

LUGANVILLE WASTE CHARACTERISATION REPORT



MAY
2012

FOR THE LUGANVILLE MUNICIPAL COUNCIL &
SANMA PROVINCIAL GOVERNMENT

Luganville Waste Characterisation Report 2012

EXECUTIVE SUMMARY

This is the first comprehensive Waste Characterisation Survey to be carried out within the Luganville Municipal Boundary. In April of this year, staff from Sanma Province, Luganville Municipality, Rural Health, Live and Learn and students from the University of South Pacific, 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 46kg of waste every week. However those in the higher socio-economic areas produce almost twice as much per person than those in the low socio-economic areas. This equates to 2.4 tonnes per household per year or 6,196 tonnes per year for the entire town. With a 4.1% annual growth rate for Luganville, this waste problem is only going to increase in the coming years.

The businesses are producing approximately 1.8 tonnes of waste per week. Much of which is recyclable in fact 1.6 tonnes of which could be prevented from being buried in landfill.

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

- Options for the separate collection of recyclables and general waste
- Options for cardboard and paper recycling
- Options for composting and worm farming of organic waste
- Collection of Waste Electrical and Electronic Equipment

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 order to measure progress towards this, 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, and will enable the effects of prevention and minimisation policies to be measured.

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 'Action Plan for Implementation' of the National Waste Management Strategy requires that Luganville, Port Vila and Lenakel carry out household and business waste characterisation surveys in 2012.

With support from the Luganville Municipality, Sanma Province, Rural Health, Live and Lean and students from University of South Pacific, the waste characterisation survey for Households and Business was carried out in April 2012.

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.

- **AREA TWO**

Second Canal/Santo East – Medium socio-economic area

Twenty houses, ten from each suburb were randomly selected to participate.

- **AREA THREE**

Pepsi/Sarakata – Low socio-economic area

Twenty houses, ten from each suburb were randomly selected to participate.

Refer to Appendix 1 for a map of the areas.

BUSINESS

A sample of 12 businesses from the main street of 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 – Hotel Santo, Natangora Café, Ocean King.

Wholesale and Retail Trade - CC Store, LCC, Bunny Fung, John Lums, Uncle Bills, LCM, Wilco.

Public Administration – Rural Health

Administrative and support services – Luganville Stationery

METHODOLOGY

HOUSEHOLD COLLECTION

The week of April 2nd 2012, staff from Luganville Municipality, Sanma Province and Rural Health 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 April 10th 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.

On Tuesday 10th of April the rubbish was collected in the morning from each household and the surveys were also collected. This occurred every day of the week. On Monday the 16th of April the waste was collected for the Friday, Saturday and Sunday prior.

BUSINESS COLLECTION

The week of April 2nd staff from Sanma Province and the 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 April 11th.

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 students from the University of South Pacific (USP) were trained to assist in the study. On April 2nd the students spent 2 hours learning how to sort the waste into the appropriate categories and measure and approximate volume. They were present at the whare for the full 6 days of the study and were paid a per diem for their services.

In addition to the staff from the Province and the Municipality, staff from Live and Learn and Rural Health played a key role in the collection and sorting of the rubbish.

At the end of each day the rubbish was collected by the Municipality rubbish truck and taken to the Luganville Landfill for disposal.



The three waste characterisation stations set up at the whare at Chapuis Stadium.

Household waste arriving at the Stadium.



The staff and students sorting through the waste.

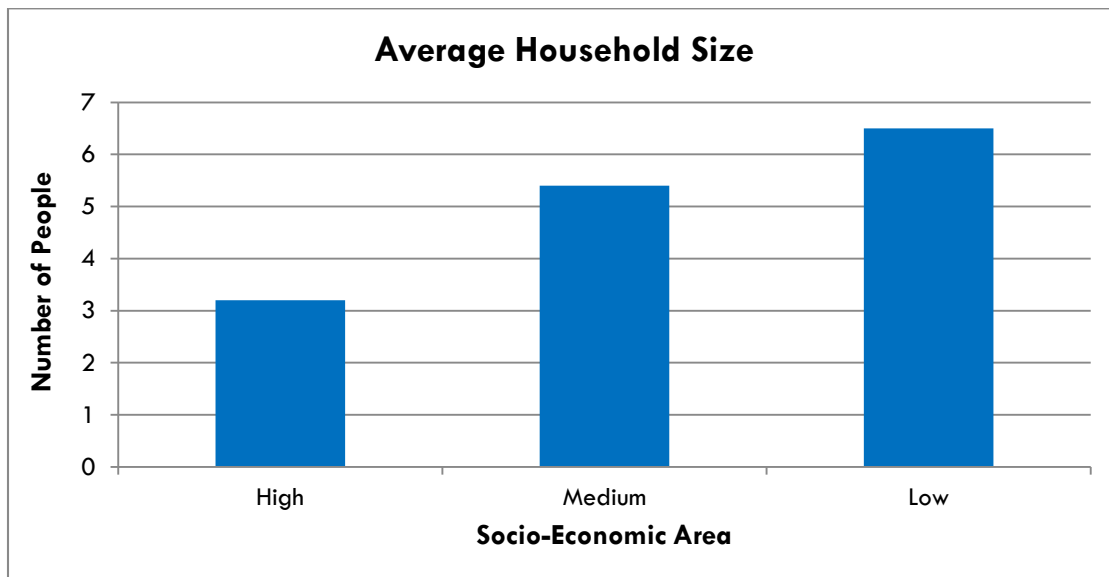
HOUSEHOLD - SURVEY RESULTS

The following information is a summary of the survey data that was completed by all but one of the 50 participating households.

Household Size

With 270 people participating in the study across 50 households, the average household size was 5.4 people. The smallest household having just one person and the largest having 14. This is slightly higher than the average Luganville household size of 5.1 (Census 2009). There was a relatively even spread across the households with 50% 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. Figure 1 shows that 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



Housing

There was a mix of housing within the study area, with the majority of houses (54%) being constructed primarily from concrete, and 30% were made from wood and concrete. This is slightly higher than the 70% recorded in the 'Household Income and Expenditure Survey, 2006' as 'living in urban areas and living in permanent houses'. The remaining houses were made from a combination of natangora, iron, tin and cardboard.

Education

Figure 2 below outlines the highest education levels achieved within each of the socio-economic areas. The results show that proportionally, those in the higher socio-economic areas are more likely to have achieved a tertiary level qualification whilst those in the lower socio-economic area have a higher rate of primary education with decreasing rate of secondary and tertiary qualifications.

Figure 2. Level of Education

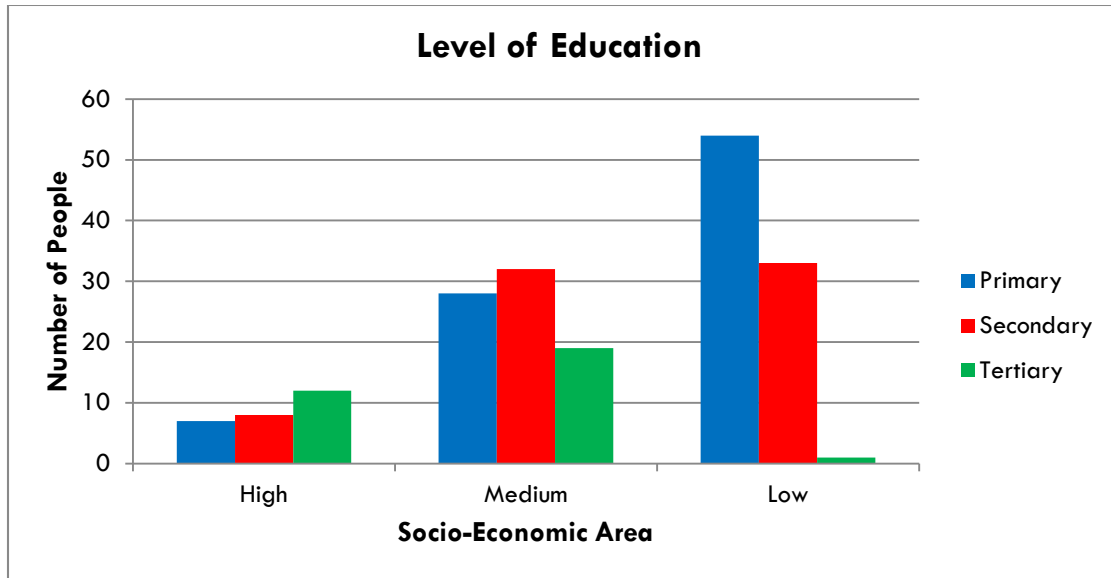
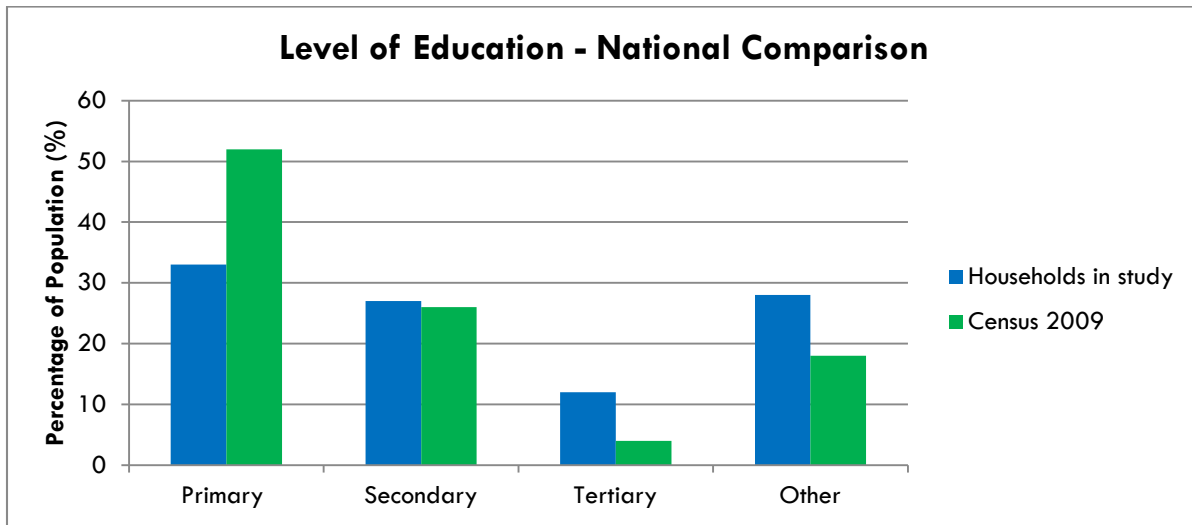


Figure 3 below shows that the level of Primary education as the highest level qualification in the participating households is lower than the National average, but on par with the National Secondary qualification numbers. However this study generated a large percentage (28%) of 'Other' responses. It is assumed that this is a mixture of respondents who are not attending school and do not want to report it; or have no qualifications, or relatively low qualifications, and did not want to report this.



Figure 3. Level of Education National Comparison

Income/Employment

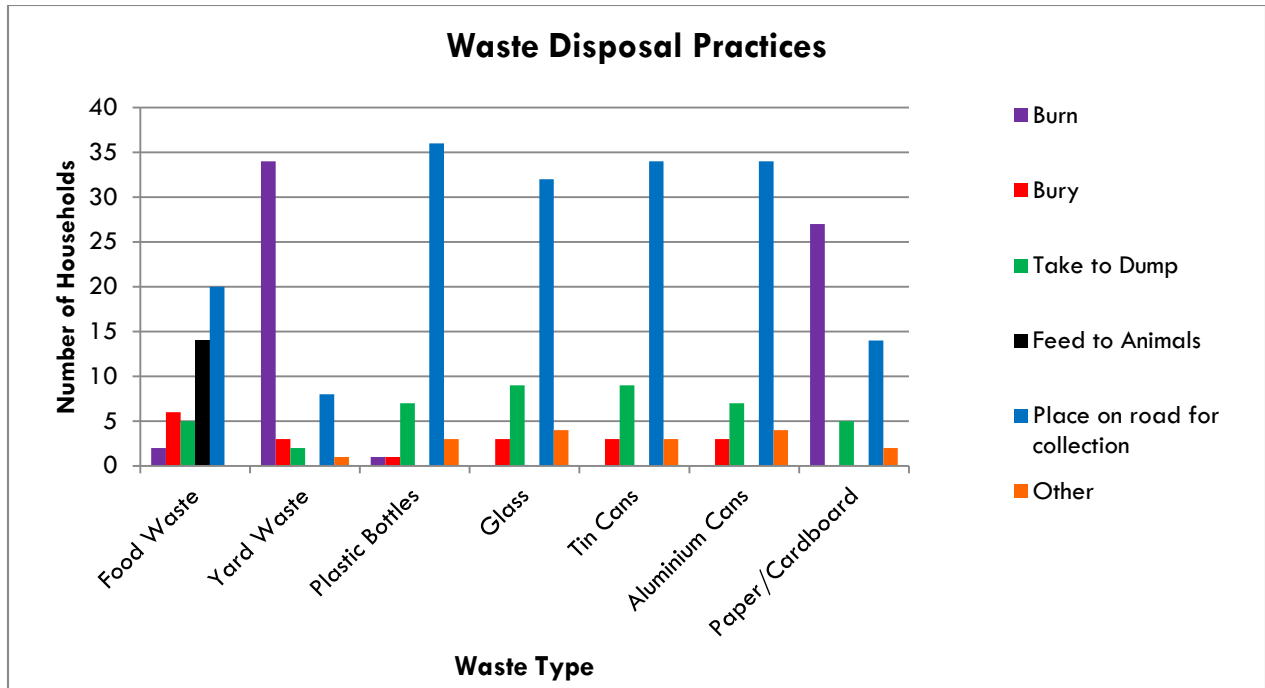
The survey showed that on average at least one person was employed within each household. Of the 70 people who stated that they were employed, seven did not specify what type of employment and 11 people selected 'Other' so the statistics here are not particularly comprehensive. However 57% of those employed 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 40% of those in Low socio-economic areas earn 500-1000 Vatu per week as opposed to the 68% in the Medium socio-economic areas 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 respondents (42%) place their food waste on the road for collection with 30% feeding it to their animals. Over 70% of the households burn their yard waste with only 17% utilising the rubbish collection service for their yard waste.

For all the recyclable materials such as plastic bottles, glass, tin and aluminium cans but excluding paper/cardboard, the majority (64%) 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 (54%) with 28% opting to place it on the road side for collection.

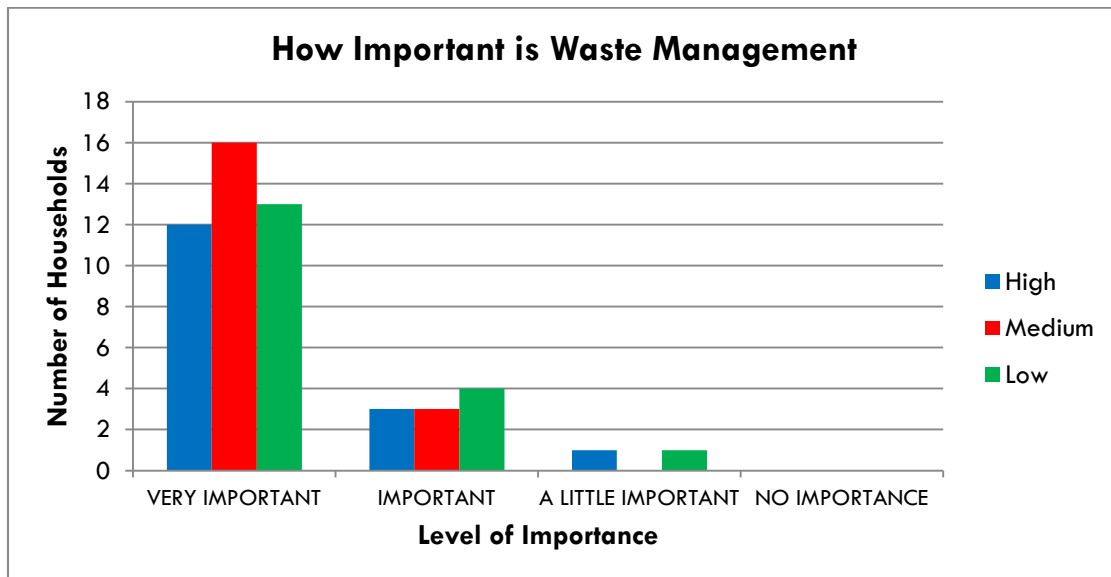
Figure 4. Waste Disposal Practices



Importance of Waste Management

All householders were asked ‘how important is waste management to you and your household?’ the overwhelming response (70%) was that it was ‘very important’. This is a very positive reaction that 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.

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 48% of the households currently take reusable bags to do their shopping, and 56% of the households would be willing to pay 10 Vatu to purchase a plastic bag for their shopping. These results are very promising at this early stage of waste management awareness in Luganville.

The householders were also asked if they knew how to compost their kitchen and garden waste, 60% of the householders said they did and of the 18 who said 'No' all 18 said they would be willing to attend a course to learn how to compost.

Summary

The results of the survey show that the randomly selected households within the study area have 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.



Scales ready for weighing



Waste about to be sorted

HOUSEHOLD – WASTE CHARACTERISATION RESULTS

Waste Generation

Over the seven day collection period the 50 households (270 people) produced a total of 2300.82 Kilograms or 2.3 Tonnes of waste. This equates to approximately 8.5Kg per person per week or 1.2Kgs per person per day. Figure 6 below shows that waste generation was highest in the Medium socio-economic Area and lowest in the High socio-economic Area.

**Please note however that the sample size for those in the High socio economic Area was 10 households (32 people) producing 11.9kg per person per week as opposed to 20 households (131 people) in the Low socio-economic Area producing 5.2 Kg per person per week. So proportionally, the High households are generating more than twice as much waste per person. This is not reflected in the Figure 6 as it would require the data to be manipulated.

Figure 6. Waste Generated by Socio-Economic Area

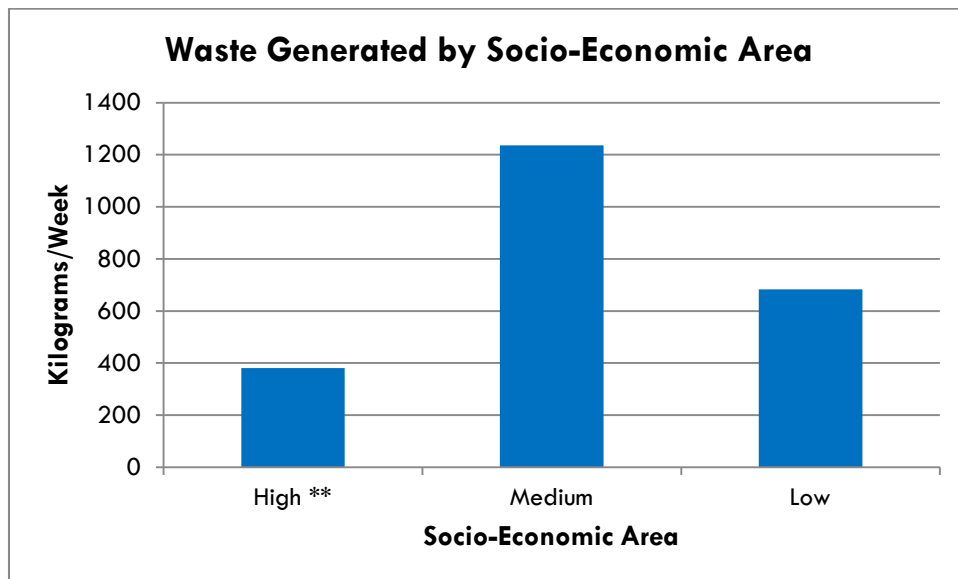
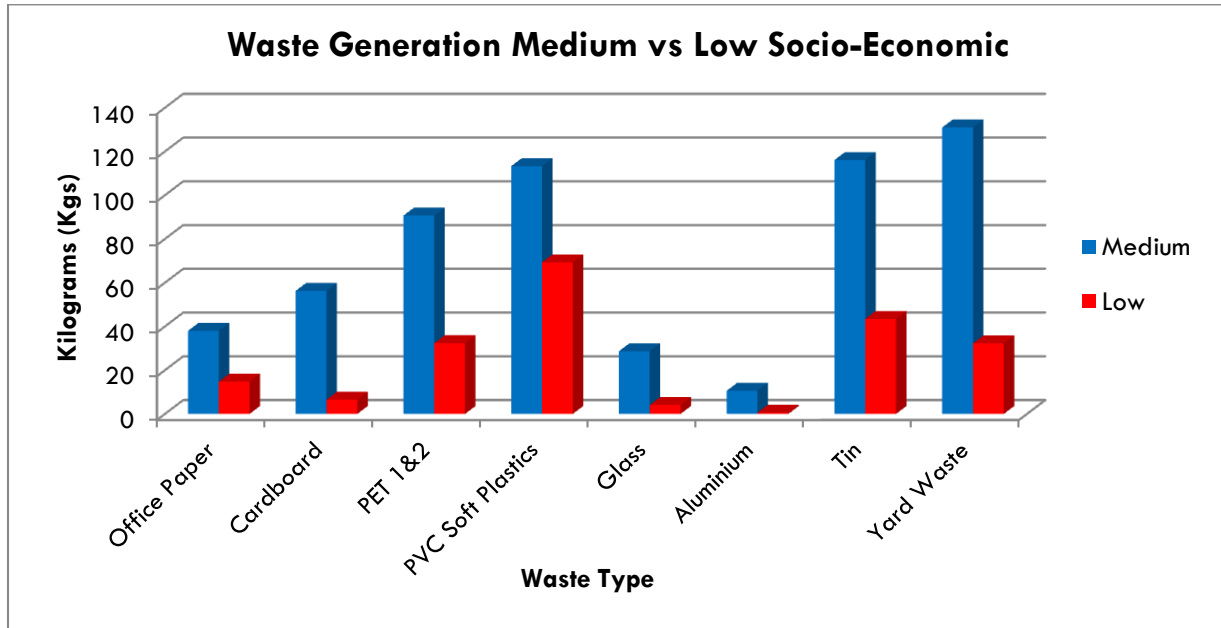


Figure 7 shows that those in the Medium socio-economic Area are producing significantly more waste than those in the lower socio-economic Area and that can primarily be attributed to the differences in household income. With a higher income (and less people per household) there are significantly more products being purchased that are in 'packaging' such as glass, tin, plastic etc as opposed to those with lower income buying more 'natural' products such as fruit and vegetables from the garden or market. In fact for each of the waste streams the Medium socio-economic households are generating more than 60% and up to 95% (Aluminium cans) more than those in the Low socio-economic households. This suggests that those in the Medium 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.

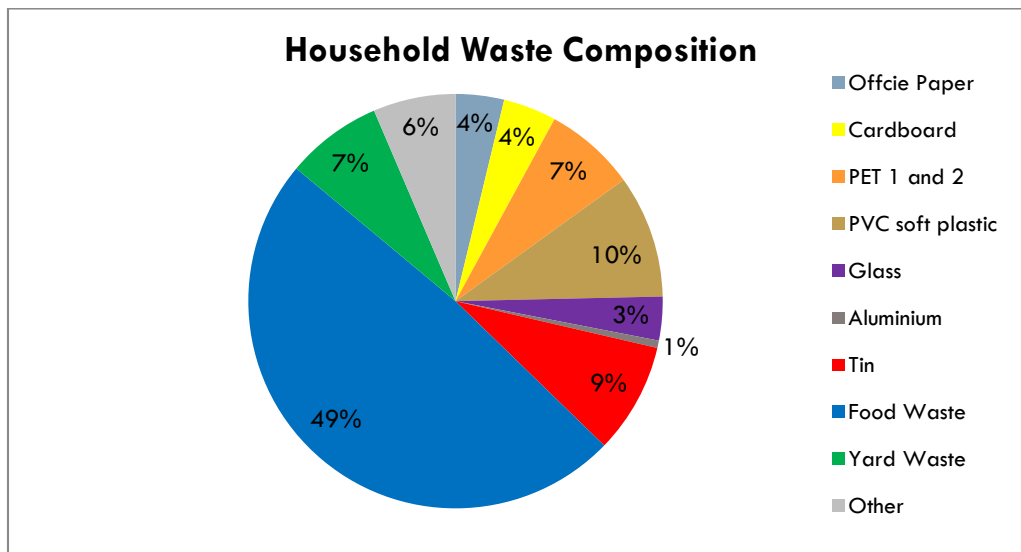
Figure 7. Waste Generation Medium vs Low Socio-Economic



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 49% (by weight) of the waste stream. The remaining 51% is spread relatively evenly across PVC soft plastics, Tin cans, Yard waste, Plastics 1&2, Cardboard and Paper. Of these waste streams, only the PVC soft plastics and ‘Other’ (16% by weight) are not recyclable.

Figure 8. Household Waste Composition



Recyclable Waste Generation

Over the seven day collection period 1921Kgs or 1.9 Tonnes (of the total 2.3 Tonnes) of recyclable waste was generated, including organic waste. Figure 9 shows that 55% of the waste generated is organic, which could be composted and utilized on crops and gardens in addition to being used to feed the animals. The remaining 28% (528 Kgs) of the waste is all recyclable and could be prevented from being disposed of in the landfill if proper systems and educational tools are put in place.

Figure 9. Total Recyclable Waste

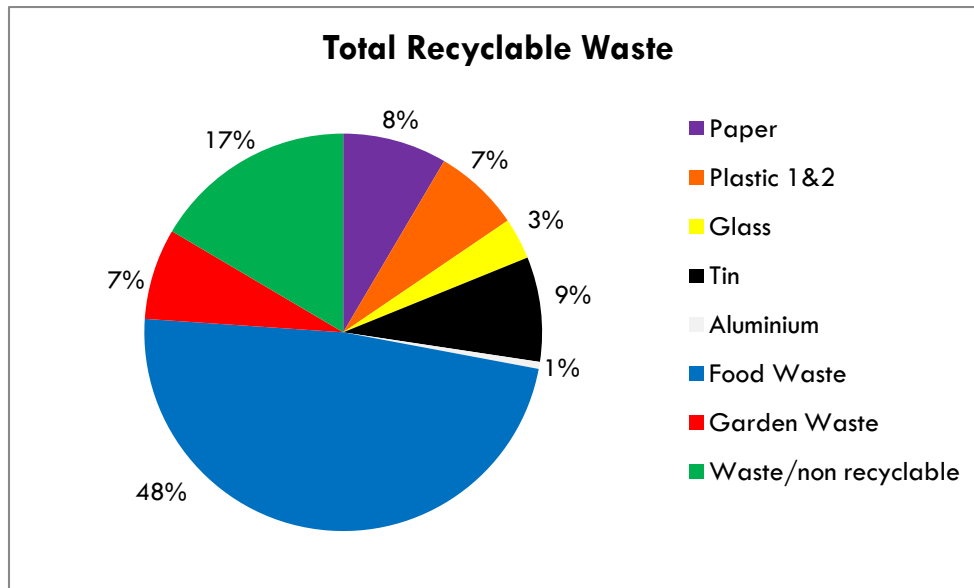
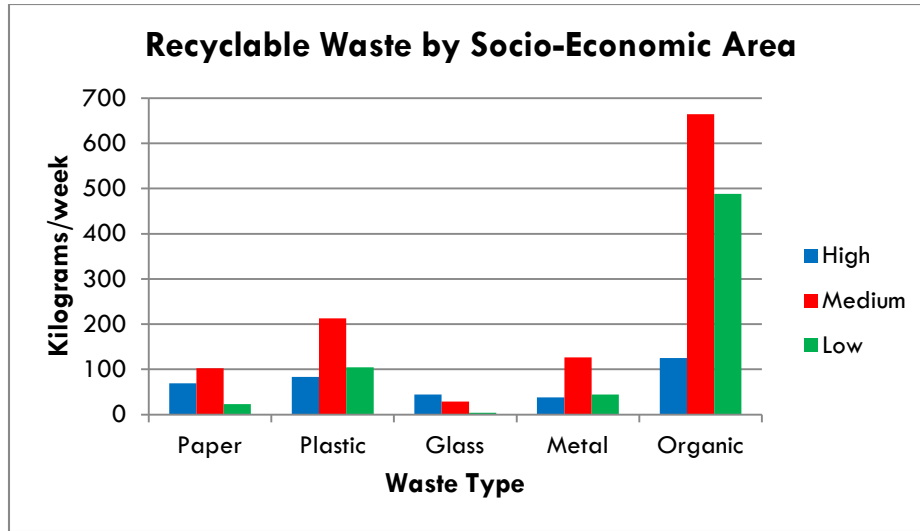


Figure 10 illustrates that when the recyclable waste is separated into the socio-economic Areas, those living in the Medium socio-economic Area produce the most organic waste (food and yard waste combined) and the most of all other recyclable materials, excluding glass. Those in the high socio-economic households produce the least organic waste and the most glass. Again 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 and purchase the more expensive packaged convenience goods.

Figure 10. Recyclable Waste by Socio-Economic Area



Assessment sheet



Weighing the waste

DISCUSSION/ANALYSIS

HOUSEHOLD

Organic Waste

This study showed that more than half (55% 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 64 tonnes of organic waste is being generated every week (56 tonnes food waste, 9 tonnes yard waste).

According to the survey only 14 out of the 50 households (28%) 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 (40%), 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 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 (these households are outside the Municipal collection area). 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, 7% 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 statistics we have, there is at minimum of 64 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.

**Home Composting, Community Composting Centre, Worm Farming,
Organic Waste Collections**

Recyclable Waste

Whilst the percentage of recyclable waste by weight in this survey is relatively small at 28% or 628kgs per week (32 tonnes per week in 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 Schweeps 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 ten 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 676 Kgs 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.

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 8.3 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, 195Kgs per week or 10 tonnes per week generated in Luganville. When surveyed as to how they dispose of this waste stream 54% of the households are burning it and 28% are placing it on the roadside for the Municipal collection. This too is a valuable waste stream that can with reasonable ease be recycled back into paper/cardboard. Refer to the Business Analysis section for further solutions to the Paper and Cardboard waste issue.

All of the recyclable material quantities mentioned above can be added to the business waste streams for better economies of scale.

Bring Banks, Small Business Opportunities, Reuse and Recycle, Art and Craft, Export.

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.
- The decision to have 10 households participating in the High Socio-economic category (as opposed to 20 in the other categories) was based on the population make up of the town and was felt to be reflective. However when generating graphs of waste quantities the high socio-economic group look to be producing less, whereas in actual fact that are producing significantly more per person than most of the other households. In order to not manipulate the data the graphs were not changed but special note has been made of this within the report so as not to misrepresent the other socio-economic areas.
- Due to staff availability the waste characterisation had to be conducted directly after the Easter Holidays. The first day of collection was Tuesday 10th of April which was Easter Monday's waste. Looking at the results there was slightly less waste collected on the Monday than the following days, as people may have been away for the long weekend.
- 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 increase the calculations 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 but one of the 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 one employee to 34, with a total of 137 staff employed full time across the 12 businesses with approximately 20 part time staff.

Customer numbers

The number of customers through each business each day also varied greatly from 20 to 1000 customers, which demonstrates that the study has captured a representative sample of businesses from the town.

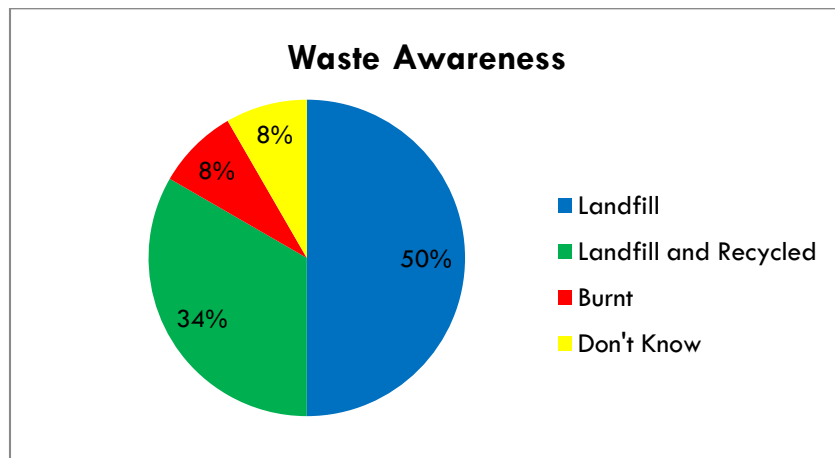
Current waste types

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. Figure 11 illustrates that of the 12 businesses 50% knew that the waste when put out for collection on the roadside goes directly to landfill. However 34% believed that an element of the rubbish was recycled. This too shows that there is scope for further education about waste disposal.

Figure 11. Waste Awareness



Willingness to change

When the businesses were asked if they would be willing to change their ways in order to reduce the amount of waste they produce eight out of 12 or 66% said they would. This is a promising statistic that will hopefully be reflected in the wider business community.



Typical days waste from a business



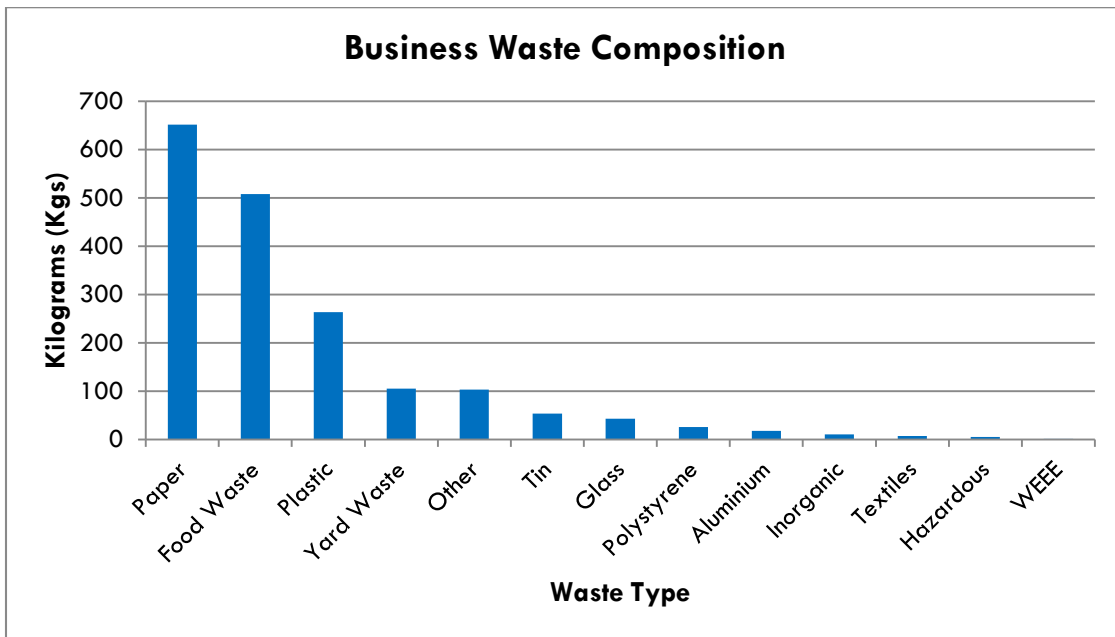
Sorting through the business waste

BUSINESS RESULTS

WASTE CHARACTERISATION RESULTS

Over the seven day collection period the 12 business employing approximately 150 people produced a total of 1792.75 Kilograms or 1.8 tonnes of waste. This equates to approximately 150Kgs per business per week or 21Kgs per business per day. Figure 12 below shows the overall waste composition from the businesses with Paper being the highest at 652 Kgs or 36% of the total waste generated. This includes, newsprint, magazines, cardboard, office paper and tetra paks. Food Waste was the next highest with 507kgs or 28% of the total waste generated and Plastics made up 263Kgs or 15% of the waste stream and was primarily made up of the PVC soft plastics.

Figure 12. Business Waste Composition



If we look at two of the major waste streams (Paper and Plastic) in more detail (Figures 13. and 14.) we can see that of most note, Cardboard comprises 79% of the Paper waste stream at 517 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 91kgs or 14% of the Paper waste was Office Paper, also recyclable and more importantly reusable. Further discussion on this can be found on Page 25, Discussion/Analysis.

The Plastic waste stream was dominated by PVC soft plastics at 68% and 179kgs. 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 13. Paper Waste

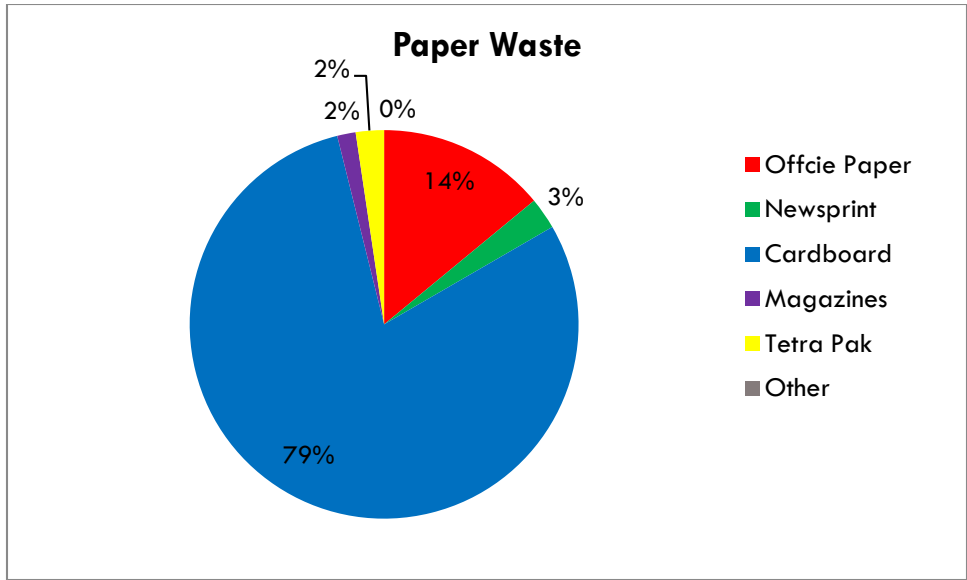
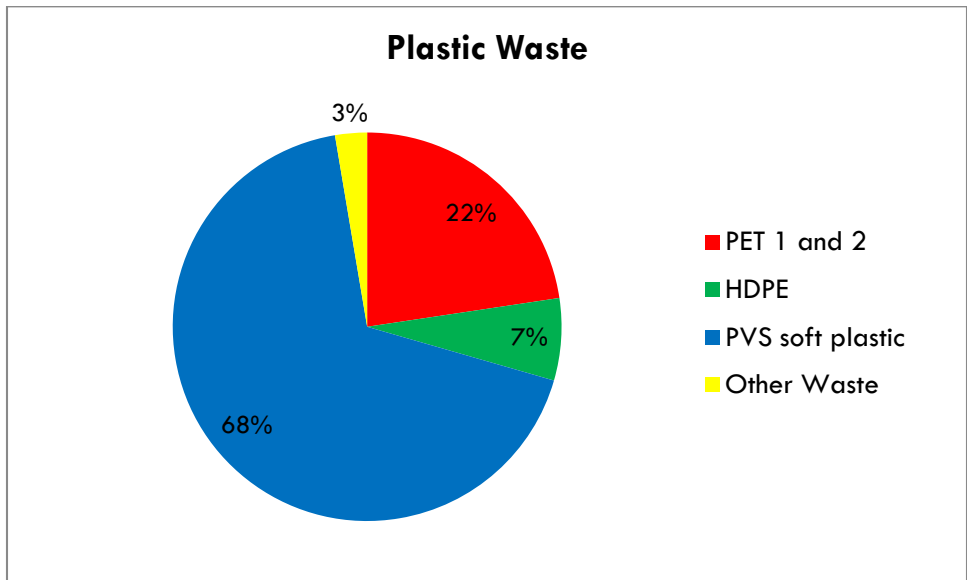


Figure 14. Plastic Waste



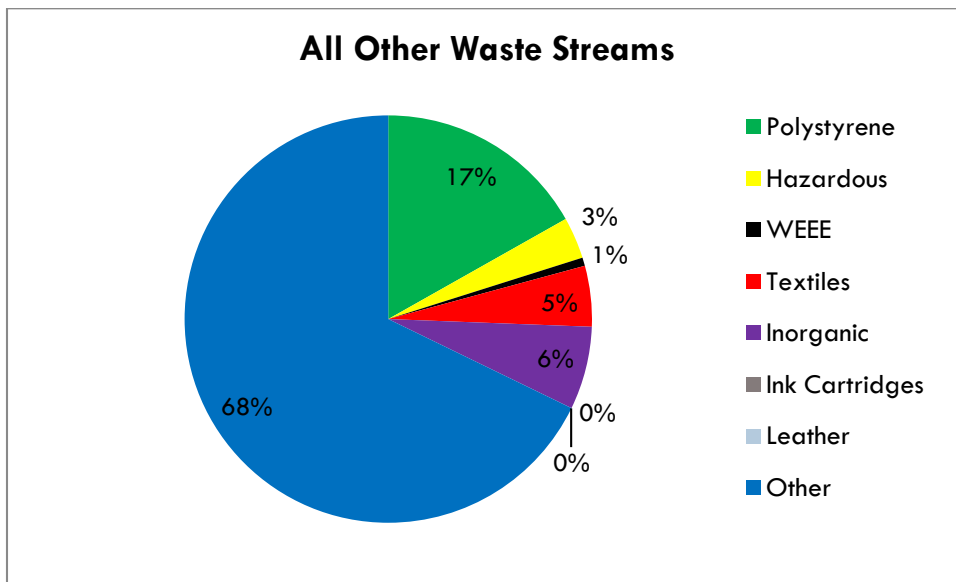
It is important to look at the other waste streams that make up the total business waste composition, in particular Polystyrene, Hazardous Waste and Other Waste, see Figure 15. Polystyrene is very light by

nature and large in volume. So to register at 17% and 26kgs 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. Electronic Waste (WEEE) should also be included in this waste stream as many components of electrical waste are hazardous.

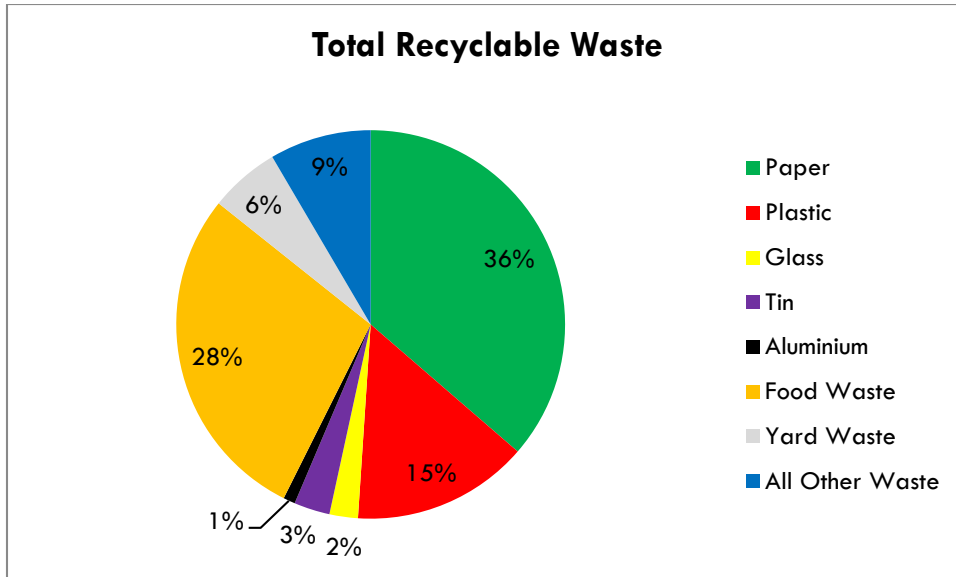
The 'Other' waste stream is significant and included items that were not listed on our assessment sheet. A significant amount of this was dirt/rubble/coral, and this was not included in the Yard Waste category due to it not being a potential component of any future composting that may be made available.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

Figure 15. All Other Waste Streams



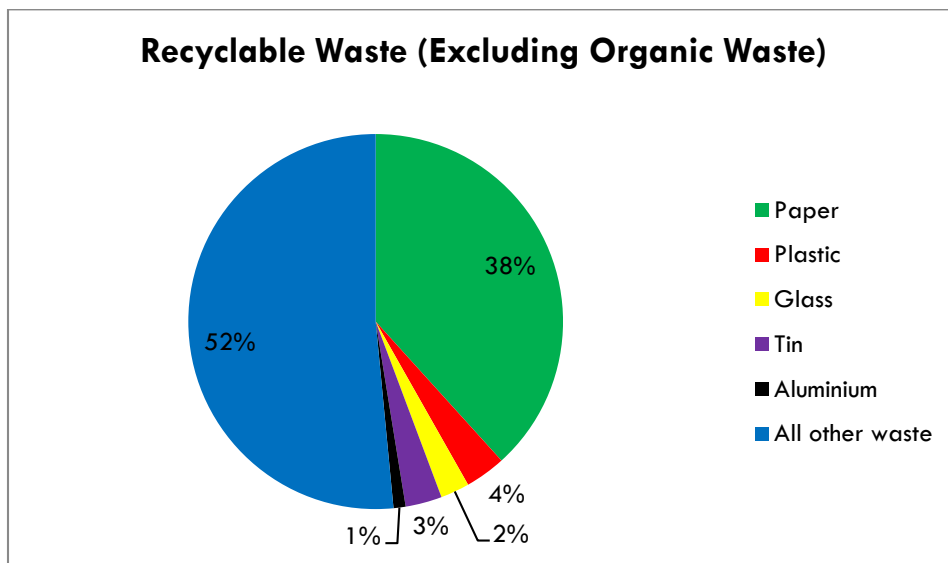
Of the 1.8 tonnes of waste generated by the businesses, approximately 91% or 1.6 tonnes of it is recyclable as shown in Figure 16. As mentioned earlier the highest generating waste stream of Paper and all its sub categories is entirely recyclable so too are the Plastics 1&2, glass, tin and aluminium cans. Food waste and yard waste when combined could be composted into a new resource for gardens/crops or even for sale.

Figure 16. 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 17 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 17. Recyclable Waste Excluding Organic Waste



DISCUSSION/ANALYSIS

BUSINESS

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

The majority of the waste generated by business is Cardboard (517kgs), closely followed by Office Paper (91kg). 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 9 tonnes of cardboard are generated each week (taking into account that not all stores will produce cardboard boxes).

A number of possible cardboard recycling scenarios exist:

- Cardboard fire logs are made of 100% recycled waxed cardboard boxes. The cardboard boxes are chopped up, pressed into a solid log and can then be re-sold as firewood. The natural wax coating found in the cardboard boxes acts both as a binder and helps the pressed cardboard burn slowly. In addition, they have no chemical additives so they are good for the environment and give off minimal emissions. This requires very low level technology and equipment and could be based at the current landfill site. It would provide employment and may be cost neutral or even run at a profit from the sale of the fire logs. In addition this would be a big improvement from the current practice of using plastic bags to drip light cooking fires.
- Partnerships or buddy systems could be established with a business and a local school. Each partnership arranges who will collect or deliver the cardboard boxes and with what frequency. The school can then use them for storage or art and craft or give them to students to take home. This is a great example of reuse and the community working together – “one man’s trash is another man’s treasure”



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 and added to the mix for the fire logs. 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.

Cardboard Fire Logs, Partnerships with Schools, 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:

- 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 depot where the cans are stored and crushed would also need to be assessed for its ability to expand and export options will also need to be explored further.

Another option that is worth investigating is a Beverage Container Deposit and Refund System. In March of this year 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.

**Additional Aluminium Can Cages, Improved Collection, Research export Options,
Container Deposit Regulations**

Plastic (Plastics 1&2, PVC Plastics and HDPE)

The Plastic waste stream was the third highest at 263.55Kgs per week, with 179Kg of PVC plastics and 60Kg of Plastics 1&2, which would be approx 4 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.

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 2000 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, de contaminated 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. If the schools were able to bring their WEEE to a single storage facility e.g. a shipping container, where it could be safely stored until an export option is available this would prevent more WEEE being buried which is environmentally very dangerous.
- WEEE Collection day's once per year would be a way of regularly collecting the WEEE from households and businesses. The upcoming Lukaotem Gud Santo Festival would be a great opportunity for the first collection day and would help raise awareness of this relatively misunderstood waste stream.
- The New Zealand Government has been working with the Cook Islands and held an E-Waste collection day (December 2010) which was very successful (5154 pieces of E-waste, including 1147 computers, 1101 monitors, 543 printers and scanners and 476 keyboards). Further research into establishing if the same arrangement could be made for Santo would be worthwhile.

Awareness of WEEE, WEEE Collection Days, Research into export options, 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 increase the calculations slightly, but when these waste quantities are extrapolated out for the entire business community it will not significantly affect the results.



Sorting through business waste



Cardboard from businesses

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

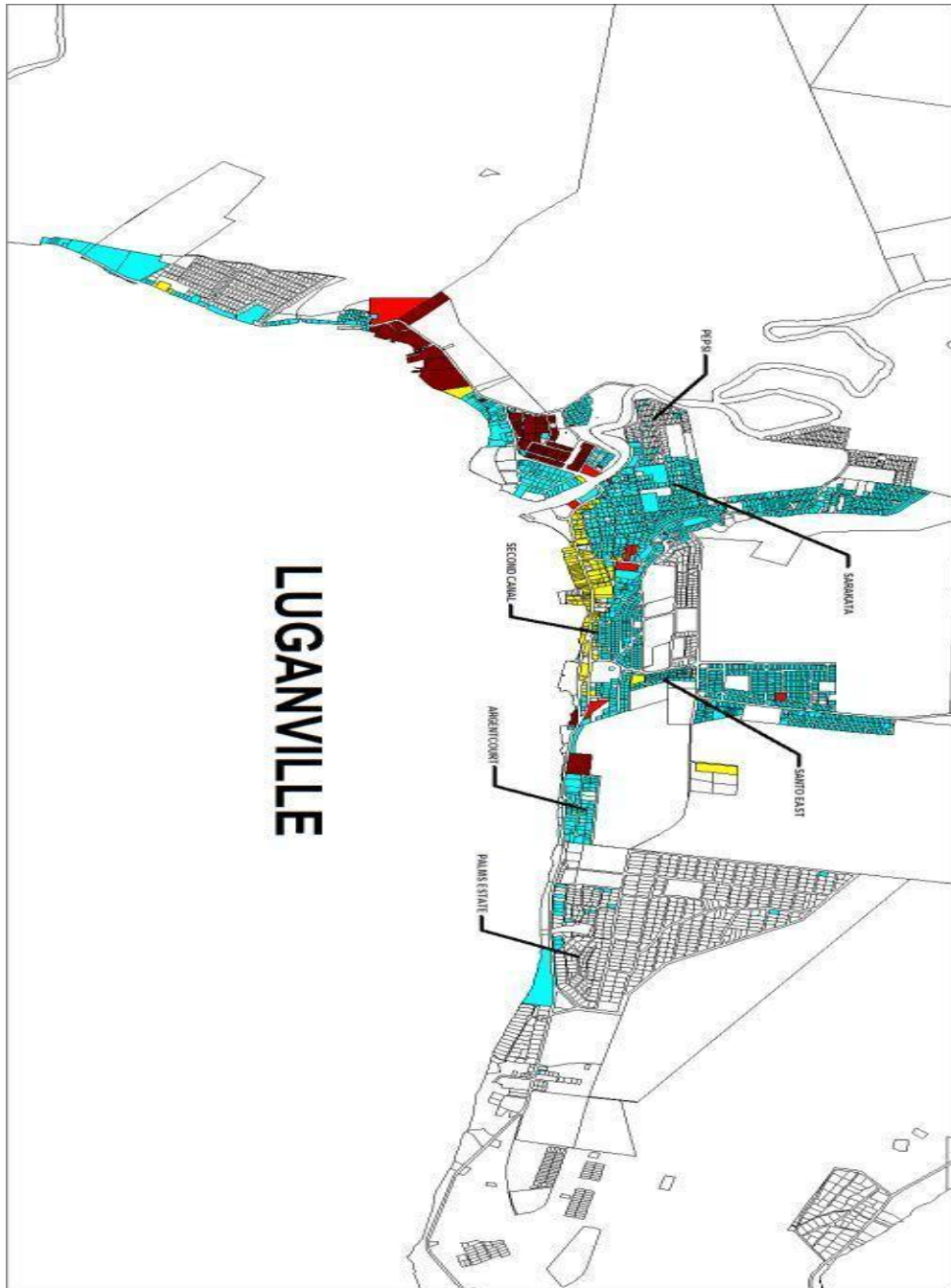
- Research to be carried out into options for Home Composting, a Community Composting Centre and Worm Farming.
- Research to be carried out regarding the viability of Bring Banks and small business opportunities, with respect to reuse and recycling of waste materials as well as export options.
- Research to be carried on the possibility of implementing a beverage container deposit legislation (Household and Business)

BUSINESS

- Research into the viability of setting up a Cardboard Fire Log business.
- Research into the sustainability of developing School/Business partnerships.
- Development of a list of Green Office initiatives that could be promoted to all businesses.
- Additional aluminium can cages to be distributed and clarification around current export situation.
- Re-visit the discussion paper on Plastic Bag Tax/Plastic Bag Ban
- Awareness campaign to increase knowledge and understanding of WEEE. Further research into the possibility of WEEE collection days, including export and treatment options.
- 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



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 April 11 (Monday's rubbish) and your last day of collection will be MONDAY April 16th (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.

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) _____

Household Residence

Please tick which type of house you live in.

- Natangora House
- Concrete
- Wood & concrete
- Iron/Tin
- Cardboard

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

What waste management issues would you like the Province or the Municipality to address?

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	

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

Would you be willing to pay 10VT for each plastic bag that is used for your shopping? Yes No

Tank yu tumas.

APPENDIX FOUR
BUSINESS INSTRUCTIONS

LMC and SPG BUSINESS WASTE CHARACTERISATION SURVEY

INSTRUCTIONS

- Your rubbish will be collected every day starting on WEDNESDAY April 11th (which will be all your rubbish from Tuesday)
- Your last collection day will be TUESDAY 17th April (Monday'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 ~
 APRIL 2012

Name of Business: _____

Owner: _____

What Business are you in (please tick one)

- Office
 Retail
 Hospitality
 Commercial

Other, please list _____

Please state which days of the week you are open and the hours that you are open?

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 Collection
 I take it to the landfill/dump

If you take it 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

What do you think happens to the waste once it leaves your business?

Please tick:

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

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

- Oil
- Chemicals
- Electronic waste
- Paint
- Batteries

How much of each item would you dispose of each week? (Number of containers or number of 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

Who is responsible for collecting the waste and putting it out for collection?

e.g. one person, all staff, It changes from day to day

Would you be willing to change your ways to reduce the amount of waste your business produces?

Yes
No

Have you any suggestions as to how you could reduce the amount of waste created by your business?

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 and 2		
HDPE		
PVC soft plastics		
Other		
Sub Total		
Glass		
Sub Total		
Metal		
Aluminium		
Tin		
Sub Total		
Organic		
Food waste		
Garden waste		
Sub Total		

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