

LUGANVILLE WASTE CHARACTERISATION REPORT



**AUGUST
2013**

**FOR THE LUGANVILLE MUNICIPAL COUNCIL &
SANMA PROVINCIAL GOVERNMENT**

Luganville Waste Characterisation Report 2013

EXECUTIVE SUMMARY

This is the second Waste Characterisation Survey to be carried out within the Luganville Municipal Boundary. In August of this year, staff from Sanma Province and Luganville Municipality and six secondary school students, worked together to audit one weeks waste from 50 households and 12 businesses. The Household surveys were spread across High, Medium and Low socio-economic areas so as to be representative of the population of Luganville. The businesses were selected in order to be as representative as possible of the current business operators in the town.

What the Household surveys show is that on average each household is producing approximately 44 kg of waste every week. This equates to 2.3 tonnes per household per year or 5,939 tonnes per year for the entire town.

The businesses houses are individually producing approximately 95 kgs of waste per week. This equates to 5 tonnes per business house per year or 988 tonnes per year from the entire business community. Much of this waste is also recyclable in fact 81% or 801 tonnes per years could be prevented from being buried in landfill.

With a total of 6,926 tonnes produced annually from households and business houses, and with a projected 4.1% annual growth rate for Luganville, this waste problem is only going to increase in the coming years.

The results from the April 2012 Waste Characterisation study are dissimilar:

- 2.4 tonnes per household per week and 6,196 tonnes for the town per year.
- 1.8 tonnes per business per week and 1,500 tonnes for the town per year.
- Total waste generated 7,696 tonnes per year.

This suggests that despite a few changes in sample size and the sample area this year, the results are in the same vicinity and are therefore valid for use in our future waste management planning exercises.

This report suggests a number of forward planning initiatives that should be instigated in the coming year with priority given to:

- Developing a home composting education programme with the provision of free or heavily subsidised compost bins.
- Develop a collection system for Waste Electrical and Electronic Equipment
- Further develop the current aluminium can recycling cages to be more accessible to the public and ensure more businesses have access to them.
- Work with the Department of Environment and Conservation to lobby for beverage container deposit legislation.

INTRODUCTION

In April of 2011 Vanuatu adopted its first National Waste Strategy 2011-2016, as a means to achieve National targets set out in the Pacific Regional Solid Waste Management Plan. The overall goal of the National Strategy is:

To create an environmentally sustainable Vanuatu, in which all types of generated wastes are collected, reused, recycled and treated by environmentally sound technologies suited to local conditions and waste going to landfill is minimized to the lowest possible amount.

In November 2012 the *Draft Sanma Province and Luganville Municipal Waste Management Plan 2013-2016* was developed. The overall vision of the Plan is:

To provide effective, efficient and safe waste management and minimisation services in order to protect the environment and provide environmental, social, economic and cultural benefits. In turn, all residents, business, schools and industry will take responsibility for the waste they produce and work to reduce it, enhancing the environment in which we live work and play.

In order to measure progress towards both these Plans, it is important that detailed, accurate and up-to-date information regarding the composition of municipal waste is collected. The data collected and methodologies used will also be useful in relation to:

Waste Prevention and Minimisation - an important step in any programme to reduce waste is to determine first of all what type and quantities of waste are being generated. This will enable target waste streams to be identified for action.

Waste Management Planning – accurate and up-to-date information on the waste being generated is essential for forward planning of waste management on a national, regional or local authority level.

Performance of Current Waste Collection Systems – data presented will indicate the capacity that the waste collection service will be required to meet in the future.

Development of New Waste Collection Systems – the data will identify the quantities of each waste stream to assist in the design of additional waste collection options.

Waste Campaigns – The improved data available will be useful to individual sectors in targeting areas for improved waste management.

The *Draft Sanma Province and Luganville Municipal Waste Management Plan 2013-2016* requires Luganville to carry out annual Household and Business Waste Characterisations. With support from the Luganville Municipality and Sanma Province this waste characterisation survey for Households and Business was carried out in August 2013.

STUDY AREA

HOUSEHOLD

A sample of 50 households within the Luganville Town Boundary were chosen for this study in line with the *World Health Organisation Western Pacific Region Healthy Cities, Guide for Municipal Solid Waste Management in Pacific Island Countries (1996)*. In order to be representative of the town's population three distinct areas were chosen:

- **AREA ONE**

Palms Estate/Argent Court – High socio-economic areas with significant ex-pat population

Ten houses, five from each suburb were randomly selected to participate. This area was also used in the 2012 Waste Characterisation Study. (A smaller sample size was used in this area so as to be representative of the smaller ex-pat population within the town.)

- **AREA TWO**

Segond Canal/Santo East – Medium socio-economic area

Twenty houses, ten from each suburb were randomly selected to participate. . This area was also used in the 2012 Waste Characterisation Study.

- **AREA THREE**

Mango/Solway – Low socio-economic area

Twenty houses, ten from each suburb were randomly selected to participate. In 2012 Pepsi/Sarakata were selected but it was decided to change this for the 2013 waste characterisation study..

Refer to Appendix 1 for a map of the areas.

BUSINESS

A sample of 12 businesses operating in Luganville were chosen for this study in line with the *World Health Organisation Western Pacific Region Healthy Cities, Guide for Municipal Solid Waste Management in Pacific Island Countries (1996)*. The businesses were selected in order to be as representative as possible of the different business sectors currently operating in the town, and have been grouped according to the 2009 Vanuatu Census Industry Categories:

Accommodation and Restaurant – The Espiritu Hotel, Nemos Hotel and Restaurant, Victoria Café

Wholesale and Retail Trade – Vanuatu Hardware, Punjas, LSC, ESAH, Vanuatu Agriculture, Wong Sze Sing

Public Administration – Department of Co-operatives and Finance, National Bank of Vanuatu

Administrative and support services – E-Tech

METHODOLOGY

HOUSEHOLD COLLECTION

The week of August 12th 2013 staff from Luganville Municipality and Sanma Province were assigned an area and were responsible for randomly selecting households for the study. The staff met with those present in the house at the time, and asked them if they were willing to participate in the study (no one declined). The participants were then given seven coded rubbish bags, a set of instructions (Appendix 2) and a Survey Form (Appendix 3) that would be collected on Tuesday August 20th along with their first rubbish collection.

The participants were asked to put all the rubbish they generate each day (unsorted) into the plastic bag and to leave it in a designated place for collection the next day.

For the week of the 20th of August the rubbish was collected each morning from each household and the surveys were also collected. On Monday the 26th of August the waste was collected for the Friday, Saturday and Sunday prior.

BUSINESS COLLECTION

The week of August 12th staff from Luganville Municipality met with the businesses that had been pre selected (so as to be representative) and asked them to participate in the study (no one declined). They were provided with a set of instructions (Appendix 4) and a Survey Form (Appendix 5) and instructed to leave their waste in an agreed location for the first collection on August 20th.

WASTE CHARACTERISATION PROCESS

Each day the collected waste was taken to the whare located on the Chapuis Stadium Grounds. Three stations were set up for each area's waste and the business waste was sorted at the conclusion of the household waste. Each station had two students and at least two staff working together, responsible for sorting, weighing and recording. Each bag of waste was spread on a tarpaulin and sorted according to the '*WHO guidelines for Municipal Solid Waste Management in Pacific Island Countries 2006*' into buckets. Each waste category was then weighed and the volume approximated and recorded on the Waste Assessment Sheet (Appendix 6).

Six secondary school students in their school holidays were trained to assist in the study. They were present at the whare for the full 5 days of the study and were paid a per diem for their services.

At the end of each day the rubbish was collected by the Municipality rubbish truck and taken to the Luganville Waste Disposal Site.



Three waste characterisation stations set up at Chapuis Stadium.

Household waste lined up and ready to be sorted.



Staff from Luganville Municipal, Sanma Province and students, ready to start sorting the waste.

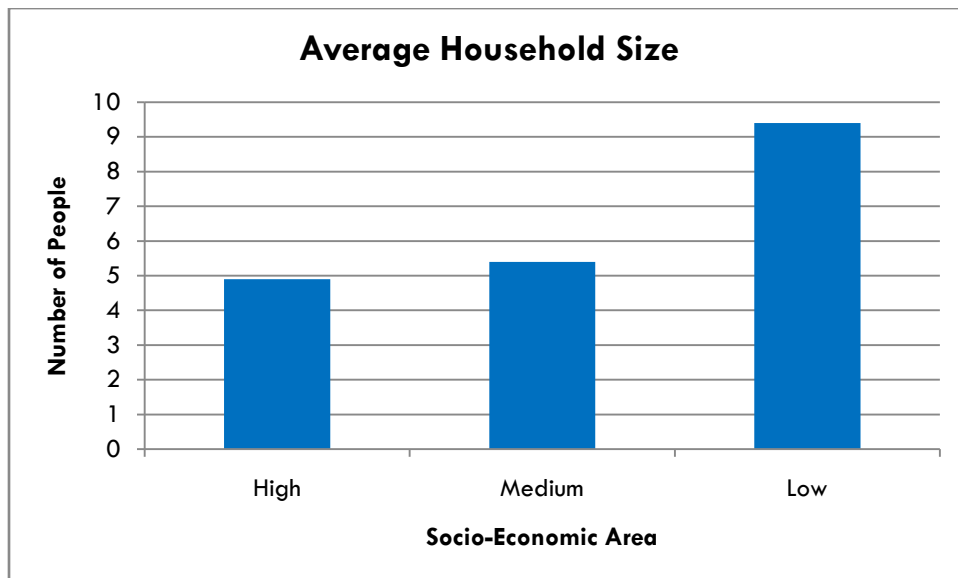
HOUSEHOLD - SURVEY RESULTS

The following information is a summary of the survey data that was completed by all of the 48 participating households. Two households in area 1, Argent Court agreed to participate in the study but did not put rubbish out to be collected any days of the week nor did they complete a Survey. So the official sample size for this report is 48 Households.

Household Size

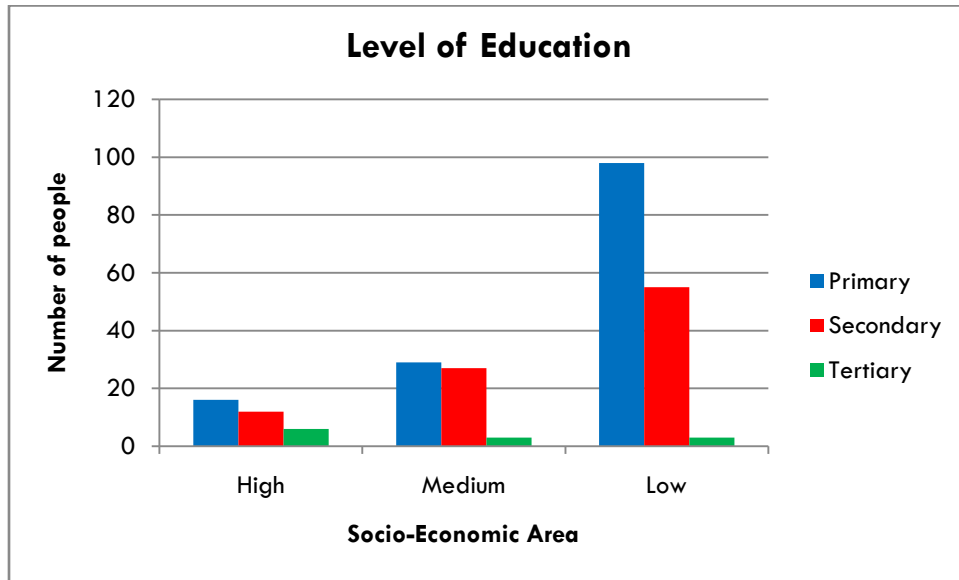
With 329 people participating in the study across 48 households the average household size was 6.6 people which is significantly higher than the average Luganville household size of 5.1 (Census 2009). The smallest household having just 2 people and the largest having 16. There was a relatively even spread across the households with 46% set up as Nuclear (parents and children) and 42% in extended family arrangements. Figure 1 below illustrates the range in household size within the different socio-economic areas in Luganville. The higher socio-economic the household the smaller the number of people residing in the house, and it is most likely to be a nuclear family situation.

Figure 1. Average Household Size



Education

Figure 2 below outlines the highest education levels achieved within each of the socio-economic areas. The results show that in lower socio-economic areas the number of those that have achieved a tertiary qualification decreases. In the High socio-economic areas 17% have achieved a tertiary level qualification whilst in the low socio-economic area 63% list Primary as their highest qualification.

Figure 2. Level of Education

Income/Employment

The survey showed that only one of the 48 households did not have one or more income earners. Of the 103 people who stated that they were employed, 18 did not specify what type of employment. The most common form of employment was laboring (21%) closely followed by Homemaker (16%), Government (14%) and Office Work (12%). Only 16% of those employed are earning more than 5000 Vatu per week. This is comparable with the average monthly income per capita of 18,800 Vatu for a resident of Luganville (*Household Income and Employment Survey, 2006*).

When split into the socio-economic areas it can be seen that whilst 30% of those in Low socio-economic areas earn only 500-1000 Vatu per week, almost as many (25%) earn more than 5000vt per week. This is a result of large extended families with an average of 2 or more people employed creating a high combined household income. The High and Medium socio-economic households are more consistent with 42% and 63% respectively that earn 5000+ Vatu per week. It can be seen later in this report that income directly affects waste generation.

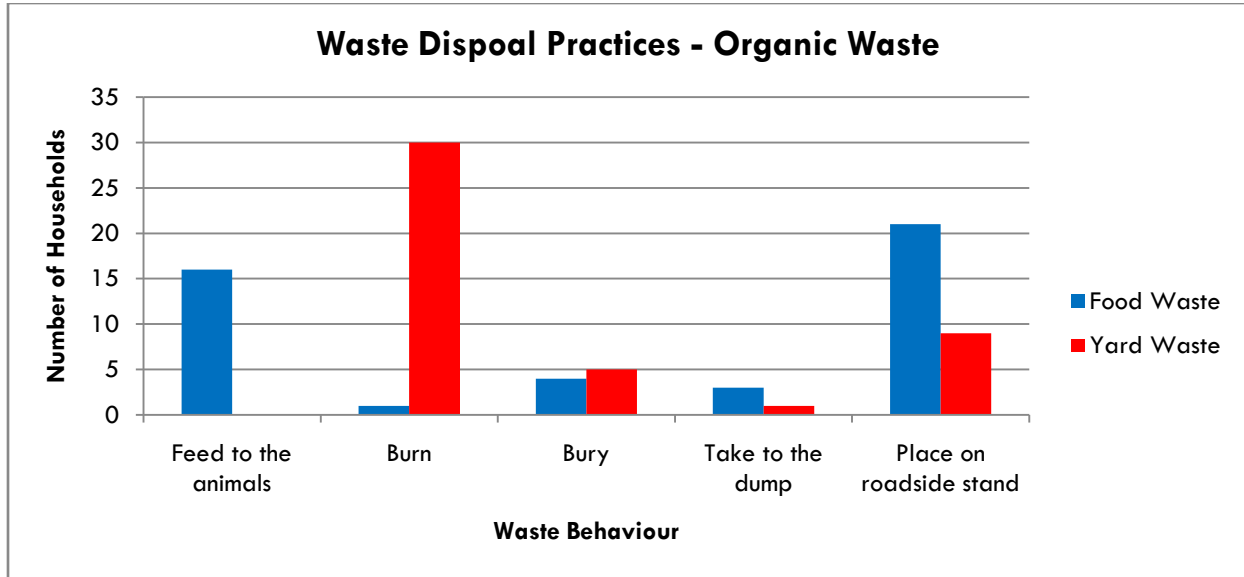
Waste Disposal Practices

The participating households were asked how they currently dispose of each waste type. All of the households are located within the Luganville Municipal Boundary and receive the rubbish collection service. Figure 4 below shows that the majority of households burn their yard waste (69%) and place their food waste out on the roadside for collection (66%). Food waste and yard waste is organic and can be turned into compost and used as a fertiliser on gardens. When it goes to landfill it causes leachate and contributes to landfill gas.

Figure 5 shows that for the recyclable materials such as plastic bottles, glass, tin and aluminium cans but excluding paper/cardboard, the majority (70%) of the households place them on the road side for collection. The next most popular option (18%) is to take them to the landfill. For paper and cardboard

the most common disposal method is to burn (65%) with 24% opting to place it on the road side for collection.

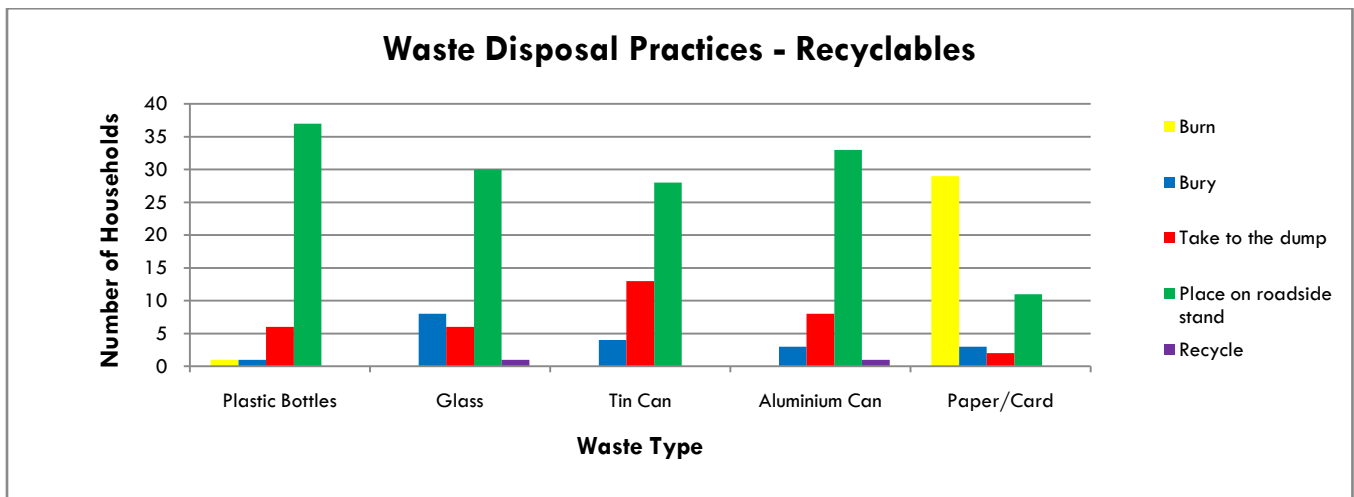
Figure 4. Waste Disposal Practices – Organic Waste

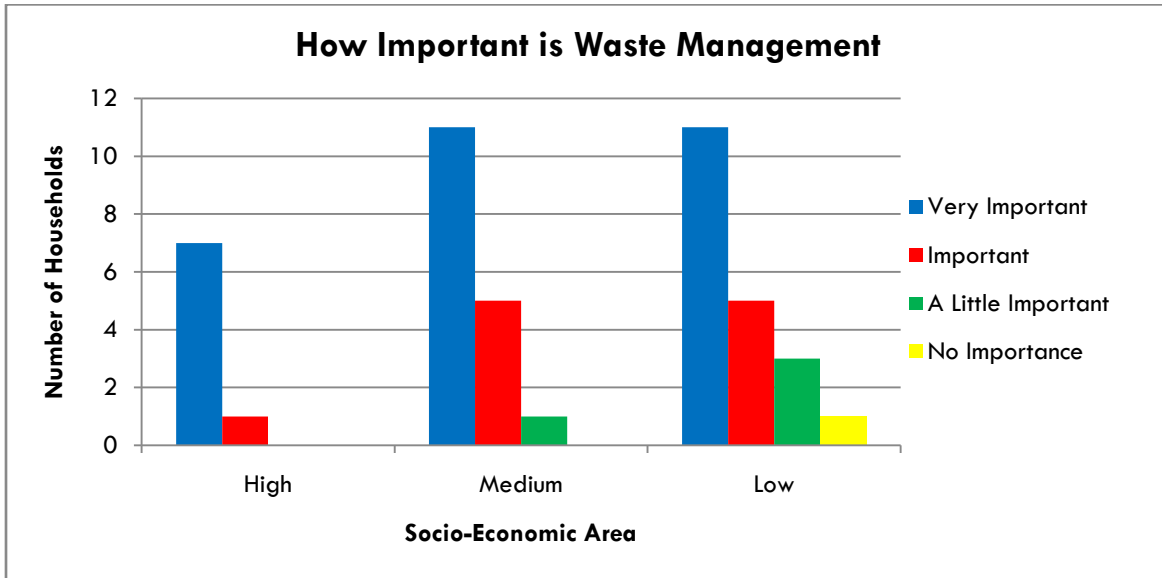


Importance of Waste Management

All householders were asked ‘how important is waste management to you and your household?’ the majority of respondents (64%) believe that it is ‘very important’. Figure 5. below outlines the difference in views between those living in different socio-economic areas. The ‘very important’ rating starts at 87% in High socio-economic, dropping to 64% and then 55% in Medium and Low socio-economic respectively. Those in the Low and Medium socio-economic area also selected ‘A Little important’ (11%) and ‘No Importance’ 5% with higher frequency.

Figure 5. How Important is Waste Management





Willingness to Change

The householders were asked a series of questions about their current behaviour with regards to waste management and their willingness to change. The results showed that 20% of the households currently take reusable bags to do their shopping.

The householders were also asked if they knew how to compost their kitchen and garden waste, only 29% of the householders said they did, however of the 16 who said they didn't know how to compost 13 of them said they would be willing to attend a course to learn how to compost.

The fact that 80% of the householders would be willing to learn how to compost their food and yard waste at home, will be of significance when it comes to implementing new systems or asking people to change certain behaviours in terms of how they manage their waste.

Communication

The householders were asked what the best method of communication would be when the Municipality wants to inform them of new waste management projects, initiatives etc. Householders could select more than one option and FM107 followed by the Daily Post appear to be the most effective means of communication. Several households also suggested that they would prefer a call/text or letter/flyer delivered to their home.

Comparison with 2012 Waste Characterisation Results

There are several significant changes in the results compared with the 2012 Waste Characterisation Study.

- The change from Pepsi/Sarakata area in 2012 to Mango/Solway this year appears to have increased the average household size result from 5.4 (2012) to 6.6 (2013) which is significantly higher than the average Luganville household size of 5.1 (Census 2009).

- The householders were asked if they take reusable cloth bags to do their shopping, this year 20% said that they do, a significant drop from 48% in last year's survey.
- The householders were also asked if they knew how to compost their kitchen and garden waste, this year 29% of the householders said they did which is another significant drop from the 60% in 2012.

Summary

The results of the survey show that despite some changes from the 2012 survey results the randomly selected households within the study area have still proven to be more than comparable with both National and Local (Luganville) statistics and trends. They therefore ensure that the study is credible and the data collected is worthy of being extrapolated for use at a larger scale. The survey also shows that there is a reasonable level of understanding about the basics of waste management and a high level of interest in future developments and most importantly a willingness to change.



Mayor of Luganville, Morris Emboi, lends a helping hand.

One day's waste sorted and ready to be taken to the Waste Disposal Site



HOUSEHOLD – WASTE CHARACTERISATION RESULTS

Waste Generation

Over the seven day collection period the 48 households (329 people) produced a total of 2,093.04 kilograms or 2.1 tonnes of waste. This equates to approximately 6.3 kg per person per week or 0.9 kgs per person per day. Figure 6 below shows that waste generation was highest in the Low socio-economic area and lowest in the High socio-economic area.

Figure 6. Waste Generation by Socio-Economic Area

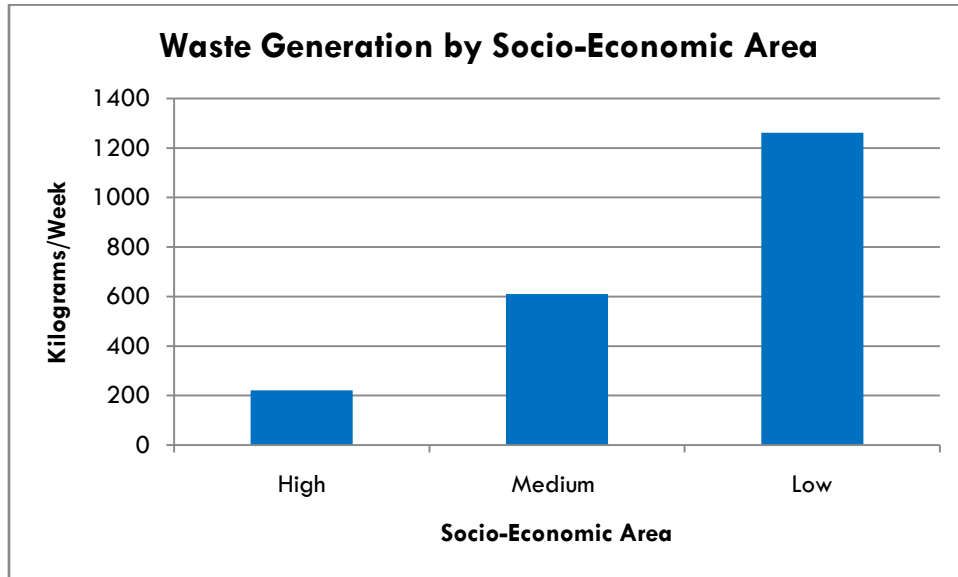


Figure 7 shows that those in the Low socio-economic area are producing significantly more waste than those in the Medium socio-economic area. For each of the waste streams the Low socio-economic households are generating more than 37% and up to 57% (Cardboard) more than those in the Medium socio-economic households.

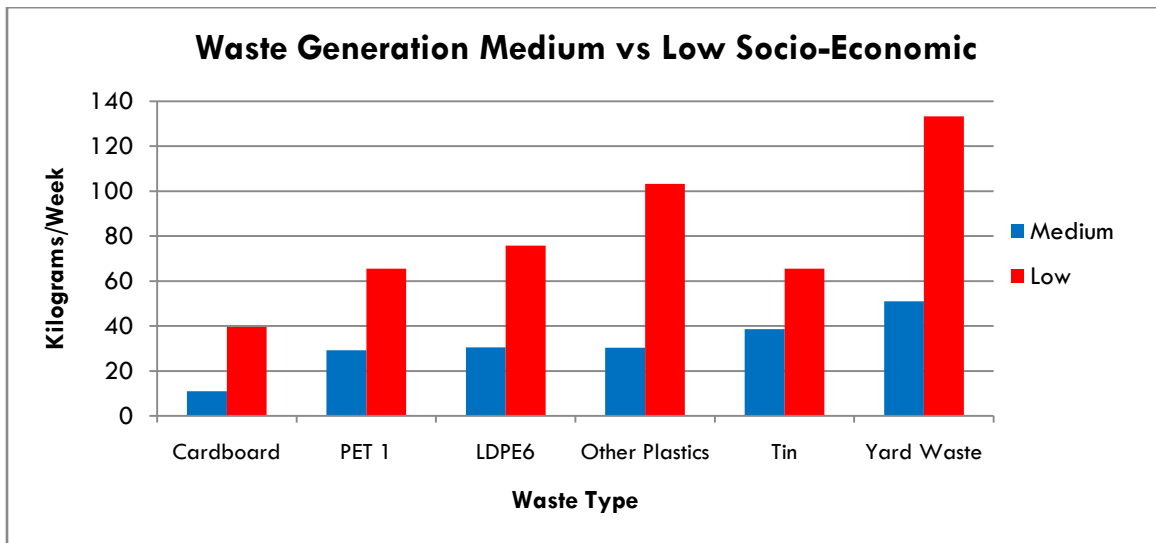
A number of reasons may explain the high waste generation rate in the Low socio economic area:

- The higher number of income earners in the larger extended family households contributes to an overall higher household income than those in the Medium socio economic area. Therefore more money can be spent on products that are in 'packaging' such as glass, tin, plastic etc as opposed to those with only one income earner where the household buys more 'natural' products such as fruit and vegetables from the garden or market.
- The high rate of 'other plastics' was primarily disposable nappies (103 Kgs). In these large extended family households there were many children in the household that would be of nappy wearing age. In the Low socio-economic households almost 20% of the people in the household were under the age of 10.
- Unfortunately it may be the case whereby the households took the opportunity to utilise their rubbish being collected everyday (there have been severe delays in the rubbish collection service over the past few months with only one truck operating for the entire town) and had a 'spring

clean' and removed a lot of rubbish that had been lying around and also used the opportunity to do a lot of gardening and cleaning of their yards.

This suggest that those in the Low socio-economic areas should be a focus of any future waste management education/awareness programme and also it would be worth considering surveying them further to better understand their purchasing decisions and their behaviour towards managing their waste.

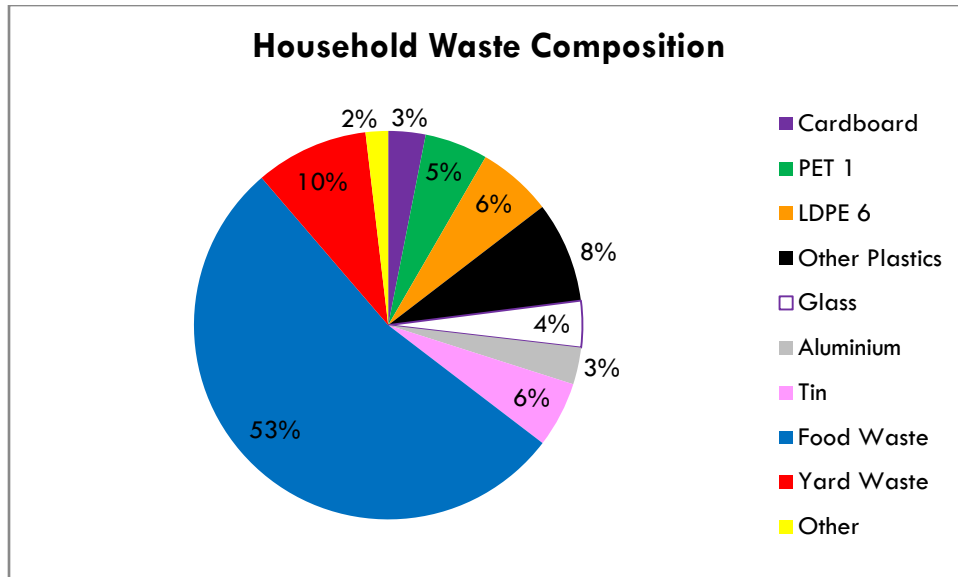
Figure 7. Waste Generation Medium vs. Low Socio-Economic



Household Waste Composition

Figure 8 below shows the composition of all the waste generated by the participating households. The majority of the waste is food waste making up 53% (by weight) of the waste stream. The next highest waste stream is yard waste at 10% and the remaining 37% is spread relatively evenly across Plastics (PET 1 and LDPE 6), Other plastics (nappies) and Tin cans. Of the major waste streams generated by the households presented here only Plastic LDPE6, Other Plastics and Other, a total of 18% by weight, are not recyclable or compostable. Therefore potentially 82% of this waste could be prevented from being buried in landfill.

Figure 8. Household Waste Composition



Recyclable Waste Generation

Over the seven day collection period 1,715 kgs or 1.7 tonnes (of the total 2.1 tonnes) of recyclable waste was generated, including organic waste. Figure 9 shows that 60% of the waste generated is organic, which could be composted and utilised on crops and gardens in addition to being used to feed the animals. 22% (461 kgs) of the waste is all potentially recyclable, leaving only 18% of the waste stream that must be buried in the landfill at this point in time if proper systems and educational tools are put in place.

Figure 9. Total Recyclable Waste

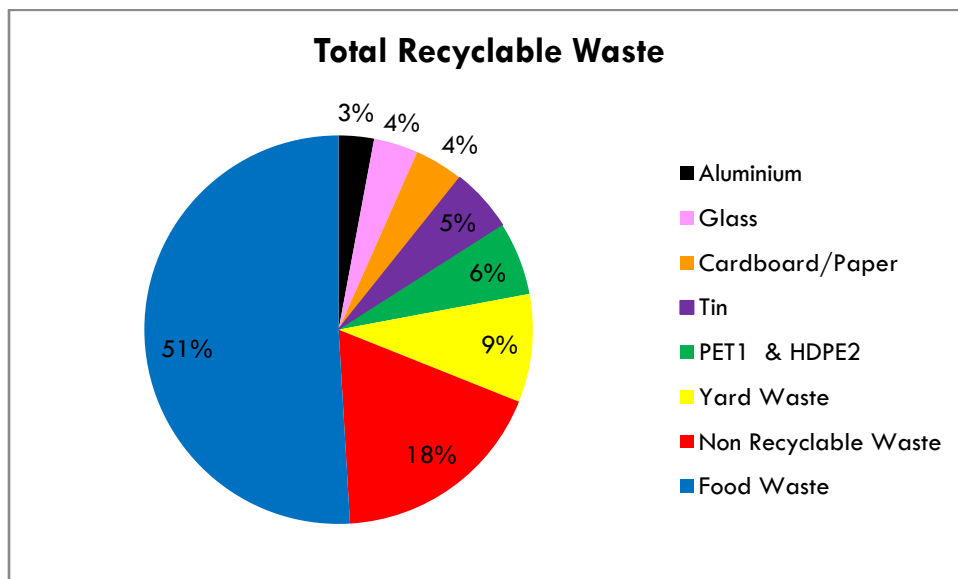


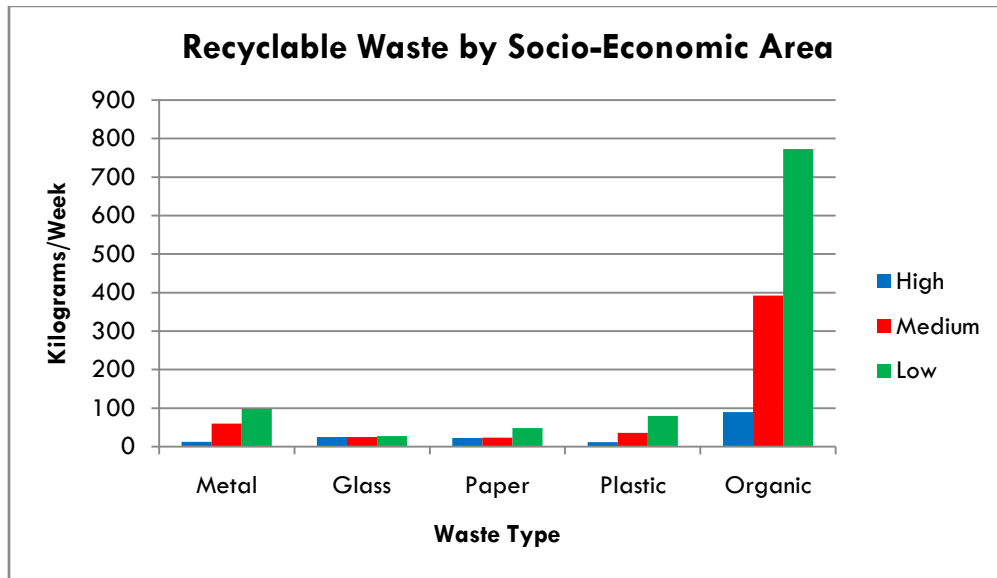
Figure 10. Recyclable Waste by Socio-Economic Area

Figure 10 illustrates that when the recyclable waste is separated into the socio-economic areas, those living in the Low socio-economic area produce the most organic waste (food and yard waste combined) and the most of all other recyclable materials. Those in the High socio-economic households produce the least of all the waste types. The difference in waste generation reflects the more traditional styles of food gathering and cooking and the lower income of those in the Low socio-economic area. Whereas those in the High socio-economic area have less food waste leftovers/scraps.

Comparisons with 2012 Waste Characterisation Results

The only major difference between the results in the 2012 study and this year is the complete reversal in waste generation results by socio-economic area. In 2012 we saw Medium households generate 1,236.2 kgs and Low households generate 683.45 kgs. This year Medium households generated 610.3 kgs and Low households 1,261.54 kgs. The reasons for this are not entirely clear but we have to assume that the higher proportion of people living in the Low socio economic households (an additional 57 people) accounts for the higher rate of waste generated.

DISCUSSION/ANALYSIS

HOUSEHOLD

Organic Waste

This study showed that more than half (63% by weight) of the waste generated by the households was organic (food waste and yard waste). With 2,582 households within the Luganville Municipal Boundary (Census 2009) approximately 67 tonnes of organic waste is being generated every week (57 tonnes food waste, 10 tonnes yard waste).

According to the survey only 16 out of the 48 households (36%) feed the food waste to their animals, which is the most sustainable and environmentally sound option available to residents at the current time. The majority (47%), place their food waste on the roadside for the municipal collection and the remainder either burn or bury the food waste. A previous waste characterisation carried out in the peri-urban areas of Ban Ban, Million Dollar Point and Showgrounds (outside of the Municipal Waste Collection area) interestingly showed that 50% of the households fed the food waste to their animals, therefore reducing the amount of food waste that was being burnt or buried. This illustrates that those living within the town boundary are less likely to have animals on their property and regularly use the Municipal collection as their food waste disposal option. What this means is that more food waste is being sent to the landfill where it breaks down in an un-controlled environment and becomes harmful to both the waterways and the atmosphere.

The quantity of yard waste recorded in the characterisation seems quite low, 9% of total waste as opposed to 33% of total waste in the peri-urban study. This may be due to the urban households having smaller properties and also that the participating households may not have included all their yard waste in the bags provided because they needed it for their fires or it was awkward to keep aside for collection.

However, with the results we have, there is at minimum of 67 tonnes of organic waste being generated each week in Luganville. Organic waste is a natural resource that when composted becomes a nutrient rich fertilizer that can be used on crops and gardens. With such high levels of organic waste being generated, the focus for future waste management planning in the urban area should be on developing a system(s) that enables the separate collection of organic waste, a community composting programme and a home composting/worm farming programme or potentially a food collection service for domestic/farm animals.

In April this year a large scale compost bin was built at the Luganville Market. This was done with support from Santo Hardware/LCM and is now receiving all the fruit and vegetable waste from the Market House. When the compost is ready it will be distributed to the mama's for free to use on their gardens and then the extra will be sold at the market. This is the first step in raising



awareness and knowledge of composting and it can be used for community and school demonstrations..

At the time of writing the author has applied for a grant for 60 household compost bins and an education program to support the running of compost workshops for the community. If successful in this grant will we be able to place a compost bin in each school and develop community 'compost champions' that will be able to teach other residents how to maximize their organic waste.

Therefore in accordance with the *Sanma Province and Luganville Municipality Waste Management Plan 2013-2016* the focus for the coming year with regards to organic waste should be on:

Home Composting, Home Composting Workshops, Promoting Market House Composting Site

Recyclable Waste

Whilst the percentage of recyclable waste (excluding Organic waste) by weight in this survey is relatively small at 22% or 461 kgs per week from the participating households (24 tonnes per week from the town of Luganville), it still warrants being managed better than it is currently. Particularly as the quantities will only increase over time as the population of the town increases.

Possible options for consideration would be to create dedicated drop-off points for all recyclable materials (plastic, glass, aluminium and tin). These 'bring banks' would need to be located at key intersections throughout the town and suburbs that are both convenient for the residents on major walking routes as well as being accessible for collection by a front loading truck or similar. The benefit of these bring banks is that they will take months to fill and therefore only require intermittent collection.



The ideal solution would be that each of the materials was able to be treated and recycled into new products or for new uses here on Santo. This would provide a unique opportunity for locals to start some small businesses. From large scale factory set up where the materials are melted or chipped and then made into new products to small reuse operations where the materials are designed into pieces of art and craft and sold locally. Alternatively, now that we have good data on each of the materials, further research should be carried out on the cost/benefit of shipping the materials to Port Villa or Australia/New Zealand for processing.

Below are examples of how each material can be recycled for further use and suggestions on how recyclable materials can be recycled or reused.

Glass

Glass is possibly the most financially viable material of all the recyclables that would be worth exporting but alternatively it too can be reused through take back programmes (Vanuatu Brewing who produce Tusker Beer give 10 vatu for each empty bottle returned and Unity Shell Store take back Schweppes Soda and Tonic bottles for a small refund). Alternatively glass can be crushed and used as an aggregate for construction and road sealing or recycled into new jars and bottles, tiles, marbles, jewelry, and fiberglass insulation. Glass may be recycled an infinite number of times since it never loses strength.

Tin/Steel

Tin/Steel cans are 100% recyclable, meaning they can be recycled over and over again into new products without losing any of its quality or strength. Tin or steel can be melted down and made into many useful products such as “new” cans, vehicle parts, toys, bikes, appliances (such as refrigerators), fire hydrants, or tools. According to this survey 6 tonnes of tin cans are generated each week in Luganville. This warrants further investigation into possible recycling operations that may be able to be established here.

Aluminium

Aluminum is also 100% recyclable and does not lose strength or quality each time it is recycled. Aluminium can be recycled into lawn chairs, window frames, pie pans, foil, car parts, or house siding. In Santo there is currently a system in place whereby some restaurants, cafés and resorts have cages provided for the collection of aluminium cans. This system was put in place by Rotary and with over 3 tonnes per week being generated in Luganville, plus the kilograms from business and the majority of resorts who currently have can cages there is definitely scope for expansion and hopefully a profit can be made. Refer to Business House Discussion/Analysis for more details on planned improvements.

Plastic (1 and 2)

Plastic can be chipped and melted down into buckets, pegs, art and craft, ‘new’ bottles, carpet, park benches, picnic tables, pipes, flowerpots, t-shirts, fleece jackets, or sleeping bags. With approximately 7 tonnes per week of these plastics being generated from all households, it is worthy of further research into business opportunities that may be viable for recycling this waste stream on Santo.

Paper (including cardboard, office paper, newsprint and magazines)

There was a remarkably high amount of paper waste, almost 5 tonnes per week generated in Luganville. When surveyed as to how they dispose of this waste stream 64% of the households are burning it and 24% are placing it on the roadside for the Municipal collection. This too is a valuable waste stream that can easily be recycled back into paper/cardboard. In August a separate storage area was built at the Waste Disposal Site for the cardboard collected from the Business Houses. (Refer to the Business Analysis section for further information on this new collection system).The general public can now bring their flattened and tied cardboard to the landfill for free and deposit it in this cardboard storage area where it will be collected by RecycleCorp and transported to Port Vila for export and recycling.

Therefore in accordance with the *Sanma Province and Luganville Municipality Waste Management Plan 2013-2016* the focus for the coming year with regards to recyclable waste should be:

Free public drop off points, Lobby for Beverage Container Deposit Legislation, Free drop off at Waste Disposal Site, Research export opportunities

Printer Toner Cartridge and Cell Phone Recycling

In September the Municipality in partnership with LCM (Local grocery store) Croxley Recycling New Zealand and PDL, a new Zealand shipping line implemented the new Toner Cartridge and Cell phone recycling Programme. Croxley Recycling Boxes for the collection of used printer toner cartridges as well as cell phones and cell phone chargers have been provided to selected Businesses Houses, Banks, Government Departments and Computer, Stationery and Printing shops. When the boxes in each business house are full they contact the Municipality who will come and collect it and replace it with a new empty box. The full boxes will be stored at LCM and then once a year they will be shipped to New Zealand for free by PDL where Croxley will process them through their recycling factory. The public and Schools can also drop off their used toner cartridges at several of the participating stores. We hope to foster a new behaviour whereby customers return their empty cartridges when purchasing new ones. Once Croxley has processed the materials we will receive a documented audit path. The plastic recycled from the cartridges is used to make a range of different products such as coat hangers, electric fence insulators and scooter stands, and the metal is sent to a metal recycler. Even the toner gets recycled – it is used to make paint. All cardboard & paper is sent for re-pulping to be made into cardboard.

Education and Awareness

Any initiatives that may be implemented as a result of this report, or later when the Waste Management Plan is developed will need to be supported by extensive education and awareness campaigns. This will ensure accurate and timely information is provided to the community to ensure smooth implementation and continued operation of waste initiatives. In addition it will assist in educating the community to reduce waste in every aspect of their lives, through increased awareness of environmental issues, provoking a response to change their behaviour, and providing access to the knowledge and skills to do so.

LIMITATIONS

A number of factors need to be taken into consideration whilst reading this report:

- The participants were asked to place all of their waste into the plastic bags provided. Therefore this study looks at how much waste is generated as opposed to how much is disposed of. So the total amount of waste generated in this study does not reflect how much waste is sent to the landfill each week.
- As with all waste characterisations, there is a risk that some participants will use this 'free' collection as an opportunity to have a clear out of rubbish that is lying around. This is inevitable and may change the results slightly, but when these waste quantities are extrapolated out for the entire community it will not significantly affect the results.

BUSINESS RESULTS

SURVEY RESULTS

The following information is a summary of the survey data that was completed by all 12 participating businesses. The businesses were selected in order to be as representative as possible of the different business sectors currently operating in the town.

Staff numbers

The level of staff employed in each business varied greatly from 2 employees to 150, with a total of 321 staff employed full time across the 12 businesses with approximately 25 part time staff.

Customer numbers

The number of customers through each business each week also varied greatly from 5 to 1500 customers, which demonstrates that the study has captured a representative sample of businesses from the town.

Current waste types

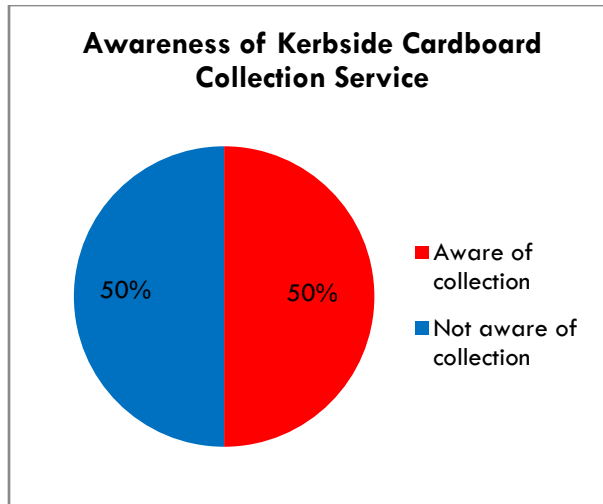
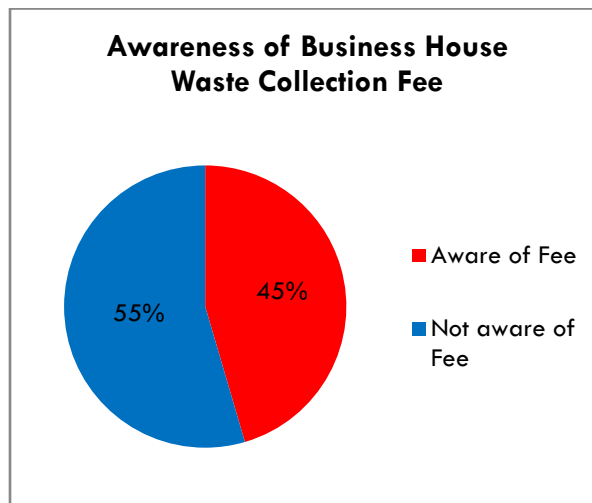
Each business was asked to list what wastes they currently generate and their responses tie in well with the actual results found in the waste characterisation. The only anomaly is that none of the businesses listed that they generate hazardous waste and yet there was reasonable amount of hazardous waste (batteries and electrical waste) found in the characterisation. This suggests that there is scope for education and awareness about the different types of hazardous waste.

Waste Disposal Practices and Waste Awareness

Not surprisingly all the business use the Luganville Municipal collection for their waste. However four out of the 12 businesses also make additional trips to the landfill, anywhere from once per week to four times per year. Nine of the 12 businesses (75%) knew that the waste when put out for collection on the roadside goes directly to landfill. Figure 11 and 12 illustrate that there is still scope for further education and awareness on two of the latest waste management initiatives (Business House Waste Collection Fee and the Kerbside Cardboard Collection Service) that have been introduced to the Business Houses.

Communication

In order that we increase the level of awareness within the business community and have better results than those in Figure 11 and 12 in the future, they were each asked what the best method of communication would be when the Municipality wants to inform them of new waste management projects initiatives etc. Business could select more than one option from the options provided, and there was an even spread across Daily Post (2) FM107 (2) and FM98 (2). However 7 of the 12 respondents said that a letter or circular delivered to them directly would be the most effective way of communicating. Facebook, email and Yuni Tok Tok Stret were also mentioned by one Business.

Figure 11. Awareness of Kerbside Cardboard collection Service**Figure 12. Awareness of Business House Waste Collection Fee**

Comparison with 2012 Waste Characterisation Survey Results

The only major change this year in comparison with the 2012 results was that 9 of the 12 businesses (75%) knew that the waste when put out for collection on the roadside goes directly to landfill. This is a marked improvement on last year's results of 50%. This shows that our increased presence in the Daily Post newspaper, and the new Luganville Waste Management facebook page is starting to make inroads into people's knowledge and understating of waste management.

Students sorting through Business House waste.



Weighing the Business House waste.



A typical day's waste from a Business House



BUSINESS RESULTSWASTE CHARACTERISATION RESULTS

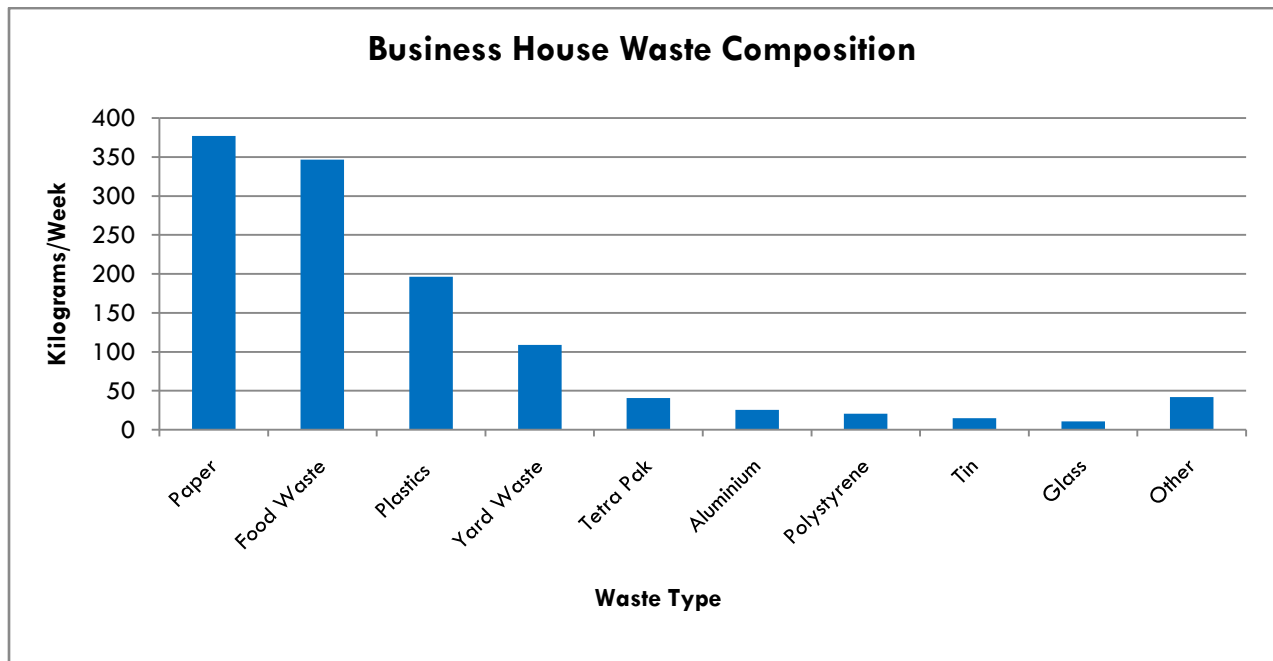
Waste Generation

Over the seven day collection period the 12 business employing approximately 321 people produced a total of 1,142.1 kilograms or 1.1 tonnes of waste. This equates to approximately 95 kgs per business per week or 13.5 kgs per business per day.

Waste Composition

Figure 13 below shows the overall waste composition from the businesses with Paper waste being the highest at 377 kgs or 33% of the total waste generated. This includes, newsprint, magazines, cardboard, office paper and tetra paks. Food Waste was the next highest with 347 kgs or 30% of the total waste generated and Plastics made up 196 kgs or 17% of the waste stream and was primarily made up of the PVC soft plastics.

Figure 13. Business House Waste Composition



If we look at two of the major waste streams (Paper and Plastic) in more detail (Figures 14. and 15.) we can see that of most note Cardboard comprises 75% of the Paper waste stream at 286 kgs. This is a recyclable material that also has a large volume. It needs to be noted that the participants were asked to put all their waste out for collection even if they would normally reuse or recycle it. So this quantity is reflective of how much cardboard is generated, not necessarily how much is disposed of. In addition 41 kgs or 11% of the Paper waste was Office Paper, also recyclable and more importantly reusable.

The Plastic waste stream was dominated by PVC soft plastics at 57% and 121 kgs. This includes plastic bags, plastic wrapping and plastic packaging material. By weight this number may be slightly inflated as the plastic was often wet and may have contained other materials adding to its weight. This is a problematic waste stream as it is difficult to recycle and is often contaminated.

The food waste proportion of the waste was significant, primarily due to the restaurants that were participating in this study however there were significant amounts of food waste coming from some of the other businesses that would suggest there may be opportunities to look at onsite compost bins or something similar.

Figure 14. Paper Waste

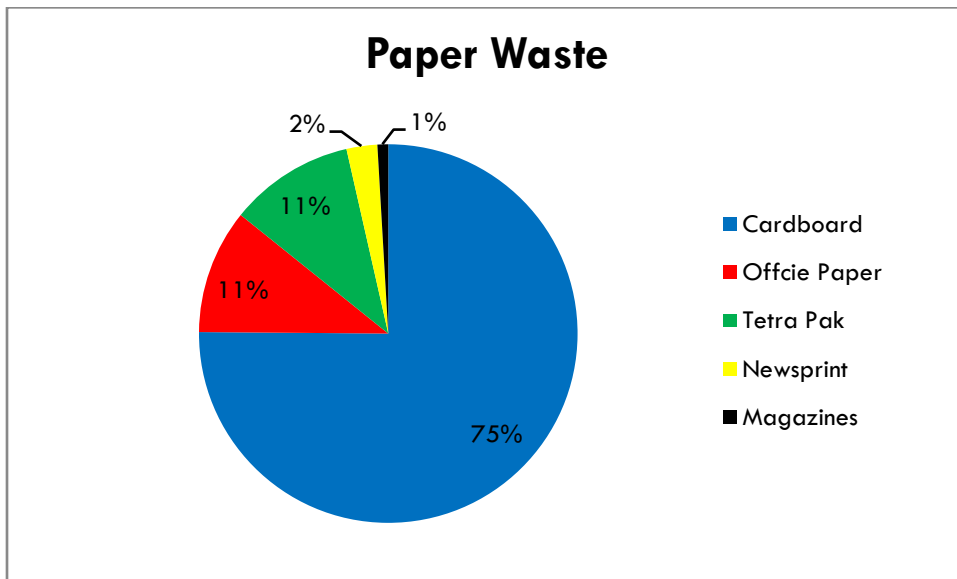
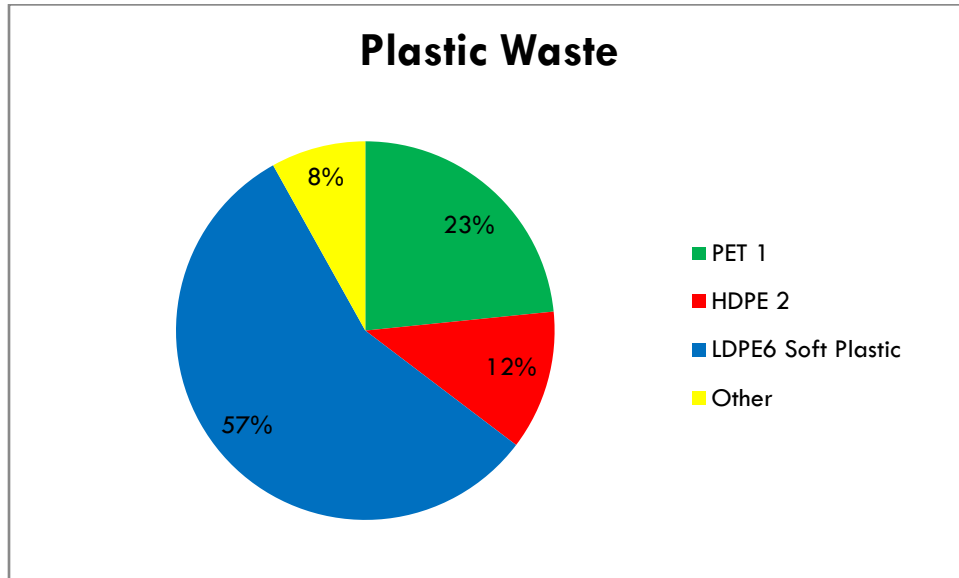


Figure 15. Plastic Waste

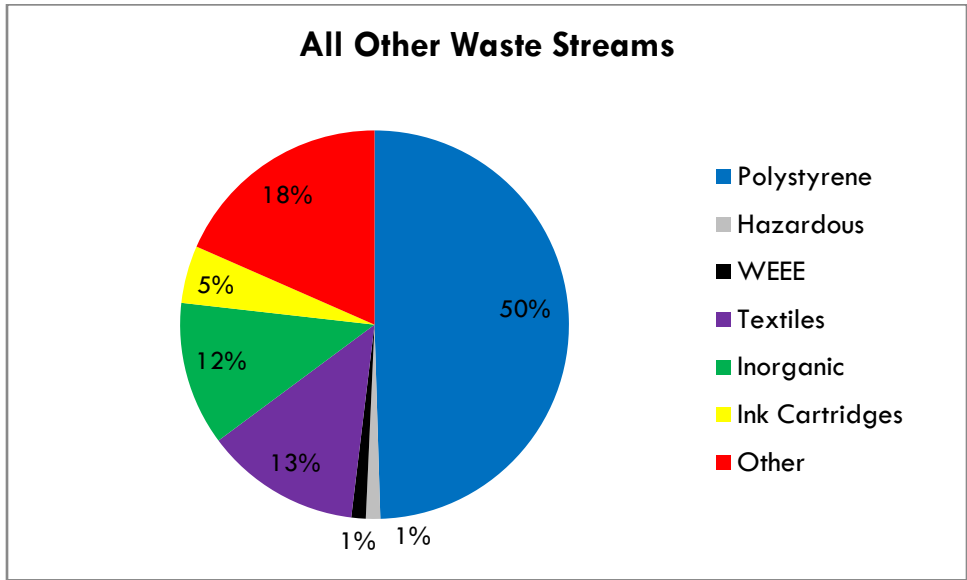


It is important to look at the other waste streams that make up the total business waste composition, in particular Polystyrene, Textiles and Hazardous Waste within the 'Other Waste' Category, see Figure 16. Polystyrene is very light by nature and large in volume. So to register at 50% and 21 kgs demonstrated that it is a significant waste stream that needs to be investigated further.

The Hazardous waste component whilst not large in terms of weight is the most dangerous of the waste streams. This was primarily made up of batteries and a small amount of paint and oil. Waste Electrical and Electronic Waste (WEEE) should also be included in this waste stream as many components of electrical waste are hazardous.

The 'Other' waste stream is significant and included items that were not listed on our assessment sheet. A significant amount of this was dirt/rubble/coral, and this was not included in the Yard Waste category due to it not being a potential component of any future composting that may be made available. There was also a significant amount of rice sacks and plastic strapping included in this waste stream.

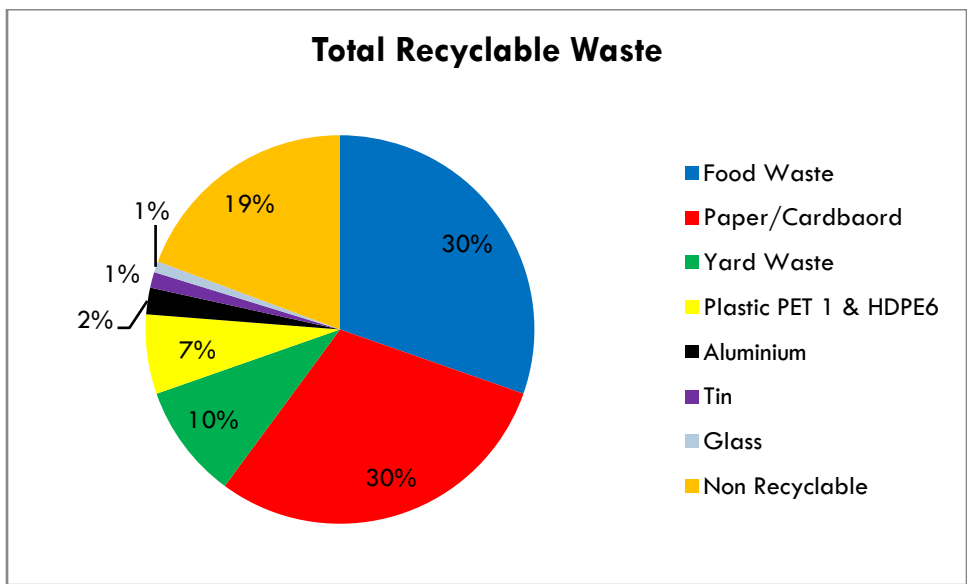
Figure 16. All Other Waste Streams



Recyclable Waste Generation

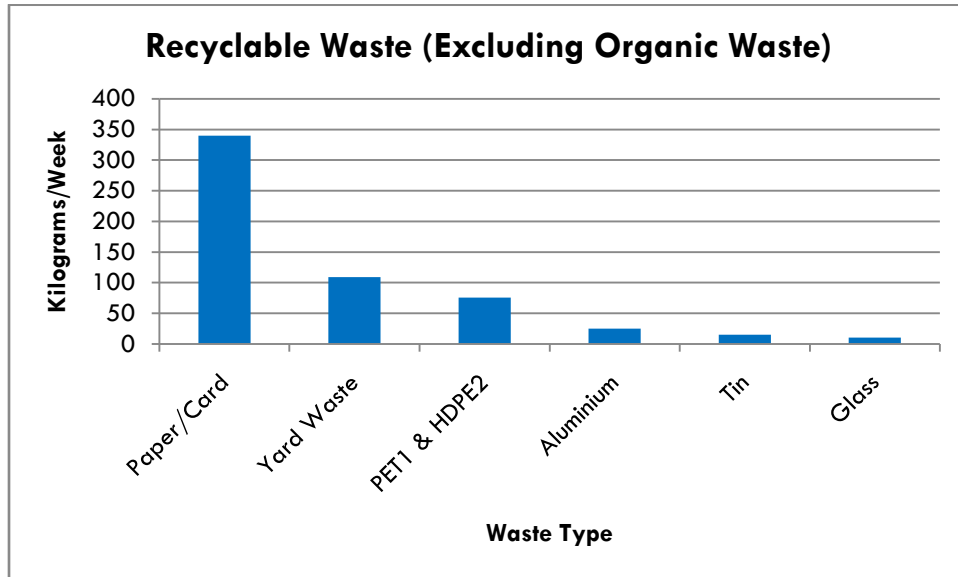
Of the 1.1 tonnes of waste generated by the businesses, approximately 81% or 921 kilogrammes of it is recyclable as shown in Figure 17. As mentioned earlier the highest generating waste stream of Paper/Cardboard and all its sub categories is entirely recyclable so too are the Plastics 1&2, glass, tin and aluminium cans. Food waste and yard waste when combined could be composted into a new resource for gardens/crops or even for sale.

Figure 17. Total Recyclable Waste



In terms of recycling systems or collections, it is much easier to develop them for materials such as paper, glass, plastic, aluminium and tin. Setting up a composting system or a collection for organic waste from businesses is difficult and unlikely to happen in the short term. Therefore Figure 18 below has removed the organic waste portion of the waste stream from the graph to quantify how much of each recyclable material is available.

Figure 18. Recyclable Waste Excluding Organic Waste



DISCUSSION/ANALYSIS

BUSINESS

In May 2013 the Municipality introduced a Business House Waste Collection Fee. All the Business Houses were surveyed over a week on rubbish collection days and categorised into Large, Medium or Small waste generators. They were then issued with a letter outlining the new system and asked to pay an annual fee of 78,000vt/52,000vt/13,000vt respectively. The first quarterly invoice was issued in September and appears to be working well so far. This financial tool works to raise awareness that waste has a value, and will help motivate the business to think about how they can reduce their waste and move down the scale over time. The results of this new fee should become quite evident in the 2014 waste characterisation study.

Paper Waste (Cardboard, Office Paper, Magazines, Newsprint)



The majority of the waste generated by business is Cardboard (286 kgs), followed by Office Paper (41 kg). Both of these waste streams are recyclable so there is no need for them to be buried in the landfill. With approximately 200 businesses in the main town area of Luganville it can be assumed that around 5

tonnes of cardboard are generated each week from the towns business houses.

The Municipality introduced a new Kerbside Cardboard Collection Service for Business Houses in May. Every Friday is Cardboard Collection day. The cardboard must be present flattened and tied and no rubbish will be collected. The cardboard is stored in a separate storage area at the Waste Disposal Site and will in time be collected by RecycleCorp, transported to Port Vila and then exported for recycling.

The Office Paper waste stream is also recyclable but more importantly it can be reused. Almost all printers can now print double sided, if all businesses set their printers to double side or duplex the paper could be used on both sides and then it could be put out for recycling with the cardboard. This is just one of many small 'green office' initiatives that could be implemented by all businesses in Luganville in order to reduce waste generation.

Therefore in accordance with the *Sanma Province and Luganville Municipality Waste Management Plan 2013-2016* the focus for the coming year with regards to paper waste should be:

Ongoing Maintenance of Kerbside Cardboard Collection, Research into recycling options for Cardboard, Green Office Initiatives

Aluminium Cans

In Luganville there is currently a system in place whereby some restaurants, cafés and resorts have cages provided for the collection of aluminium cans. This system was put in place by Rotary and has the potential to be expanded. There are a number of options planned to make this a more efficient system:

- Businesses that currently have the cages place them out the front of the business so that the public can utilise them as well.
- More businesses to receive a can cage, or 2-3 businesses share a cage
- The cages are also put in key public spaces, such as Unity Park, Unity Shell Store, green space opposite LCM etc.
- Businesses could pay a small amount to purchase the cage (to contribute to the cost of making them) but the collection is free.

The can cages are currently collected on demand when they are full. This is not a particularly efficient way of doing this but currently works due to the small number of cages in operation. However if this initiative was to be expanded a more efficient system would need to be arranged. The author is currently in talks with RecycleCorp and Rotary to develop a better collection and storage collection system.

Another option that is worth investigating is a Beverage Container Deposit and Refund System. In March 2012 Fiji implemented such a scheme whereby "the producers and importers add a compulsory deposit for every beverage produced or imported. The deposits from the producers and importers will be paid

into a revolving fund managed externally. Retailers then sell the beverages to consumers with the increased compulsory deposit amount to reflect the deposit paid by the producers or importers. After consumption of the beverage, the consumer can return the used container to licensed collectors and claim a refund of their deposit less a handling fee. If the consumer discards the container, someone else can pick it up and claim the refund, which allows for stimulation of new businesses. The collector will buy used containers from the consumer and then bring the collected materials to the processor for recycling” (www.fiji.gov.fj and www.environment.gov.fj). The regulations allow for the collection of a deposit of 10-12 cents and refund of 8-10 cents on each beverage container including plastic (PET), glass and aluminium.

Therefore in accordance with the *Sanma Province and Luganville Municipality Waste Management Plan 2013-2016* the focus for the coming year with regards to aluminium waste should be:

Additional Aluminium Can Cages, Public Aluminium Can Cages, Improved Collection, Container Deposit Regulations

Plastic (Plastics PET 1 & HDPE2, PVC Plastics)

The Plastic waste stream was the third highest at 213.7 kgs per week, with 121 kg of LDPE6 soft plastics and 75.5 kg of Plastics PET1 and HDPE2, which would be approx 3.6 tonnes from the entire business community per week. The Plastics 1&2 are easily recycled and if added to the household quantity produced per week it would warrant further research into viable business opportunities.

PVC soft plastics, primarily in this case plastic shopping bags, are the hardest to recycle as they have extremely high rates of contamination from food and liquids. The author of this report has written a discussion paper on the option of a Plastic Bag Tax or Ban on Plastic Bags. This paper should be considered further. There are currently Plastic bag taxes in at least a dozen countries including Pohnpei in the Federated States of Micronesia.

Therefore in accordance with the *Sanma Province and Luganville Municipality Waste Management Plan 2013-2016* the focus for the coming year with regards to plastic waste should be:

Collection options for PET1 and HDPE2, Plastic bag Tax, Ban on Plastic Bags

Waste Electrical and Electronic Waste (WEEE)

In this Waste Characterisation Survey there was only a small amount of WEEE present, however it is clear that it is likely to be an increasing waste stream in Luganville. New sub-divisions have been planned for up to 2,000 people and these properties will have electricity. It is inevitable that over time more and more electrical appliances will be purchased, e.g. kettle, radio, fridge, fan etc. What happens to this waste at the end of its life? There are a number of options that should be considered:

- The preference is that the item is repaired which will be of benefit to local businesses in this trade, however it must be cheaper to 'repair than replace' for this system to work effectively.
- WEEE can contain harmful and hazardous chemicals such as lead, cadmium, beryllium and other toxic materials so if recycling it on the Island is an option then it is essential that the waste is properly sorted, decontaminated and disassembled correctly before it is disposed of in the landfill. WEEE does also present opportunities whereby the valuable components such as lead, copper and gold can be recovered and on-sold.
- There is also the option of working with the suppliers of WEEE and developing a user pays principal whereby an additional charge or 'recycling fee' is added to the product that will help pay for its recycling or safe disposal at the end of its life.
- The Secondary Schools in Santo have many computers and other WEEE, which over time has built up as each monitor and keyboard gets replaced. Many schools have been burying this waste as they do not know what else to do with it. Others have been storing it in the hope that a better option may become available. The author has been in talks with RecycleCorp and they intend to increase their presence here in Santo. They currently accept and pay for items of WEEE in Port Vila and are keen to offer the same service in Luganville.
- WEEE Collection day's once per year would be a way of regularly collecting the WEEE from households and businesses.
- The New Zealand Government has been working with the Cook Islands and held an E-Waste collection day (December 2010) which was very successful (5,154 pieces of E-waste, including 1,147 computers, 1,101 monitors, 543 printers and scanners and 476 keyboards). Further research into establishing if the same arrangement could be made for Santo would be worthwhile.

Therefore in accordance with the *Sanma Province and Luganville Municipality Waste Management Plan 2013-2016* the focus for the coming year with regards to waste electrical and electronic equipment should be:

Awareness of WEEE, WEEE Collection Days, Develop a partnership with RecycleCorp, Research into retail take-back schemes.

Education and Awareness

Any initiatives that may be implemented as a result of this report, or later when the Waste Management Plan is developed will need to be supported by extensive education and awareness campaigns. This will ensure accurate and timely information is provided to the community to ensure smooth implementation and continued operation of waste initiatives. In addition it will assist in educating the community to reduce waste in every aspect of their lives, through increased awareness of environmental issues, provoking a response to change their behaviour, and providing access to the knowledge and skills to do so.

LIMITATIONS

A number of factors need to be taken into consideration whilst reading this report:

- The businesses were asked to place all of their waste out for collection, including all the cardboard boxes and other waste *that they may normally reuse or recycle*. Therefore this study looks at how much waste is generated as opposed to how much is disposed of. So the total amount of waste generated in this study does not reflect how much waste is sent to the landfill each week.
- As with all waste characterisations, there is a risk that some participants will use this 'free' collection as an opportunity to have a clear out of rubbish that is lying around. This is inevitable and may change results slightly, but when these waste quantities are extrapolated out for the entire business community it will not significantly affect the results.

RECOMMENDATIONS

This report has shown that Luganville has a significant waste problem that will only continue to grow as the Island becomes more urbanised. With an un-sanitary landfill as the only disposal option, it is more important than ever that we find ways to reduce and recycle the waste that is being produced by both households and businesses at an alarming rate. The following recommendations are based on the data collected in this Waste Characterisation Survey and are summarised below:

HOUSEHOLD

- Implement a home composting education programme with provision of free or heavily subsidised compost bins. Further utilise the Market Composting Bin for demonstrations.
- Further develop the current aluminium can recycling cages to be more accessible to the public.
- Work with the Department of Environment and Conservation to lobby for beverage container deposit legislation.
- Develop a collection/drop off system for Tin Cans.

BUSINESS

- Ensure a suitable system is established for the collection and recycling of the Business House cardboard.
- Develop a list of Green Office initiatives that could be promoted to all businesses.

- Further develop the current aluminium can recycling cages to ensure more businesses have access to them.
- Implement a simple and effective collection system for WEEE in partnership with RecycleCorp. This to be supported by an awareness campaign to increase knowledge and understanding of WEEE.
- Re-visit the discussion paper on Plastic Bag Tax/Plastic Bag Ban
- Further discussion to be had around product stewardship/take back schemes.

All initiatives that are proposed must go through the community consultation process. When agreed upon, each initiative must be accompanied by a comprehensive education and awareness campaign, to ensure both the success and the sustainability of each initiative.

APPENDIX ONE
MAP OF THE STUDY AREA



Luganville Waste Characterisation Map

APPENDIX TWO

HOUSEHOLD INSTRUCTIONS

LMC and SPG HOUSEHOLD WASTE CHARACTERISATION SURVEY

INSTRUCTIONS

- Council staff will provide you with seven coded rubbish bags, one for every day of this survey.
- Please place all your rubbish in the bag, do not burn or bury your rubbish or feed to your animals.
- If the yard waste does not fit in the bag please place it in another bag or beside the bag for collection each day by council staff.
- Your first collection will be on TUESDAY August 20th (Monday's rubbish) and your last day of collection will be MONDAY August 26th (Friday, Saturday and Sundays rubbish)
- Please don't change your behaviour or eat differently this week.
- Everything is confidential.

If you would like a copy of the end results we will be happy to provide them to you.

Thank you for participating.

vt3000 – vt5000 per week
 More than Vt 5000 per week

Other sources of income (estimation/year?) _____

Expenses

What do you spend the most on per week (Please tick)

Food
 Electric bills
 Water bills
 Medical
 School
 Recreation
 Rent

Others (please explain) _____

Average household expenses

How much do you spend on average each week in your household (please tick)

Less than vt 500 per week
 Vt 500 – vt1000 per week
 Vt 1000 – vt3000 per week
 vt3000 – vt5000 per week
 More than Vt 5000 per week

Household assets (Vehicles)

Please tick the assets of the household

No vehicle
 One vehicle
 Two vehicles
 Three or more vehicles

Other (explain) _____

Views on Waste Management

How important is waste management to you and your household? (Please tick)

Very important
 Important
 A little important
 No importance

Waste Management Behaviour

How do you normally dispose of the following wastes (circle only one)

Food waste	Burn	Bury	Place on stand on road side	Take to dump	Feed to animals
Yard waste	Burn	Bury	Place on stand on road side	Take to dump	
Plastic bottles	Burn	Bury	Place on stand on road side	Take to dump	
Glass	Burn	Bury	Place on stand on road side	Take to dump	
Tin cans	Burn	Bury	Place on stand on road side	Take to dump	
Aluminium cans	Burn	Bury	Place on stand on road side	Take to dump	
Paper/cardboard	Burn	Bury	Place on stand on road side	Take to dump	

If we want to communicate with you about new waste management projects what is the best way to do this?
(Please tick)

- Daily Post
- The Independent
- Vanuatu Times
- Radio FM 107
- Radio FM 98

Other (please explain) _____

When you go shopping do you take your own reusable shopping bags?	Yes	No
Do you know how to compost your kitchen and yard waste?	Yes	No
If No, would you be interested in going to a course to learn how to compost?	Yes	No
Are you aware of the large wooden compost bins at the Luganville Market?	Yes	No

Tank yutumas.

APPENDIX FOUR
BUSINESS INSTRUCTIONS

LMC and SPG BUSINESS WASTE CHARACTERISATION SURVEY

INSTRUCTIONS

- Your rubbish will be collected every day starting on TUESDAY August 20th (which will be all your rubbish from Tuesday)
- Your last collection day will be MONDAY August 26th (Friday, Saturday and Sunday's rubbish)
- Please place all your rubbish in one convenient location for collection each day.
- Please do not put any rubbish out for collection or take rubbish to the dump during this week.
- Please don't change your behaviour this week.
- Everything is confidential.

If you would like a copy of the end results we will be happy to provide them to you.

Thank you for participating.

APPENDIX FIVE
BUSINESS SURVEY

LMC AND SPG WASTE CHARACTERISATION STUDY
 ~ BUSINESS SURVEY ~
AUGUST 2013

Name of Business: _____

Owner: _____

What Business are you in (please tick one)

- Office
- Retail
- Hospitality
- Commercial

Other, please list _____

Please tick which days of the week you are open and write the hours that you are open beside it:

- | DAYS | HOURS |
|------------------------------------|-------|
| Mon – Fri <input type="checkbox"/> | |
| Mon - Sat <input type="checkbox"/> | |
| Mon – Sun <input type="checkbox"/> | |

Other, please list _____

How many full time staff do you employ? _____

How many part time staff do you employ? _____

How many customers would you get through the door per week? _____

Please tick the waste types that you create each week:

- Organic (foodwaste)
- Cardboard
- Paper
- Glass bottles
- Aluminium Cans
- Tin cans
- Plastic bottles
- Plastic bags
- Plastic wrapping
- Hazardous waste

Other please list _____

How do you currently dispose of your rubbish? (please tick)

- I put it on the street for the Luganville Municipal Kerbside Collection
- I take it to the landfill/dump

If you use the kerbside collection what do you think happens to the waste once it leaves your business?

Please tick:

- Landfill/dump
- Burnt
- Recycled
- Don't know

If you take your rubbish to the landfill/dump, please answer the following:

How often do you take it to the landfill? _____

How much do you pay each trip: 500vatu 1000vatu Other

Do you regularly dispose of hazardous waste? If so please tick which items:

- Oil
- Chemicals
- Electronic waste
- Paint
- Batteries

Do you have an aluminium can collection cage (provided by Rotary)?

Yes If so, how long does it take to fill up? _____

No

Do you recycle any waste?

Yes If so, what _____

No

Are you aware of the Municipality's new cardboard collection system where cardboard can only be put out on Friday's for collection?

Yes

No

Are you aware of the new Business House Waste Collection fee that is being charged for you to use the Municipal kerbside collection?

Yes

No

If we want to communicate with you about new waste management projects what is the best way to do this? (Please tick)

- Daily Post
- The Independent
- Vanuatu Times
- Radio FM 107
- Radio FM 98

Other (please explain) _____

Tank yu tumas for taking the time to fill in this survey.

APPENDIX SIX
WASTE ASSESSMENT SHEET

WASTE AUDIT ASSESSMENT SHEET

Household Name:

Date of Audit:

Sample Collected 1 Day 2 Days Other

Employees Conducting Audit:

Factors Affecting the Waste Audit (some waste not available, low staff numbers, weather etc):

TOTAL WEIGHT BEFORE AUDIT:

Waste Type	Weight (Kg)	Volume Bucket (Litres)
Paper		
Office Paper		
Newsprint		
Cardboard		
Magazines		
Tetra Pak		
Sub Total		
Plastic		
PET 1		
HDPE 2		
LDPE 6 soft plastics/bags		
Other		
Sub Total		
Glass		
Sub Total		
Metal		
Aluminium		
Tin		
Sub Total		
Organic		
Food waste		
Garden waste		
Sub Total		

Other		
Polystyrene		
Hazardous (batteries)		
WEEE		
Textiles		
Inorganic (ceramic)		
Ink Cartridges		
Other		
TOTAL		