A STUDY OF RECYCLING IN SAINT LUCIA (2013)

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Abbreviation

SLSWMA	–	Saint Lucia Solid Waste Management Authority
UNEP	–	United Nations Environment Programme
Taiwan ICDF	–	Taiwan International Cooperation and Development Fund

Interpretation

In this study –

“Recycler” means either the person involved in the collection of recycling material on the island for shipment to buyer countries or a person who collects material and reuses or recycles it on the island.

“Recycling related enterprise” means either the business involved in the collection of recycling material on the island for export to buyer countries or a business that collects material and reuses or recycles it on the island.

Acknowledgement

The Authority and the Taiwan ICDF Overseas programme are grateful to the recyclers for the work presently being undertaken for Saint Lucia. Their activity should not only be viewed as economic but also a display of love for the environment and care for the local people. Despite the challenges, recyclers did not wait for great things to happen but made and continue to make great things happen. Their ability to overcome different challenges on their own is an indication that they are not afraid of the difficulties associated with the task.

We appreciate the precious time and valuable information which recyclers supplied and shared with us. They were all very generous and open with respect to the information shared. All of the information gathered is important and critical for the development of the Saint Lucia Solid Waste Management Authority (SLSWMA) and the country at large. Moreover, information gathered from this study, if utilized can assist the Saint Lucia Solid Waste Management Authority and other related sectors to make better decisions regarding environmental protection and sustainability.

With the contribution of all the recyclers, we hope that this study could assist the country in becoming not only just simply beautiful but more environmental friendly, clean and more suitable for human habitation.

Abstract

The main goal of this study is to understand and explore the current status of recycling activities in Saint Lucia with a view to encouraging increased participation in recycling activities thereby extending the life of the landfills. The study specifically highlights the status of recycling on Saint Lucia through the collection of information and data from the various recyclers identified. Information gathered focused on items recycled, location of facilities, recycling markets, management and challenges of recycling in Saint Lucia. Meanwhile, suggestions for possible collaboration and support from SLSWMA and related organizations are provided.

Many materials are being collected among the twenty-one (21) recyclers on the island and are either exported or recycled locally. The recycling business appears to be difficult in the county due to many challenges such as lack of awareness on the part of the public and financial constraints etc. faced by recyclers. Government support for recycling appears to be haphazard as there is no structured approach in support of recycling. The granting of concessions for the importation equipment is haphazard at best. Regulations and/or standards for both recyclers and the public are absent. Recycling standards and regulations are necessary for the public to effectively engage in recycling and for recyclers to improve their recycling activities.

Public awareness on recycling in Saint Lucia is very limited. While some persons are aware of the concept of recycling they may not know where, how and what to recycle in the country. For solid waste recycling to be successful, there needs to be greater involvement of the public and promotion of recycling particularly the how, what, and where to recycle on the island through environmental education and information.

In addition, greater collaboration between recyclers and government/government related agencies is necessary in order to better appreciate the activities of recyclers, to understand the challenges being faced, and provide assistance and support to recyclers where necessary to ensure a viable and vibrant industry.

1. Introduction

The Saint Lucia Solid Waste Management Authority, established in 1996 is mandated to 'manage, regulate, control and treat waste either alone or in conjunction with private companies or organizations (SLSWMA, 2013). Presently the Authority, through solid waste management contractors, collects solid waste from residential properties, government/public offices and institutions. Additionally the Authority makes provision for the disposal of solid waste at two waste management facilities namely the Deglos Sanitary Landfill and the Vieux-Fort Solid Waste Management Facility. Consistent with the mandate is also the responsibility to establish and promote a resource recovery system that would serve to divert a number of waste streams away from the landfills resulting in the extension of the life of the landfills.

The Authority, recognizing the importance of solid waste recycling in prolonging the lifespan of the landfills, undertook in collaboration with Te-Hsin Tsai (Grace) - a volunteer from the Taiwan ICDF Overseas Volunteer programme, a study to determine the status of recycling activities in the country. The purpose of this study was to understand more clearly recycling activities in Saint Lucia through the collection of information and data from all recycling related enterprises identified.

To achieve this, the study will firstly through the section on 'background information' examine the current state of waste management in the country. Environmental issues associated with the present waste management situation will also be highlighted. Secondly is the discussion of the methodology where the sources of information are identified and the methods used to investigate the status of recycling are described. Thirdly, the findings of the study/survey will be presented to be followed by a discussion of the results/analysis of the findings; and finally a conclusion summarises the findings, draws conclusions from the discussion of the results and offers recommendations.

It is envisaged that the recommendations of the study if implemented will contribute to an overall improvement in the management of recyclables on the island as the results of the research would serve to provide suggestions to the relevant agencies such as the Saint Lucia Solid Waste Management Authority and the government of Saint Lucia can utilize the study in making timely and appropriate decisions as it related to recycling activities in Saint Lucia.

2. Background

The island of Saint Lucia is located within the eastern Caribbean, with a population of 170,000 (est. 2010) and a land space of 616 km^2 (238 sq. mi) (Saint Lucia Tourist Board, 2012). The beautiful tropical environment attracts more than 200,000 visitors each year (Euromonitor International, 2012). However, Saint Lucia does not have many manufacturing industries compared with many other countries. Most goods are imported.

During the past seven (7) years, an average of 81,000 tons of solid waste was produced on the island with 78,000 tons being the lowest recorded (SLSWMA Annual Reports 2006-2012). Comparatively, Saint Lucia produces 4.35kg per person per day (World Bank, 2012). The quantity is also influenced by tourists especially during the tourism season lasting January to April (Saint Lucia Tourist Board, 2012). During the tourism season, tourists can generate double the amount of waste of a resident in Saint Lucia. Additionally, waste management systems in small-island developing states like Saint Lucia are under pressure due to issues such as population increase, urbanization, changing consumption patterns, and trade. Based on the current waste generation trend in Saint Lucia, it is anticipated that the projected rate of increase in waste quantities for the next five to ten years will be approximately 4% per year (Binger, 2011).

Environmental issues such as inappropriate disposal/littering, environmental pollution and waste burning are still prevalent on the island. These issues were also highlighted by a study which revealed that 88% of households use the refuse collection vehicle as their main method of waste disposal. The remaining 12% is either burnt, dumped on land, dumped in rivers, sea, ponds or other ways (ibid). These poor waste management practices continue to be a menace and are detrimental to human health, the environment and the economy. Recycling efforts could help minimize those issues as is presently being experienced in the community of Dennery where the Zonal Supervisor and Mayor have both reported a decline in plastic litter in Dennery and environs.

While the Saint Lucia Solid Waste Management Authority provides for disposal of solid waste at the islands two waste management facilities namely Deglos Sanitary Landfill and Vieux-Fort Solid Waste Management Facility, the main landfill, Deglos Sanitary Landfill has a lifespan of twenty years, concluding 2023 (SLSWMA Operations Report 2009-2010). Given the smallness of the island, limited land space along with changes in social conditions may contribute to an increase in waste generation therefore necessitating the establishment and promotion of a resource

recovery system aimed at diverting various solid waste streams away from the waste management facilities thereby extending their lifespan.

UNEP (2010) points out that Saint Lucia has many policies and pieces of legislation aimed at responding to many environmental issues. However, with respect to recycling matters, there is no official recycling system in Saint Lucia. Despite the current situation twenty-one (21) private recycling related enterprises/individuals operate on Saint Lucia. They recycle plastic, paper & cardboard, glass, metal, e-waste, oil and batteries etc.. Given the country's heavy dependence on a private sector also faced with challenges which include lack of financial resources, low volumes of recyclable waste, high labour costs, transportation and freight cost and low value of most recyclable materials (SLSWMA Annual Report, 2012) a well established and promoted system would be very beneficial to the country.

The Waste Characterization Study (2008) undertaken at the island's landfills revealed the following: 22% plastic, 10% paper & paperboard, 7% glass and 5% metal (ibid). With approximately 44% of solid wastes with potential for recycling being disposed of in the islands landfills, the potential for strengthening recycling activities on the island exists if these materials were diverted away from the landfills.

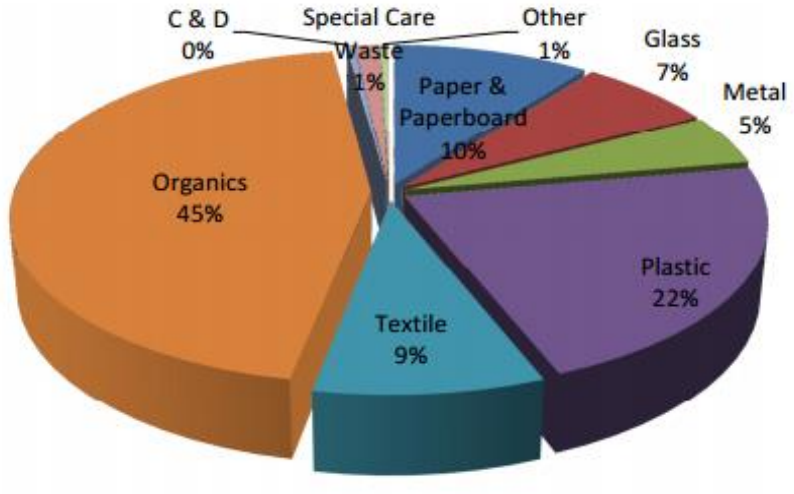


Figure 1. Components of Municipal Solid Waste in Saint Lucia
Source: Waste Characterization Study 2008

The latest research regarding recycling entitled "A Study of Recyclables and their Negative Impacts on Landfills, Waterways and Costal Areas: Knowledge, Attitudes and Practices of St. Lucians" undertaken by Gilroy Satney (2013) for the SLSWMA reports a general willingness on the part of the public to participate in recycling activities. However environmental education was cited as the most importation element

for reducing the quantity of recyclable waste entering into landfills, waterways and coastal areas on the island (Satney, 2013).

Any well established and promoted resource recovery system therefore will not only strengthen the activities of the present recyclers but divert a number of waste streams away from the islands waste management facilities and reduce collection costs.

3. Research Methodology

The research area comprised the whole island of Saint Lucia. Both qualitative and quantitative data were collected during the research activity. A semi-structured interview and questionnaire with both open and closed questions were applied (see Appendix I). The semi-structured approach allowed both the researcher and the respondents to express freely their views, perspectives and experiences as well as ensure that issues inherent to the research questions and objectives of the study were responded to.

Photographs were taken and field observations conducted. These facilitated the assessment of the physical operations of the sites and verification of information obtained from the interviews and questionnaires due to possible misunderstanding during communication between the researcher and recyclers. Photographs also facilitate the documentation of the findings.

All data were collected from September 2013 to October 2013. Findings are presented and analysed and followed by associated suggestions and recommendations.

3-1. Scope

- The study investigates recycling activities of each enterprise/individual involved in some form of recycling on the island. It focuses on items recycled, location of recycling activity, management, challenges and possible collaboration and support from the SLSWMA etc.
- It maps out the location of each recycling enterprise (SLSWMA website: www.sluswma.org).
- It also analyses the findings and provides possible solutions for improved recycling on the island.

3-2. Research Questions

The study was guided by the following questions:

- Who are the recyclers?
- What materials are recycled in Saint Lucia by recyclers?
- Where are the recyclers located? / Where are their collection sites or points?
- How do they operate recycling activities in the island?
- What are the challenges faced by the recycling industry?

3-3. Sample Population

The population of this study includes all recycling and recycling related enterprises identified. A total of twenty-one (21) recycling enterprises were identified and studied. The list is shown below. (For more information on the recyclers see Appendix II)

- AH Communication Recycling Company Ltd.
- Biohelps Ltd.
- Construction & Recycling Ltd.
- Chemical Manufacturing & Investment Co. Ltd.
- Clay Products Ltd.
- D & D Recycle Ltd.
- EMC2 - Electronic Material Reycling Company
- Global Battery Recycling INC.
- J Robinson General Contractor
- Larry’s Scrap Metal
- Leon’s Backhoe and Trucking Service
- Mr. Mikey Marcelle
- Mr. Sekou Remy
- Mr. Gurprit Singh
- Northern Recycling Centre
- Power Engineering Services Ltd.
- Recycle It Ltd.
- Renew Saint Lucia Ltd.
- Recycle Solutions Ltd.
- St. Lucia Distillers Group of Companies and
- St. Lucia Linen Services Ltd.

4. Findings

Findings obtained from interviews, questionnaires and observations undertaken during the months of September and October in the year of 2013 are presented.

4-1. The History of Recycling Activities

The history of the recycling business in Saint Lucia can be traced back from the early 1990s; Table 1 represents the year of commencement of operations for the twenty-one recyclers identified; there were five (5) recyclers or recycle related enterprises in the country during that time. Most recycling enterprises were established after the year 2000.

Table 1. Recyclers Identified and Year of Commencement of Operations

Recyclers	Year of Commencement
AH Communication Recycling Company Ltd.	1993-2008
Clay Products Ltd.	1993
St. Lucia Linen Services Ltd.	1994
St. Lucia Distillers Group of Companies	1995
Larry's Scrap Metal	1996
Renew Saint Lucia Ltd.	2001
Chemical Manufacturing & Investment Co. Ltd.	2005
D & D Recycle Ltd.	
Northern Recycling Centre	
Construction & Recycling Ltd.	2007
J Robinson General Contractor	
Mr. Gurprit Singh	
Power Engineering Services Ltd.	
Biohelps Ltd.	2008
Recycle Solutions Ltd.	
Recycle It Ltd.	2010
EMC2 - Electronic Material Cycling Company	2011-2013
Global Battery Recycling INC.	2012
Leon's Backhoe And Trucking Service	
Mr. Mikey Marcelle	
Mr. Sekou Reny	2013

4-2. Identification of Recyclers

The twenty-one (21) recyclers identified can be categorised into two groups namely collectors of waste materials for exports and collectors of waste materials for reuse or recycling on island (Table 2).

Among the sixteen (16) collectors of waste materials for export, thirteen (13) reported that they are registered businesses and three (3) of them are individual recyclers. They include

1. AH Communication Recycling Company Ltd.,
2. Biohelps Ltd.,
3. Construction & Recycling Ltd.,
4. D & D Recycle Ltd.,
5. EMC2 - Electronic Material Recycling Company,
6. Global Battery Recycling INC.,
7. J Robinson General Contractor,
8. Larry's Scrap Metal,
9. Leon's Backhoe And Trucking Service,
10. Northern Recycling Centre,
11. Recycle It Ltd.,
12. Renew Saint Lucia Ltd. and
13. Recycle Solutions Ltd. However,
14. Mr. Mikey Marcelle,
15. Mr. Sekou Reny,
16. Mr. Gurprit Singh

AH Communication Recycling Company Ltd. and EMC2 - Electronic Material Recycling Company are presently nonoperational due to the planned relocation of the facilities and financial issues. On the other hand, three (3) of the sixteen (16) recyclers operate as individual material collectors; they include Mr. Mikey Marcelle, Mr. Sekou Reny and Mr.Gurprit Singh.

The remaining five (5) out of twenty-one (21) recyclers are namely Chemical Manufacturing & Investment Co. Ltd., Clay Products Ltd., Power Engineering Services Ltd., St. Lucia Distillers Group of Companies and St. Lucia Linen Services Ltd. focus

on reusing and recycling the materials collected on island.

Table 2. Categories of Recyclers

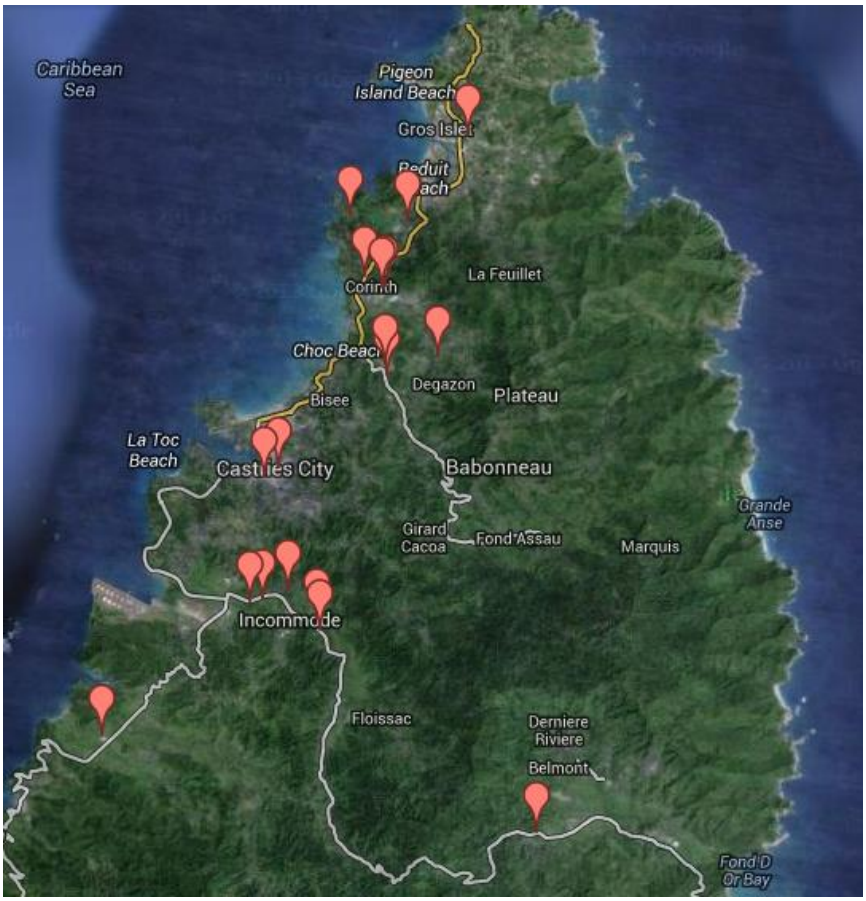
Collectors of Waste Material for Export	**Collectors of Waste Material for Reuse/ Recycling during Business Operations**
● Biohelps Ltd. ● Construction & Recycling Ltd. ● D & D Recycle Ltd. ● Global Battery Recycling INC. ● J Robinson General Contractor ● Larry's Scrap Metal ● Leon's Backhoe And Trucking Service ● Northern Recycling Centre ● Recycle It Ltd. ● Renew Saint Lucia Ltd. ● Recycle Solutions Ltd.	● Chemical Manufacturing & Investment Co. Ltd. ● Clay Products Ltd. ● Power Engineering Services Ltd. ● St. Lucia Distillers Group of Companies ● St. Lucia Linen Services Ltd.
Dormant Pending Relocation ● AH Communication Recycling Company Ltd. ● EMC2-Electronic Material Recycling Company	
Individuals ● Mr. Mikey Marcelle ● Mr. Sekou Reny ● Mr. Gurprit Singh	

4-3. Location of Recyclers

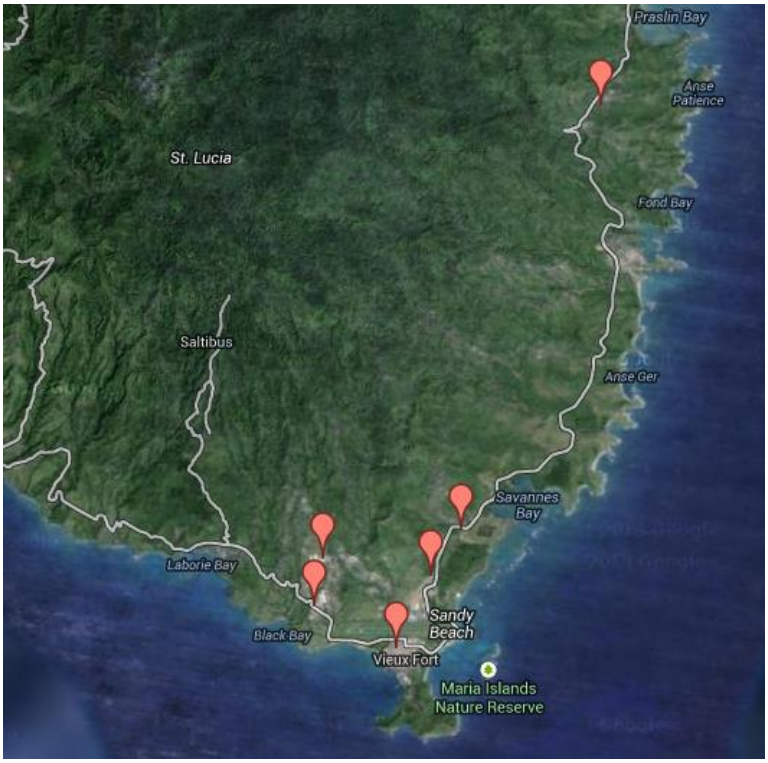
While twenty-one (21) recyclers were identified, twenty-four (24) recycling sites exist as some recyclers operate two recycling sites (Table 3, Map 1 and 2). Most sites are however located at the north-western and south-eastern area of Saint Lucia. Eighteen (18) of the recycling sites are located at the northern section of the island while six (6) recycling sites are located at the southern section of the island.

Table 3. Locations of Recyclers

	Recycler	Location
Northern area	Biohelps Ltd.	Grande Riviere, Glos Islet
	Construction & Recycling Ltd.	Castries City and Trouya
	D & D Recycle Ltd.	Cul de Sac
	Global Battery Recycling INC.	Castries City and Bois D'orange
	J Robinson General Contractor	Union
	Leon's Backhoe And Trucking Service	Bexon
	Northern Recycling Centre	Beausejour
	Recycle It Ltd.	Cul de Sac
	Renew Saint Lucia Ltd.	Deglos and Grande Riviere, Dennery
	Mr. Mikey Marcelle	Corinth
	Mr. Sekou Reny	Corinth
	Clay Products Ltd.	Ferrands, Cul de Sac
	Power Engineering Services Ltd.	Marisule
	St. Lucia Distillers Group of Companies	Roseau
	St. Lucia Linen Services Ltd.	Union
Southern area	J Robinson General Contractor	Beanfield, Vieux-Fort
	Larry's Scrap Metal	Vieux Fort Town and Aupicon
	Recycle Solutions Ltd.	St. Jude's Highway, Vieux Fort
	Mr. Gurprit Singh	Mon Repos
	Chemical Manufacturing & Investment Co. Ltd.	Cedar Heights, Vieux-Fort



Map 1. Recyclers: Northern Part of Saint Lucia



Map 2. Recyclers: Southern Part of Saint Lucia

4-4. Items Collected for Recycling

A variety of materials are being collected on the island. They include metals, plastics, paper/cardboard, glass, e-waste, batteries, waste oil (auto oil and cooking oil), tires and wooden pallets.

Metal includes material such as derelict vehicles, white goods, tin, steel containers and aluminium containers. It can also be classified as ferrous and non-ferrous. Categories of plastics vary and are usually assigned numbers 1 to 7. (see Appendix III)

Table 4. Materials Collected for Recycling

Metal	Plastic	paper/cardboard	Glass	E-waste	Waste oil
Derelict Vehicles Bulky waste / White Goods (Fridges, stoves, air conditioner) Tin/Steel containers Aluminium containers	HDPE (2) (cloudy white) Film plastic (2+4) Water/ beverage bottle PET(E) (1) Other PET(E) containers	Cardboard / boxboard Magazines / catalogues Office paper Newspaper Other miscellaneous paper	Glass bottle Clear glass Green glass Amber glass	Computer Personal computer TV	Auto oil Cooking oil Oil from Lucelec
			Tire	**Wood**	**Batteries**
<u>Ferrous</u> : Iron <u>Non-ferrous</u>: Brass Steel Lead Stainless steel Copper Aluminium	Green PET(E) Clear PET(E) PVC (3) LDPE (4) PP (5) PS (6) Mixed resins (7)		Tires	Wood pallets	Car battery Used lead-acid battery Small battery

Most materials are collected by a varying number of recyclers. Figure 2 displays the

number of recyclers involved in the recycling of the various materials identified.

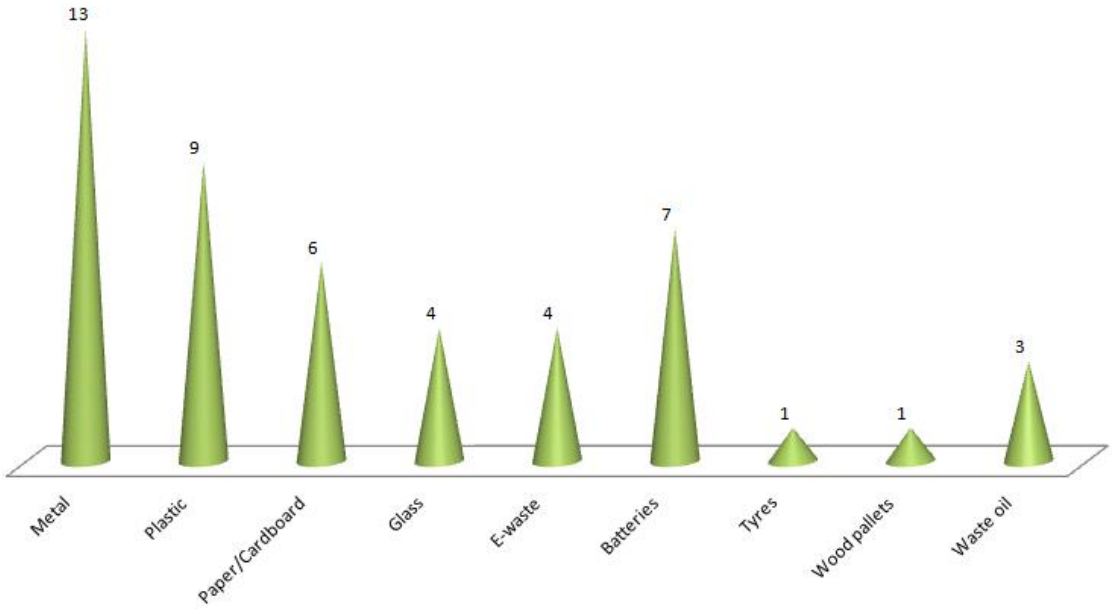


Figure2. Number of Recyclers Engaged in the Collection of Various Materials

Similarly, recyclers involved in the collection of materials do not focus on the collection of one type but instead collect several types of material. This is represented by table 5. Such an approach makes the business more worthwhile as the price of materials generally fluctuate on the international market.

Table 5. Materials Collected by the Various Recyclers

Companies / recycling material	Metal	Plastic	Paper/Cardboard	Glass	E-waste	Batteries	Tires	Wood pallets	Waste oil
Biohelps Ltd.	*	√	√						
Construction & Recycling Ltd.	√				√	√			
D & D Recycle Ltd.	√	√	√	√		√			
Global Battery Recycling INC.						√			
J Robinson General Contractor	√								
Larry's Scrap Metal	√								
Leon's Backhoe A Trucking Service	√					*			
Northern Recycling Centre	√	√	√			√			
Recycle It Ltd.	√	√	√	√	√	√	√		
Renew Saint Lucia Ltd.	√	√	√		√	√			
Recycle Solutions Ltd.	√	√	√	√				√	
Mr. Marcelle	√	√			√				
Mr. Reny	√	√							
Mr. Singh	√								
Chemical Manufacturing & Investment Co. Ltd.		√							
Clay Products Ltd.									√
Power Engineering Services Ltd.						√ *			
St. Lucia Distillers Group of Companies				√					√
St. Lucia Linen Services Ltd.									√

*Collect the item but give/sell it to other recyclers

4-5. Incentive/Payment Offered for Recyclable Materials

Most of the recyclers provide an incentive for materials supplied on the island; however the incentive is not provided for all materials. Glass, waste oil and wooden pallets do not attract incentives. Prices offered are generally similar but vary slightly from recycler to recycler. While the incentive given is mainly fixed; the price on the international market fluctuates. In the case of waste oil however an incentive is received for collection from the cruise ships. The incentives offered for the various materials can be viewed in the table below.

Table 6. Incentive Offered for Recyclable Materials

Recycling item	**Incentive**
Metal – Aluminium	0.5 - 1 EC / pound
Metal – Brass	1 - 2 EC / pound
Metal – Copper	2 - 3.5 EC / pound
Metal – Iron	100 - 200 EC / ton
Metal –Lead	1 - 1.5 EC / pound
Metal – Stainless steel	0.5 - 1 EC / pound
Metal – Steel	200 EC / ton
White goods	0.03 - 1 EC / pound
Plastic	0.1-0.2 EC / item or 1570 EC / ton or 5 EC / bag (45*56 inch)
Plastic bottles (originate from CHEMICO)	1 EC / 1 gallon bottle 0.5 EC / 0.5 gallon bottle 0.4 EC / 1 litre bottle 0.2 EC / 473 ml bottle
Cardboard	30 - 135 EC / ton
Battery	10 - 200 EC / item (depend of the battery's size)
Glass	X
Rum Glass bottles (originate from St. Lucia Distillers	0.5 EC / item (above 700 ml) 0.25 EC /item (below 700 ml)
Electronic waste	0.23 - 0.5 EC / pound or 250 EC / ton
Waste auto oil	X
Waste cooling oil	X
Wood pallet	X

4-6. Selling Price of Material and Costs of Processing

The selling price of material and the costs of processing were requested during the research. However not all the recyclers were willing to share this information with the researcher as it was treated as confidential.

4-7. Collection Sites and Sources of Recyclable Materials

There are presently no structured collection service and/or collection depots for recyclables instituted by the SLSWMA. Most recyclers move around and source materials from various individuals or collect when called upon by the public. Sixteen (16) of nineteen (19) active recyclers however demonstrated their willingness to travel around the island in order to collect more materials. Some suppliers also transport waste materials to the recycling sites. However, for smaller businesses particularly those with no transportation, waste materials could only be collected in the vicinity of the recycling site or the local community.

Few recyclers offer a regular and sustained collection service throughout the week. They include Biohelps Ltd., Renew St. Lucia Inc. and St. Lucia Linen Services Ltd.

- Biohelps Ltd. undertakes regular collection service every Friday in the north of the island. It targets 20 schools, in Gros-Islet, Babonneau and Bexon.
- Renew St. Lucia Inc. offers a regular collection service in Dennery and Environs, Praslin, Mon Repos, Micoud, Vieux Fort, Desruisseux, Bexon, Morne Siseau, Marchand, and the Graveyard. The company collects from the Dennery area on Mondays and Tuesdays. The collection service is offered to Vieux Fort, Micoud, and environs on Wednesdays. From Thursdays into the weekends the company deals with Castries to the Gros Islet area. However, the date can change according to the amount of recyclable waste available.
- St. Lucia Linen Services Ltd. collects waste oil from 5 different zones (island divided into 5 zones for the purposes of collection). Each zone is serviced once a week.

Materials are sourced from a wide cross section of the public. The major sources of

recyclable materials are as follows: households, schools, supermarkets, shopping malls, shops, hair salons, restaurants, printing companies, banks, hotels, garages, auto companies, LUCELEC, electronic contractors, government offices, cruise ships, building construction sites, industry sites, waste construction sites and landfills.

4-8. Processing Procedures and Logistics Prior to Export

Twelve (12) out of the fourteen (14) recyclers who presently collect materials for export have procured equipment to assist with the management of the material prior to export (Tables 7 and 8). Moreover, eleven (11) of the fourteen (14) recyclers own transportation which facilitates the collection of material from suppliers. One recycler has gone into an agreement with another recycler with respect to the use of a crusher whenever needed. Balers were identified to be used for materials such as cardboard, plastics, and metal. Moreover, the frequency of use of machines and equipment depends on the availability of recyclable material. A more detailed representation of the equipment available on island is listed in Tables 7 and 8.

Table 7. Recycling Machine /Equipment (Recyclers who Export Materials)

Machine / Equipment	Number of recycler who own the machine / equipment	Total number of machine /equipment
Baler	6	9
Backhoe	2	2
Compactor	2	2
Crusher machine	2	3
Excavator	1	1
Forklifts	2	3
Pickup truck	4	5
Trawler truck	1	1
Truck	10	21
Cutting saw	8	X
Torch	5	X

Table 8. The Number of Machines and Equipment Used by Recyclers

	Baler	Backhoe	Compactor	Crusher machine	Excavator	Forklifts	Pickup truck	Trawler truck	Truck
Biohelps Ltd.	1		1			2			3
Construction & Recycling Ltd.							1		2
D & D Recycle Ltd.	2								4
Global Battery Recycling INC.							1		
J Robinson General Contractor		1							1
Larry's Scrap Metal									2
Leon's Backhoe And Trucking Service		1						1	1
Northern Recycling Centre	2					1	1		1
Recycle It Ltd.	1			2					3
Renew Saint Lucia Ltd.	1		1		1		2		3
Recycle Solutions Ltd.	2			1					
Mr. Singh									1

Recyclers who conduct recycling on the island, deal with plastic, glass bottles and waste oil. Those recyclers own specialized machines/equipment which facilitates the process. Machines /equipment available for recycling in the country are listed below.

Table 9. Recycling Machine/Equipment (Recycler Deals with Material Locally)

Machine / Equipment	Number of recycler who own the machine / equipment	Total number of machine /equipment
Crusher machine for plastic bottle	1	1
Battery rebuild equipment	1	2
Glass bottle wash machine	2	2
Oil truck	3	3
Oil separator	1	2
Oil tanks	3	225,200 gallon storage tank

For the export type recyclers, all material collected is processed prior to export. Most of the time, materials are sorted, cleaned, stored, baled, packaged and loaded into containers at the recycling sites and shipped out either from Castries or Vieux Fort seaports. Containers are also loaded away from the recycling site if quantities are sufficient and then transported directly from the location to the sea port for shipping. Materials are shipped to countries such as China, Dubai, England, India, Israel, Jamaica, Japan, Puerto Rica, Singapore, Taiwan (R. O. C.), Thailand, United States, Venezuela and Vietnam.

Recycle Solutions Ltd. Operates differently from other exporters of waste materials. It is contracted to oversee waste management at the Windward and Leeward Brewery. The agreement makes provision for the collection of materials for recycling. Glass is shipped back to the bottle producing companies in Panama, Costa Rica or Trinidad for production of new bottles. Other materials e.g. cardboard and plastics collected from the company are shipped and sold to other countries. Moreover, Windward and Leeward Brewery Ltd. also undertakes a bottle reuse system. Another glass recycler is St. Lucia Distillers Group of Companies, but the company only collects rum glass bottles in good condition for reuse in their operations.

Recyclers who conduct recycling on the island, engage in the collection of plastics, glass bottles and waste oil. Collection is either undertaken all over the island or a refund is offered to those who return plastics and glass bottles originating from the local business. The following table highlights the logistics of locally recycled material on the island.

Table 10. Logistics of Locally Recycled Material

Recycler		Logistic	Use of Collected Material
Plastic bottle	Chemical Manufacturing & Investment Co. Ltd.	Buys back bottles from individuals. Bottles are received at the factory. All bottles are cleaned for reuse or reproduced into new bottles.	Bottles in good condition are re-filled. Damaged bottles are shredded into small pieces and used as material for reproducing new bottles.
		The company also provides a re-fill service in various communities.	
Waste oil	Clay Products Ltd.	Collects waste auto oil from companies and garages and then stores at the site.	Used as fuel for making clay products.
	St. Lucia Linen Services Ltd.	Collects waste auto oil from Lucelec, cruise ships, garages and landfill and stores it on compound belonging to the company.	Used as fuel for generating heat and steam for the commercial laundry.
		Collects waste cooking oil from households and restaurants.	Produces bio-diesel. Uses it as fuel for company's vehicles.
Glass	St. Lucia Distillers Group of Companies	Waste cooking oil mainly collected from cruise ships.	Uses it as fuel for generating heat for rum production.
		Company buys back the rum glass bottles. All bottles are cleaned and re-filled with rum.	Re-filled with rum.
Battery	Power Engineering Services Ltd.	Company collects batteries from auto dealers and garages. All the batteries are re-built and sold. However, approximately 40% of the batteries cannot be re-built. These batteries are sold or swapped for those which can be rebuilt.	Re-built and sold.

4-10. Management of Onsite Waste

Not all the recycling businesses generate onsite waste because all material collected is sold. Any onsite waste generated is transported by recyclers to either the Deglos Sanitary Landfill or the Vieux-Fort Solid Waste Management Facility. In some other cases the onsite waste is discarded together with household waste.

4-11. Recyclable Material Exported

Twelve of the fourteen active recyclers (two have no experience in the exportation of materials) are involved in the export of materials to other countries. Table 11 shows the approximate number of containers of recyclable material exported monthly.

Table 11. Containers and Weight Exported by Recyclers Monthly

Material	Total containers per month	Total weight(tons) per month	Number of recyclers
Metal	25.7-31	483-653	9
Cardboard	4.3-5.3	86-106	4
Battery	1.8-2.5	34.5-51.5	3
Plastic	2	40-46	2
Glass	1.5	22	1
E-waste	0.6	10.2-13.8	2
Mix material	2	40	2

According to the information, metal which includes ferrous and non-ferrous material is the most widely exported. Cardboard and batteries are the second and third highest recyclables exported; however they are much smaller than the amount of metal exported. Although the plastic production and collection is high in the country, plastic is rarely exported due to the low price on the international market. Recyclers reported that there is hardly any profit associated with the sale of plastic. Most of the recyclers of plastics have not exported the plastic collected, even though the amount is sufficient for shipping as they await the opportunity for a higher market price. Glass, E-waste and mixed materials (usually ferrous materials mix with non-ferrous materials or metal mixed with e-waste) are the least exported.

On the other hand, the recyclers who deal with material locally collect waste oil, plastic, glass bottles and batteries. The quantity collected is shown in Table 12.

Table 12. Material Recycled/Reused Locally

Material	Total amount per month	Number of recyclers
Waste auto oil	15,246 gallon 30,024 gallon (tourist season)	3
Waste cooking oil	1,823 gallon	1
Plastic bottles (from Chemical Manufacturing & Investment Co. Ltd.)	16 oz bottle: 585 bottles 24 oz bottle: 149 bottles 32 oz bottle: 386 bottles 64 oz bottle: 233 bottles 128 oz bottle: 1,459 bottles Totals : 2,812 bottles	1
Rum bottles (St. Lucia Distillers)	Information unavailable	1
Batteries	160 batteries are collected and about 96 batteries can be re-build monthly	1

4-12. Potential Plan for Expansion

Most of the recyclers plan to expand business in the future. Following is a summary of the plans.

- Increase in type and volume of materials collected
- Expansion of collection areas
- Collaboration with other recyclers and enlisting business partners
- Purchase of new equipment, machines and transportation
- Expansion or relocation of the recycling site (rental or purchase of land or warehouse space)
- Upgrade of recycling sites e.g. build shelters, erect fences, office space, upgrade of electrical system
- Sort materials into different categories for better selling price
- Expansion of the business abroad
- Greater collaboration with SLSWMA

- One company (Chemical Manufacturing & Investment Co. Ltd.) intends to introduce products which are highly concentrated and packaged in smaller bottles thereby generating less plastic containers.

However, some recyclers indicate that although plans are under consideration, they are unable to implement at this time due to competition associated with other local recyclers and scarcity of material on island.

4-13. Challenges Faced by the Recycling Business

Challenges experienced by the recycling industry in Saint Lucia are summarized below.

Financial Challenges

- People are not willing to pay for the collection service
- Everything in the county has become more expensive (e.g. VAT) resulting in an increase in operational costs, however the incentive is fixed on the island
- Some recyclers are unable to provide incentives
- Recyclers are unable to guarantee expansion and regular collection of recyclables
- Local suppliers of recyclables are demanding higher payment/incentive from recycler even when the material is not worth it

Recycling Facility

- Suitable equipment unavailable to deal with recyclables
- Inadequate facilities such as shelters, fencing, office space and electricity for recycling activities
- Lack of vehicles for transportation of materials

Sensitization and Awareness

- The sorting/recycling behaviour is not developed among the public
- Public is not aware of recycling activities on island
- People are not aware that local recyclable products are better for the environment therefore continue buying cheaper imported products.

Business Development and Competition

- Finding good overseas buyer with good price is challenging
- People or workers steal material from the site and sell it to other recyclers or back to the original recycler
- Competition among recyclers involved in the business
- Unprofessional recyclers make the business more difficult. For example they offer unreasonable incentives which make the business unsustainable for themselves and other recyclers.
- Materials may not be readily available not only inside the country but also internationally. For example, waste auto oil from cruise ships is collected not only in Saint Lucia but also other countries in the Caribbean.
- Training of staff involved in recycling

Recyclers Issues as it pertains to the SLSWMA

- Problem with weighbridge service e.g. issue with charge for weighbridge service or sometimes the service is not allowed
- Opportunity to buy material from the landfill either nonexistent or rare
- SLSWMA only provides recyclable materials to selected recyclers
- No incentive received from government for the service which cleans up the environment
- Standards/Procedures with respect to conducting sale of materials e.g. customer service, transparency in the conduct of buying and selling, ownership of materials

4-14. Areas for Possible Collaboration, Assistance and Support

Based on the potential plans for expansion and challenges faced by recyclers suggestions were offered for the improvement of recycling on the island. The suggestions are summarized below.

Financial Support

- Provision of incentives, duty free concessions and financial support
- Free weighing service at the landfills
- Provision of car/metal crushing service to recyclers

- Assistance with purchase of adequate recycling equipment
- Provide government owned land (crown lands) for recycling

Support from SLWSMA

- Establishment of a national recycling centres/collection depots
- Collaboration with SLSWMA to enhance better management of the industry. For example, providing information about the sources of recyclable materials on island
- Equal opportunity for buying/receiving material from the landfill
- Collection points/depots set up/established in public area
- Allowing recyclers to collect recyclable waste from public events/activities
- Provision of transportation/collection service for recyclable materials.
- Schedule collection days for recyclable materials

Education and Technical Assistance

- Environmental education regarding recycling and recycling activities on the island
- Provide information about material buyers to recyclers
- Provide industry consultant and support

Legislation and Regulation

- Development and implementation of regulations that force people and businesses to undertake recycling and sorting of recyclable materials
- Ban of disposal of recyclable waste at the landfills
- Introduce licensing for recyclable waste collection. Prevent unprofessional recyclers from disrupting the local market price.
- Setting up regulation/standard/structure for the operation of recycling facilities

Recyclers

- Collaboration among recyclers

5. Discussion and Suggestion

Based on the findings many types waste materials generated on the island can be collected for recycling. These include metal, plastics, paper/cardboard, glass, e-waste, used lead acid batteries, waste oil (auto oil and cooking oil), tires and wooden pallets. Along with the

recyclers, the SLSWMA, stakeholders and the strengthening of the recycling industry, the researcher believes that the quantity of waste which goes to landfill could decrease by approximately 44 % leaving only organics, textile, special care waste and construction & demolition waste and other categories to be discarded at the landfill.

5-1. Status of Materials Recycling

The study identified nine (9) recyclers involved in the collection of plastics. Approximately two namely: Recycle It Ltd. and D & D Recycle Ltd. export plastics. One (1) i.e. reuses/recycles the plastic in the operations of his business (Chemical Manufacturing & Investment Co. Ltd.). The balance store the plastic until the price on the market improves. Plastic recyclers indicated that the market price of plastic is very low and almost non profitable. With twenty two percent (22%) of waste in landfills being plastic (SLSWMA, 2008), the researcher suggests that solutions to this situation to be explored e.g. implementation of the returnable containers bill if more plastic material is to be gathered and recycled.

The recycling and reuse model utilized by Chemical Manufacturing & Investment Co. Ltd. is feasible and practical. It is recommended that this model be promoted to other businesses.

Power Engineering Services Ltd. treats waste batteries through a rebuild/reuse battery process. Other battery recyclers could collaborate with the company in order to salvage as many batteries as possible for the benefit of a better environment in Saint Lucia.

Waste oil collection and reuse are actively pursued on the island, especially the collection of waste auto oil. Collection/recycling of waste cooking oil could therefore be promoted more actively to the public, restaurants and food processing industry.

Four (4) recyclers namely Recycle It Ltd., D&D Recycle Ltd., Recycle Solutions Ltd. and St. Lucia Distillers Group of Companies deal with glass recycling. Two, namely Recycle Solutions Ltd. and St. Lucia Distillers Group of Companies deal only with the glass bottles

originating from their companies while the others Recycle It Ltd. reuses the glass material locally and D&D Recycle Ltd. stores glass or gives it to other recyclers. Considering that approximately seven percent (7 %) of the waste received at landfills is glass (SLSWMA, 2008) greater recycling of glass needs to be explored if more glass material is to be recycled.

E-waste is collected by four recyclers namely Recycle It Ltd., Construction and Recycling Ltd., Renew St. Lucia Inc. and Mr. Mikey Marcelle. Three recyclers export the material at the moment. The researcher is uncertain how much e-waste is produced on the island but compared to other material, the quantity of E-waste recycled is relatively low (refer to table 12).

Recycling of metal is actively pursued on the island. Actually, it is the most widely recycled material on island in comparison to other materials (refer to table 12). This is largely due to the price on the international market. In comparison, other materials occur in larger percentages in the landfills. It is recommended that consideration be given to improving the recycling of other materials found to occur in larger percentages at the nations landfills.

Despite 45% of the waste received at landfills being organics (SLSWMA, 2008), there is presently no recognized recycler of organic material in the country. Attempts are however on the way by the Belle-Vue Farmers Cooperative to develop a facility while a few persons do undertake some form of composting at the household level.

Paper/cardboard is the second highest recyclable material recycled in Saint Lucia (Table 12). It is also the second highest recyclable material presently recycled on island received at the landfills (Figure 1). Six (6) recyclers deal with paper/cardboard material. Four (4) of them export the material. The other two (2) are still awaiting shipping arrangements. With paper/cardboard accounting for approximately 10% of solid waste reaching the landfills (SLSWMA 2008), improved arrangements for the recycling of paper/cardboard would contribute to a decrease in quantities received at both landfills.

Given that businesses/individuals are involved in the recycling of paper/cardboard, metal, glass, and plastics any strengthening of the activity could result in approximately 44% of solid waste being diverted away from the landfills. A further development of the organic waste recycling sector could redound to another 45% diversion based on the waste characterization study (2008). It is recommended that SLSWMA work closer with the recyclers to reduce the amount of waste on the island and prolong the lifespan of the landfills.

5-2. Management of Recycling Sites

From site visits and interaction with recyclers, most recyclers have access to buildings and space available for their recycling activities. The number of machines and equipment used for recycling purposes seem to be managed well by most of the recyclers, yet for some others funding for the purchase of new machines and equipment could be an issue. However, there are still some areas that can be improved. They include cleanliness of the site, sorting areas for materials, pollution prevention measures especially for hazardous waste such as batteries and handling of asbestos as onsite waste as well as adequate shelter for materials. Furthermore, health and safety of workers, training and management of onsite waste are recommended for consideration. Regulations are therefore necessary for the operations of recycling sites/facilities if a satisfactory standard is to be attained by all.

5-3. Business Development and Challenges

Most of the recyclers are planning the expansion of the business, especially with respect to materials collections, recycling site improvement, collaboration with other recyclers and with SLSWMA. However, finance could be a challenge for the expansion of some businesses. Due to the increasing cost of operations and higher incentives requested by suppliers, expansion efforts could be hindered. Increasing costs would negatively impact the provision of a regular and sustainable collection service, the adequacy of storage facilities and procurement of equipment. These in turn affect the quality and quantity of materials exported for recycling and as such may require some form of assistance if a

reliable service and shipping standards are to be maintained.

Competition among recyclers can hinder business development for all. Moreover, less professional recyclers increase the challenges for other recyclers. The suggestion therefore is greater understanding and collaboration among recyclers or even the establishment of a guild/union/association of recyclers.

The researcher recommends that issues highlighted by recyclers as it pertains to the SLSWMA be carefully looked at and avenues for possible solutions be considered in conjunction with the recyclers. Both parties are encouraged to work together as a team to create a cleaner and better environment for Saint Lucia.

5-4. Areas for Collaboration, Assistance and Support

Suggestions by recyclers were highlighted earlier in the document (Chapter 4-14). The researcher recommends that SLSWMA and related organizations discuss and consider whether the suggestions made are possible to execute. However, in order to create a better environment for recycling, regulation of recycling for both the public and recyclers as well as awareness building require immediate consideration.

5-5. Recycling Awareness and Promotion

From this survey we realize that there are many recyclers actively involved in recycling on the island. Nevertheless, one of the issues frequently raised was the absence of public awareness on recycling in Saint Lucia. The poor awareness of recycling results in little or no participation in recycling activities presently undertaken on island. Secondly, people who have attained some level of awareness and are interested do not know where to recycle their materials. Therefore, the promotion of when, where and how to recycle becomes very important considering the present situation.

Moreover greater promotion of bottle refund programmes which facilitate the reuse/recycling of containers generated after the use of locally manufactured products is

encouraged. Additionally encouraging the public to purchase locally produced products given that waste materials generated from their consumption could be reused/recycled could augur well for the improvement of the quality of the environment. Recycling awareness is required if the public is to become an integral part of the activity; Public awareness and participation can reduce the work load and cost to recyclers and increase the efficiency of the collection and recycling service.

However, it is recommended that most if not all recyclers operate at a minimum acceptable standard developed in collaboration with all stakeholders and implemented and monitored by the SLSWMA prior to the implementation of a full-fledged recycling awareness programme in order to safeguard any negative environment impacts that may arise as well as the image of the SLSWMA.

5-6. Future Study and Research

According to the survey findings, recycling activities started in the early 1990s and increased dramatically after 2000. However, due to the limited availability of documented information, there may be other recycling activities in the country which the researcher did not identity during the survey.

This document possibly the first study of recyclers in Saint Lucia highlights basic information about recycling on the island. The researcher suggests that a related and follow up study be implemented as recycling strengthens and develops on the island.

Although most of the recyclers indicate that the collection service is island wide, yet most of the recycling sites are located north-west and south-east of the island. Further study and investigation of the south-west of the island is recommended in order to determine whether any recycling activity exists. Moreover, in the south-eastern area, only recyclers of metal provide a collection service; the other two recyclers, Recycle Solutions Ltd. and Chemical Manufacturing & Investment Co. Ltd. deal specifically with waste material generated from their businesses or associated businesses. Therefore, studies of different areas of Saint

Lucia, such as south-west area, regarding recycling behaviour can be looked at in future studies.

It is difficult to tell the percentage and the total quantity of waste which through recyclers has been diverted away from landfills every year since the 1990s, due to the absence of records at the Authority. However, the researcher recommends that a future study focus on this aspect and facilitate the recording of present and future data.

6. Conclusion

This survey has provided a snapshot of recycling on Saint Lucia. Information about each recycling enterprise/individual with respect to items recycled, location, management and challenges are provided. Meanwhile, suggestions for possible collaboration and support from SLSWMA and related organizations are also provided.

The study identified twenty one (21) recyclers; two (2) presently dormant, five (5) involved in the collection of waste material for reuse/recycling on island and fourteen (14) involved in the collection of materials for export. Many materials are collected on the island. They are either exported or recycled inside the country to a lesser extent. The items recycled include metals, plastics, paper/cardboard, glass, e-waste, waste oil, tires, wooden pallets and batteries.

Recycling sites are not evenly spread over the island. Approximately three quarters are located in the north of the island and the remaining quarter in the south. Most recyclers offer an incentive for the materials collected. Incentives are not offered for all materials nor are all recyclers able to offer or sustain an incentive programme. Recyclers are willing to offer a collection service for the materials generated by the various publics but are unable to guarantee a sustainable regular collection service. They do however collect throughout the island wherever sources are identified. Some members of the public also deliver to the recycling sites.

Most recyclers own specialized equipment which enhances their operations. Equipment is

however unavailable to some recyclers. With respect to markets, Asian markets appear to dominate followed by European to a lesser extent. Metal is the most widely exported. While large quantities of plastics are collected they fetch a very low price on the international market and are kept in storage until a better price is available.

The recycling industry like any other industry faces many challenges which hinders progress and could jeopardize the sustainability of the industry. Low market prices, high operational costs, non existence of recycling awareness and promotion, financial constraints, low level of governmental support for recycling activities are all contributing factors. Moreover, there are no recycling standards and regulations for both recyclers and the public.

It is evident from the findings that collaboration between government (SLSWMA) and recyclers is key to the success of the industry if it is to significantly contribute to a reduction in waste reaching landfills. Some form of support and assistance designed to strengthen the sector is necessary. Recycling standards and regulations are necessary if recyclers are to improve their recycling activities and if the public is to practice recycling. Promotion of the industry requires serious consideration. In order to promote recycling then, environmental education needs to be undertaken particularly with respect to the when, how and where to recycle locally.

Additionally, related studies should be undertaken in the future geared towards improving the situation and for serving as reference for related organizations to make important decisions.

In conclusion, the researcher hopes that this study provides guidance that will assist with the goal of prolonging the lifespan of the landfills as there is now greater understanding of recycling in the country of Saint Lucia.

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Appendix

Appendix I: Recyclers Assessment/Audit Proforma

Recyclers Assessment/Audit Proforma

Date of data collection:

Business Name		
Business Location		
Business owner(s)		
Business partner(s)		
Contact person		
Contact information	Phone	
	Fax	
	Email	
	Postal Address	
Month and year started		
Area of recycling site		
Storage capacity		

Items collected/recycled	**Incentive/payment for return of item**	**Selling price of material**

Collection points/depots

Source of material collected (Household, schools, companies, Government offices etc.)

Processing procedures prior to export / machine used & used frequency

Items collected/recycled	**Wash**	**Baled**	**Shredded**	**Crushed**	**Compressed**	**Cut/Slice**	**Other (Please specify)**

Logistics of the recycling material

Management of onsite waste (liquid/solid waste)	
Items collected/recycled	**Quantity Received (kg) /shipped & Shipping frequency**
Costs of processing (handling, sorting, cleaning/washing, stripping and other processing, conversion to final product, packing and storing, transportation [fuel], shipping, employment etc.)	
Export port	
Export countries	
Potential/plan for expansion	
Challenges	
Areas for possible collaboration / Assistance / Support	

Appendix II: List of Recycling Enterprises

List of Recycling Enterprises

Enterprise	Email	Contact person	Number
Biohelps Ltd.	bio-helps@hotmail.com	Hilary Morgan	285-7386 452-4120
Construction & Recycling Ltd.	albertonrichelieu@gmail.com	Alberton Richelieu	452-4515 458-2514 284-1434
D&D Recycle Ltd.	brownsugar_393@hotmail.com slim60@live.com	David Gayle Ania Alexander	584-8630 518-9622 712-8748
Global Battery Recycling INC.	globalbatteryrecycling@gamil.com	Benhamin Collymore	451-3134 719-8334
J Robinson General Contractor	deryckrobinson@yahoo.com	Junior Robinson	719-3604
Larry's Scrap Metal	bongbang_3@hotmail.com	Larry Cadette	712-5201 722-3535
Leon's Backhoe, A Trucking Service	leontransport@hotmail.com	Aaron & Joseph Leon	719-6923
Northern Recycling Centre	angelisaac49@ymail.com	Angel Isaac	286-5330
Recycle It Ltd.	recycle@candw.lc josephat2@candw.lc	Josaphat Small	451-5263 459-0273 486-7704 714-4790
Renew St. Lucia Ltd.	lynch204@hotmail.com	Cornellius Lynch Collins Lynch	453-3382 720-7462 718-1511 453-8396 (F)
Recycle Solutions Ltd.	frankflood05@yahoo.com	Frank Flood	720-7915 454-3411 459-6200
Mr. Mikey Marcelle	x	Mikey Marcelle	722-1636
Mr. Sekou Remy	Jah2wayne@hotmail.com	Sekou Reny	717-7234
Mr.Gurprit Singh	luciansingh20@yahoo.com	Mr. Singh	712-0549
Chemical Manufacturing & Investment Co. Ltd.	info@chemicoslu.com	Celma Peter	454-6133 454-9115
Clay Products Ltd.	info@claycaribbean.com	Steven Antoine	451-5675 715-6455
Power Engineering Services	service@powerengineeringservices.org	Urban Preville	450-8600
St. Lucia Distillers Group of Companies	lennox.wilson@saintluciarums.com roger.miller@saintluciarums.com wilson.sifflet@saintluciarums.com	Lennox Wilson Roger Miller Wilson Sifflet	456-3118 456-3100
St. Lucia Linen Services Ltd.	kenty00@hotmail.com maintain@stlucialinen.com	Kent Desir Garnet Laurent	719-9273 719-9280

Appendix III: Description of Plastic and Metal Recyclable Materials

Plastic

#1: PETE or PET Most often called PET, #1 bottles are made of polyethylene terephthalate. This plastic is most commonly used for water and soda bottles, peanut butter and other food jars, and such. Only about 20% of these containers are recycled; they can be made into polar fleece, carpet, new containers and more. These are the plastics most commonly picked up by curbside recycling programs.

#2: High Density Polyethylene (HDPE) HDPE is a very versatile plastic that is used in a variety of products. HDPE is used for thin products such as milk jugs and juice bottles, butter and yogurt tubs, cereal box bags, sandwich bags, shopping bags and garbage bags, among other things. #2 plastics are commonly picked up with curbside recycling and can be recycled into new bottles, floor tile, drainage pipe, lumber, fencing and more.

#3: Vinyl or PVC These bottles are most often used for storing cleaners and detergents, as well as plumbing pipes, but can also be found in some medical products, siding, building windows and more. #3 plastic is rarely recycled, but some facilities will take it to be recycled into siding or lumber products. Heating PVC releases many toxins, thus they cannot be burned and melting must be highly controlled.

#4: Low Density Polyethylene (LDPE) These plastics are usually thin and pliable, and are used for shopping bags, squeezable bottles, frozen food containers, clothing, furniture and more. These plastics are rarely recycled, though more facilities are starting to accept them.

#5: Polypropylene (PP) Most commonly found in some condiment bottles, as well medicine bottles and straws, PP plastics can be recycled into brushes, battery cables, and a huge variety of materials. However, they have rarely been accepted by most recycling facilities.

#6: Polystyrene (PS) Most commonly used in foam cups, plates, egg cartons and carry-out containers, PS plastics can be recycled into insulation, among other things, but rarely are. Recent research has suggested that this plastic can leach toxins into food when heated, so some companies are moving away from this product for food containers.

#7: Miscellaneous This category basically refers to a variety of plastics (from sunglasses to water bottles) that do not fit into other categories. These are very rarely recycled.

Information from: Green Business Bureau (2011) Recycling Plastic: Understanding the Grades, from 1-7 [Online] Available at: http://www.gbb.org/news/recycling-plastic-understanding-the-grades-from-1-7 [Accessed on 26th of November 2013].

Metal

Ferrous metals include mild steel, carbon steel, stainless steel, cast iron, and wrought iron. These metals are primarily used for their tensile strength and durability, especially mild steel which helps hold up the tallest skyscrapers and the longest bridges in the world. Ferrous metals can also be found in housing construction, industrial containers, large-scale piping, automobiles, rails for railroad and transportation, most of tools and hardware in use around the house, such as knives are made with ferrous metal.

Due to the high amounts of carbon used when creating them, most ferrous metals and alloys are vulnerable to rust when exposed to the elements. While this is not true of wrought iron, which is so iron pure that it resists oxidization, or stainless steel, which is protected thanks to its high chromium content, it's a good rule of thumb that if rust is seen, it's a ferrous metal.

Non-ferrous metals include aluminium, brass, copper, nickel, tin, lead, and zinc, as well as precious metals like gold and silver. While non-ferrous metals can provide strength, they are primarily used where their differences from ferrous metals can provide an advantage.

For instance, non-ferrous metals are much more malleable than ferrous metals. Non-ferrous metals are also much lighter, making them well-suited for use where strength is needed, but weight is a factor, such as in the aircraft or canning industries. Because they contain no iron, non-ferrous metals have a higher resistance to rust and corrosion, which are the reasons these materials are in use for gutters, water pipes, roofing, and road signs. Finally, they are also non-magnetic, which makes them perfect for use in small electronics and as electrical wiring.

Information from: Alton Materials (2013) The differences between ferrous and non-ferrous scrap metal [Online] Available at:
http://www.altonmaterials.com/the-differences-between-ferrous-and-non-ferrous-scrap-metal/ [Accessed on 26th of November 2013].