been disseminated to other countries including Vanuatu through JICA's Project

List of Acronyms

ADB	Asian Development Bank		
CBD	Central Business District		
CDS	Container Deposit Scheme		
DARD	The Department of Agriculture and Rural Development		
DEPC	Department of Environmental Protection and Conservation		
DLA	Department of Local Authorities		
DSPPAC	Department of Strategic Policy, Planning & Aid Coordination		
ESDP	The Economic and Social Development Program		
FTFP	Fixed-Time Fixed-Place		
GDP	Gross Domestic Product		
IRC	Imere Rubbish Collection		
	Japanese technical cooperation project for promotion of regional initiative		
J-PRISM II	on solid waste management in pacific island countries, Phase-2)		
JCC	Joint Coordination Committee		
JET	JICA Expert Team		
LMC	Luganville Municipal Council		
NBSAP	National Biodiversity Strategy and Action Plans		
NEPIP	National Environment Policy and Action Plans 2030		
NSDP	National Sustainable Development Plan 2030		
NWMPCS	National Waste Management and Pollution Control Strategy 2016-2020		
OSH	Occupational Safety and Health		
PVCC	Port Vila City Council		
PVMC	Port Vila Municipal Council		
PWOs	Private Waste Operators		
T&M survey	Time and Motion survey		
UNDP	United Nations Development Program		
VSA	Volunteer Service Abroad		
VUV	Vatu (Vanuatu currency)		
WACS	Waste Amount and Composition Survey		
WB	The World Bank		
WMD	Waste Management Division		
WPs	Waste Pickers		

INTRODUCTION

1.1 Background

As a capital city, Port-Vila, located on the south coast of the island of Efate, is the economic and cultural center of the Republic of Vanuatu and the gateway to tourists visiting from abroad. Its municipal population in the last census (2016) was at 50,994, an increase of 16% on the previous census result (40,040 in 2009). Port Vila is Vanuatu's most important harbor and the center of the country's trade. The international airport, Bauerfield International (VLI) is also located in the city. Major industries in the city remain agriculture and fishing. Tourism is also becoming important, especially from Australia and New Zealand. There were over 255,985 visitors in 2019¹.

Port Vila City Council (PVCC) drafted the Solid Waste Management Plan 2008-2017 in 2008 under the support of JICA, but it had not been approved. In the meantime, due to the financial collapse of the municipal council, several competent experienced persons in the field have left their jobs, the equipment is not sufficiently maintained and half of them are out of order, which causes lack of satisfactory waste management.

The Waste Management Act No. 24 of 2014 declares that "Each Municipal Council or a Provincial Government Council must formulate, adopt and implement an annual Waste Management Plan" in clause 10 of the Act. To comply with the Act, the Annual Solid Waste Management Plan of PVCC in Year 2019 (ASWMP2019) was developed and endorsed by the City Council.

In March 2018 the new Mayor was appointed and the intention to improve waste management of PVCC was confirmed. The J-PRISM II (Japanese technical cooperation project for promotion of regional initiative on solid waste management in pacific island countries, Phase-2), which the Vanuatu Government has been implementing with JICA since March 2017, held a Joint Coordination Committee meeting on October 29, 2018, and the Output "Solid Waste Management (SWM) activities of PVCC is appropriately implemented and monitored in line with the SWM Plan" was newly added to the Project, and J-PRISM II decided to support PVCC to create a new SWM Plan for the next 10 years.

On March 11th 2020, the COVID 19 Global Pandemic was announced by the World Health

¹ Source: Vanuatu National Statistics Office (VNSO) "STATISTICS UPDATE: INTERNATIONAL VISITOR ARRIVALS, December 2019." 255,985 visitors include 120,628 visitor arrivals by air and 135,357 cruise ship arrivals.

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Organization. Over the coming months countries around the world began to close their borders to ensure the safety of their citizens. The JICA Expert Team (JET) based in Vanuatu at the time were repatriated to Japan on March 18th.

Vanuatu at the time of writing was still COVID19 free. The borders were closed on March 20th and a State of Emergency was issued until 31st of December 2020. As a country who is reliant on Tourism (upwards of 50% of GDP is generated through tourism) this pandemic and consequent border closure has had a massive impact on all its citizens.

The JET Team continued to work remotely with local staff however there is a limit to how successful this can be with limited access to technology on the Vanuatu side. As a result of time lines slipping, J-PRISM II recruited an in-country waste management specialist in September to assist with the completion of the SWMP.

1.2 Preparation Process of the SWM Plan

Preparation process of the SWM plan is shown in Fig. 1-1.



1.3 Review of the Previous SWM Plan

The previous SWM Plan (2008-2017) aimed to establish a SWM system in Port Vila Municipal Council (PVMC)² by maximizing the operational capacity of Bouffa Landfill based on minimizing disposal waste amount. In order to achieve this target, the following four main actions were set up.

Previous SWM Plan 2008-2017

- 1. Establishment of Sound SWM Finance
- 2. Strengthening of SWM Organization and Coordination with Respective Sectors
- 3. Arrangement of SWM Related Institutional System
- 4. Establishment of Proper SWM Technical System

This plan was developed with the support of the Japanese Government Assistance, through the project which had begun in 2006 to install a "Sanitary Landfill" for the rehabilitation for Bouffa Landfill. However, as mentioned in the Background section, this plan was not approved. As such, a part of the action plan was implemented by PVMC. One of the significant actions was the introduction of waste collection using pre-paid garbage bag, which was originally begun in 2010 and re-introduced in 2014. This system enhanced the revenue of SWM and improved waste collection efficiency. Other action plans such as improving the organization and institutional systems of SWM did not take place. In addition the resignation of several competent experienced persons in the field due to financial collapse of the municipal council, caused a lack of satisfactory waste management.

During the target period, there was positive social movement toward waste management, such as an endorsement of the National Waste Management and Pollution Control Strategy (NWMPCS) 2016-2020 and a ban of single-use plastic bags by 2018 for the purpose of reducing marine litter. Nevertheless, the waste generation has drastically increased as the population has grown, and theissues which were pointed out in the previous SWM plan, such as finance, organization, institutional systems and technical issues of SWM stillremain. In addition, some new issues have emerged due to the extension of urban area under the concept of the "Greater Port Vila".

Therefore, in this revision, the direction and main concerns of the previous SWM plan will be followed and the plan is updated in collaboration with the Shefa province who will be a key stakeholder of the urban development of the Greater Port Vila.

² Port Vila Municipal Council changed its name to "Port Vila City Council" in January 2020.

1.4 Planning Policy in collaboration with Shefa Province

Planning Policy

In principle, a Solid Waste Management (SWM) Plan of Port Vila City Council (PVCC) (2021-2030) is the independent plan apart from Shefa province. However, geographically and historically, PVCC and Shefa province have been sharing local resources and development context of infrastructure of SWM for decades. Especially, waste collection service in Peri-urban area and management of Bouffa landfill site are the common issues for two local authorities. Therefore, PVCC and Shefa province develop the SWM plan together in regard to these two issues.

Responsibility of Annual Waste Management Plan

Every province and municipal have a responsibility to submit an annual waste management plan to the Department of Environmental Protection and Conservation (DEPC) in line with the Waste Management Act. No. 24 of 2014. PVCC and Shefa province have a responsibility to submit a separate annual plan every year in compliance with the Act. This long-term SWM plan is supposed to be used as a legal ground and basic policy for developing an annual plan.

1.5 Target Area and Waste

Target Year

The period covered by the SWM Plan is 10 years from 2021 to 2030. PVCC realizes the plan in two phases shown as below.

4	Phase 1 (2021 – 2022):	Establishment of Management System
4	Phase 2 (2023 – 2030):	Expansion phase of 3Rs to achieve goals of the SWM Plan

Target Area

The target area of the SWM Plan is inside the jurisdiction of Port-Vila City Council and Peri-Urban area in Shefa province.

Table 1-1 Taiget Area of the Swin Flat			
	Ward	Target Area	
	Northern Ward	(1) Agathis, (2) Ohlem Mataso, (3)Ohlen, (4) Ohlen Freshwin, (5) Switi, (6) Tagabe, (7) Tagabe Bridge, (8) Vila North, (9) Ohlen Nambanga	
	Anamburu-Melcoffee- Marapoa Ward	(1) Namburu, (2) Simbolo, (3) Socapo, (4) Tebakor, (5) VMF Camp	
Port Vila Municipal	Freshwota-Tassirriki Ward	 (1) Freshwota 1, (2) Freshwota 2, (3) Freshwota 3, (4) Freshwota 4, (5) Freshwota 5, (6) Freshwota 6, (7) Koroman Studium, (8) Tasiriki 	
	Central Ward	(1) Stade, (2) Sea side, (3) Nambatu, (4) Joint Court, (5) Independence Park, (6) Vila CBD	
	Southern Ward	(1) Ellouk, (2) Tokyo, (3) Nambatu Wallis, (4) Nambatri, (5) Nambatri Ellouk, (6) Le Lagoon	
Shefa Province	Peri-urban	 (1) 2nd Lagoon, (2) Bellevue, (3) Beverly Hills, (4) Black sands, (5) Bladiniere Estate, (6) Kawareki, (7) Kokoreko, (8) Malapoa Estate, (9) Malapoa Whitewood, (10) Manples, (11) Monmartre, (12) Salili, (13) Smet, (14) Sumalapa, (15) Pango, (16) Mele, (17) Prima, (18) Abbatoir-YCC, (19) Mele maat, (20) Teouma, (21) Rentapao, (22) Academy, (23) Whitesand, (24) Cascade sub-division (above mele maat) 	

Table 1-1 Target Area of the SWM Plan





Figure 1-1 Target map in Port Vila

Source: Esri, © OpenStreetMap contributors, HERE, Garmin, USGS, METI/NASA, NGA | (c) Esri Japan

Target waste

The SWM Plan targets the Municipal waste such as household waste, commercial waste and market waste.

Infectious medical waste and hazardous industrial waste etc. of which its generator is responsible for the appropriate treatment, are not targeted in this plan. However, regarding what was brought to the Bouffa landfill site after processing, its disposal method is included in this plan.

1.6 National Policy and Legislation

National Policies

The following national policies address the issues of Waste Management and Pollution Control.

- 1) National Sustainable Development Plan 2030 (NSDP)
- 2) National Environment Policy and Action Plans 2030 (NEPIP)
- 3) National Waste Management and Pollution Control Strategy 2016-2020 (NWMPCS)
- 4) National Waste Minimization Plan 2021-2025
- 5) National Biodiversity Strategy and Action Plans (NBSAP)
- 6) Vanuatu Climate Change and Disaster Risk Reduction Policy (2016-2030)
- 7) Vanuatu National Oceans Policy

Legislations and Orders

The following national legislations and orders are the legal ground of the Waste Management and Pollution Control.

- 1) Waste Management Act. No. 24 of 2014
- 2) Waste Management Regulations Order No. 10 of 2018 (amended on October 2019)
 - i. Control of single use plastic bags, plastic straws and polystyrene takeaway boxes
 - ii. Littering
 - iii. Licensing of Private Waste Operators (PWOs)
- 3) Pollution Control Act. No. 10 of 2013
- 4) Environmental Protection and Conservation and Conservation Act [Cap 283]

Relevant Regional Policies and Plan

The following regional policies are also related to the Waste Management and Pollution Control.

- 1) Regional Waste Management and Pollution Control Strategy 2016-2025 "Cleaner Pacific 2025"
- 2) Regional Disaster Waste Management Guideline
- 3) SAMOA Pathway for sustainable development goals
- 4) Greater Port Vila Urban Development Plan (Draft)

OVERVIEW

2

2.1 Profile of Port Vila City Council

Port Vila Municipal has an area of 12 km² and a population of 50,944 in 2016³. Its population includes a suburb area surrounding Port Vila called "Greater Port Vila" which belongs to Shefa province. Outline of PVCC is shown in Table 2-1.

ltem	Value		
1. Population	50,944 cf. Vanuatu 272,459 (2016)		
2. Service Area (km2)	12 km ²		
3. Number of wards	5		
4. Waste Collection Amount	23.9 ton/day (2016-2017)		
5. Incoming Waste Amount at Bouffa	57.1 ton/day (2016-2017)		
6. Revenue of SWM (2016)	Tipping fee (Gate fee): 5,358USD/month		
	Pre-paid bag (Yellow bag) income: 8,960USD/month		
7. Area of Disposal site	Bouffa Landfill Site (48 hectare)		
8. Central Garage	In front of Cemetery		
9. Collection trucks	12 (6 is operational)		
10. Waste management Staffs	64 staffs (including drivers)		
11. Website	https://pvmc.gov.vu/		
	https://www.facebook.com/PortVilaMunicipleCouncle/		

Table 2-1 Basic Information of Solid Waste Management in Port Vila

2.2 Present Waste Flow in PVCC

Waste Unit Generation

The average amount of household waste unit generation in Port Vila is 0.91 kg/capita/day as shown in Table 2-2. Compared with the results in 2011 and 2014, the waste generation rate has drastically increased and it is quite high in general. Average waste generation rate by business type is shown in

³ Vanuatu National Statistics Office (VNSO) "2016 Post-TC PAM Mini-Census Report Volume 1"

Table 2-3.

			(Unit:	(Unit: kg/capita/day)	
Year	Low	Middle	High	Average	
2011	0.39	0.35	0.62	0.43	
2014	0.60	0.68	0.65	0.63	
2017	0.96	1.20	0.87	0.91	

Table 2-2 Unit Generation Rate of Household Waste

Source: J-PRISM II "Waste Amount and Composition Survey Report (2018)"

Table 2-3 Average Waste Generation by Business Type

Area	Unit generation rate (kg/business establishment/day)
Kava Bar	7.95
Hotel	10.16
Restaurant	9.37
Office	2.76
Shop	7.41

Source: J-PRISM II "Waste Amount and Composition Survey Report (2018)"

Waste Composition

The composition of household waste is shown in Fig. 2-1. 62.4% of household waste is vegetables or organic waste, which should be taken into consideration in terms of waste reduction. It is also remarkable that 19.2 % of all the household waste is plastic. Density of waste is 0.45kg/L.



Waste Amount and Composition Survey (WACS)

Waste amount and Composition Survey (WACS) was conducted from 15th November to 23rd November 2017 with full support of Community, Survey Volunteers and PVCC.



Instruction of Questionnaire Survey



Weighing a plastic bag



Segregation by survey volunteers

PVCC would appreciate your cooperation for the Survey



You may refer to "Waste Amount and Composition Survey Report (2018)" for further information.

Waste Type

The largest volume of waste is Household waste accounting for 50.3% of the incoming waste at Bouffa. The second is commercial waste (34.8%) and third is Market waste (2.9%). Other type of waste accounts for 12% such as septic waste (sewage), medical waste, construction waste and quarantine.





Waste Amount by Area

Central ward is the biggest ward of waste generation among five (5) wards, in which more than 2,000 ton of waste was generated and disposed a year. Average of waste generation in each ward is 1,277 ton/year. 3,433ton of waste (34%) was transported from suburb and rural area belonging to Shefa province.



Characteristics of Waste Generation by Ward

Each ward has its characteristics of waste. Main characteristics are summarized below.

Table 2-4 Characteristics of Waste Generation by Ward

WARD	CHARACTERISTICS		
	Industrial Area		
	Bauerfield International Airport		
ANAMBURU- MELCOFFEE WARD	Residential Area - Household Waste (56%)		
FRESHWOTA-TASSIRRIKI WARD	Residential Area - Household Waste (69%)		
	CBD (Central Business District)		
CENTRAL WARD	- Commercial Waste (65%)		
	- Market Waste (14%)		
SOUTHERN WARD	Tourist Spot		
SOUTHERN WARD	High-income Residential Area		



Source: J-PRISM II "Report on Incoming Vehicle Survey at Bouffa (2016-2017)"

Fig. 2-4 Characteristics of Waste in Each Ward and Area

Present Waste Flow in 2018

Based on a survey on the incoming waste data in Bouffa from September 2016 to August 2017, municipal solid waste generation rate was estimated 1.090 kg/person/day in 2018. Waste generation was estimated by considering projection of population growth in 2018 in target area. Waste Flow of Port-Vila in 2018 derived from the result of the survey is shown in Fig. 2-5. PVCC collects 35.5% of discharged waste. Private collectors collect 41.6% of discharged waste, but the actual situation is not fully grasped. Large-scale waste generator such as supermarkets etc. transport their waste by themselves directly to the Bouffa landfill site, which amounts to 22.9% of the total discharged waste. Self-disposal carried out at home includes inappropriate treatment such as burning. Unmanaged waste such as illegal dumping is equivalent to 12% of generated waste. Some vegetable waste is sorted and collected for animal feeding in the central market, but recycling activity is rarely done in Port-Vila.



Fig. 2-5 Present Waste Flow as of 2018

Table 2-5 Collection amount by service provider

	Targ	Total (ton/day)			
	Household	Business	Market	iotal (ton/day)	
PVCC collection	8.7	5.1	0.9	14.7 (35.5%)	
Private collection	10.1	7.2	0.0	17.2 (41.6%)	
Direct haulage	4.9	4.1	0.5	9.5 (22.9%)	
Total	23.6	16.3	1.4	41.3 (100.0%)	

Incoming Vehicle Survey at Bouffa Landfill

Recorded Period: September 2016 – August 2017

J-PRISM II following its phase I from 2011-2016 was initiated in April 2017. Originally it was planned to install a weighbridge at the entrance of Bouffa landfill in order to keep a record of incoming waste in Phase I. However due to lack of electricity supply to the site, it was decided instead to develop a manual recording system for the incoming waste. The daily records for February 2015 were input into MS Excel and the data was analyzed in order to obtain the total waste amount arrivals, the areas of generation, the waste categories and the share that PVCC transported by its own collection trucks.



Fig. 2-6 Recorded days (2016-2017)

J-PRISM II experts analyzed incoming vehicle records from September 2016 to August 2017, and it was found that records were not completed (59% were recorded but 41% were missing). Total waste amount was 10,057 ton/year according to the records. When 41% missing record was taken into account, the estimated incoming waste amount was 17,143 ton/year.





2.3 Present Solid Waste Management in Port-Vila

SWM By-Law

A Waste Management By-Law has been drafted and is due to go to Council for approval in the last quarter of 2020. The By-Law aims to regulate the following:

- 1. Curbside collection services for waste from individual properties
- 2. Council waste collection points for use by communities without a curbside collection service
- 3. The types of waste that may be disposed of
- 4. The waste management fees that may be charged
- 5. The powers of enforcement

Pre-Paid Garbage Bag By-Law

The Yellow Bag By-Law has been drafted and approved by the PVCC Council and is now with the State Law Office waiting to be gazetted. The By-Law aims to regulate the following:

- 1. The distribution of the Yellow Bag,
- 2. The collection Service for the Yellow Bag
- 3. The terms for the contracted supplier of the Yellow Bags
- 4. The powers of the Municipal Police to enforce the By-Law
- 5. The offences and associated fines

SWM Implementation Organization

In 2019 the Town Clerk requested that a review of the PVCC Waste Management Staff Organization Structure be completed. The review found that the waste management staff were split across two separate divisions, as can be seen in Fig. 2-8 and Fig. 2-9. There was no official connection between the Waste Management Officer and the staff involved in the Waste Collection service. There was also no connection between the Landfill management staff and the waste collection staff, leading to communication challenges and poor service delivery.

Port Vila and Shefa Province Solid Waste Management Plan 2021-2030 Senior Town Planning Officer Waste Landfill Management Officer Supervisor JCB/Excavaot Labourers Gate Keeper r Driver Fig. 2-8 Organization Structure of Landfill Management Unit in PVCC Superintende nt Public Works CBD Tourism **City Waste Mechanics** Cemetery **Drivers Drivers Drivers** Labourers Labourers Labourers Labourers Fig. 2-9 Organization Structure of Waste Collection Unit in PVCC

Waste Collection and Transportation

Waste Collection Area Map

Waste collection areas and schedule are illustrated on a map by GIS operator in PVCC as shown in Fig. 2-10.



Fig. 2-10 Baseline Map of Waste Collection Area in PVCC

PVCC Waste Collection Vehicle Fleet

PVCC operates the following trucks as shown in Table 2-6.

No.	Truck number	Туре	Haul capacity (ton)	Purchased/ donated Year	Mileage (km)	Operation Status
1	1VE035	Compactor (blue) donated from Hokkaido	2.7	Donated in 2016 (Second hand, 20 yrs)	251,589	Partially
2	241	Compactor	2.0	Donated in 2016 (Second hand, 20 yrs)	424,601	Partially
3	4146	Compactor	3.0	Donated in 2016 (Second hand, 20 yrs)	297,911	Partially

able 2-6 Waste Collection Vehicles Operated by PVCC (as of June 2019)
No.	Truck number	Туре	Haul capacity (ton)	Purchased/ donated Year	Mileage (km)	Operation Status
4	4149	Dump truck with crane	3.5	No information	195,554	Out of order
5	4VE412	Pick-up Truck	2.2	TBC	N/A	Working
6	12703	Dump truck (Landfill)	N/A	TBC	N/A	Working
7	14624	Pick-up truck (Cemetery)	N/A	2014	N/A	Working
8	15592	Flatbed truck	2.0	2015	N/A	Working
9	15593	Flatbed truck	2.0	2015	120,980	Partially
10	16391	Pick-up truck (Market)	1.3	2016	N/A	Working
11	16392	Pick-up truck	1.3	2016	120,980	Partially
12	16393	Pick-up truck	1.3	2016	N/A	Working
13	18827	Flatbed truck	N/A	2018	N/A	Partially
14	18857	Flatbed truck	N/A	2018	4,741	Working
15	19854	Flatbed truck	4.6	2019	N/A	Working
16	19855	Flatbed truck	4.6	2019	190	Working
17	20227	Compactor	4.6	2020	N/A	Working

Time and Motion Survey (2017)

Time and Motion (T&M) survey was conducted in September 2017. The purpose is to evaluate the collection route design, number of trips implemented, amount of waste transported, the waste generators discharge practices and the working conditions of the collection crews. A pickup truck of capacity 1.3 tons was followed by the project team and time and motion was recorded on the map with GPS.

(1) Survey area and date

- 1) Freshwota ward route 21st September, 2017
- 2) Central ward route 22nd September, 2017

(2) Example of the survey result: Freshwota ward route

The route of the survey and results are shown in Fig. 4-6. The truck moved from Freshwota workshop (depot) to the first collection point in 5 minutes. The truck spent 36 minutes in the collection area. Waste was collected from 52 points along the collection route, in other words 42 seconds at each point. It then took the truck 21 minutes to reach Bouffa landfill, including traveling the 3.2 kilometers of unpaved road leading to the landfill. Overall the collection efficiency for the trip was 50 minutes per ton.



Fig. 2-11 T & M survey result: Freshwota ward route

Time and Motion Survey (2019)

Time and Motion (T&M) survey was conducted in September-October 2019. The purpose of the survey is i) to develop a baseline map of waste collection, ii) to evaluate the efficiency of waste collection, iii) to identify the hot spots and area where waste collection service is not provided well and iv) to discuss the way to solve the problems among community and drivers.

(1) Survey area and date

- 1) First survey: From 10th September to 16th September, 2019
- 2) Second survey: From 30th September to 4th October, 2019

(2) Survey results of GPS trucking (Second Survey)

				Daily Basis		
Vehicle Number	Vehicle Haul Max speed Average speed		Average trip	Average Waste Collection Volume		
19854	4.6 ton	30.1 km/h	4.5 km/h	1.6 trips/day	7.5 ton/day	
19855	4.6 ton	42.0 km/h	5.2 km/h	2.3 trips/day	10.4 ton/day	
20227	4.6 ton	27.1 km/h	4.8 km/h	2.5 trips/day	11.5 ton/day	
16393	3.0 ton	43.1 km/h	4.9 km/h	1.9 trips/day	5.6 ton/day	
4VE412	2.2 ton	23.1 km/h	5.2 km/h	1.6 trips/day	3.6 ton/day	
-	-	-	-	9.9 trips/day	38.5 ton/day	



Source: J-PRISM II "Interim Report of Baseline Survey for Waste Collection Improvement (2019)" Fig. 2-12 Example of findings from the survey results of GPS trucking

Private Collection

PWOs' license system was endorsed under the Waste Management Act No. 24 of 2014 and the Waste Management Regulations Order No. 15 of 2018. In 2019, there are 13 waste operators registered in DEPC. Shefa province contracts out the waste collection service for seven PWOs.

SN	Private Waste Operators	Collection area in Shefa Province
1	Ayong kaltokel	Eratap
2	CKS	-
3	Express Rubbish Removals	Erakor
4	IRC (Imere Rubbish Collection)	-
5	The havannah rubbish removal	North west Efate
6	Kins	-
7	Nail Construction	Erakor
8	MELE Rubbish collection	Tanvasoko
9	Pacific Supply (Green Box)	-
10	Pango Green Force	Pango
11	PKE	-
12	Ronnys rubbish removal	Mele
13	Wan Small Bag	-

 Table 2-7 List of Private Waste Operators (PWOs) (as of February 2020)

Source: DEPC and Shefa Province

Road Cleaning Services

Eight staffs are hired for road cleaning in Central Business District (CBD) area and eight for Fatumaru Bay and sea front area. Community volunteers also support cleaning activities occasionally.

Community Consultation

Community consultation was implemented to understand the satisfaction of waste collection, participation willing for waste management, road condition and necessary action to be taken by PVCC. Results of the community consultation meeting is summarized in Table 2-8.

Ward	Target Area	Population (2016)	Satisfaction with Waste Collection	Participation of Community	Road condition	Number of Station Point	Other issues
	(1) Agathis	1,043	Not satisfied	Good	Unpaved	0	AwarenessCleaning campaign
ward	(2) Ohlem Mataso,	1,068	No data	No data	No data	No data	No data
	(3) Ohlen	3,586	No data	No data	No data	No data	No data
	(4) Ohlen	1,437	Satisfied	Moderate	Unpaved	0	 Awareness

Table 2-8 Summary of Community Consultation Meeting (as of 2018)

Ward	Target Area	Population (2016)	Satisfaction with Waste Collection	Participation of Community	Road condition	Number of Station Point	Other issues
	Freshwin						 Cleaning campaign
	(5) Switi	749	Satisfied	Good	Unpaved	0	Awareness
	(6) Tagabe	1,041	No data	No data	No data	No data	No data
	(7) Tagabe Bridge	530	No data	No data	No data	No data	No data
	(8) Vila North	570	No data	No data	No data	No data	No data
	(9) Ohlen Nambanga	629	No data	No data	No data	No data	No data
	Total	10,653	-	-	-	0	-
Annahara	(1) Namburu	3,511	Little complaint	Active	Partially unpaved	To be confirmed	 Awareness Cleaning campaign
Anamburu- Melcoffee-	(2) Simbolo	1,166	Little complaint	Good	Unpaved, Narrow	2	Awareness
Malapoa	(3) Socapo	320	No data	No data	No data	No data	No data
waru	(4) Tebakor	1,093	No data	No data	No data	No data	No data
	(5) VMF Camp	139	No data	No data	No data	No data	No data
	Total	6,229	-	-	-	2	-
	(1) Freshwata 1	1,141	Satisfied	Moderate	Partially unpaved	0	 Awareness Source separation
	(2) Freshwata 2	1,379	Satisfied	Moderate	Partially unpaved	0	 Awareness
	(3) Freshwata3	1,335	Satisfied	Good	Unpaved, Narrow	1	Awareness
Frachwata	(4) Freshwata 4	1,885	Satisfied	Good	Partially unpaved	0	 Bulky waste Accessibility of Yellow Bag
Tassirriki ward	(5) Freshwata 5	875	Satisfied	Active	Unpaved	2	 Awareness Cleaning campaign (Once a month)
	(6) Freshwata 6	1,181	Satisfied	Moderate	Partially unpaved	0	Awareness Cleaning campaign
	(7) Koroman Studium	789	No data	No data	No data	No data	No data
	(8) Tasiriki	687	No data	No data	No data	No data	No data
	Total	9,272	-	-	-	3	-
	(1) Stade	913	No data	No data	No data	No data	No data
	(2) Sea side	2,104	Satisfied	Moderate	Good	0	AwarenessRubbish bed
_	(3) Nambatu	1,224	No data	No data	No data	No data	No data
Central	(4) Joint Court	560	No data	No data	No data	No data	No data
ward	(5) Independence Park	1,263	Not satisfied	Good	Good	0	 Cleaning campaign Rubbish bed
	(6) Vila CBD	413	No data	No data	No data	No data	No data
	Total (1) Ellouk	6,477 269	- Satisfied	- Good	- Unpaved	3 0	Communicatio n channel of PVCC
Southern ward	(2) Tokyo	623	Satisfied	Good	Good	2	 Awareness Cleaning campaign at illegal dumping spot
	(3) Nambatu Wallis	292	No data	No data	No data	No data	No data

Ward	Target Area	Population (2016)	Satisfaction with Waste Collection	Participation of Community	Road condition	Number of Station Point	Other issues
	(4) Nambatri	528	Satisfied	Moderate	Good	2	 Upgrade of rubbish bed
	(5) Nambatri Ellouk	692	No data	No data	No data	No data	No data
	(6) Le Lagoon	148	No data	No data	No data	No data	No data
	(7) Pango	352	No data	No data	No data	No data	No data
	Total	2,904				4	

Source: J-PRISM II, Vanuatu National Statistics Office (VNSO)

Vehicle Maintenance

PVCC previously employed a Senior Mechanic who was responsible for maintaining and repairing all PVCC vehicles. The Waste Management Department vehicles are made up of compactors, camions, bulldozers and excavators; most of which are diesel and require specialist diesel mechanics to service them. In addition, the waste collection vehicles are required to carry heavy loads and travel on extremely rough roads which results in very frequent breakdowns and long delays in purchasing parts due to restricted finances and parts often needing to be sourced from Australia. As a result, the decision was made to outsource the servicing of all Waste Management Vehicles. This company will now be responsible for ensuring that each new vehicle receives a service at 5,000km, and then every 10,000km after that. They will receive a full service and any areas of concern will be able to be identified and repaired or replaced prior to a breakdown occurring. This will greatly decrease the amount of time each vehicle is off the road due to damage and waiting for parts.

Waste Minimization

Market Compost

PVCC had introduced projects to separate and compost green wastes from the markets in 2015. PVCC transports the separated market green wastes to Vanuatu Direct, a private company which composts the green waste and uses it in its agricultural activities.

Pilot Project-1: Market Waste Compost

The memorandum of understanding is entered for the purpose of establishing the partnership between the Vanuatu Direct and the PVCC on December 9[,] 2015 regarding the market waste composting system through the utilization of organic waste produced at the Central Market. The trial was implemented for a year but due to incomplete separation of waste, it was difficult to maintain a quality of products and the trial was no longer continued.

[Lessons Learnt]

- <u>Education and awareness raising for separation</u>: Organic waste should be discharged separately. Continuous education and awareness raising for the staffs in Central Market is necessary.
- 2. <u>Cooperation of Market Manager</u>: To secure the quality of separation, Market Manager's initiative is essential.

Home Compost

Several NGOs are working on a promotion of home compost in community as a grassroots activity. There is no regular program for promotion of home compost officially provided by PVCC.

3R + Return

In Port Vila, a private recycle company known as Recycle Corp Vanuatu collects and pay materials such as Copper (Cu), Brass, Aluminum (Al), Gear box, lead acid batteries, stainless steel, compressors, brass radiators, aluminum radiators and electric motors for storage and then export to overseas for further processing. Other electronic wastes such as old computers, keyboards, CPU and monitors are collected for free.

In addition, there are two brewers/bottling companies in Vanuatu, Vanuatu Brewing Limited (VBL) and Vanuatu Beverage (VB), and both companies often reuse glass bottles as part of their normal operations. A deposit is paid on each bottle when purchased from wholesale and retail locations and this is refunded when the bottle is returned for reuse.

Wan Small Bag, a Port Vila-based NGO that promotes awareness in certain areas, is also engaged in a community initiative to collect plastics, cans, scrap steel, packaging waste and diapers from seven communities in Port Vila. The recyclable material collected is transported to the recycler (Recycle Corp) and the remainder goes to the Bouffa Landfill.

Unused plastic bags are remained even after plastic ban was endorsed. Installation of recycle facility might be taken into consideration. For further promotion of 3R + Return, Polluter Pays Principal should be applied to separation and collection of recyclables for compensation of recycling cost.

Pilot Project-2: Aluminum & Steel Cans Separation and Recycling (2015)

As a pilot project, 2 sets of cages were allocated at Freshwota 1 & 4. The community members collected both aluminum and steel cans and brought them to the cages in the community. Both community members and J-PRISM were responsible for the monitoring of cages. Once the cages got full, the J-PRISM contacted a recyclable collection company, Recycle Corp, and they bought the aluminum and steel cans. The sales from the cans were donated for the benefits of Freshwota communities. Total cans generated in target areas was 5808.53 kg per year. Amount of waste reduction was below:

- \checkmark Aluminum =126kg reduced in three months.
- ✓ Steel = 268kg



2 vatu/kg (steel cans) to Community

[Lessons Learnt]

- 1. <u>Size of target area</u>: The size of target areas should be determined with the consideration that the community activities can be organized smoothly.
- 2. **Monitoring**: The cages were rarely damaged through the monitoring by the community, which shows that the community can look after anything that belongs to the community.
- Public awareness: Public awareness should be strengthened to avoid discharge of cans in a mix way.
- 4. <u>Environmental committee</u>: An environmental committee is important to be set up at each zone in order to clarify the responsibilities of communities and to sustain the whole management including the sales from cans.
- 5. <u>Collection</u>: In this project, one recyclable collection company played a vital role. It is essential to secure the sustainability of collection.

You may refer to J-PRISM Report on "Aluminum and Steel Cans Separation Pilot Project as Freshwata Ward (2015)" for further information.

Public Awareness

Community Clean-up Campaign

PVCC goes on a clean-up campaign in a community periodically. DEPC takes the initiative in a promotion on National Environmental Week in June and World Clean-up Day in September each year.

Almost all communities pointed out the importance of awareness raising and community clean-up campaigns. PVCC explained to communities that ward secretaries and staff in the branch office at the garage will arrange a truck for a special collection after the clean-up campaign. At that time, the community will bear the cost of fuel for transport.

Environmental Education

Environmental education is actively promoted in LMC. LMC compiled an educational book and it will be helpful to promote environmental education in Port Vila. Some NGOs are promoting environmental education independently.

Environmental Education in Luganville

'Primary Schools Waste Management' is a newly published educational book on waste separation and composting, aiming to educate the younger generation on waste management and to bring about changes in the long run in communities and society in the future.



(Daily Post, April 6, 2017

http://dailypost.vu/news/jica-promotes-waste-managementin-luganville-schools/article_1bbe3f9d-9c30-5c06-a906-dbeb69f2d65d.html)

Community Participation

Existing Community Group

In general, several group exists in a community such as youth group, chiefs' group, women's group, disabilities' group and church. They are the potential group to become a solid waste management supporter.

Existing Activities related to Solid Waste Management in a Community

Several solid waste management activities are observed during the survey. For example, world vision, NGO, is working with community to start-up a community based social enterprise of solid waste management in Anamburu ward. In freshwota 5, youth group manages public dust bins as shown in the photo below. In southern ward, DEPC and PVCC equipped a separation cage as an award of world clean-up campaign in 2018.

Regular Communication with the City Council

Some communities are working on solid waste management actively together with a ward secretary and councilors. However, many communities don't recognize the ward secretary in their areas and they feel isolation from the city council. During the community consultation meeting, PVCC staffs convey the message to communities that the ward secretary will be a communication channel with community and staffs in the workshop will arrange the special collection with the ward secretary.

Disposal

Outline of Bouffa Landfill

Solid waste generated in the municipality is disposed at Bouffa Landfill located 9.8 km to the east of the municipality center in Etas. Initially, the landfill was constructed from a World Bank loan in 1995 and upgraded as a sanitary landfill through the technical cooperation project (2006-2008) by the Japan International Cooperation Agency (JICA). In 2014, a recording system of incoming vehicle at site was introduced by J-PRISM. After the Tropical Cyclone PAM in 2015, Bouffa landfill was rehabilitated with support of the PACWASTE. Existing landfill area was extended in September 2017.

ltem	Contents					
Name of FD site	Buffa landfill site					
Address	Etas, Port Vila, Vanuatu					
Land Owner	Port Villa Municipal Council					
Area	48 ha, now using only 5 ha					
Year of operation	10 years (2008 up to now)					
Remaining	43 ha (estimate life span: 20-30 year)					
capacity						
Operation by	PVCC					

Table 2-9 Basic Information of Bouffa Landfill



Fig. 2-13 3D Model of Bouffa Landfill Site

Finance

Income Source

PVCC has two income sources mainly on SWM, yellow bag (pre-paid bag) and tipping fee (gate fee). There are two types of yellow plastic bag, 45L and 70L, and the price of a bag is 70VT and 100VT respectively. Tipping fee (gate fee) is set as 2,500VT/truck, 3,500VT/middle size truck and 8,500VT/dump truck for industrial waste. SWM by-law stipulating tipping fee is prepared but not endorsed. Rubbish collection fee for business is planned but not collected in fact.

Budget and Expenditure

In FY 2017, Yellow Plastic Bag sales was 18,898,600 VT, which was the fourth largest earner in PVCC. PVCC had an independence account for SWM but it is no longer operational. Expenditure on SWM is not recorded separately in general account.

PVCC Waste Management Department Budget	2017	2018	2019	2020	2020
				to October	Extrapolated
EXPENDITURE					
Collection Expenses					
Waste Collection Truck Maintenance and Repairs	2,428,211	4,132,774	2,886,604	1,656,486	1,987,783
Waste Collection Truck Fuel	9,343,591	10,603,433	6,079,400	3,660,969	4,393,163
Landfill Site Expenses					
Landfill Site Maintenance	145,058	0	0	0	0
Landfill Machinery Maintenance and Repairs	1,196,279	1,968,690	1,218,759	928,469	1,114,163
Hire of Landfill Machinery	7,239,187	4,763,500	8,296,152	861,797	1,034,156
Landfill Machinery Fuel	3,361,992	3,690,773	3,836,857	3,660,969	4,393,163
Waste Management Administration					
Stationery	0	490,876	1,221,596	322,005	386,406
Training and Professional Development	0	0	0	30,000	36,000
Medical Checks	0	0	0	0	0
Uniforms	0	115,773	595,243	1,391,304	1,669,565
Catering	0	20,000	24,080	16,770	20,124
Signage (Landfill and trucks)	0	0	0	0	0
Workshop/Community Awareness materials	0	0	0	0	0
TOTAL EXPENDITURE	23,714,318	25,785,819	24,158,691	12,528,769	15,034,523
INCOME					
Waste Collection Income					
Yellow Bags Large	14,962,240	13,825,800	18,011,640	17,500,400	21,000,480
Yellow Bags Small	3,936,360	3,556,830	5,437,110	5,721,690	6,866,028
Landfill Site Income					
Landfill Gate Fees	10,018,913	18,507,300	37,113,612	27,204,200	32,645,040
Enforcement Income					
Fines for Illegal Burning	2,413,361	2,648,956	765,000	0	0
Fines for Illegal Dumping	0	0	0	0	0
TOTAL INCOME	<u>31,330,874</u>	38,538,886	61,327,362	50,426,290	60,511,548
NET PROFT/(LOSS)	7,616,556	12,753,067	37,168,671	37,897,521	45,477,025

Table 2-10 Budget and Expenditure for SWM in FY2017 – FY2020 (as of October 2020)

2.4 Present Issues

Technical Issues

Frequency of Waste Collection

Basically, communities are satisfied with the frequency of waste collection (two to three times per week). Some communities requested that waste collection should be provided four times per week and/or on weekends. Collection schedule is well-known in a community but delay of schedule happens on a regular basis, which causes the complaint from communities. Waste collection schedule should

be reviewed to realize Fixed-Time Fixed-Place (FTFP) collection.

Waste Collection Drivers' attitude

There are several complaints about drivers' attitude. Sometimes divers and boys (collection assistants) rush to pick up yellow plastic bags and let them tear up carelessly. A community is forced to clean up such scattering waste. On the other hand, sometimes a yellow plastic bag is overstuffed and easy to tear up. Training for drivers and assistants is required to maintain cleanliness after the collection service, as well as an awareness raising of communities.

Request for Source-separated Collection (Green Bag, Recyclables etc.)

Some communities requested to start a spouse-separated collection with different colored plastic bags such as green bags. PVCC has to carefully analyze the cost efficiency and affordability to evaluate the feasibility of a source-separated waste collection system. For the time being, PVCC offers a special collection that PVCC provides a truck and community bear the fuel cost.

Duplication of Waste Collection Service Area

Residents in the peri-urban area pay the property tax for Shefa province, including waste treatment fee, and also pay for the Yellow Garbage Plastic Bag to discharge their own waste. To avoid the duplication and keep the consistency of waste collection area and fee payer, the boundary of waste collection area of PVCC and Shefa province has to be re-confirmed and awareness raising for peri-urban residents should be promoted.

Monitoring System of Private Waste Collection Companies

Private collections are not managed and PVCC does not grasp the actual condition. PWOs require to get a national license from DEPC and a business license from municipalities and provinces where their service providing area is located. There are 13 private waste collection companies in Vanuatu according to the registration of waste operator license. However, some of the licensed companies don't renew their license but continue their business without the license. Some don't have either a business license of PVCC.

Short Life Cycle of Waste Collection Vehicles and Equipment

Maintenance and management of equipment is not performed properly (breakdown of collection vehicles, lack of heavy equipment for landfill). The equipment is not updated

Shortage of Life Span of Bouffa Landfill Site

Although the Bouffa landfill site was improved to operate as a Fukuoka method, actual operation seems to be a controlled dump.

Institutional Issues

Endorsement of Waste Management By-law

There is no official by-law of waste management approved by authorities in PVCC yet. Therefore, there is a lack of legal ground to define the amount of gate fee and pre-paid bag.

Establishment of Waste Management Division

There is no division specialized in waste management for PVCC. There are few technicians familiar with waste management.

Basic Policy of Landfill Site Construction and Management

Shefa province has an idea to construct their own landfill site in the future. In consideration of the time span of new landfill site construction and urbanization speed of the Greater Port Vila, PVCC and Shefa province decide that Bouffa landfill site will continue to receive all waste discharged inside the boundary of Port Vila and Shefa province until Shefa province secures their own landfill site.

Concerning the rural areas and isolated villages in Efate, Shefa province will make their own SWM plan and determine the waste collection and disposal policy. The possible measures of waste management in villages are, for example, feeding animals, piggery, compost, farming, closing unmanaged random dumpsite, instruction of appropriate community dumpsite, and group collection of recyclables.

Financial Issues

SWM Budget

Main income source of SWM in PVCC is i) Yellow garbage bag and ii) Gate fee at Bouffa landfill site. Shefa province secures around 13 million vatu per year for SWM, which is covered by the property tax. Shefa province is seeking to sustain a SWM finance by securing a new income source such as a pre-paid bag. Special discount of gate fee is also requested by Shefa province to PVCC.

FRAMEWORK

3.1 VISION

Vision

Our Vision for Port Vila City is that through an improved waste collection service, a safe and sanitary landfill, increased education and awareness in our School curriculum, more home and community composting and better enforcement, we will start to see a decline in the amount of waste that is generated by every household.

The introduction of the Plastic Bag Ban in 2018 put Vanuatu on the map and garnered worldwide attention, so too has the proposed ban on disposable nappies. This is our time; it is our chance to put Port Vila on the map – the capital city of Vanuatu - a Pacific leader in waste management and minimization.

To do this, as residents of this City we need to think differently about waste and we all need to do our part - Council, individuals, and businesses - to reduce waste and look after the environment for future generations. At a National level, a Container Deposit Scheme is in development, this will reduce the amount of plastic, glass and aluminum containers that are disposed of to landfill, and at the same time will provide opportunities for entrepreneurs at the community level to make money from waste. This scheme is a great example of how the public will begin to see that waste can be a resource, that it has a value and that it can provide economic opportunities.

The next 10 years will see more changes in Waste Management than we have seen since independence. This is an exciting time to be involved, to participate in achieving the vision of a City that is focused on increasing waste awareness, reducing waste generation and waste disposal and improving recycling. Let's get it done!

National and International Goals to be Achieved

This Solid Waste Management Plan takes into account in both its design and content, the bigger picture of both the National, Regional and International aims with regards to managing and minimizing waste.

National Strategies and Goals

At a National Level the National Waste Management and Pollution Control Strategy (NWMPCS), the National Environment Policy and Implementation Plan (NEPIP) and the National Sustainable Development Plan are the key documents that this SWMP must align with and work towards. The NWMPCS is currently being reviewed and a new Strategy will be written so this SWMP currently works towards contributing to the goals of the outgoing Strategy.

The NEPIP runs till 2030 in the same timeframe as this document. Policy Objective 3 of NEPIP has three core deliverables:

PO 3.1) Reduce waste and pollution through effective waste management and pollution control PO 3.2) Review and implement the National Waste Management Strategy and Action Plan PO 3.3) Establish incentive schemes that implement the polluter pays principle by encouraging cleaner production and waste recovery

Policy Objective 3.1 is the purpose of this SWMP and PO 3.2 and 3.3 whilst the essentially the responsibility of the DEPC to achieve, PVCC are key stakeholders in both and play an important role in ensuring these objectives are achieved.

Pacific Regional Strategies and Goals

With regards to the Pacific Region the Regional Waste Management and Pollution Control Strategy 2016-2025 "Cleaner Pacific 2025" is the primary guide for all Pacific Island Countries (PICs) and its mission is to *'implement practical and sustainable solutions to the prevention and management of waste and pollution in the Pacific'*. This SWMP aims to contribute to this mission by focusing in particular on Guiding Principles 1, 2 and 3 over the next 10 years.

GP 1) Reduce, Reuse, Recycle, and Return (3Rs + Return)GP 2) Product stewardshipGP 3) Polluter pays

International Strategies and Goals

Internationally, the Sustainable Development Goals, in particular Goals 11 and 12 are the high-level drivers behind the local Waste Management Plans such as this document.

SDG 11) Mobilize Sustainable Cities and Communities; SDG 12) Influence Responsible Consumption and Production There is a strong belief in Vanuatu that many small changes at a local level can and will have a global impact over time.

3.2 **Population Projection**

Estimated population until 2030 is shown in Table 3-1.

Sum and the second			ET B	(1	unit: persons)
Year	2016*	2018**	2021	2025	2030
Population of Vanuatu	272,459	282,135	296,870	316,504	339,102
Shefa Province	101,387	107,306	116,323	128,014	140,930
Northern Ward	10,653	11,275	12,222	13,451	14,808
Anamburu-Melcoffee Ward	6,229	6,593	7,147	7,865	8,658
Freshowata-tassirriki Ward	9,272	9,813	10,638	11,707	12,888
Central Ward	6,477	6,855	7,431	8,178	9,003
Southern Ward	2,904	3,074	3,332	3,667	4,037
PVCC Area total	35,535	37,609	40,770	44,867	49,394
Peri-urban Area total	15,409	16,309	17,679	19,456	21,419
Target area Total	50,944	53,918	58,449	64,323	70,813

Table 3-1 Future Population of the Target Area

* The population of 2016 is quoted from the Mini Census announced by the statistics office ** The population of 2018-2030 is estimated by J-PRISM II

3.3 Waste unit generation rate

The average amount of house hold waste unit generation in Port Vila, 0.91 kg/capita/day, is estimated based on the J-PRISM II "Waste Amount and Composition Survey Report (2018)", is quit high. In consideration for actual living standards of household in target area, 0.654 kg/capita/day that is estimated based on the incoming survey from September 0f 2016 to October of 2017 by the JET is founded in reality. Considering increment of business waste and market waste that estimated based on growth rate and population projection, municipal solid waste generation rate in target area was estimated 1.090 kg/person/day in 2018.

Future plan is developed based on the municipal solid waste generation rate in target area that is estimated as the sum of house hold (0.654 kg/capita/day), business and market waste unit generation rate.

3.4 Future Waste Flow without Plan

If PVCC's solid waste management problem is neglected, about a half of the waste generated will be left in the city after 10 years, as shown in the table below. Waste burning is done everywhere, the amount of illegally dumped will be more than three times the current amount.



Fig. 3-1 Waste Flow without Plan in 2030

2			- 1	(unit: ton/day)
	2018	2021	2025	2030
1 Waste Constation	58.7	63.9	70.9	78.1
	(100.0%)	(100.0%)	(100.0%)	(100.0%)
2 Solf-Disposal	10.2	11.1	12.2	13.4
	(17.3%)	(17.3%)	(17.2%)	(17.2%)
3. Recycle	0.2	0.2	0.2	0.2
(Feeding from market)	(0.3%)	(0.3%)	(0.3%)	(0.3%)
4 Waste Collection	41.3	41.3	41.3	41.3
	(70.4%)	(64.6%)	(58.3%)	(52.9%)
5 Upmanaged waste	7.0	11.3	17.2	23.2
5. Onmanaged waste	(11.9%)	(17.6%)	(24.3%)	(29.7%)
6 Disposal amount	41.3	41.3	41.3	41.3
o. Disposal amount	(70.4%)	(64.6%)	(58.3%)	(52.9%)
7. Waste other than PVCC	3.7	4.0	4.4	4.8
8. Total Landfilled waste	45.2	45.6	45.8	46.2

Table 3-2 Future Waste Flow without Plan

3.5 Future Waste Flow with Plan

The plan aims to eliminate unmanaged waste by 2030, and to process 5% of the generated amount properly. Also, it aims to reduce 10% of the waste amount generated through 3R promotion. The disposal rate when those are achieved is expected to be 85%.



Fig. 3-2 Waste Flow with Project in 2030

				(unit: ton/day
	2018	2021	2025	2030
1 Masta Constation	58.7	63.9	70.9	78.1
1. Waste Generation	(100.0%)	(100.0%)	(100.0%)	(100.0%)
2 Solf Disposal	10.2	10.3	7.9	3.9
	(17.3%)	(16.2%)	(11.2%)	(5.0%)
3 Rocyclo	0.2	0.8	3.9	8.0
	(0.3%)	(1.3%)	(5.5%)	(10.2%)
4 Waste Collection	41.5	46.6	58.6	74.0
4. Waste Collection	(70.6%)	(73.0%)	(82.6%)	(94.7%)
5 Upmanaged waste	7.0	6.9	4.2	0.0
5. Onmanaged waste	(11.9%)	(10.8%)	(6.0%)	(0.0%)
6 Disposal amount	41.3	46.0	54.4	66.2
o. Disposal amount	(70.4%)	(72.0%)	(76.8%)	(84.8%)
7. Waste other than PVCC	3.7	4.0	4.4	4.8
8. Total Landfilled waste	45.0	50.0	58.8	71.1

Table 3-3 Future Waste Flow with Plan

3.6 Indicators of achievement

Municipal Solid Waste Capture Rate

95% of generated waste amount shall be collected in 2030 by public, private service and selftransportation. Definition of municipal solid waste capture rate is shown in Appendix.

Municipal Solid Waste Collection Coverage Rate

Ensure that all citizens can enjoy the collection service at an early stage in the planned area (100% population). Definition of municipal solid waste collection coverage rate is shown in Appendix.

Disposal Rate

The final disposal rate (proportion of final disposal amount to generated amount) shall be 85% by 2030.

Waste Reduction by 3R Promotion

The targeted recycling rates (ratio of recycled volume to generated volume) are shown in Table 3-4. The amount of vegetable waste separated in the Central Market and used as animal feed is counted as compost amount.

		1		(unit: ton/day)
	2018	2021	2025	2030
1. Market waste compost	0.2	0.5	0.8	1.2
2. Home compost	0	0.1	0.1	0.2
3. Material recovery	0	0.1	3.4	6.6
- Group collection	0	0.1	0.3	0.5
 Separate collection 	0	0	3.1	6.1
Target recycle amount	0.2	0.7	4.3	8.0
	(0.3%)	(1.0%)	(6.1%)	(10.2%)

Table 3-4 Waste Reduction by 3R Activities

3.7 Pilot Projects

The following Pilot Projects were implemented in order to test the suitability of institutional, technical and financial systems recommended in the framework of SWM plan in resulting to clarify the feasibility of this plan and select the priority activities of the action plan.

Outline of Pilot Projects

Outline of the Pilot Projects (PPs) is shown in Table 3-5. Due to the COVID-19 and Tropical Cyclone Harold, implementation of PPs had to be postponed and lessons learnt were extracted to some extent based on the achieved results as of March 2020 and following-up activities.

No.	Pilot Projects		Plan		Results
1	Waste Collection		Station collection	V	12 uncollected locations were
	Improvement		Special collection of bulky waste		identified for station collection
				\square	Waste collection routes and schedule
					was improved.
2	Private	٦	GPS tracking for monitoring of	M	GPS survey was done for four trucks
	Collection		PWOs with DEPC		of two companies.
	Monitoring		Monitoring of the collection area of	V	Monitoring methods has to be
			PWOs in the peri-urban		improved to fit side business PWOs.
3	Waste Pickers'	٦	Baseline survey and registration	$\mathbf{\nabla}$	Baseline survey and OSH
	Survey		of Waste Pickers (WPs) at Bouffa		preliminary training were carried out.
			Training of the Occupational	\square	128 waste pickers were registered.
			Safety and Health (OSH) to WPs		
4	Market Compost	٦	Baseline survey on market	M	Baseline survey on market compost
			compost		was done and the result says more
			Training for source segregation of		than 80% of market waste can be
			organic and non-organic		reduced by composting.
			Verify usability of biodegradable	V	Awareness of shop keepers on
			plastic bag for composting		source segregation is vital for
					compositing.
5	Home Compost	٦	Community workshop for	M	Role model of home composting was
	and Gardening		promotion of home compost and		identified.
			gardening	V	Community workshop was canceled
			Seeking other method for waste		due to COVID-19 spread.

Table 3-5 Outline and Results of the Pilot Projects

	No.	Pilot Projects	Plan Results
			reduction at source
	6	Promotion of	□ Group collection of materials ☑ Lessons of on-site composting were
6		Clean School	On-site Composting in school
		Program	composter was installed.
-	7	Awareness	□ Illustration contest for SWM plan ☑ Illustration contest is planned for the
		raising activities	Awareness event for promotion cover and last page of this SWMP.
		in National	3R such as a bulky waste reuse Ø Other activities were canceled due to
		Environmental	program, exhibition booth and a COVID-19 spread.
		Week	clean-up short movie
	8	Yellow Bag	□ Review on the specification of ☑ Concept note of Yellow Bag review
1		Review	yellow bag including a feasibility process was developed.
		Committee	study of biodegradable or
			biomass plastic

Waste Collection Improvement

Station Collection

Uncollected yellow plastic bags were still observed during the survey visit. PVCC and the community identified a total of 12 locations (2 in the anamburu ward, 3 in the freshwota ward, 3 in the central ward and 4 in the southern ward) where it is required to shift to the station collection system instead of door to door collection, due to the bad road condition. Four station collection stands were installed in early October.

Special Collection of Bulky Waste

Bulky waste is remaining in the community. There is no official collection service provided by PVCC and the community has to bear the cost for disposal of their bulky waste. To avoid illegal dumping, PVCC offers a special collection for the bulky waste every Wednesday afternoon.

GPS Tracking for Waste Collection Improvement

PVCC decided to equip GPS to the every waste collection vehicle by their own budget. Time and Motion analysis results are expected to be useful for prevention of misuse of fuel expenses and improvement of waste collection efficiency.

Private Collection Monitoring

GPS tracking for monitoring of PWOs with DEPC

Shefa province contracts out the waste collection service to seven private waste collection companies. GPS survey was done for four trucks in two companies but the useful data was not obtained because most of PWOs were not specialized for waste collection but also they were using trucks to transport other materials than waste.

An annual report is an obligation for PWOs and the GPS trucking record could be an efficient method for DEPC to monitor the PWOs by sophisticating the methods. Survey has to be done every July to assess the eligibility of renewal of license.

Monitoring of the collection area of PWOs in the peri-urban

GPS will be installed for all PVCC vehicles including the waste collection trucks by December 2020 and then a GPS truck survey will be conducted for a week in each vehicle, working together with DEPC. Based on the monitoring results, PVCC and Shefa province will give an instruction for the private companies to carry out an awareness raising campaign for the community on waste collection schedule and responsibility.

Waste Pickers' Survey

Baseline survey and registration of Waste Pickers (WPs) at Bouffa

Baseline survey and OSH preliminary training were carried out and 128 Waste Pickers (WPs) were registered.

Training of Occupational Safety and Health (OSH) to WPs

Waste Pickers (WPs) are active at the Bouffa landfill in Etas. Even though PVCC will manage the WPs by issuing WP permits and IDs and improving their working conditions through provision of Personal Protective Equipment (PPE) and providing training in Occupational Safety and Health (OSH), PVCC decided to firstly fence the landfill. PVCC has included a line item in the budget for fencing, which if successful would be carried out early 2021. The monitoring of improvement of WPs Occupational Safety and Health (OSH) should start after the fencing is complete.

Market Compost

Baseline Survey on Market Compost

A week-long waste audit was conducted to grasp the waste amount and composition discharged from the central market. The survey result shown in Fig. 3-3 says that more than 80% of waste is organic (food, grass/leaves/woods, and food skin) which can be composted. Coconut husk (16 % of waste from shops and 7% of waste from restaurant) is composed of strong fibers and it is not suitable for composting. Based on the results of the survey, compost facility owned by PVCC will be designed. Partnership with private sectors who needs food waste for piggeries can be promoted for reduce the volume of waste.



Fig. 3-3 Composition of Market Waste (Central Market, 2020)

Training for source segregation of organic and non-organic

In consideration of lessons learnt by the previous pilot project in J-PRISM, segregation promoters is hired and instruct organic and non-organic waste to shop owners and cleaners in the central market for a month. Market staff was trained by waste management officer of PVCC and market manager to take over the role of segregation promoter.

Verify usability of biodegradable plastic bag for composting

Food waste discharged from restaurants is a potential target for the trail of biodegradable plastic bag collection. Small-scale trail of compost in bio-degradable plastic bags will be conducted at Bouffa landfill site.

Home Compost and Gardening

Community Workshop for Promotion of Home Compost and Gardening

Community practitioner is determined during the community consultation. Community workshop was planned but canceled due to COVID-19 spread. In a plan, the community practitioner and the Department of Agriculture and Rural Development (DARD) is supposed to give a lecture of home compost and backyard gardening in a community. Ward secretary of each ward arranges the workshop (three times in each). The target of each workshop is 10-20 households. Monitoring survey is supposed to be conducted after a month.

Seeking Other Method for Waste Reduction at source

Wind-dry methods to reduce the water content of organic waste could be tried at households who cannot produce home compost due to the limitation of land-use.

Promotion of Clean School Program

Group Collection of Materials

Group collection of recyclables (Aluminum cans etc.) in schools is one of the major component of Clean School Program (CSP). It is ideally promoted in collaboration with community. Awareness campaign in this regard is canceled due to COVID-19 spread.

On-site Composting in School

Lessons of on-site composting were done in a model school and composter was installed. On-site compost could be promoted in collaboration with a science club in a school. DEPC and LMC could be a supporter of this activity through the working group of the NWMPCS.

Awareness raising activities in National Environmental Week

Illustration Contest for SWM Plan

PVCC and J-PRISM II implement an illustration contest throughout the schools, and the winning artwork will be on the cover page of the SWM plan. This activity will also serve as an awareness raising event.

Awareness event for promotion 3R

Awareness event such as a bulky waste reuse program, exhibition booth and a clean-up short movie etc. is discussed but those activities were not implemented due to COVID-19 spread.

Yellow Bag Review Committee

Review on the Specification of Yellow Garbage Bags

Au Bon Marche is supportive for reviewing the specification of Yellow Garbage Bags. Targets of comparison analysis are size of plastic bag, thickness and material such as biodegradable plastic and biomass plastic.

The current contract runs until July 2022 so during this time a Yellow Bag Review Committee will be established to look at what changes are required so that a new Request for Tender Document can be issued and awarded prior to the current contract ending.

FUTURE PLAN

4.1 Main activities to realize SWM Plan

PVCC identifies the eight (8) main approach/field of activities to realize the SWM plan in line with the National Waste Management and Pollution Control Strategy 2016-2020.

NWMPCS	Main approach to realize SWM Plan									
Thematic Area 1	(8) Development of SWM Regulatory Principals									
Policy, Legislation and Enforcement										
Thematic Area 2	(7) Sustainable Financing for Appropriate Waste									
Sustainable Financing	Management									
Thematic Area 3	(5) Establishment of Waste Management Division									
Capacity Development										
Thematic Area 4	(3) Waste Minimization through Promotion of 3R (Reduce,									
Waste Minimization	Reuse and Recycle)									
Thematic Area 5	(1) Strengthening of Waste Collection Capacity and									
Integrated Waste Management	System									
	(2) Extension and Rehabilitation of Bouffa Landfill Site									
	(6) Improvement of Operation and Maintenance System									
	for Waste Collection Vehicle and Equipment									
Thematic Area 6										
National Coordination										
Thematic Area 7	(4) Public awareness raising									
Public Awareness										

Table 4-1 Consistency of NWMPCS and the SWM Plan

Thematic Area 1		(1)	Strengthening of Waste Collection Capacity
olicy, Legislation and Enforcement			and System
SALAN NO STATE	-\. <u>x</u> -/	(2)	Extension and Rehabilitation of Bouffa
Thematic Area 2			Landfill Site
Sustainable Financing			
		(3)	Waste Minimization through Promotion of 3F
Thematic Area 3			(Reduce, Reuse, Recycle)
Capacity Development			
LTXS COMANNER!	Kor	(4)	Public Awareness Raising
Thematic Area 4		(E)	Establishment of Waste Managemen
Waste Minimization		(၁)	Division
A PARAMADAN		- 1	
Thematic Area 5		(6)	Improvement of Operation and Maintenance
Integrated Waste Management			System for Waste Collection Vehicle and
			Equipment
Thematic Area 6		(-)	
National Coordination		(/)	Sustainable Financing for Appropriate
Market Street			
Thematic Area 7		(0)	
Public Awareness	1	(8)	Development of SWM Regulatory Principals
	15		2500
Fig. 4-1 NWMPCS 2016	2020 and M	ain a	approach to realize the SWMP

4.2 Strengthening of Waste Collection Capacity and System

Objectives and Indicators of achievement

Municipal Solid Waste Capture Rate: The targeted capture rates (ratio of discharged waste amount to generated volume) are as shown in the table below.

Table 4-2 Target capture amount

	1 That is	Ser and Marine	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	(unit: ton/day)
	2018	2021	2025	2030
	41.5	46.6	58.6	74
raigeleu capiule amount	(71%)	(73%)	(83%)	(95%)

Waste Collection Service Coverage Rate: Ensure that all citizens can enjoy the collection service at an early stage in the planned area. (100% population)

Main Stakeholders

Communities, Ward Secretaries, Drivers, PWOs, DEPC, Shefa province

Outline

The amount of waste to be collected in 2030 will be 1.8 times the current amount. PVCC and Shefa province are necessary to collaborate cope with the increased amount of discharged waste.

In utilizing the private sector, in order to manage and supervise their performance, PVCC and Shefa province will entrust the waste collection services to the private collection companies. For private use of collecting services, it is necessary for PVCC and Shefa province to secure commission money.

Regarding direct transport by major supermarket etc., PVCC will register transport trucks and make them follow a manners of transportation and unloading in Bouffa Landfill site.

Waste amount to be collected

If PVCC serves waste collection service for both of Port Vila Municipal and Peri-urban area, based on

the Minutes of Understandings (MOU) between PVCC and Shefa province, waste amount to be collected by PVCC in the term of this plan is estimated as shown in the table below. Increment of collection amount of private collection and direct haulage is estimated along with rate of population growth.

17-2	Charles I.	1	3. 19	S. 18.	A 12	11 × 4		9 J.			(10	on/day)
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
MSW disposal		43.4	46.0	47.5	49.7	52.0	54.4	56.6	58.9	61.2	63.7	66.2
1	Private collection	18.2	18.7	19.2	19.7	20.2	20.8	21.2	21.6	22.0	22.5	22.9
2	Direct haulage	10.0	10.3	10.6	10.8	11.1	11.4	11.6	11.9	12.1	12.3	12.6
3	PVCC collection	15.2	17.0	17.7	19.1	20.6	22.2	23.8	25.4	27.1	28.9	30.7

Table 4-3 Waste amount to be collected by PVCC

Yellow Garbage Bag Collection Plan

Demarcation of Waste Collection Area between PVCC and Shefa Province

Demarcation of waste collection area, especially in the peri-urban area, should be identified between PVCC and Shefa province, and information should be disseminated to ward secretaries, drivers and communities. Meantime Shefa province will continue to collect waste in the peri-urban area. This collection system will be reviewed after the financial analysis of the pre-paid bag and gate fee between PVCC and Shefa province gives a conclusion.

Station Collection

Station collection will be started on a pilot basis. It is expected to reduce the uncollected yellow plastic bags in the area where it is required to shift the collection method to the station collection, instead of door to door collection, due to the bad road condition.

GPS trucking for monitoring and reviewing of waste collection

GPS tracking devices are equipped with every waste collection vehicle for a week and keep a record continuously. Based on the data of GPS records collected from each device, a GIS map is developed, which enables to trace a waste collection route and efficiency of collection by vehicle. It is also used as a baseline map to analyze how to improve waste collection route and method.

Collection of Bulky Waste

Special collection system for bulky waste should be established to clean-up the remaining bulky waste

in a community or on a road and avoid illegal dumping. PVCC allocates a staff to organize a special collection in the afternoon of every Wednesday on demand.

Vehicle Procurement Plan

Capacity of existing collection vehicles owned by PVCC is estimated to decrease in the term of this plan as shown in the table below.

			100			72			(to	on/day)
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
i. Capacity of existing collect ion vehicles in PVCC	29.2	28.4	26.4	21.4	18.2	17.3	16.4	12.8	9.9	7.7
ii. PVCC capacity required*	21.6	22.5	24.3	26.2	28.3	30.2	32.3	34.5	36.7	39.1
Variance (i - ii)	7.6	5.9	2.1	-4.8	-10.1	-12.9	-15.9	-21.7	-26.8	-31.4

Table 4-4 Capacity of existing collection vehicles owned by PVCC

* PVCC capacity required indicates collection amount that should be collected per collection date.

The waste collection vehicle procurement plan to close the variances between waste amount to be collected by PVCC and capacity of existing collection vehicles owned by PVCC in each year is estimated as shown in the table below.

Table 4-5 The collection vehicle procurement plan

	S & 2			X						(unit)
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Flatbed truck	-	-	-	2	1	-	-	1	2	2
Compactor	-	-	-	-	-	-	1	-	-	-

Budget plan (CAPEX)

A procurement cost of a waste collection vehicle is estimated 2,000,000VT/truck, and 10,000,000 VT/compactor, respectively. Budget plan is estimated based on the collection vehicle procurement plan as shown in the table below.

Table 4-6 The capital expenses (CAPEX) associated with the collection vehicle procurement

	Туре	Units	Unit Cost (VUV)	Cost/year (VUV)
2024	Flatbed truck	2	2,000,000	4,000,000
2025	Flatbed truck	1	2,000,000	2,000,000

C

		1. Second all	Start Back he he	4
	Туре	Units	Unit Cost (VUV)	Cost/year (VUV)
2027	Compactor	1	10,000,000	10,000,000
2028	Flatbed truck	1	2,000,000	2,000,000
2029	Flatbed truck	2	2,000,000	4,000,000
2030	Flatbed truck	2	2,000,000	4,000,000
		Total	24,00	0,000

4.3 Extension and Rehabilitation of Bouffa Landfill Site

Objectives and Indicators of achievement

Disposal rate: The final disposal rate (proportion of final disposal amount to generated amount) shall be 85% by 2030.

Main Stakeholders

Waste pickers, Etas Community, Landfill staff, Drivers, PWOs, DEPC, Shefa province etc.

Outline

The collected waste is landfilled in Bouffa landfill site. The total area of the Bouffa landfill site is 48 ha, but the Cell-1 currently in use started operation in 2008 and expanded in 2016, and its area is about 1.0 ha.

Basic Policy of Landfill Site Construction and Management

Transition of Bouffa Landfill Site

The World Bank (WB) conducted a waste management survey at Port Vila Municipality (PVM) in 1994, and selected the Bouffa district as a final disposal site. WB continued to fund the development of Bouff disposal site in 1995 as part of a mortgage program. PVM began landfilling in 1996 using the trench method. However, due to inadequate landfill management, the disposal site became open dumps, and environmental problems such as foul odors and flies became serious.

The Bouffa Waste Disposal Site Improvement Project was started as a technical cooperation project by JICA in September 2006, and Cell-1 was constructed in September 2008 as a sanitary landfill. An advanced technology called semi-aerobic landfill method (Fukuoka method) was adopted for the landfill of Cell-1.

As Cell-1 was nearly full in 2016, PVM expanded it with the financial support from Pac-Waste Project and technical support from J-PRISM. Current landfill operation is being carried out in the expanded Cell-1.

Management policy between PVCC and Shefa province

Shefa province has an idea to construct their own landfill site in the future. In consideration of the time span of new landfill site construction and urbanization speed of the Greater Port Vila, PVCC and Shefa province decide that Bouffa landfill site will continue to receive all waste discharged inside the boundary of Port Vila and peri-urban area in Shefa province until Shefa province secures their own landfill site.

Concerning the rural areas and isolated villages in Efate, Shefa province will make their own SWM plan and determine the waste collection and disposal policy. The possible measures of waste management in villages are, for example, feeding animals, piggery, compost, farming, closing random dumpsite, instruction of appropriate community dumpsite, and group collection of recyclables.

Long term development plan of Bouffa Landfill Site

Area

Area of landfill site is 48ha in total.

According to the previous environmental assessment conducted in 1994 by the World Bank at the initial development of the Bouffa landfill, the site is located within the area with a thick clay layer providing natural liners, and the depth of groundwater is considered low. Therefore, the infiltration of the leachate into the basement is considered negligible, and the development of Cell-2 and 3 will not adopt the impermeable sheet same as Cell-1.

Target Level of Landfill Operation

The target level of landfill operation is "Sanitary landfill" and landfill type is "Semi-aerobic landfill method (Fukuoka method)".

Acceptable Waste at Bouffa Landfill Site

The waste received at Bouffa landfill site is as follows:

- i. Municipal waste
- ii. Hazardous waste⁴: such as liquids containing heavy metals generated by school science experiments, but it must be small amounts.
- iii. Sewage sludge: Sewage sludge is collected separately from municipal waste and processed at the sludge treatment facility at Bouffa landfill site.

Zoning of Bouffa Landfill Site

The following facilities have been or will be built at the site of Bouffa.

- (1) Administration zone
 - Administration office
 - Weighbridge and accessories
- (2) Maintenance zone
 - Workshop for landfill equipment
 - Spare parts storage
 - Rest facilities for workers
 - Special waste storage facility
- (3) Landfill zone
 - Landfill area for municipal waste
 - After the landfill is covered with soil, it will be used as a temporary storage area for scrap cars and compost yards.
- (4) Leachate treatment zone
 - It consists of a pond for storing leachate collected from the Landfill area and a pumping facility to return leachate to the landfill.
- (5) Sewage sludge treatment zone
 - It is already operating at a sewage sludge treatment facility constructed with ADB and Australian funding.

⁴ Hazardous waste generated in industrial activities must be treated and disposed of at the responsibility of the producer.

(6) Recycling zone

Market waste compost

Recyclable sorting

(7) Temporary storage zone for disaster waste

This area temporarily stores disaster waste generated in urban areas during cyclones and other disasters.

Recyclable waste is sorted and extracted, and the residual is landfilled at the disposal site.



Fig. 4-2 Zoning Plan of Bouffa Landfill site

Target Disposal Amount

As mentioned above, Cell-1 was developed as a sanitary landfill in 2008 and expanded in 2016, total area is currently about 1.0 ha. However, it is almost full at the end of 2019, and PVCC is raising landfill area to extend its life, and dumping waste in old landfills when access is difficult.

An accumulated final disposal amounts during a planning period is estimated as shown in the table.

1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	Table	4-7 L31	innatet	a minar	uispos		ame ut	ning p	amm	g perio	Ju	OF A
	unit	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Disposal	ton/day	43.4	46.0	47.5	49.7	52.0	54.4	56.6	58.9	61.2	63.7	66.2
	m ³ /day	48.3	51.1	52.8	55.2	57.8	60.5	62.9	65.4	68.0	70.7	73.6
annount	m³/year	17,613	18,659	19,254	20,143	21,080	22,066	22,950	23,869	24,826	25,821	26,855
Accumulat ed volume	m ³		18,659	37,913	58,057	79,137	101,203	124,153	148,022	172,848	198,668	225,524

able 4-7 Estimated final disposal volume during planning period

The specific gravity of landfill waste was set at 0.9 ton/m³.

Source: JICA Expert Team (JET) of J-PRISM II

Landfill waste is estimated to be 17,613m3 in 2020. If this is landfilled at Cell-1 (approx. 1.0ha) and old landfill (approx. 0.8ha), the additional landfill height will be approximately 1.0m. So, it is judged that the current operation which use Cell-1 and old landfill area can be maintained technically. Therefore, the target landfill amount for the next cell is 226,000 which is cumulative disposal amount after 2021.

Activities in the Long-term Development Plan

Activities have been identified for the development of Bouffa DS as a sanitary landfill. These activities and their projected implementation schedule are shown in Table below.

					1 21 -	1 V all					
Activities	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
LF-1 Construction of access roads											
LF-2 Development of landfill Cells											
- Development of Cell-1											
- Development of Cell-2											
- Development of Cell-4											
LF-3 Construction of compost facilities											
LF-4 Integrated development of Bouffa DS											
- Improvement of access road to Bouffa DS											
- Construction of Administration facilities											
- Installation of weighbridge											
LF-5 Monitoring of landfill operation											
Landfill operation		(Cell-2 ope	ration		Cell-3	operatio	n	Cel	I-4 opera	tion

Table 4-8 Activities in the Long-term Development Plan
This access road is indispensable for the development of Cell-1 and subsequent landfill. At this time, PVCC needs to develop access roads and cells2 with its own resources, as donor support for landfill expansion has not been identified.





LF-2 Development of landfill Cells

Based on the land use concept, a development plan for cells that can accommodate the final disposal volume by 2030 in the landfill zone was created. In preparing the plan, based on the experience that collection vehicles could not access the landfill due to rain during the operation of Cell-1 and had to dump garbage on the road, development of all-weather access roads were prioritized, and the Cells were set up along the access roads.

Table	Table 4-9 Expected Landfill Capacity of Bouffa Landfill Site									
Cell	Area (ha)	Capacity (m³)	Accumulated Volume (m ³)							
2	0.75	75,000	75,000							
3	0.75	75,000	150,000							
4	1.60	160,000	310,000							
5	1.13	113,000	423,000							
Total	5.23	423,000	-							

Source: JET



Fig. 4-4 Development Concept of landfill areas in Bouffa Landfill Site

The development schedule of the Bouffa landfill site required for the appropriate and sustainable final disposal is prepared in the table below based on the estimated final disposal amount and the capacity of each cell. According to this, it is necessary to extend Cell 2, 3, 4 during this SWM plan's period.

RAVEL					-Sela-	No ten					-	LN
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Disposal amount	m3/year	17,613	18,659	19,254	20,143	21,080	22,066	22,950	23,869	24,826	25,821	26,855
Accumulated volume	m3		18,659	37,913	58,057	79,137	101,203	124,153	148,022	172,848	198,668	225,524
Cell 1		Cell 1										
Cell 2				Cell 2								
Cell 3								Cell-3				
Cell 4											Cell 4	

Table 4-10 Expansion Schedule of Cells in Bouffa Landfill Site

Nevertheless, the site of the Bouffa landfill site has been secured for 48ha as mentioned above, so it can be used as a final disposal site in the next 20 to 30 years.

Since Cell-1 is expected to fill up by 2020, J-PRISM has implemented preliminary designs for Cell-2

and 3, which need to be developed quickly. The design report is attached to this plan as a reference. As mentioned above, PVCC must develop at least Cell-2 with its own resources.

The development of Cell-3 and Cell-4 should be included in the integrated development mentioned in LF-4, because it is desirable to construct necessary and sufficient facilities for semi-aerobic landfill operation.

LF-3 Construction of compost facilities

The market waste compost, which has been in operation since early March 2020 as a pilot project, will be continuously expanded with the aim of reducing landfill waste and reducing leachate water quality and greenhouse gas emissions caused by organic waste. This activity requires a suitable size of compost yard and building.

The compost yard will be secured by covering Cell-1 with excavated soil generated during the construction of the access road, which PVCC can do with its own resources. However, since the construction of the building requires a large amount of funds, it is desirable to include it in LF-4 in the next section.

LF-4 Integrated development of Bouffa Landfill Site

Since this activity requires a large amount of funding, it is desirable to implement it with the support of international organizations and donor countries.

In order to operate the Bouffa landfill as a sanitary landfill that can be properly managed, it is necessary to complete the following facilities.

- i. Improvement of access road from trunk road to Boufa disposal site
- ii. Administration facilities
- iii. Installation of weighbridge

Also, as mentioned above, it is desirable to include the construction of Cell-2 and 3 and the construction of a compost facility including yard, building and instruments necessary.

LF-5 Monitoring of Landfill operation

PVCC Waste Management Division (WMD) shall monitor the landfill operation in accordance with the landfill operation manual developed based on the SWM plan.

The terms to be monitored shall include the following:

- i. Ensure operations are as described in the operation manual
- ii. Provide sufficient WMD staff to monitor the operations
- iii. Conduct environmental monitoring for water quality, leachate quality, etc.

Operation and Maintenance (O&M) plan

SWM Data Management Flow

Proposed SWM data management flow is shown in Fig. 4-5.



Fig. 4-5 Proposed SWM data management flow

Occupational Safety and Health (OSH) of Waste Pickers

PVCC should take a preventive action to improve the Occupational Safety and Health (OSH) of Waste

pickers (WPs) to avoid the risk of injuries and infectious diseases. Registration system is started to identify the total number of WPs and the leaders who actively work for recycling and have an influence for other WPs to establish a WP committee to implement and disseminate a safety training.

Heavy equipment operation and maintenance plan

PVCC requested a compactor truck and heavy machine for landfill site (Bulldozer and Backhoe) to the Japanese government through the Economic and Social Development Program (ESDP). There vehicles should be considered to develop a vehicle procurement plan

Budget plan (CAPEX)

These construction costs are estimated as shown in the table below.

	giulta de la		
Items	Spec.	Quantity	Cost (million. VUV)
Improvement of Access road	Gravel road	L=720m	99.8 (39.3)
For Cell-2, 3	Gravel road	L=520m	72.1 (28.4)
For Cell-4	Gravel road	L=200m	27.7 (10.9)
Landfill area development			623.1 (201.1)
Cell-2	0.9 ha,	1 set	158.1 (76.4)
Cell-3	0.6 ha	1 set	143.4 (69.3)
Cell-4	1.6 ha	1 set	321.6 (155.4)
Administration facilities	Admin. Building with equipment, Gate	1 set	39.1
Installation of weighbridge	50 tons class	1 set	24.2
Administration facilities	Admin. Building with equipment, Gate	1 set	14.9
Other facilities			13.6
Fencing	H-2.0m, L-526m	1 set	4.6
Compost facilities	Leveling of the covered area,1,200m ² , instruments	1 set	9.0
Total			775.6 (393.1)

Table 4-11 Cost for Integrated development of Bouffa LFS

() is the cost assuming that the excavated soil is sold

4.4 Waste Minimization through Promotion of 3R (Reduce,

Reuse and Recycle)

Objectives and Indicators of achievement

Waste reduction by 3R Promotion: The targeted recycling rates (ratio of recycled volume to generated volume) are as follows.

The amount of vegetable waste separated in the Central Market and used as animal feed is counted as compost.

	and March			(unit: ton/day)
	2018	2021	2025	2030
1. Market waste compost	0.2	0.5	0.8	1.2
2. Home compost	0	0.1	0.1	0.2
3. Material recovery	0	0.1	3.4	6.6
4. Group collection	0	0.1	0.3	0.5
5. Separate collection	0	0	3.1	6.1
	0.2	0.7	4.3	8.0
Target recycle amount	(0.3%)	(1.0%)	(6.1%)	(10.2%)

Table 4-12 Waste Reduction by 3R Activities

Main Stakeholders

Community, Ward secretary, SWM committee, Recycling Company, NGOs, DEPC, the Department of Agriculture and Rural Development (DARD) etc.

Outline

Since the amount of waste generated increases year by year, reduction of waste is indispensable. In this plan, composting and recycling of organic waste, which accounts for almost half of the waste generated, will be promoted and 10% of the generated amount will be reduced as a material recovery by 2030.

Composting of the market waste will be introduced with a target of 20% of generated amount as a

pilot project in 2020 and will be expanded to 50% in 2030.

Waste reduction at the source reduces the burden of collecting and transporting waste, and it is also expected that an enlightenment effect will be obtained from citizen's activities. 40 units of home composters will be introduced in 2021 and aim to prevail about 250 units in 2030.

Recyclable waste is collected in two ways. One is to collect groups as part of school education, and the other is collected by waste separate cages placed in the communities and large-scale business establishments. In each case, the collector entrusted by PVCC collects resource waste and transports it to the recycling company.

Market Compost Promotion Plan

Promotion of Source Segregation at Markets

Based on the lessons learnt from the previous trial of market composting in 2016, waste segregation at source is observed as a key to successful implementation of market composting. Through the pilot project at the central market in 2020, promotion tools of market compost (short movie, poster and leaflets) were developed, and volunteers and staff were trained to instruct shop keepers which types of waste are suitable for composting. Market composting can contribute to the massive volume of waste reduction.

Construction of compost facility at Bouffa landfill site

PVCC should accumulate the experience how to work composting at Bouffa landfill site before searching partners or selling products, to secure the quality of compost and seek the way to improve the method as a system from awareness raising of source segregation, waste collection, operation of compost facility and make profit to sell the products. Temporary composting yard was prepared through the pilot project in 2020. It is planned to be updated by PVCC's own budget.

Collaboration with the Dept. of Agriculture and private sector

Collaboration with the Department of Agriculture and Rural Development (DARD) and private sector should be considered to expand the composting activity. It is better to expand the activity after the PVCC accumulates enough experience and knowledge of compost.

Home Compost Promotion Plan

Community Workshop for Promotion of Home Compost

Continuous support is necessary to the community for promotion of home compost. Community practitioners are helpful to spread the method and knowledge of home composting and backyard gardening by peer coaching.

Material Recovery Promotion Plan

Group Collection of Recyclables

Recycling activities are not popular in Vanuatu. A private recycling company known as Recycle Corp, some NGOs and local producers are taking initiative for promoting recycling. Recycle stations using sacks by materials can be established as an easy way for group collection of recyclables in a community. A recycling company will come and collect recyclables or the community will bring the recyclables to the stock yard of the recycling company when sacks are full.

PVCC should establish a committee to look after the group collection of recyclables, cost for transportation and profits on sale of recyclables in a community with a ward secretary of each area.

Container Deposit Scheme

The Government of Vanuatu is seeking a possibility to introduce a Container Deposit Scheme (CDS) under Waste Management Act No. 24 of 2014. CDS operate by taking a small deposit when a container either enters the country or is filled in-country, and refunding money to anyone who returns that container for recycling. This will reduce quantities of beverage containers to landfill significantly, as well as support the recycling industry overall.

4.5 Public Awareness Raising

Objectives and Indicators of achievement

Waste reduction by 3R Promotion: The targeted recycling rates (ratio of recycled volume to generated volume) are as follows.

The amount of vegetable waste separated in the Central Market and used as animal feed is counted as compost amount.

Table 4-13 Waste Reduction by 3R Activities (unit: ton/day20182021202520301. Market waste compost0.20.50.81.22. Home compost00.10.10.23. Material recovery00.13.46.6Group collection00.10.30.5Separate collection003.16.1Target recycle amount						
	2018	2021	2025	2030		
1. Market waste compost	0.2	0.5	0.8	1.2		
2. Home compost	0	0.1	0.1	0.2		
3. Material recovery	0	0.1	3.4	6.6		
Group collection	0	0.1	0.3	0.5		
Separate collection	0	0	3.1	6.1		
Target regula amount	0.2	0.7	4.3	8.0		
rarget recycle amount	(0.3%)	(1.0%)	(6.1%)	(10.2%)		

Main Stakeholders

Schools (Teachers and students), Provincial education officer, Ward secretary, Community, NOGs, DEPC, Ministry of Education and Training etc.

Outline

PVCC will actively enlighten residents, aiming for establishment of public participatory waste management. In educational activities, PVCC will introduce the proven Clean School Program by J-PRISM, and lead a series of community-based meetings across the target area to ensure thorough separation and discharge rules.

National Environment Week & World Clean-up Day

40 years anniversary of Vanuatu independence will be celebrated in 2020. On that occasion, PVCC and J-PRISM II will implement an illustration contest for the cover page of the SWM plan as a pilot project. Illustrations will be utilized as a decollation of awareness raising events.

Such activities should be initiated by PVCC regularly to promote involvement of the community to solid waste management.

Clean School Program

With the establishment of an effective system for awareness raising of waste reduction by 3R activities, PVCC needs to promote education and awareness raising at the same time. Schools will take a core role on this point since the children, who develop our future based on their learning at school, can

also pass on these ideas from schools to home and communities.

The component of education will be i) Environmental awareness raising, ii) School composting and iii) Rubbish separation & recycling.

4.6 Establishment of Waste Management Division

Objectives and Indicators of achievement

Objectives: Waste Management Division (WMD) is established and staff is assigned officially based upon the approved organization structure.

Staffing rate: More than 50%

Main Stakeholders

The Department of Local Authorities, the Public Service Commission etc.

Outline

In order to execute the SWM Plan, PVCC must organize the Waste Management Division (WMD) consisting of a data management unit, waste collection service group, landfill work group, equipment maintenance group, public relations group.

The staff should appoint existing personnel as much as possible, but in order to make the organization function smoothly, it is necessary to place persons responsible for data management and contract management under the waste management officer.

Proposed Solid Waste Management Division

Organization Structure

The new organization structure of Waste Management Division is as shown in Fig. 4-6. This organization structure is still not including the Waste Management Communications Office and The Waste Management Officer – Schools.

The Waste Management Communications Officer which is a proposed new role who will report directly to the Waste Management Manager. This position will be primarily responsible for dealing with all external phone calls that come to the Waste Management Division, managing complaints, requests for information, and directing calls to the relevant Supervisor or Manager. They will also be responsible for administration duties of the Waste Management Office including booking trucks for services, ordering parts etc. They will then manage the new WM Facebook page along with the Waste Management Officer – Schools, and create media releases to communicate waste management messages via newspaper and radio. This role will provide a single point of contact both internally and externally to ensure the smooth running of the Waste Management Office.

The Waste Management Officer – Schools is also a proposed new role. This position will be responsible for working with every primary school within the Municipal area. They will carry out a waste characterization for each school, report on results and develop a waste management plan for each school. They will provide teacher training and develop lesson plans with the teachers to incorporate waste management into the curriculum. They will assist with the Facebook page and media releases of success stories and progress.



Fig. 4-6 Organization Structure of Waste Management Division

Staff and Responsibility of Each Position

Job descriptions of each position were developed based on the above-mentioned proposed organogram which should be materialized by the target year of this SWM plan. It includes a suggestion on which level and pay grade each position sits within. Once the new Job Descriptions are approved some positions may need to have the salary reviewed.

4.7 Improvement of Operation and Maintenance System for

Waste Collection Vehicle and Equipment

Objectives and Indicators of achievement

Waste Management Department is self-funding.

Outline

Currently there is no mechanic hired by PVCC. Vehicle O&M systems should be developed on a premise that daily maintenance is implemented by PVCC and major repair and periodical maintenance is contracted out to private repair shops. PVCC has to secure the budget for periodical maintenance as well as operation and maintenance expenses.

Preventive and Periodical Maintenance System

Waste collection vehicles and equipment should be maintained appropriately before it is broken. The maintenance schedule of vehicles/equipment is the period when equipment should be maintained or serviced. Heavy equipment like bulldozers or excavators are serviced at the hourly rating, whereas waste collection trucks or ordinary dump trucks are serviced based on mileage. These important aspects must be considered in order to properly carry out proper maintenance. The service manuals are the best guide for this work. Example of the items of daily inspection and periodic maintenance are show in the table below.

Category	Example of Inspection/Maintenance Items					
Deily Inspection	Radiator coolant water, Bottom of truck (Front), Bottom of truck					
Daily Inspection	(Rear), Brake oil, Air tank water, Engine oil etc.					
Deriedie Meintenenee	Oil, Filter and Water (Engine oil, Fuel filter, Brake oil, Hydraulic oil,					
Periodic Maintenance	Radiator coolant water etc.), Engine room, Driving (Engine genera					

Table 4-14 Example of Inspection/Maintenance Items

			15 201	5 4 5 6	A						
Category		Example of Inspection/Maintenance Items									
	(start,	running	sound,	smoking),	Brake,	Clutch/Transmission,					
	Steerin	ig, Noise)	and Outs	ide (Consur	nables si	uch as Hose and Pipe,					
	Frame	, Body, Lig	hts/Mille	r etc.) etc.							

4.8 Sustainable Financing for Appropriate Waste Management

Objectives and Indicators of achievement

The Waste Management Department is self-funding by 2025.

Main Stakeholders

The Waste Management Department Staff, Finance Department and Councilors.

Outline

In order to achieve a sustainable financial system within the Waste Management Division, a Full Cost Accounting approach needs to be implemented and there are several actions that need to take place for this to be achieved, such as an improvement of financial processes and building a close relationship with the Finance team.

Financial Management Plan

Financial Processes

The first area needed to be improved is in the financial processes of WMD. The following actions should be taken:

- Improved data collection of all waste management expenses (how much does each service cost to provide e.g. waste collection and landfill)
- Improved data collection of all waste management income, ensuring each income stream is allocated a code in MYOB
- Annual analysis of service leakage and opportunities for improvements in efficiency
- Improved use of MYOB to ensure all income and expenditure is listed accurately

Service Delivery

The second process is service delivery:

- Mandatory use of Yellow bag in target area
- Review of landfill gate fees and strict fee collection
- Enforcement of new Waste Management By-Laws

Timeframe of the Financial Assessment

It is essential that the WM team works closely with the Finance team to develop a financial assessment system aiming to i) provide accountability and transparency to the community and ii) enhance the accuracy of the WMD's annual budget request to Council.

Short-term financial analysis (every 6 month and 12 month)

Short-term analysis should be done every 6 months and 12 months to assess i) how much the initial budget proposed that the WMD would spend and how much the WMD actually spent in each line item, and ii) analyzing why WMD have underspent or overspent for each line item. This analysis will allow for identification of missing items that should be included in future budgets, and more accurate budget projections for each future year.

Mid – Term financial analysis (2023)

An additional mid-term analysis can be done in the third year of the account being operational (2023). The purpose of this analysis will be to assess whether after two years of the account being operational the WMD can actually be financially sustainable and 'afford' to pay for all its services as well as the salaries of its staff. If this is not sustainable then an alternative solution will need to be investigated. If however, the WMD is sustainable and or making a profit, then ongoing 6 month and 12 months reviews will still be essential to ensure this is maintained.

Each Analysis should be done by the WMD in partnership with the Finance Department. The Finance Department will be responsible for providing the financial report summaries and the WMD will be responsible for looking in more detail at the expenditure and income for each line item.

These Analysis Reports can then be sent to Council to show that the WMD is being both transparent and accountable.

Training

It will be necessary to provide ongoing training within the Finance Department to ensure that they are inputting all the incoming and outgoing correctly and are using the recommended MYOB line item structure. The relevant WMD staff will also require ongoing training and monitoring to ensure they are recording the correct codes on all their invoices, receipts LPOs etc.

Independent Account

2021 will be the first year that the Waste Management Bank Account will be in operation. This account will now receive all waste management income - landfill gate fees, yellow bag sales etc. and will be responsible for paying for all Waste Management Division related expenses, including staff salaries. It remains to be seen whether the account will operate at a surplus or a deficit however it will, for the first time, allow the Waste Management Division to develop accurate and transparent annual budgets. Being in control of the finances will also enable the Department to commit to and better afford long term purchases such as a weigh bridge for the landfill and additional waste collection vehicles.

4.9 Development of SWM Regulatory Principals

Objectives and Indicators of achievement

Development of a Waste Management By-Law and a Pre-Paid Garbage Bag By-Law by 2022.

Main Stakeholders

Waste Management Department, State Law Office, Municipal Police.

Outline

The Pre-Paid Garbage Bag By-Law has been drafted and is now sitting with the State Law Office to be gazetted. The Waste Management By-Law is currently being drafted is a more general By-Law that provides regulation around the provision of waste collection services, waste disposal services and restrictions on the burning and dumping of waste.

Principle of By-law

These By-Laws have two roles as follows:

- They provide a legal framework for PVCC to implement the SWMP 2021-2030
- They provide the Municipal Wardens with the power to issue fines for illegal behavior

Monitoring System in line with the Waste Management Act

The By-Laws will need to be updated whenever there are significant changes in waste management services, e.g. Price of pre-paid bag is increased or recycling services are introduced

Annual SWM Plan and Report

Annual plan has to be developed and submitted to DEPC in line with the Waste Management Act No. 24 of 2014. Annual report is recommended to be developed for analysis of current status, monitoring of progress of this SWMP and as a tool for information disclosure of SWM to the public.

ACTION PLAN

5.1 Financial Requirements

5

Expenditure (CAPEX and OPEX)

Total SWM expenditure in 2030 is estimated 61,148,020VUV in total as shown in Fig. 5-1. It consists of capital expenditure (CAPEX), operation expenditure (OPEX) and administrative cost.



Fig. 5-1 Estimated OPEX and CAPEX annual shares of the PVCC SWM Plan

CAPEX

Total CAPEX from 2021 to 2030 is estimated 26,000,000 VUV.

OPEX

- Total OPEX from 2021 to 2030 is estimated 416,700,000 VUV.
- The number of waste collection staff (Driver, Supporter) and landfill staff (Operation staff, Engineer, Supporter) will be deferred.

- The salary for waste collection staff and landfill staff will be deferred.
- Cost for solid waste management education is included.

Administration Cost

 Administration cost includes salary for superintendent, accommodation cost, office expenses, etc.

Revenue (Yellow Bag and Tipping Fee)

Budget plan of estimated income from 2020 to 2030 is shown in Fig. 5-2.



Fig. 5-2 Estimated Income of the PVCC SWM Plan

Yellow Bag

- Total income from yellow bag in 2030 is estimated 44,070,000 VUV.
- The wholesale price of yellow bag will be reviewed in 2025 and 2028.

Tipping Fee

- Total income from tipping fee in 2030 is estimated 16,120,000 VUV.
- · The unit of tipping fee will be deferred.

5.2 Implementation Schedule

Priority Activities

The areas where identified and implemented as pilot projects and improvement of Bouffa landfill site are selected priority activities of this SWMP.

Timeframe and Planning Policy

Planning policy of implementation schedule of activities in each category is shown below.

Table 5-1 Time frame and Planning Policy by Category

(1) Strengthening of Waste Collection Capacity and System

- The introduction of waste collection stands will make a significant difference to the efficiency of the waste collection service and also to the residents that will be able to use the stands. PVCC will be installing GPS trackers on all Waste Collection Vehicles by the end of 2020. This will enable analysis of truck efficiency, misuse and service provision to be analyzed and changed where necessary to ensure the most appropriate vehicle is being used for each route.
- Additional collection routes in the Greater Port Vila Area are going to be discussed with Shefa Province and the drafting of a Memorandum of Understanding will ensure that the system is fair and equitable.
- The Yellow Bag Contract is going to be reviewed by an internal committee to assess if any changes are required to the bag design and material as well as the percentage that PVCC receives from the sale of each bag. The current contract ends in July 2022, so prior to that the committee will draft a new Request for Tender document to be advertised publicly for all interested parties to tender for the new contract.

(2) Extension and Rehabilitation of Bouffa Landfill Site

• Extension of dumping area in Bouffa landfill site has to be done without delay in line with the development plan to avoid the overflow of incoming waste.

(3) Waste minimization through promotion of 3R (Reduce, Reuse and Recycle)

 The recruitment of the proposed Waste Management Officer – Schools will play a major role in the coordination and communication of the 3Rs throughout the education sector. This is considered to be the most effective and efficient way of increasing knowledge and understanding of this concept.

(4) Public awareness raising

The recruitment of the Waste Management Communication Officer will play a significant role in the coordination of the messages that are communicated via social media, newspaper and radio. This position will also have a key role to play in ensuring that there is consistent messaging from all teams within the Waste Management Division and also between other

organizations that work in waste management at the community level.

(5) Establishment of Waste Management Division

This is well underway with the Council approving the revised structure as mentioned in Section 4.6. The Waste Management Manager has been appointed and once he is in place he will be responsible for recruiting for the new positions in the structure.

(6) Improvement of Operation and Maintenance System for Waste Collection Vehicle and Equipment

• With the decision to outsource all PVCC vehicle maintenance and repairs along with the GPS trackers being installed, there should be a significant reduction in the amount of time waste collection vehicles are out of service due to repairs and waiting for parts. Overall, the vehicles should be better maintained, stay in service longer and have better resale value.

(7) Sustainable Financing for Appropriate Waste Management

With the introduction of the separate Waste Management Bank Account, PVCC will be in a
position to control its own income and expenditure in such a way that it can then forecast the
following year's budget. The value of this is that money can be allocated to each deliverable of
the SWMP to ensure it is completed – e.g. Clean School Program resources, waste collection
stand building and installation etc.

(8) Development of SWM Regulatory Principals

• The Pre-Paid Garbage Bag By-Law and the Waste Management By-Law are both underway. They will provide a legal framework that supports the aims of the SWMP 2021-2030

Implementation Schedule

Implementation plan of activities with schedule is shown below.

Print Share	TaleTe				Idiri or				- Charles		
Action	Phase-1			Phase-2							
Action	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
(1) Strengthening of Waste) Strengthening of Waste Collection Capacity and System										
MOU between PVCC and											
Shefa Province											
Improvement of waste											
collection including											
installation of waste											
collection stand											
GPS trucking for											
monitoring and reviewing											
of waste collection											
Collection of Bulky Waste											
Yellow Bag Review											
(2) Extension and Rehab	ilitation	of Bou	ffa Lan	dfill Sit	е						

Table 5-2 Implementation Plan of Activities

Action	Phase-1		Phase-2						
Action	2021 2022	2023	2024	2025	2026	2027	2028	2029	2030
Rehabilitation of existing			[[ĺ	
cell									
Construction of access									
road for Cell-2									
Extension work and									
operation (Cell-2)									
Extension work and									
operation (Cell-3)									
Extension work and									
operation (Cell-4)									
(3) Waste minimization th	rough promotic	on of 3R	(Reduc	e, Reus	e and R	ecycle)		•	
Recruitment of the									
proposed Waste									
Management Officer –		-							
Schools									
Market compost									
Home compost									
Material Recovery									
(4) Public awareness raisi	ng			1	1				
recruitment of the Waste									
Management		l							
Communication Officer									
National Environment									
Week & World Clean-up									
Day									
Clean School Program		Distant	-						
(5) Establishment of Wast	e Management	DIVISIO	n		1	1	1	1	
Establishment of Waste									
Staffing to WMD			Cure te m	for Marc		ation M		n al E avai	
(6) Improvement of Opera	tion and Mainte	enance	System	for was			enicie a	na Equi	oment
I raining of daily inspection									
by drivers									
Monitoring of periodic									
maintenance by private									
(7) Sustainable Einanaing	for Appropriate	Wasta	Manag	mont					
Financial association			wanaye						
Training of WMD staff and									
finance department									
(9) Development of SMM	Poquiatory Drin	cinala							
Waste Management Di									
waste wanagement By-									
Law Dro Doid Carbona Dog Du									ļ
Fie-Paiu Garbage Bag By-									
Law Delevent Dy Jawa									
Annual Plan and Report							11 11-2		

6 CONCLUSION

6.1 Conclusion

The Solid Waste Management Plan 2021-2030 aims to realize the clean Vanuatu in line with the National Waste Management and Pollution Control Strategy 2016-2020 and the following strategy. Development of the plan is not a goal but a start. In order to implement and realize the plan, it is necessary for PVCC to establish a PDCA cycle, in which improved annual plan for the next year are formulated based on the results of monitoring activities of the last year. Besides, cooperation among DEPC, PVCC, Shefa province and citizens is a key for implementing main activities in the SWM Plan effectively.

The SWM Plan suggests the following approach/fields of activities for realizing an integrated and sustainable SWM.

- (i) Strengthening of Waste Collection Capacity and System
- (ii) Extension and Rehabilitation of Bouffa Landfill Site
- (iii) Waste Minimization through Promotion of 3R (Reduce, Reuse, Recycle)
- (iv) Public Awareness Raising
- (v) Establishment of Waste Management Division
- (vi) Improvement of Operation and Maintenance System for Waste Collection Vehicle and Equipment
- (vii) Sustainable Financing for Appropriate Waste Management
- (viii) Development of SWM Regulatory Principals

In addition, the SWM Plan identified the following priority activities based on the practical experience of pilot projects.

- (i) Waste Collection Improvement
- (ii) Private Collection Monitoring
- (iii) Improvement of Bouffa Landfill Site and working environment of Waste Pickers
- (iv) Promotion of Market Compost, and Home Compost & Gardening
- (v) Promotion of Clean School Program
- (vi) Awareness raising activities in National Environmental Week

(vii) Yellow Bag Review Committee

6.2 Recommendations

The recommendations enlighten the future direction of SMW beyond 2030. PVCC and Shefa province have to prepare emerging issues arose from social changes owing to the drastic population growth and economic development, such as a rapid increment of waste generation, complication of waste composition and higher requirements of global standard for protection of environment and climate change.

In addition, the following points are raised as potential issues that may occur in the near future, which can be discussed in the future Master Plan for the next term.

New life style rooted in the principle of waste reduction

Waste reduction to landfill is essential for island nation due to limitation of lands and small budget. As efforts to reduce waste to landfill, there are two main options such as promotion of 3R and incineration.

In SWM Plan, promotion of composting and recycling of organic waste, which accounts for almost half of the waste generated, is indicated and 10% reduction of the generated amount is expected as a material recovery by 2030. Composting should be conducted continuously because organic waste is predicted to increase along with population growth.

On the other hand, in terms of nonorganic waste to landfill such as plastic and metal waste, which is predicted to increase along with urbanization, should be reduced with promotion of the "3R+Return" concept. Although the Government of Vanuatu is seeking to introduce a Container Deposit Scheme (CDS) that is expected to reduce quantities of beverage containers to landfill significantly, for succeeding to sink the scheme in proper institution design and public awareness are needed.

Adaptation of appropriate and affordable technology

Reducing the amount of disposal waste by incineration is effective for extending the life span of landfill site. On the other hand, construction and O&M (operation and management) of incineration facilities must be a heavy burden on PVCC. Therefore, fiscal strengthening is recommended as a first step for preparation of the construction of intermediate treatment facilities in the future.

<u>Medical and hazardous waste management for eliminating risks of damaging human</u> <u>health and contaminating environment</u>

In this plan, infectious medical waste and hazardous industrial waste are not targeted, except for those which was brought to the Bouffa landfill site with/without processing. These waste have a negative impact on human health and contaminating environment. PVCC should have a plan to manage medical waste from all hospital and hazardous waste properly. It requires a technical knowledge and coordination with international organization such as SPREP can be helpful.

Importance of regional cooperation and south-south cooperation

PVCC has a responsibility, as a capital city, to lead the establishment of the proper waste management system in Vanuatu with the national governments by positively and widely share its experience with other provinces and municipalities.

In addition, cooperation among island countries that have similar constrains, such as geographical isolation, limited resources and economic scale, and dependence on foreign aid, contributes to effective and efficient development of solid waste management in the Pacific region.

Enhancement of the resilience and sustainability of solid waste management towards the post-Corona and post-SDGs

This plan is developed under COVID-19 spread. Therefore, the impact of COVID-19 is not fully analyzed and reflected to the plan. It is mandatory to take actions for prevention of the infectious diseases including COVID-19 even though the case of COVID-19 infection in Vanuatu is less than other countries. These initiative will contribute to enhance the resilience and sustainability of solid waste management aligned with the initiative of disaster waste management.

7

APPENDIX & REFERENCE

Appendix

"Municipal Solid Waste Capture Rate" (%)

- Capture Rate (%) = [Waste Collection by public service + Waste Collection by private service and self-transportation] ÷ [Waste Generation from Household + Waste Generation from other than household (Industry and Business)] × 100
- Capture Rate (%) = Collected Amount / Generated Amount \times 100

"Municipal Solid Waste Collection Coverage Rate" (% of population)

Collection Coverage Rate (%) = [Number of people in the area where waste is collected <u>by public</u> <u>service</u>] ÷ [Total Number of people in the area] × 100

Practical Guide to Solid Waste Management

in Pacific Island Countries and Territories (2018)

This Practical Guide is the compilation of good practices identified and developed by experts in Pacific island countries and territories through J-PRISM, which is primarily targeted at the practitioners of solid waste management.

You may refer to SPREP&J-PRISM II "Practical Guide to Solid Waste Management in Pacific Island Countries and Territories (2018)" for further information.

(URL: <u>http://www.sprep.org/j-prism-2/publications</u>)



Pacific Region Solid Waste Management and Recycling Pacific Country Profiles & Territory (2018)

This compendium of Pacific Country and Territory Profiles in the solid waste and recycling sector is published as part of a PRIF sponsored study that seeks to identify and quantify the opportunity

to improve the resource recovery of fifteen common commodities present in the solid waste stream in fifteen Pacific island countries and territories (PICs).

You may refer to PRIF "Pacific Region Solid Waste Management and Recycling-Pacific Country Profiles & territory (2018)" for further information.

(URL: <u>https://www.theprif.org/documents/regional/urban-development-waste-</u> management/pacific-region-solid-waste-management-and)







