

E-waste management policy and regulatory framework for Saint Lucia

Project
ITU-SSA No. 12843



February 6, 2017



Telecommunications Management Group, Inc.

1600 Wilson Blvd, Suite 710

Arlington, Virginia 22209 USA

TEL + 1 (703) 224 1501 • FAX + 1 (703) 224 1511

www.tmgtelecom.com

E-waste management policy and regulatory framework for Saint Lucia

Project ITU-SSA No. 12843

This case study was prepared by Juan Manuel Roldan, Senior Technical and Economic Advisor at Telecommunications Management Group, Inc.

The author wishes to thank the Ministry of the Public Service, Information and Broadcasting of Saint Lucia, Mr. Cleveland Thomas, Area Representative, International Telecommunications Union (ITU) Area Office for the Caribbean, and anonymous reviewers, for their assistance and useful comments in the preparation of this report; and Andrew Joseph for research assistance.

The views expressed in this paper are those of the author and do not necessarily reflect the views of the government of Saint Lucia or the ITU.

February 6, 2017.

Contents

Executive Summary	6
Objective of the report.....	6
Main findings.....	6
Recommendations	8
E-waste definition	8
Strategy to develop an e-waste management system.....	9
Financing model	10
Education and awareness.....	10
Monitoring and licensing.....	11
Transboundary flow of e-waste	11
1. E-waste in Saint Lucia	13
1.1. E-waste value chain in Saint Lucia	13
1.2. E-waste regulation in Saint Lucia.....	15
1.3. Interviews to e-waste stakeholders in Saint Lucia.....	16
1.3.1. Government.....	17
1.3.2. Recyclers	18
2. Information available in Saint Lucia.....	18
2.1. Computers.....	19
2.1.1. Census Report 2010	19
2.1.2. Imports.....	21
2.2. TV sets.....	22
2.2.1. Census Report 2010	22
2.2.2. Imports.....	24
2.3. Mobile phones	24
2.3.1. Census Report 2010	24
2.3.2. International Telecommunication Union data	26
2.3.3. Imports.....	27
3. E-waste forecast for Saint Lucia.....	27
3.1. Mobile phones	29
3.2. Computers.....	31

3.3.	Television sets.....	33
3.4.	Transition to digital terrestrial television	35
3.5.	Summary.....	36
4.	E-waste Policy framework for Saint Lucia.....	37
4.1.	E-waste definition	37
4.1.1.	Broad Definition.....	37
4.1.2.	Narrow Definition	38
4.1.3.	Additional definitions.....	39
4.1.4.	Recommendation.....	40
4.2.	Strategy to develop an e-waste take-back system	42
4.2.1.	TPO-centric	43
4.2.2.	Government-centric.....	45
4.2.3.	Recommendation.....	47
4.3.	Financing models	48
4.3.1.	Society.....	48
4.3.2.	Consumers	49
4.3.3.	Producers/importers.....	49
4.3.4.	Recommendation.....	50
4.4.	Recommendations on education and awareness.....	50
4.4.1.	EEE retailers	50
4.4.2.	SLSMWA.....	51
4.4.3.	Government entities.....	51
4.4.4.	Radio and TV advertisement.....	51
4.5.	Recommendation on e-waste collection and storage	52
4.5.1.	Permanent drop-off locations.....	52
4.5.2.	Drop-off events	52
4.5.3.	Door-to-door pick-up.....	52
4.5.4.	Storage	53
4.6.	Monitoring and licensing	54
4.6.1.	Recommendations on Monitoring.....	54
4.6.2.	Recommendation on licensing.....	56

4.7. Transboundary flow of e-waste56
Annex 1: Definition of EEE according to the Harmonized Commodity Description and Coding System58
Annex 2: Population forecast59

Executive Summary

Objective of the report

Pursuant to the terms of reference for this project, the objective of this report is to design an e-waste policy and regulatory framework for St. Lucia in two phases. Phase one will include an assessment of current e-waste treatment and a forecast of e-waste volumes and values, and phase two will focus on e-waste management policies and the regulatory framework, which will include a:

- Definition of e-waste
- Strategy to implement a responsible e-waste management system
- Identification of activities and responsibilities of each of the stakeholders, both private and public, involved in the e-waste management system
- Financing model for the e-waste management system
- Monitoring strategies to oversee the progress and implementation of the e-waste management system

E-waste for this project will include waste from electric and electronic equipment based on mobile phones, computers, and TV sets.

Main findings

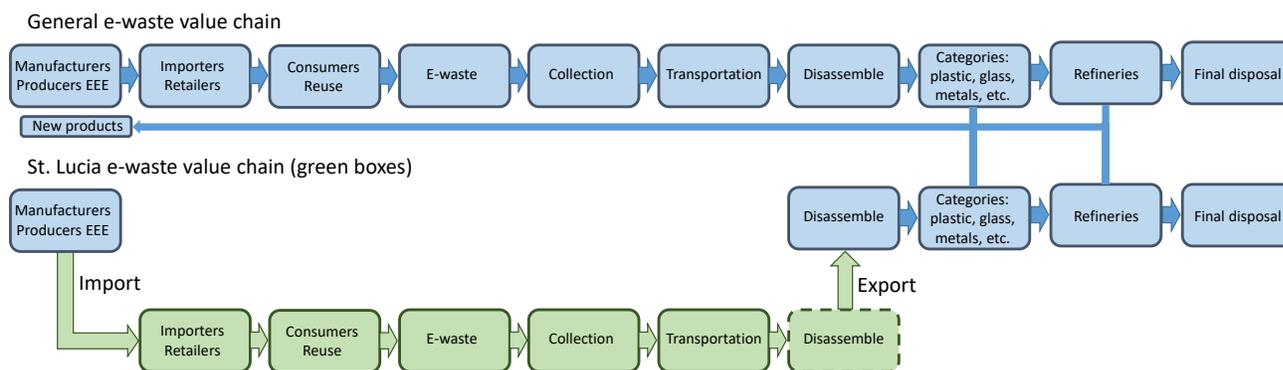
St. Lucia's e-waste management system is poorly developed. Currently, there are four e-waste recyclers in St. Lucia that collect and export e-waste without recycling it, *i.e.*, most of the time they pack e-waste as they receive it and export it to overseas refineries, mainly in China and Canada.¹ The Basel Convention, which St. Lucia adopted in 1994, requires that e-waste be sent to legally established e-waste recycling companies and refineries overseas, in order to comply with international regulations.² Some e-waste is manually disassembled with common tools, but no specialised machinery is used to shred, impact, and fragment or granulate e-waste parts. Thus, the e-waste value chain in St. Lucia is basically limited to collection, storage and exportation. To some extent, this makes sense, as the volumes of e-waste are small and do not justify further treatment. In addition, based on the e-waste management practices in St. Lucia, workers who manually dismantle e-waste products do not face a substantial risk of exposure to toxins because e-waste composed of hazardous substances, such as lead from cathode ray tube (CRT) TVs, is stored and exported without any treatment.³

¹ Based on the survey to St. Lucia's e-waste recyclers.

² Source: <http://www.basel.int/TheConvention/Overview/tabid/1271/Default.aspx>.

³ Based on the survey to St. Lucia's e-waste recyclers.

St. Lucia e-waste value chain



Note: Disassemble (dotted green box) in St. Lucia is done only for few e-waste material, e.g., desktop PCs.

Recyclers also recycle other types of materials, such as plastic, metals, cardboard, etc. Accordingly, volumes of e-waste represent a very low percentage of recyclers’ overall business (less than 5%). In total, we estimate that about 14% of annual e-waste generation is exported in St. Lucia, while the remaining 86% is either improperly stored in houses, business, or other buildings, or improperly disposed of in landfills. In total we estimate that between 198 and 230 tons of e-waste will be generated each year during the next five years, with a value between US \$318,000 to US \$387,000.

E-waste generation from mobile phones, PCs, and TV sets for 2017-2021, summary

Type of e-waste device	E-waste devices per year average (000)*	Weight per e-waste device (kg)	Tons per year of e-waste	Value per year From 2017 to 2021 (US\$)	Average value per e-waste device (US\$)
Mobile phones	57 to 77	0.11	6.1 to 8.4	106,000 – 143,000	2
PCs	12 to 24	Desktops: 24 Laptops: 3.5	122 to 143	163,000 – 190,000	14
TV sets	4.7 to 5.3	15	70 to 90	49,000 – 54,000	10
Total	74 to 96	-	198 to 230	318,000 – 387,000	-

Respective UNU-KEYS: Mobile phones (0306); Desktops (0302); Laptops (0303); CRT Monitors (0308); Flat Display Panel Monitors (0309).

Note: This table can neither differentiate between desktops and their monitors, nor differentiate between CRT and Flat Display Panel Monitors, as the data sources does not separate this information.

The above table summarizes e-waste generation from mobile phones, PCs, and TV sets in St Lucia, spanning the course of the next five years (2017-2021). The above figures are based on e-waste generation and value estimations, created using data from St. Lucia, the International Telecommunications Union (ITU), and various written works. As demonstrated above, between 990 and 1,152 tons of e-waste will be generated over the next five years, with a value of US \$1.5 - \$1.9 billion. During this time, between 369,000 – 482,000 EEE devices will be disposed of, and relative to the population, it will amount to 1 – 1.2kg per person per year or US \$1.7 - \$2 per person per year.

Recommendations

E-waste definition

E-waste definitions vary greatly from country to country, but can be split into two categories: 1) broad definitions, often covering all kinds of e-waste, and 2) narrow definitions focusing on country specific needs. Narrow definitions tend to work much better for national monitoring than broad ones, as e-waste programs can be developed on a smaller scale and slowly be expanded as the need arises. This same type of model can be found in Australia, the U.S. state of Hawaii, Canada's British Columbia, and more. Accordingly, we recommend that St. Lucia utilize a narrow definition, focusing on telecommunications equipment, computers, and TVs, and later scale-up the program as they see fit, eventually employing more broad definitions based on those of the EU. The following table presents the recommended e-waste definition set. Note that in addition to their EU definitions, some of the categories in this table, and in various other sections of this paper, are labelled according to their United Nations University product groups called UNU-KEYS.⁴ These keys are "constructed such that product groups share comparable average weights, material compositions, end-of-life characteristics and lifespan distributions."⁵

Recommendation on e-waste definition⁶

Electrical or electronic equipment definition:

Equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer or measurement of such currents and fields and designed for use with a voltage rating not exceeding 1,000 volts for alternating current and 1,500 volts for direct current.

Broad E-waste definition:

Any electrical or electronic equipment, which the holder discards or intends or is required to discard, including all components, sub-assemblies, and consumables which are part of the product at the time of discarding, provided they belong to one or more of the following categories, as defined in the ANNEX III of the EU-WEEE Directive:

1. Temperature exchange equipment;
2. Screens, monitors, and equipment containing screens having a surface greater than 100 cm²;
3. Lamps;
4. Large equipment (any external dimension more than 50 cm) including, but not limited to:

⁴ C.P. Balde, R. Kuehr, K. Blumenthal, S. Fondeur Gill, M. Kern, P. Micheli, E. Magpantay, J. Huisman (2015), E-waste statistics: Guidelines on classifications, reporting and indicators. United Nations University, IAS - SCYCLE, Bonn, Germany. 2015. https://i.unu.edu/media/ias.unu.edu-en/project/2238/E-waste-Guidelines_Partnership_2015.pdf.

⁵ C.P. Balde, R. Kuehr, K. Blumenthal, S. Fondeur Gill, M. Kern, P. Micheli, E. Magpantay, J. Huisman (2015), E-waste statistics: Guidelines on classifications, reporting and indicators. United Nations University, IAS - SCYCLE, Bonn, Germany. 2015. https://i.unu.edu/media/ias.unu.edu-en/project/2238/E-waste-Guidelines_Partnership_2015.pdf.

⁶ Based on Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE) <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012L0019>.

Household appliances; IT and telecommunication equipment; consumer equipment; luminaires; equipment reproducing sound or images, musical equipment; electrical and electronic tools; toys, leisure and sports equipment; medical devices; monitoring and control instruments; automatic dispensers; equipment for the generation of electric currents. This category does not include equipment included in categories 1 to 3;

5. Small equipment (no external dimension more than 50 cm) including, but not limited to: Household appliances; consumer equipment; luminaires; equipment reproducing sound or images, musical equipment; electrical and electronic tools; toys, leisure and sports equipment; medical devices; monitoring and control instruments; automatic dispensers; equipment for the generation of electric currents. This category does not include equipment included in categories 1 to 3 and 6;
6. Small IT and telecommunications equipment (no external dimension more than 50 cm).

Narrow E-waste definition for St Lucia:

Any electrical or electronic equipment, which the holder discards or intends or is required to discard, including all components, sub-assemblies, and consumables which are part of the product at the time of discarding, provided they belong to one or more of the following categories, as defined in the ANNEX III of the EU-WEEE Directive:

1. Screens, monitors, and equipment containing screens having a surface greater than 100 cm² (UNU-KEYS 0303, 0308, 0309, 0407, 0408);
2. Small IT and telecommunications equipment (no external dimension more than 50 cm). (UNU-KEYS 0301-0302, 0304-0306, 0702).

E-waste definition expanded:

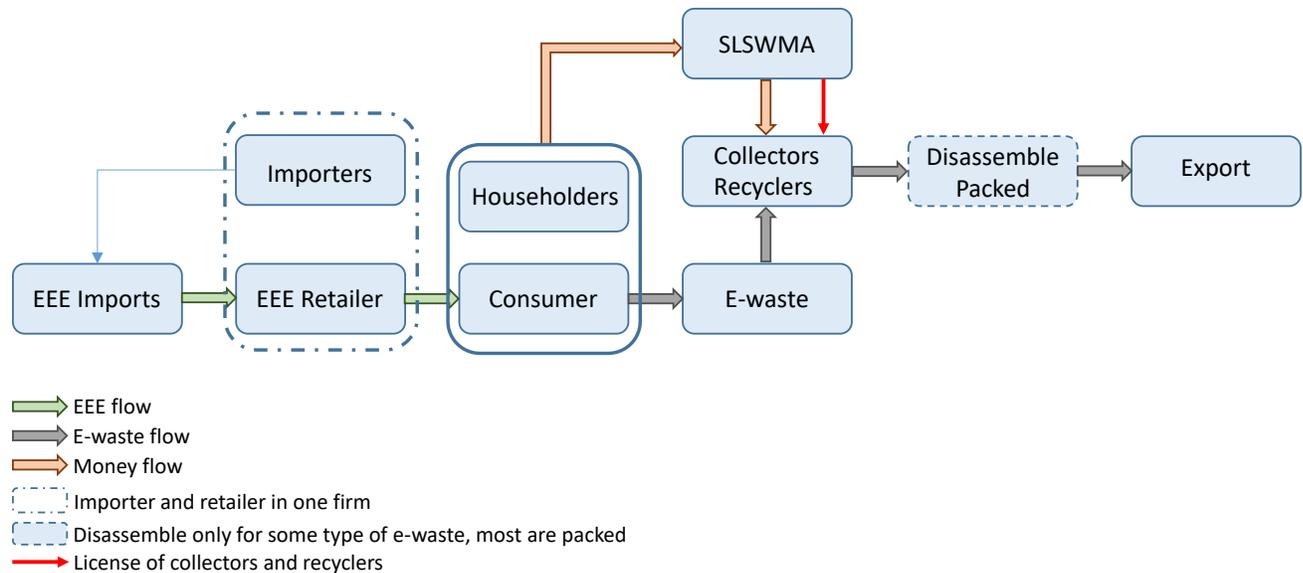
Once the take-back system for e-waste belonging to the categories recommended above is in place and working correctly, *i.e.*, e-waste volume targets are achieved, the e-waste definition must be expanded to include all EEE that is included the EU e-waste directive.

Future studies and legislative actions looking to implement take-back systems for the other categories of e-waste included in the EU E-waste Directive should include the definitions in this expanded definition section. Additionally, such studies should rely on the experience of the prospective take-back system for categories 2 and 6, respectively screens and small IT, of ANNEX III of the EU-WEEE Directive.

Note: These definitions are based on those of the EU, modified to suit the needs of Saint Lucia.

Strategy to develop an e-waste management system

An e-waste take-back system can be developed around either a government agency having control of the overall system, or a third party organization (TPO), mainly EEE importers, taking responsibility for the system, which follows the extended producer responsibility (EPR) principle. In Section 4.2, after demonstrating possible system models based on each of these practices, we recommend the former, primarily because having the Saint Lucia Solid Waste Management Authority (SLSWMA) manage the e-waste system alongside the existing solid-waste management program meshes perfectly. This allows SLSWMA to monitor both systems, collect fees for both systems, and work directly with collectors and recyclers for both types of waste at the same time. Below is a demonstration of the proposed model.



The primary reason an EPR model does not work for St. Lucia is due to the country’s high levels of alternative e-waste importation. As our research demonstrates, many St. Lucians travel overseas to buy EEE products or buy it through online vendors in order to avoid paying taxes on it. Accordingly, it would be untenable and unfair to hold importers responsible for such e-waste, especially because a significant portion of the electronics in St. Lucia are brought in through this channel. Even an attempt to identify the source of e-waste during pickup would be impossible, as there is no guaranteed method to differentiate between products imported through different channels, which would again lead to holding importers responsible for all e-waste.

Financing model

As the chosen general approach relies on SLSWMA to manage the e-waste take-back system, the Authority will also be in charge of developing and instituting a financing model to fund itself and the program as a whole. As such, the most suitable financing mechanism for this type of general model relies on collecting a flat non-visible fee from all households. This is a superior model primarily because taxation systems inherently create variability in the amount of tax revenue brought in on a per period basis, meaning SLSWMA may be over or underfunded, depending on consumer expenditure and government priorities. As an added benefit to the flat fee model, the cost of collecting e-waste is spread out over all citizens, meaning the individual impact is much lower, and if changes need to be made to the fee, it can easily be recalculated based on the needed revenue and change in households.

Education and awareness

Education and awareness efforts need to come from four primary stakeholders: SLSWMA, retailers, e-waste collectors, and other government entities. SLSWMA must of course play its part in educating the public, by independently, and in coordination with the other stakeholders, handing out information at popular events about e-waste recycling, buying TV and radio advertisement spots, educating retailers, and holding special

recycling events. Branching off of this, once educated on these matters, retailers should encourage e-waste recycling by putting waste collection bins in their stores and answering any e-waste questions customers may have. Additionally, retailers should encourage customers to properly dispose of their old e-waste whenever they come in to upgrade and/or buy new EEE.

As collectors go door-to-door to pick up e-waste, they should be prepared to answer any questions households may have about e-waste, while providing informational pamphlets about pickup dates and what materials constitute e-waste. These same collectors should be amenable to providing pickup services to retailers who place e-waste collection bins on their premises. Lastly, other government entities should play their part in e-waste education by instituting educational programs in schools, workplaces, and other forums in order to maximize outreach effectiveness.

Monitoring and licensing

SLSWMA should begin the e-waste recycling process by licensing collectors and recyclers that meet their standards. These standards, as later expanded on, describe the methods of e-waste collection, facility requirements, and e-waste handling techniques which must be employed to minimize negative environmental and human health effects. Only licensed collectors and recyclers should be allowed to participate in the e-waste recycling business. In addition, throughout the process SLSWMA should monitor levels of e-waste from various points in the management stream; this includes points such as e-waste collection during door-to-door pickup, retrieval of e-waste from the collectors' facilities, export records, and more. This monitoring should be performed in accordance with the ITU's guidelines on classification, reporting, and indicators for e-waste.⁷ This information enables SLSWMA to gain useful statistical information, allowing them to use it to forecast future e-waste levels and develop targets around this. In addition, other relevant agencies, such as the Central Statistical Office of Saint Lucia (CSO), should collect these statistics as they see fit.

Transboundary flow of e-waste

Throughout the monitoring and licensing processes, SLSWMA must make sure its exporters comply with international standards and regulations regarding e-waste exportation. Most important is the Basel Convention, which St. Lucia signed on to in 1994 and aims to restrict the transnational movement of hazardous materials. In order to do this, SLSWMA should incorporate periodic inspections into its monitoring process, allowing it to make sure companies comply with these standards as well as those SLSWMA requires for e-waste management methods and facility requirements. Although St. Lucia adopted the Basel Convention in 1994, St. Lucia is not required to submit any e-waste-specific reports to the Secretariat. However, St. Lucia

⁷ C.P. Balde, R. Kuehr, K. Blumenthal, S. Fondeur Gill, M. Kern, P. Micheli, E. Magpantay, J. Huisman (2015), E-waste statistics: Guidelines on classifications, reporting and indicators. United Nations University, IAS - SCYCLE, Bonn, Germany. 2015. http://www.itu.int/en/ITU-D/Statistics/Documents/partnership/E-waste_Guidelines_Partnership_2015.pdf

must comply with Article 13 of the mandate, as it already does,⁸ which requires that signatory countries report certain information related to their hazardous waste practices.⁹

* * *

The document is divided in four chapters. Chapter one describes St. Lucia's current e-waste situation, looking at the value chain and current roles of recyclers and government. Chapter two provides all of the relevant information available in St. Lucia, gathered from census reports, interviews, and import/export records. Chapter three combines the information gathered in Chapter two to create an e-waste forecast, in order to estimate e-waste generation on a yearly basis as well as its value. Chapter four proposes an e-waste definition, general collection and system model, financing mechanisms, monitoring and licensing practices, educational programs, and considerations for transboundary e-waste flows, all while recommending best practices and actions for St. Lucia.

⁸ Basel Convention National Reporting – Year 2015 (latest year available), <http://www.basel.int/Countries/NationalReporting/BaselConventionNationalReports/BC2015Reports/tabid/5384/Default.aspx>

⁹ Basel Convention, National Reporting. See: <http://www.basel.int/Procedures/NationalReporting/tabid/1332/Default.aspx>

1. E-waste in Saint Lucia

As Saint Lucia moves toward greater digital connectivity, specific types of waste from electrical and electronic equipment (e-waste) will become more prevalent in the coming years. The United Nations University estimates that Saint Lucia generated approximately 2,000 tons (or the equivalent of 9.9 kg per inhabitant) of e-waste in its broad definition.¹⁰ Personal computers (PCs) and mobile phones are driving this advancement, leaving behind hazardous materials contained in their internal components. Not only does recycling these materials prevent harmful chemicals from entering Saint Lucia's environment, it also allows many of the elements that make up these products to be resold and reused.

PC monitor and television (TV) screen waste are also products of the rapidly advancing technology sector, with better monitors replacing cathode ray tube (CRT) TVs as they become more affordable, even in developing nations. One may also recover valuable elements from TVs and monitors, but they contain hazardous chemicals and must be handled accordingly. With a looming digital TV migration, wherein people will no longer be able to receive analogue TV broadcast signals with their old TVs, many consumers will opt to simply throw away their old TV sets rather than purchase a digital-to-analogue signal converter. This will create a surge in e-waste, requiring proper management facilities and a flexible e-waste framework.

With this in mind, the full list of e-waste covered in this study includes:

- Mobile phones (UNU-KEY 0306)¹¹
- Personal computers (PCs), including desktops and laptops (UNU-KEY 0302 and 0303)
- TV sets (UNU-KEY 0407 and 0408)¹²
- CRT monitors for personal computers (UNU-KEY 0308)
- Flat panel display monitors (UNU-KEY 0309) Monitors for personal computers

The first section of this chapter describes the e-waste value chain in St. Lucia, including the relevant stakeholders. Although there is no regulation on e-waste in place in St. Lucia, there is legislation and regulation on general waste. Some of the activities of the Saint Lucia Solid Waste Management Authority (SLSWMA), created by the Waste Management Act (Act), are related to e-waste collection and transportation, as well as to the licensing and approval of waste management facilities. These activities are described in the second section of this chapter. Finally, in the third section, a summary of the interviews with several stakeholders regarding e-waste management in St. Lucia is presented.

1.1. E-waste value chain in Saint Lucia

Saint Lucia does not manufacture or produce electrical and electronic equipment (EEE), including mobile phones, PCs or TV sets. EEE enters St. Lucia in three primary ways: through (1) imports from retailers, later

¹⁰ Baldé, C.P., Wang, F., Kuehr, R., Huisman, J. (2015), The global e-waste monitor – 2014, United Nations University, IAS – SCYCLE, Bonn, Germany. <https://i.unu.edu/media/unu.edu/news/52624/UNU-1stGlobal-E-Waste-Monitor-2014-small.pdf>.

¹¹ Note: UNU-KEYS (i.e. United Nations University Keys) classify different types of products and are “constructed such that product groups share comparable average weights, material compositions, end-of-life characteristics and lifespan distributions.” See: https://i.unu.edu/media/ias.unu.edu-en/project/2238/E-waste-Guidelines_Partnership_2015.pdf.

¹² Note: The data on TV sets from the Central Statistical Office of Saint Lucia does not differentiate between CRT and flat panel display monitors.

sold to consumers; (2) consumers who travel overseas and buy EEE for personal use; and (3) online commerce, buying directly from overseas retailers that ship EEE to St. Lucia through transportation carriers, *e.g.*, FedEx, UPS, etc. The latter two means in which EEE enters St. Lucia are becoming increasingly popular, as it allows consumers to avoid paying duty and sales taxes.¹³

Once EEE becomes e-waste, *i.e.*, when devices are no longer useful to the consumer and have reached their end-of-life (EoL), sometimes not occurring until after having been reused, consumers traditionally do not dispose of e-waste in a responsible manner as there are no disposal process regulations or mechanisms in place. There are also no awareness or education policies on how to properly dispose of e-waste. In fact, according to our estimations, only a very small fraction of the e-waste generated annually is currently being managed through the appropriate mechanisms. Therefore, the majority of e-waste generated must be either stored within consumer premises or disposed of in public places.¹⁴

Currently, St. Lucia has four e-waste recyclers (Table 1). The activities carried out by these recyclers include collection, transportation and shipment abroad of all e-waste received. In a few cases, recyclers disassemble e-waste products to separate plastic from electronic parts. However, recyclers normally do not shred, impact, fragment or granulate the remaining pieces into smaller parts. In the cases where e-waste is disassembled, the remaining parts are cleaned, compacted, and packaged for shipping overseas jointly with other e-waste that is shipped completely untouched and not disassembled due to the hazardous materials they contain, requiring special treatment. In other words, the recycling process is basically limited to collection, transportation and storage of e-waste before shipment overseas. Even if the recyclers would like to process the material further, there is no advanced treatment or sophisticated machinery to process e-waste into smaller parts and sort them into different categories, *e.g.*, plastic, glass, cable, ferrous and non-ferrous materials, etc.¹⁵ Accordingly, recyclers in St. Lucia are not technically “recyclers” given that they do not convert waste into reusable material, however, they do help collect and ship e-waste for treatment abroad.

Table 1: E-waste recyclers in St. Lucia

Recycler	Materials collected
Construction and Recycling Ltd.	Metal, e-waste , batteries
Recycle It Ltd.	Metal, plastic, paper/cardboard, glass, e-waste , batteries, tires
Renew Saint Lucia Ltd.	Metal, plastic, paper/cardboard, e-waste , batteries
Mr. Marcelle	Metal, plastic, e-waste

Source: Te-Hsin Tsai, “A Study of Recycling in Saint Lucia”, November 2013.¹⁶

The quantity of e-waste collected and transported by recyclers in St. Lucia is very low compared to the estimates of e-waste generated in the island, both in section 3 and in relation to the overall recycling business of the four recyclers. According to e-waste recyclers in St. Lucia and in terms of volume, e-waste recycling

¹³ Information provided during the interviews with government entities. Computers are duty rate exempted. Mobile phones and TV sets have a 20% duty rate. Sales tax in St. Lucia is 15%. Source: Common External Tariff of the Caribbean Community, 2012, available at: https://www.customs.gov.lc/hs_2012_customs_tariff.pdf, and <http://www.vat.gov.lc/>.

¹⁴ On conversations with SLSWMA, they assert that no e-waste is disposed in their landfills.

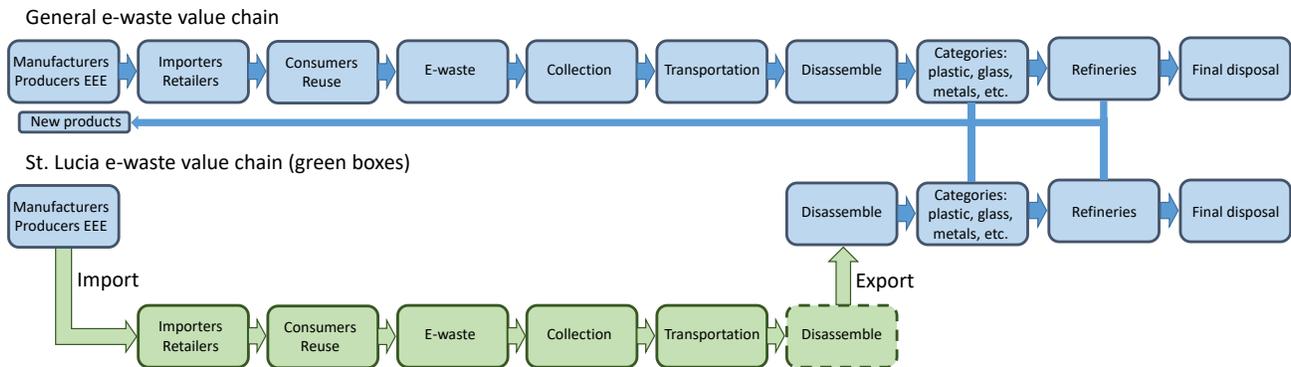
¹⁵ Information provided during the interviews with recyclers.

¹⁶ Available at: http://www.slswma.org/index.php?option=com_content&view=category&layout=blog&id=16&Itemid=128.

makes up less than five percent of their overall recycling business, as they also recycle other types of waste such as plastics, cardboard, metals, etc.¹⁷

In Figure 1, the green boxes represent the steps related to the e-waste value chain currently in place in St. Lucia. Recyclers in St. Lucia mainly collect e-waste in two ways: through door-to-door collection if the recycler is called and the volume of e-waste justifies its transportation costs, and by people dropping off e-waste at the recycler’s facilities.

Figure 1: E-waste value chain in St. Lucia – green boxes



Note: Disassemble (dotted green box) in St. Lucia is done only for few e-waste material, e.g., desktop PCs.

Source: Based on “Review of International practices relating to the control of imports/production of TV devices and e-waste management practices and standards in the Caribbean,” TMG, Inc., 2015.

E-waste is sold by St. Lucia’s recyclers to international e-waste recyclers who collect large quantities of e-waste from the entire region, that is, the Caribbean countries/territories. They begin the recycling process by separating materials into different categories such as plastic, glass, ferrous and non-ferrous materials. Metals are often smelted and refined to separate the different elements at specific refineries built for this purpose. Such metals and other materials are then sold to manufacturers for the production of new products. Finally, elements that are not recyclable are incinerated or disposed of in specific landfills. None of these processes are done in St. Lucia because of the high costs of the machinery/refineries needed and the low volumes of e-waste generated. Thus, e-waste is sold and exported in bulk to international recyclers.

1.2. E-waste regulation in Saint Lucia

There is no legislation or regulation in place in St. Lucia specifically for e-waste management. However, there is legislation for other types of waste defined as “solid waste,” which includes “garbage, refuse, organic waste, scrap metal, silt, back filling material, construction and demolition material, and other solid materials discarded from (a) residential, industrial, commercial or government establishments or operations, and (b) public or community activities.”¹⁸ The St. Lucia Solid Waste Management Authority (SLSWMA) created by the Waste Management Act is responsible for the provision of coordinated and integrated systems to collect, treat, recycle and dispose of solid waste, including hazardous waste, as well as manage sanitary landfills

¹⁷ Information provided during the interviews with recyclers.

¹⁸ Waste Management Act No. 8 of 2004, available at <http://www.sluswma.org/images/pdf/waste%20management%20act.pdf>, and the Waste Management (Amendment) Act No. 10 of 2007, available at <http://www.sluswma.org/images/pdf/waste%20management%20amendment%20act.pdf>.

throughout St. Lucia.¹⁹ Although including solid waste management it is not part of this study, it is important to highlight some activities SLSWMA is currently undertaking which are directly related to e-waste collection and transportation.

SLSWMA provides solid waste collection services, door-to-door, twice a week through eight private contractors on the island.²⁰ These contractors also collect bulky waste, once a month, door-to-door, which is comprised of “waste that is too large in size and volume to be accepted during the regular waste collection service.”²¹ Bulky waste items include discarded furniture, white goods,²² large appliances and e-waste, such as TV sets and monitors that are “large in size and volume.” Small size e-waste such as mobile phones or laptops are not picked-up. When “large” e-waste is collected, SLSWMA separates this type of waste at the landfill and hands it to the e-waste recyclers on a first-come first-serve basis, therefore, e-waste is not dumped into the landfill.

It is important to highlight that, although there is no legislation or regulation requiring the collection and transportation of “large size” e-waste, SLSWMA collects this type of waste through private contractors in small quantities on a door-to-door basis once a month to deliver it to the e-waste recyclers.²³ Private contractors have “to ensure that all waste collected is adequately contained during transportation and disposed at a designated waste management facility.”²⁴

SLSWMA also allows licenses to operate waste management facilities,²⁵ such as “recyclable materials processing facilities.”²⁶ According to the Act, these facilities should be located at landfill sites or in industrial areas, and must comply with specific facility design requirements, e.g., “(...) facilities should be housed in weatherproof and hurricane-proof buildings with full access to electrical services and water supply compatible with the operations of the facility. The floor should be constructed of concrete slab.”²⁷ In addition, the Act establishes other requirements related to the storage, haul, and processing of recyclable materials.

Although the Act does not include specific provisions for the management of waste related to EEE, it does set general provisions related to recyclable waste that can be used by SLSWMA to define the specificities for e-waste to be properly managed.

1.3. Interviews to e-waste stakeholders in Saint Lucia

In the course of this study, five interviews were carried out with government entities and recycling companies in St. Lucia. Unfortunately, it was not possible to interview any representative from the private

¹⁹ Section 3, Part I, Waste Management Act No. 8 of 2004.

²⁰ See: http://www.sluswma.org/index.php?option=com_content&view=article&id=15&Itemid=121.

²¹ See http://www.sluswma.org/index.php?option=com_content&view=article&id=30:types-of-waste&catid=12&Itemid=122.

²² White goods are defined in the Waste Management Act, Part I(2) as “disused and abandoned refrigerators, washing machines and other domestic appliances.”

²³ Information provided during the interview with SLSWMA.

²⁴ See http://www.sluswma.org/index.php?option=com_content&view=article&id=15&Itemid=121.

²⁵ Part IV Waste Management Act No. 8 of 2004.

²⁶ Schedule 6 Waste Management Act No. 8 of 2004.

²⁷ Schedule 6 Waste Management Act No. 8 of 2004.

sector, e.g., St. Lucia Hotel and Tourism Association, ICT Association of St. Lucia, the Chamber of Commerce, mobile providers, among others. The entities interviewed were:

Government

- Department of Sustainable Development
- Ministry of Finance
- Saint Lucia Customs and Excise Department
- Saint Lucia Solid Waste Management Authority

Recyclers

- Renew Saint Lucia Ltd.
- Construction and Recycling Ltd.

The following sections present the main findings from these interviews.

1.3.1. Government

The government recognises the absence e-waste regulation in St. Lucia. However, the government understands the need to implement such regulations in the future. There is no knowledge of the volumes of e-waste generated in St. Lucia as the government has never estimated these figures. In the government, there is a consensus that e-waste management should be led by SLSWMA. In this case, the SLSWMA would be responsible for proposing and implementing e-waste regulation, as well as working close with other government entities, such as the Department of Sustainable Development, or private sector companies, e.g. recyclers, in order to articulate any activities related to e-waste management.

There is no clear solution on how to finance the e-waste management system. Government officials believe that if it is financed through the government's national budget there is a risk that other government initiatives will have priority over the e-waste management system. This would also mean that the government would need to increase the national budget to account for SLSWMA, which currently relies entirely on the national government to finance the solid waste management system. An alternative environmental levy for EEE, solely dedicate to managing the e-waste takeback system, is not tenable given that St. Lucia recently had such an environmental levy that was replaced with the general sales tax; thus, it would be difficult to justify returning to an environmental tax system. Finally, any solution that would increase the price of EEE for the end user (e.g. a specific tax for EEE to finance the e-waste management system) or oblige the private sector to responsibly manage EEE once it reaches its EoL, would increase retail costs of the EEE sold. This would encourage consumers to find alternative means of purchasing EEE, such as online shopping, which is fast becoming popular in St. Lucia.

Currently, PCs have a 6% service charge rate applied on their importation and are exempt of import duties and sales tax to encourage people to purchase them.²⁸ Mobile phones, TV sets and other EEE have, in addition to the service charge rate, a 20% import duty and 15% value added tax (VAT), i.e., a 41% price increase due to additional taxes. The government officials interviewed believe that given the current level of taxes on EEE, the private sector will oppose any additional cost or taxes that would increase EEE prices any more. Such price increases would negatively affect the demand for EEE goods, stunting digital economy growth and overall innovation.

²⁸ VAT Act No. 7 of 2012.

SLSWMA would like to implement a public-private partnership (PPP) for e-waste management, similar to the existing one for collecting and transporting solid waste. As described above, SLSWMA contracts private companies to collect solid waste, door-to-door, which covers 100% of households. E-waste collection could take a similar approach, although it is not clear how it would be financed. Once e-waste is collected, it will be passed over to the recyclers that are approved of and licensed by SLSWMA to process this type of waste. SLSWMA would also be responsible for any awareness campaigns to educate the people on how to dispose of e-waste correctly, as well as the environmental consequences and human health risks for not doing so.

Finally, there is consensus that regulation is necessary to provide an opportunity for the government to throw-out their own e-waste. Currently, government-generated e-waste is stored haphazardly and not properly disposed of. It could be the responsibility of the IT department within the government to provide the guidelines and approval for when government EEE must be discarded and sent to the licensed recyclers.

1.3.2. Recyclers

E-waste is a small part of the recycling business, less than five percent overall. However, recyclers see potential in the future growth of e-waste collection. Based on the information provided by 2 of the 4 recyclers, it appears that total exports of e-waste per year may reach 30 tons, which represents, at most, 15% of the e-waste estimated per year in St. Lucia (see section 3.5). Recyclers already have the infrastructure to collect, transport and store e-waste, but they do not have the specific machinery to dismantle e-waste devices or to shred, fragment or granulate e-waste components into smaller parts.

E-waste pick-up is only performed for customers with large quantities. The recyclers also accept drop-offs of e-waste at their facilities, however, those dropping-off the waste expect some money in return. Everyone, not just collectors, tend to assign e-waste higher value than it actually deserves, and therefore expect compensation in return; unfortunately, this it is not financially viable for the recycling sector. Recyclers see this demand for monetary compensation as a big barrier for the growth of the e-waste business.

Normally, when e-waste arrives at a recycler's facility, it has already been reused or refurbished several times, and therefore, devices often arrive broken or damaged, incapable of being used for their intended purposes. PCs are the only EEE manually dismantled using screwdrivers, hammers and drills, to separate plastic from electronic boards, which takes 5 to 8 minutes on average. TV sets, including CRTs, are not dismantled due to hazardous materials. Therefore, all e-waste is shipped in the same state it is received, except for the PCs.

The biggest challenge faced by recyclers in St. Lucia is the collection and transportation of e-waste that comes from major e-waste generators, including the government and various private sector organizations. Recyclers complain that there are no policies instructing how the private or public sectors should dispose of e-waste responsibly, which leads to most of the generated e-waste being stored instead of being handed over to the recyclers. In addition, due to the lack of education, recyclers complain that everyone wants compensation for the e-waste generated. Finally, the same lack of education and awareness prevents people from properly disposing of e-waste, *i.e.*, not sending it to the landfill.

2. Information available in Saint Lucia

In order to create an effective e-waste policy, current and future volumes of e-waste must be accurately accounted for. On one hand, if volumes are underestimated, not enough funding and resources will be

allocated to the e-waste management system, creating a surplus of untreated waste. Additionally, educational efforts require substantial amounts of funding, and if consumers are not properly educated, they will continue to dispose of e-waste in an unsustainable manner and/or store e-waste on their premises with its associated environmental hazards. On the other hand, if an overestimate is given, the government may impose an undue burden on producers or consumers by taxing them for non-existent waste or demanding unachievable volumes of e-waste to be managed, creating resentment and wasting precious capital. For these reasons, the estimates must be as accurate as possible.

As the first step in estimating the volumes of e-waste generated in St. Lucia, in this chapter we present the sources and information available on which we rely to calculate e-waste generation for the next five years. Based on the findings of this chapter, we will present our e-waste forecast for St. Lucia in the following chapter.

It is important to highlight the difficulties in obtaining data related to the current use of PCs, mobile phones, and TV sets in St. Lucia. The most recent census, which collects data on household ICT device consumption, *e.g.*, households with TV sets, or the number of PCs per household, among other metrics, started in 2010. In addition, the inventory of ICT devices imported to St. Lucia, supplied by the Customs and Excise Office,²⁹ does not take into account devices that St. Lucians bring back after traveling abroad or purchase through online commerce, both of which have grown considerably in recent years, mainly due to the country's high sales tax rate.³⁰ We also use data from the International Telecommunications Union (ITU), which contains a complete series for mobile cellular penetration, supplied by the government of St. Lucia. The ITU data, however, does not include information on TV sets or PCs.

This chapter is divided in three sections, one section for each type of EEE: PCs, TV sets and mobile phones. Information is provided for each EEE is based on the 2010 census report, the Customs and Excise Office, and the ITU.

2.1. Computers

2.1.1. Census Report 2010

Saint Lucians are joining the digital age by bringing computers into their homes at an increasing rate. In fact, from 2001 to 2010 the average penetration rate of households with at least one computer grew from 13.1% to 38.6%, equating to a nearly 12.8% compound annual growth rate (CAGR).³¹

According to the census report from 2010, 32,967 PCs including laptops and desktops, were being used by 22,743 households, which is 1.4 PCs per household on average.

²⁹ Annex 1 presents the codes of the devices imported to St. Lucia.

³⁰ Information provided during the interviews with different stakeholders.

³¹ Saint Lucia Central Statistics Office, "2010 Population and Housing Census," April 2011, available at: <http://192.147.231.244:9090/stats/images/OtherPublications/StLuciaPreliminaryCensusReport2010.pdf>

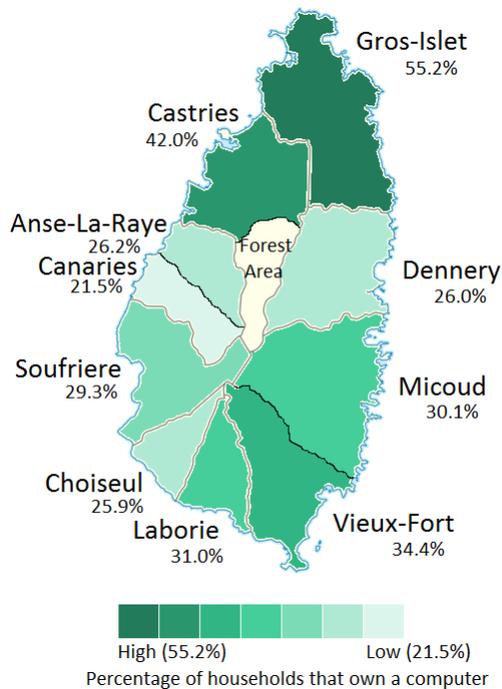
Table 2: Total number of computers (desktops and laptops) - 2010

Number of computers (X) owned by household	Number of households with X desktops	Number of households with X laptops	Total number of desktops	Total number of laptops
0	43,469	46,111	-	-
1	14,481	10,380	14,481	10,380
2	794	1,820	1,588	3,640
3	100	439	300	1,317
4	27	89	108	356
5	11	28	55	140
6	14	39	84	234
7	11	2	77	14
8	9	5	72	40
9	3	6	27	54
Total	58,919	58,919	16,792	16,175

Source: 2010 Population and Housing Census, Central Statistics Office, April 2011.

Saint Lucia’s individual districts have varying penetration rates. Such rates create bubbles of higher waste production, stressing the system at specific points. This primarily occurs in the north in the Gros Islet and Castries districts, which have the highest PC penetration rates of 55.2% and 42.0% respectively, followed by Vieux Fort in the south with 34.4%.³²

Figure 2: Percentage of households with computer ownership by district - 2010



³² Saint Lucia Central Statistics Office, “2010 Population and Housing Census,” April 2011.

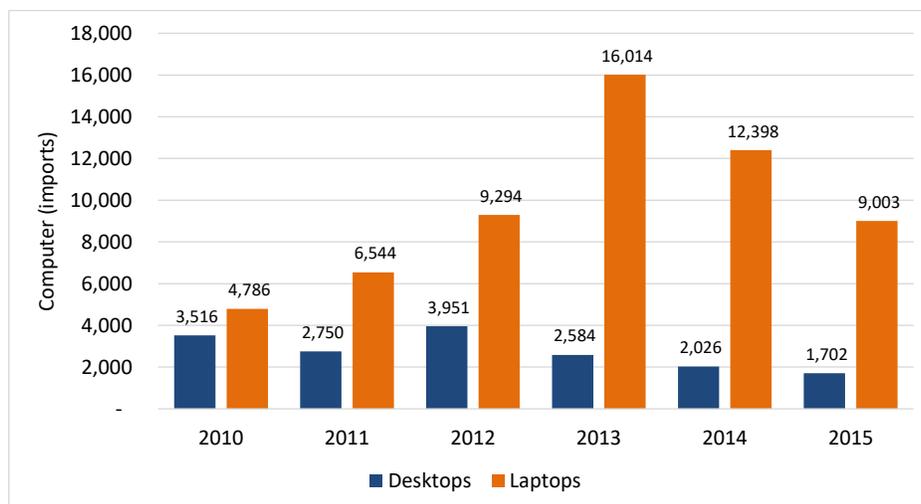
Source: 2010 Population and Housing Census, Central Statistics Office, April 2011.

2.1.2. Imports

The figures for PC imports, including laptops and desktops, are based on the information reported by the Customs and Excise Office in Figure 3. During the last six years, since the 2010 census, nearly 75,000 PCs have been imported to St. Lucia. Of the PCs, 78% or 58,039, are laptops and the remaining 22% or 16,529 are desktops. These figures align with international trends, as consumers in St. Lucia prefer laptops over desktops.

From 2010 to 2013, the annual imports of laptops increased considerably from 4,786 in 2010 to more than 16,000 in 2013. However, since 2013, laptop imports have decreased to 9,003 annually in 2015. In addition, desktop imports have decreased annually since 2012, from nearly 4,000 to 1,702 in 2015.

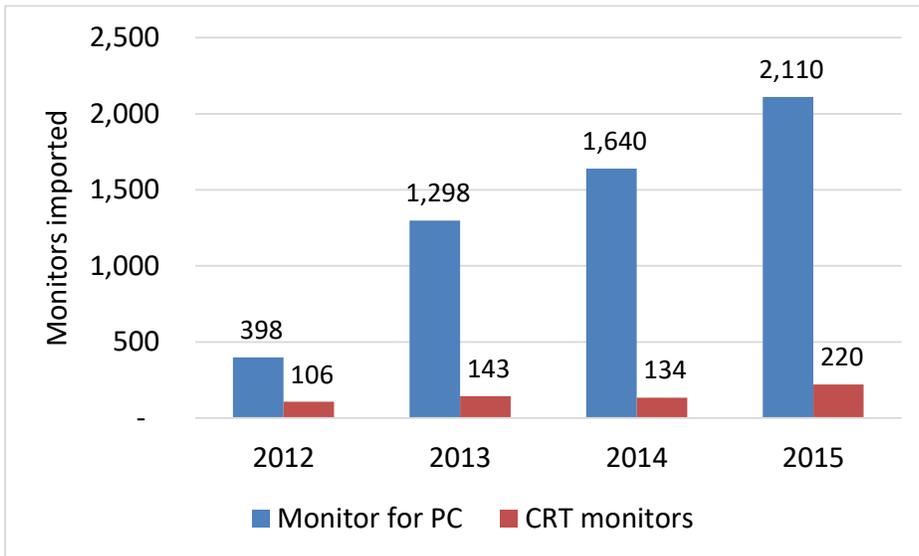
Figure 3: Imports of desktops and laptops to St. Lucia from 2010 to 2015



Source: Customs and Excise Office

Similarly, PC monitor imports to St. Lucia have increased from 398 in 2012 to 2,110 in 2015. CRT monitors, although in a very low quantity, have been entering St. Lucia since 2012, increasing annually from 106 to 220 in 2015. CRT monitors should be forbidden to enter or be sold in St. Lucia due to the environmental hazard that such devices present.

Figure 4: Imports of monitors to St. Lucia from 2012 to 2015



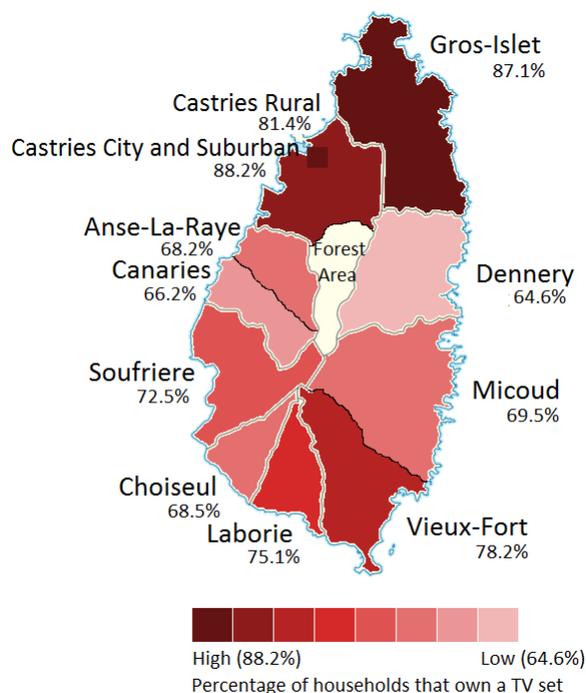
Source: Customs and Excise Office

2.2. TV sets

2.2.1. Census Report 2010

Just as the Castries and Gros Islet districts have a higher percentage of households with computers, they also have a higher percentage households with at least one TV set. As the census data does not specify the numbers of TV sets per household on average, one may assume households have between 1 and 2 TVs per household, for a total of ~50,000 to 100,000 TV sets being used in households. The number of TVs in St. Lucia has grown from an average of 79% of households having TVs in 2001, to 86.4% in 2010. Although a greater number of TVs allows the public to be better informed and entertained, it also creates more e-waste.

Figure 5: Percentage of households with TV set ownership by district - 2010



Source: 2010 Population and Housing Census, Central Statistics Office, April 2011.

The greatest concern for TV waste is a mass disposal of CRT TV sets after the digital broadcast TV migration occurs. Although a prospective date has not yet been determined, thus far 136 out of 196 countries have either completed, launched, or plan on launching their digital TV transitions, meaning St. Lucia will likely develop a plan sometime in the coming years.³³ When this occurs, consumers with CRT TVs must either obtain a digital-to-analogue signal converter for their old TV sets or buy newer models fitted with digital signal receivers. The number of CRT TV sets thrown away will be compounded by how far in the future the digital transition occurs, as the further in the future it is, the lower price of newer TV sets and the more likely people will be to purchase them if they have not done so already. Adding to this influx of waste, computer monitors will be replaced as newer monitors become more affordable as well.

Even barring the digital migration, TV sets should be a primary focus of St. Lucia’s e-waste program, as they contain extremely dangerous chemicals and are fragile, i.e., chemical spills are likely to occur. Table 3 provides an estimate of the number of TV sets in Saint Lucia.

Table 3: Total number of TV sets in households in 2010

District	Number of households in district	Percentage of households who own at least 1 TV	Total TV sets assuming 1 TVs per household	Total TV sets assuming 2 TVs per household
Castries City	1,640	89%	1,460	2,919
Castries Suburban	6,553	91.7%	6,009	12,018
Castries Rural	15,300	88.2%	13,495	26,989

³³ ITU, Status of the transition to Digital Terrestrial Television Broadcasting, Accessed November 18, 2016, <http://www.itu.int/en/ITU-D/Spectrum-Broadcasting/Pages/DSO/default.aspx>.

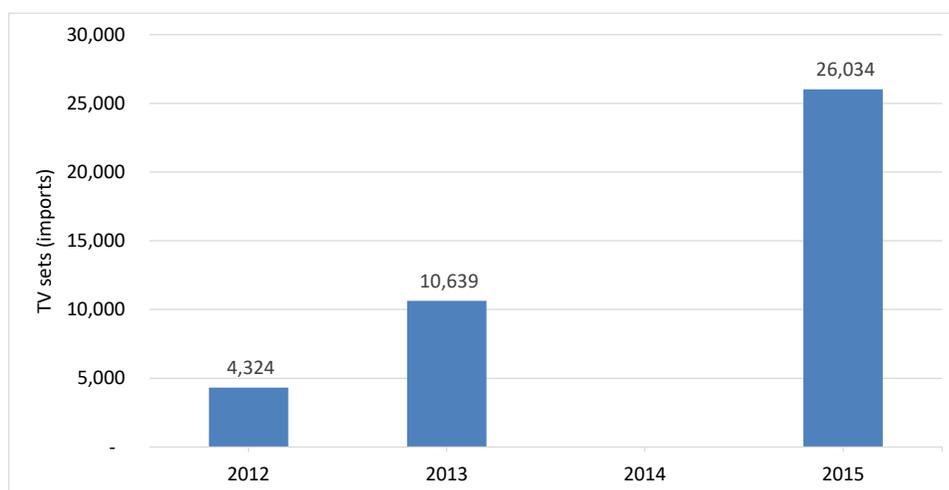
District	Number of households in district	Percentage of households who own at least 1 TV	Total TV sets assuming 1 TVs per household	Total TV sets assuming 2 TVs per household
Anse La Raye	2,162	81.2%	1,756	3,511
Canaries	786	71.3%	560	1,121
Soufriere	2,875	85.1%	2,447	4,893
Choiseul	2,069	80.4%	1,663	3,327
Laborie	2,180	85.2%	1,857	3,715
Vieux Fort	5,740	86.4%	4,959	9,918
Micoud	5,601	80.1%	4,486	8,973
Dennery	4,402	79.9%	3,517	7,034
Gros Islet	9,583	91.8%	8,797	17,594
Total	58,891	86.4%	51,006	102,012

Source: 2010 Population and Housing Census, Central Statistics Office, April 2011.

2.2.2. Imports

TV set imports have increased six-fold between 2012 and 2015, from 4,324 to 26,034 TV sets imported annually. 2014 is an outlier data point, with 152,357 TV set imports, which we believe is a mistake (not included in Figure 6). To follow the trend, the imports of TV sets to St. Lucia in 2014 should be around 17,000.

Figure 6: Imports of TV sets to St. Lucia from 2012 to 2015



Note: 2014 is an outlier data point, with 152,357 TV set imports, which we believe is a mistake and therefore do not include in the figure.

Source: Customs and Excise Office

2.3. Mobile phones

2.3.1. Census Report 2010

Just as with the other EEE items, the capital city and Gros Islet have the highest penetration rates for mobile phones. As with the rest of the world, and in particular in developing countries, access to affordable

mobile phones continues to rise. This is best highlighted in the rise in households with at least one mobile phone from 13.7% in 2001, to 85.1% in 2010. Recent research show a continual increase in adults who own smartphones.³⁴ This is especially the case in developing nations, where “smartphone ownership rates in emerging and developing nations are rising at an extraordinary rate,” due to their nature as a primary means of connecting to the Internet.³⁵ This seems to be the case in St. Lucia as well between 2001 and 2010.

Table 4: Percentage of households with mobile phones - 2010

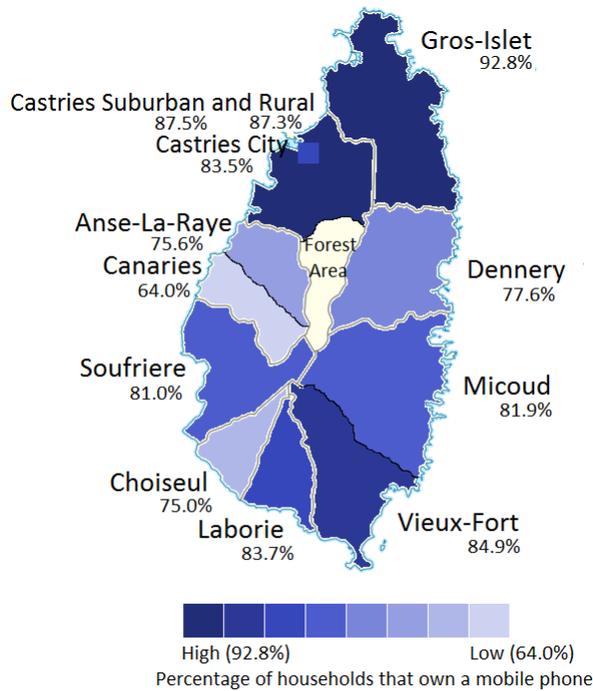
District	Number of households in district	Percentage of households who own a cellular phone
Castries City	1,640	83.5%
Castries Suburban	6,553	87.5%
Castries Rural	15,300	87.3%
Anse La Raye	2,162	75.6%
Canaries	786	64.0%
Soufriere	2,875	81.0%
Choiseul	2,069	75.0%
Laborie	2,180	83.7%
Vieux Fort	5,740	84.9%
Micoud	5,601	81.9%
Dennerly	4,402	77.6%
Gros Islet	9,583	92.8%
Total	58,891	85.1%

Source: 2010 Population and Housing Census, Central Statistics Office, April 2011.

³⁴ PewResearchCenter, Smartphone Ownership and Internet Usage Continues to Climb in Emerging Economies, February 22, 2016
http://www.pewglobal.org/files/2016/02/pew_research_center_global_technology_report_final_february_22_2016.pdf

³⁵ PewResearchCenter, Smartphone Ownership and Internet Usage Continues to Climb in Emerging Economies, 2016.

Figure 7: Percentage of households with mobile phone ownership by district - 2010



Source: 2010 Population and Housing Census, Central Statistics Office, April 2011.

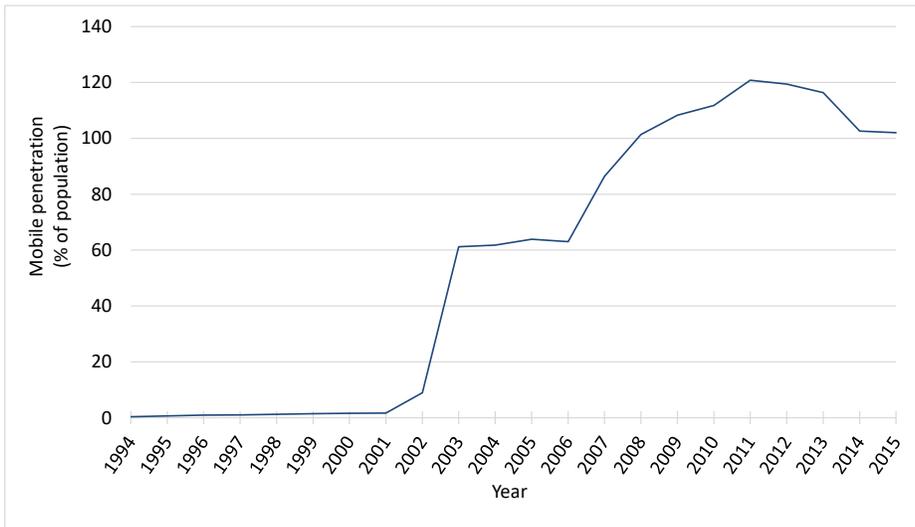
2.3.2. International Telecommunication Union data

Midway through a short-lived increase in fixed telephone penetration rates during the 1990s, mobile telephony service in St. Lucia began in 1994. Fixed line penetration rates continued to rise until 2003, when the number of households with a mobile phone surpassed those with a fixed line. Since then, the CAGR for mobile phones from 2004 to 2014 was 6.4%, reaching its peak in 2011. Additionally, in 2004 the mobile penetration rate was 61.8% with 101,000 mobile lines, which rose to 188,351 mobile lines and a mobile penetration rate of 102.6% in 2014.

Based on data from the ITU, the mobile market reached its peak in 2011, and has been steadily declining since. After reaching this peak, the market declined from 216,530 mobile subscriptions in 2011, to 187,741 subscriptions in 2015. From here, the market will most likely equilibrate and only fluctuate in small amounts, as it has reached full market saturation. Still, new users will continue to trickle in, primarily from rural, less saturated districts (see Figure 7), but for the most part the customer base will grow at the same pace of the population.

Existing customers will continue to create e-waste as well, as they will upgrade and throw away phones once they have reached the end of their lifecycle.

Figure 8: Evolution of mobile-cellular telephone penetration

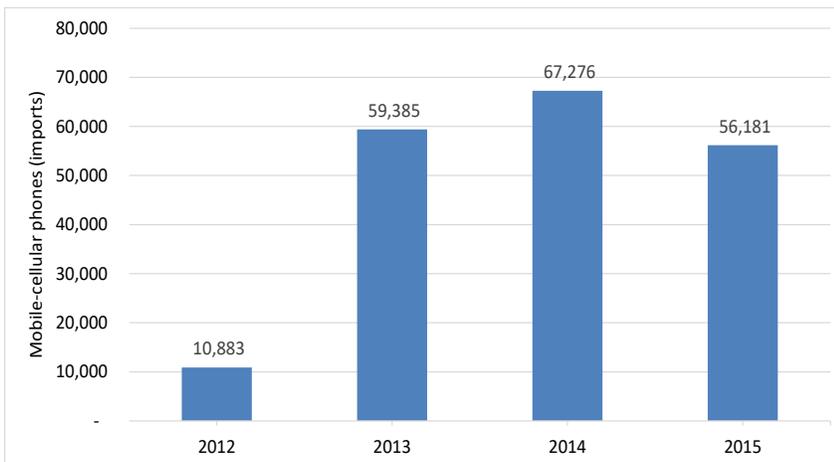


Source: ITU

2.3.3. Imports

Imports of mobile phones to St. Lucia increased considerably between 2012 and 2013, going from nearly 11,000 to 59,000. Since 2013, annual imports have remained stable with an average of 61,000 per year. One must note that from 2013 to 2015, the total number of mobile phone imports to St. Lucia was 182,000, which is similar to St. Lucia’s population of 185,000 in 2015. Also considering that mobile penetration has been over 100% since before 2013, many mobile phones were imported to upgrade existing mobile phones.

Figure 9: Imports of mobile phones to St. Lucia from 2012 to 2015



Source: Customs and Excise Office

3. E-waste forecast for Saint Lucia

Based on the information described in chapter 2, in this chapter we estimate the e-waste generation of the coming five years in St. Lucia, *i.e.*, for the period 2017-2021. As noted in the preceding chapter, data regarding existing ICT devices in St. Lucia is either not updated or is missing; therefore, the estimates in this

chapter are conservative. Reasonable assumptions, *such as those* regarding the number of TV sets per household or the EoL of different devices, are made and explained throughout the chapter.

In addition to estimating the volume of e-waste generated in the next five years, we also estimate the value of this e-waste based on Table 5, which describes the amount of valuable material that can be recovered from PCs, TV sets and mobile phones and its price per kilogram. It is important to note that the value of the following five years of e-waste is obtained with the current price of the materials, and therefore does not account for future changes due to market fluctuations.

Table 5: Value of materials from e-waste related to PCs, TV sets and mobile phones

Element**	Material recovered through processing (%)						Selling prices of materials recovered			
	Personal Computers		TVs		Mobile Phones		Price: USD per kg	Value per Ton of PCs	Value per Ton of TVs	Value per Ton of Mobile Phones
Content (kg)	Recoverable quantity per ton (kg)*	Content (kg)	Recoverable quantity per ton (kg)*	Content (kg)	Recoverable quantity per ton (kg)*					
Plastics	6.21	174.38	3.6	93.62	.06	375	0.22	38.36	20.60	82.5
Lead	1.62	45.49	.06	1.56	0	3.75	1.78	80.97	2.78	6.68
Aluminium	3.78	106.15	.36	9.36	-	-	1.57	166.66	14.70	-
Iron	5.4	151.64	7.8	202.84	0	22.50	0.25	37.91	50.71	5.63
Tin	.27	7.58	-	-	0	7.50	16.98	128.71	-	127.35
Copper	1.89	53.07	1.02	26.53	.02	112.50	4.73	251.02	125.49	532.13
Nickel	.23	6.45	.01	.30	0	15	9.20	59.34	2.76	138
Zinc	.54	15.16	.09	2.34	0	3.75	1.95	29.56	4.56	7.31
Gold	0	.01	0	.01	0	.30	44,388.7	443.89	443.89	13,316.62
Cobalt	0	.12	-	-	0	30	29.50	3.54	0	885
Palladium	0	0	-	-	0	.11	24.38	0	-	2.68
Manganese	.01	.24	-	-	-	-	0.73	.	-	-
Silver	.01	.14	0	.02	0	3.0	603.19	84.45	12.06	1,809.57
Silica	6.72	188.64	15.90	413.49	.02	112.50	.03	5.66	12.40	3.38
Total Value (USD)								1330.07	689.95	16,916.85

*Recoverable quantity is ~75% of initial weight.

**Other elements not included due to their low weights & values.

Sources: United Nations Environment Programme, "E-Waste Volume III, WEEE/E-Waste 'Take Back System'", 2012, IMF Actual Market Prices for Non-Fuel and Fuel Commodities, Average Price of 2016Q1/Q2/Q3, London Metal Exchange, 15-months buyer average as of 11/22/16, World Bank global Economic Monitor (GEM) Commodities Average Price of 2016Q1/Q2/Q3, London Metal Exchange, 2015 Average Price of Palladium (averaged from AM and PM)

3.1. Mobile phones

To forecast the volume of e-waste regarding mobile phone devices, we first forecast mobile penetration, *i.e.*, mobile lines per 100 inhabitants, and St. Lucia's population³⁶ for the upcoming 5 years. Second, we obtain the number of mobile devices in the market based on the forecast of mobile penetration and population. Finally, we estimate different scenarios of EoL, over two to four years, to estimate the e-waste generated in St. Lucia from mobile devices.

We use the following logistic function to forecast mobile penetration:³⁷

$$n(t) = \frac{K}{1 + e^{-(p+qt)}}$$

Where:

- $n(t)$ is the mobile penetration in year t
- K is the maximum mobile penetration
- q is the growth rate in any given year t as a function of the fraction of the population that still has not subscribed to mobile services
- p is the timing or location variable that jointly with q , shifts the diffusion function, $n(t)$, forwards or backwards

Reorganizing the terms we obtain:

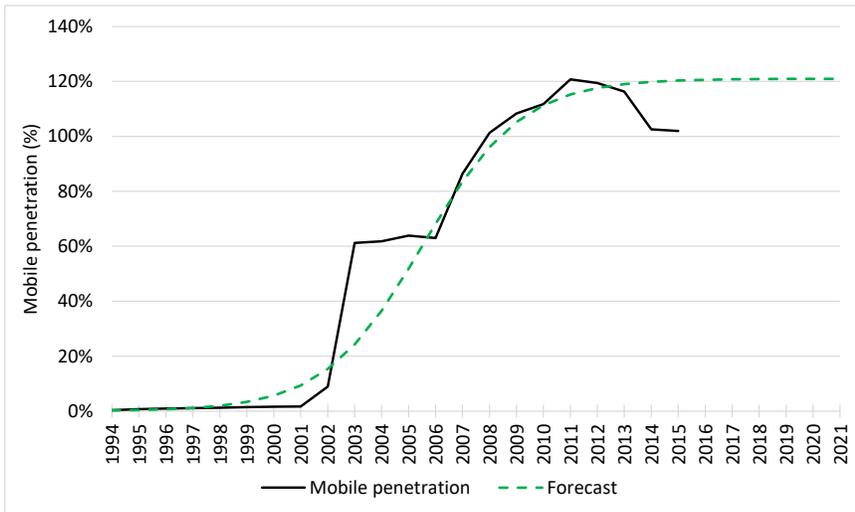
$$\ln \frac{n(t)}{K - n(t)} \equiv y(t) = p + qt$$

This equation is regressed using ordinary least squares (OLS) to obtain p and q . We assume K as 120%, *i.e.*, a long-run mobile penetration of 120 mobile lines per 100 inhabitants, and use the ITU data from 1994 to 2014 concerning mobile penetration. Note that 120% of mobile penetration was reached in 2011 in St. Lucia and, although it has decreased since then, we believe that mobile penetration will be above 100%, which is consistent with international trends. Figure 10 presents the real mobile penetration from the ITU data and the forecast mobile penetration through 2021 (green dotted line).

³⁶ See annex 2 with regards to St. Lucia's population forecast.

³⁷ We follow the logistic function described in the paper Zaber, M. and Sirbu, M., "A Cross-National Analysis of the Effect of Spectrum Management Policy on the Deployment of 3G Technology," TPRC 2011, available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1985779.

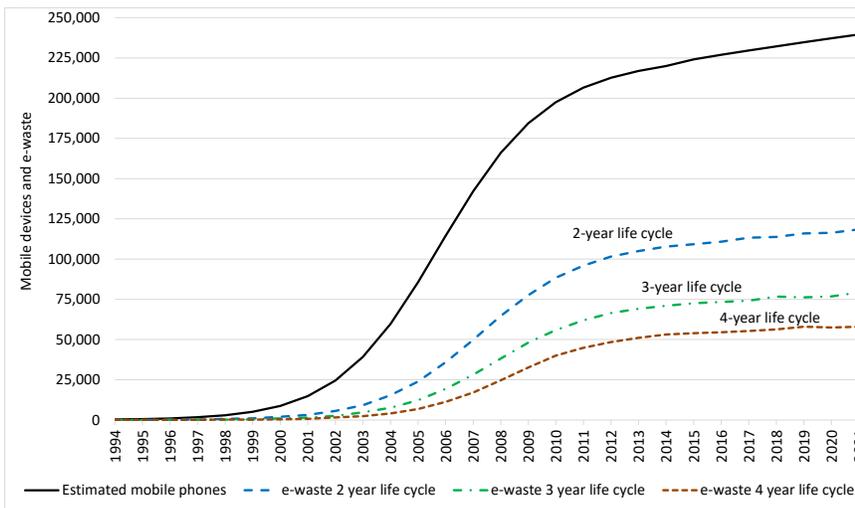
Figure 10: Forecast of mobile penetration (mobile lines per 100 inhabitants)



Source: TMG

Based on the mobile penetration forecast, we estimate the number of mobile phones in St. Lucia and the e-waste generated from mobile phones using different EoL years, *i.e.*, two, three and four. Figure 11 presents the evolution of e-waste from mobile phones.

Figure 11: Mobile devices and e-waste from mobile devices



Source: TMG

By 2021, nearly 240,000 mobile phones will be present in the market. For a 2-year life cycle, nearly 120,000 mobile devices will be replaced every year. For a 4-year lifecycle, nearly 60,000 mobile devices will be replaced every year. Comparing the number of mobile devices imported since 2013 on an annual basis, *i.e.*, between 56,000-67,000, with mobile phones being replaced according to the different life cycles over the same years, the life cycle in St. Lucia for mobile phones is between three to four years.

Assuming an average weight of 0.11 kg per mobile phone,³⁸ a life cycle of 3 to 4 years, and 75% of its material being recoverable, the average volume of e-waste from mobile phones will reach between 6.1 and 8.4 tons per year from 2017 to 2021, with a value between US \$106,000-143,000 per year.

Table 6: Summary – e-waste from mobile phones

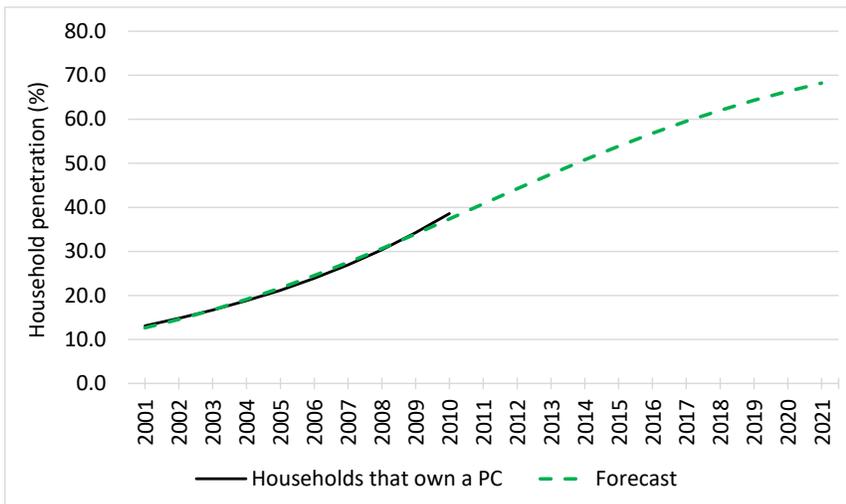
Mobile phone e-waste per year average	Mobile phone average weight (kg)	Tons per year of mobile phone e-waste	Average value per year from 2017 to 2021	Average value per recycled mobile phone
57 to 77 thousand	0.11	6.1 to 8.4	~US \$106,000 - \$143,000	~US \$1.86

Source: TMG

3.2. Computers

Similar to forecasting mobile phone penetration, we used a logistic function for forecasting household PC penetration. However, given that only two data points were available, *i.e.*, household PC penetration in 2001, 13.1%, and in 2010, 38.6%, we first estimated the evolution from 2001 to 2010 using a CAGR equal to 12.8%. Once we have an estimate for household PC penetration for the period 2001 to 2010, using the logistic function of section 3.1, with *K* equal to 80%, considering that in the long-run there will be an 80% household PC penetration, we forecast the household PC penetration for 2010 to 2011 in St. Lucia. Figure 12 presents the household PC penetration, *i.e.*, households with at least one PC.

Figure 12: Forecast of PC household penetration (households with at least one PC)



Source: TMG

Based on our assumptions, by 2021, 68% of households will own at least one PC. To check how reasonable our assumptions are, we compared this results to similar countries in the Caribbean. According to the ITU data, a group of countries/territories in the Caribbean had a higher PC household penetration in 2010. Based on our estimations, by 2014, although the same group of countries will continue to have a higher household

³⁸ Source: <http://ewasteguide.info/weight>.

PC penetration rate, St. Lucia will close the gap due to the high increase in PC imports between 2010 and 2014, near 64,000, thus reaching a household PC penetration of 50.8%.

Table 7: Household PC penetration (%)

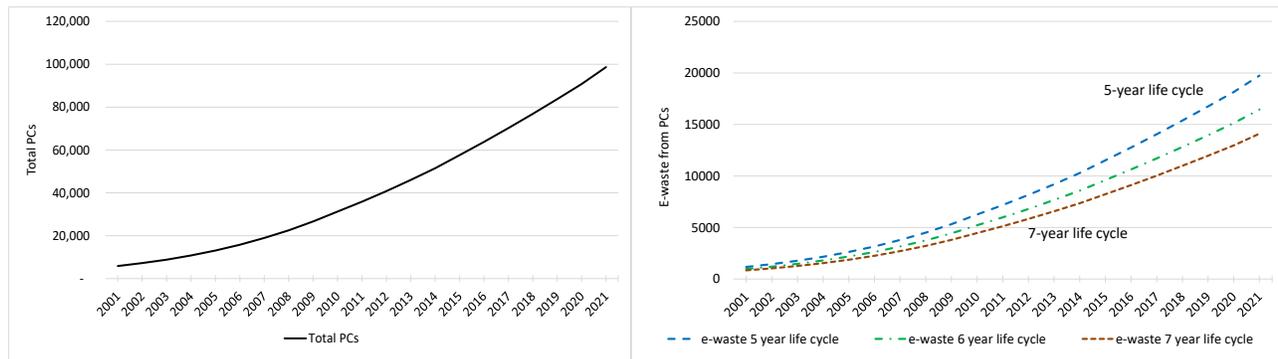
Country/Territory	2010	2014
Antigua and Barbuda	48.9	56.1
Aruba	62.5	73.1
Barbados	61.4	70.0
Cayman Islands	73.8	74.3
Saint Kitts and Nevis	64.0	66.5
Saint Lucia*	38.6	50.8
Trinidad and Tobago	53.1	64.0

* Estimated data for 2014.

Source: ITU except for St. Lucia 2014

On average, in 2001, each household in St. Lucia had one PC, by 2010, this indicator increased to 1.4 PCs per household. Due to the trend of replacing desktops with laptops due to their ease of mobility and personal use, it is expected that PCs per household will keep increasing. Therefore, we expect that by 2021, on average, each household will have 2.1 PCs.

Figure 13: PCs forecast (left) and e-waste from PCs (right)



Source: TMG

Based on the assumptions considered, we estimate that by 2021 St. Lucia will have nearly 100,000 household PCs, representing a three-fold increase from 2010, with 68% of households having at least one PC. We also expect PCs to have a higher life cycle than mobile phones, *i.e.*, between five to seven years. For a 5-year life cycle, nearly 85,000 PCs will be replaced in the following five years, 2017-2021. For a 7-year lifecycle, approximately 60,000 PCs will be replaced in the following five years, 2017-2021. Comparing the number of PCs imported since 2010 on a yearly basis, *i.e.*, between 8,000 and 18,000, with the PCs replaced according to the different life cycles over the same period from 2010 to 2015, and the increase in PC household penetration, the PC life cycle in St. Lucia for appears to be between six to seven years.³⁹ This takes into account

³⁹ Note that desktops have a lifecycle of three to eight years. See Teehan, P. and Kandlikar, M. (2012), "Sources of Variation in Life Cycle Assessments of Desktop Computers," *Journal of Industrial Ecology*, available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1530-9290.2011.00431.x/pdf>.

that the majority of imports are to increase the stock of PCs in St. Lucia, and the rest are to replace or update former PCs that go through their EoL.

Assuming an average weight of 24 kg per desktop PC and 3.5 kg per laptop PC,⁴⁰ a proportion of 33% desktops and 67% laptops,⁴¹ a life cycle of 6 to 7 years, and a 75% composition of recoverable material, the average volume of e-waste from PCs will reach between 122 and 143 tons per year from 2017 to 2021, with a value between US \$163,000 and \$190,000, also per year.

Table 8: Summary – e-waste from PCs (desktops and laptops)

PC e-waste per year on average	PC weight (Kg)	Tons per year of PC e-waste	Value per year From 2017 to 2021	Average value per recycled PCs
12 to 14 thousand	Desktop 24 Kg Laptop 3.5 Kg	122 to 143	~US \$163,000 - \$190,000	~US \$14

Source: TMG

3.3. Television sets

There are several challenges in forecasting the number of TV sets in St. Lucia. First due to the lack of information, we only have two data points: from the 2001 and 2010 Census Report regarding the percentage of households with at least one TV set, 79.0%, and 86.4%, respectively. The Census Report does not provide information on the average number of TV sets per household.⁴² In addition, due to the lack of information, the data provided by the Customs and Excise Office appears to have over-counted the number TV sets imported in 2014, reporting nearly 152,000 sets, way above the number of imports in 2013 and 2015 with 11,000 and 26,000 respectively (see Figure 6).

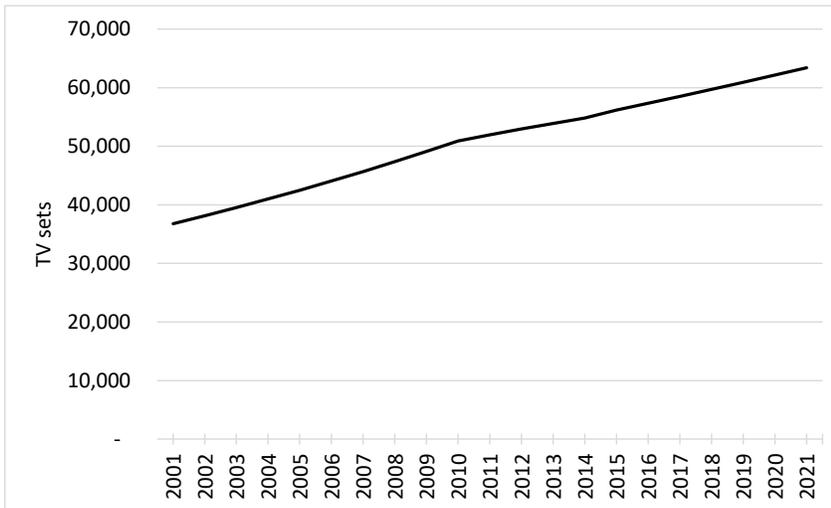
Therefore, for TV set e-waste we have established some assumptions to obtain a conservative number. First, we kept the growth trend of ~1% every year for TV set household penetration. By 2021 TV set household penetration will reach 96%. Second, we assume each household only has one TV set.

⁴⁰ Source: <http://ewasteguide.info/weight>.

⁴¹ Between 2010 and 2014, imports of laptops were higher than desktops. Including the stocks of PCs present in 2010, for every desktop in St. Lucia, there are two laptops.

⁴² For future census in St. Lucia, we recommend to include a question related to the number of TV sets per household, as well as the type of TV set, e.g., CRT or flat screen.

Figure 14: TV sets evolution in St. Lucia – estimation



Source: TMG

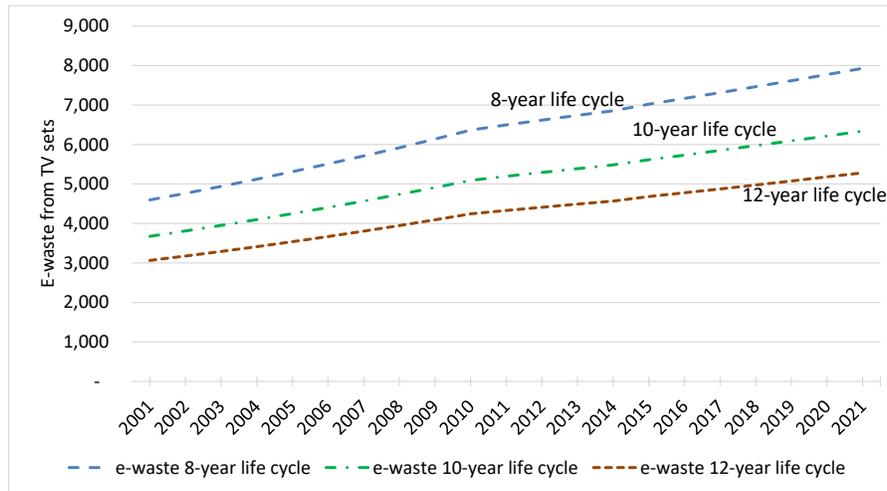
Based on these assumptions, by 2021 we estimate a stock of at least 63,000 TV sets in St. Lucia’s households. Note that imports are higher in comparison to new households adopting TV sets for all of the years except 2014. There are two possible explanations for this. First, St. Lucia has a high penetration of TV sets meaning most of the imports are for replacing existing TV sets, or second, imports include TV sets for businesses, such as hotels. Given that tourism is one of St. Lucia’s most important economic sector, if not the most important, we would expect that some of the TV imports are to replace or serve as additional TV sets for St. Lucia’s hotel rooms.⁴³

The life cycle of TV sets varies among different countries. In the US, the average life cycle is about 8 years, while in the European Union, the life cycle ranges from 7 to 15 years, depending on TV type and source of the data. In recent years, TV set technology has changed rapidly, prices have fallen and demand for new TV sets with cutting-edge technologies, such as TV sets connected to the Internet, have all shortened the life cycle in some places. In the United Kingdom, since more than a decade, primary TV sets have been replaced every 4.9 years.⁴⁴ Based on this information, we assume a life cycle of 10 to 12 years for St. Lucia (Figure 15), above developed countries.

⁴³ TV sets from St. Lucia’s hotel industry was not included given to the lack of public information. In addition, it was not possible to interview with the private sector.

⁴⁴ See Park, Phadke, Shah, Letschert, “Efficiency improvement opportunities in TVs: Implications for market transformation programs,” 2013, Energy Policy.

Figure 15: E-waste from TV sets



Source: TMG

Based on a life cycle of 10 to 12 years, between 23,000 and 26,000 TV sets will be replaced in the following five years, 2017-2021. Also assuming an average weight of 15 kg per TV set,⁴⁵ and 75% of material is recoverable, the average volume of e-waste from TV sets will reach between 70 and 79 tons per year from 2017 to 2021, with a value between US \$49,000 and \$54,000 per year.

Table 9: Summary

TV set e-waste per year average	TV set weight (kg)	Tons per year of TV set e-waste	Value per year From 2017 to 2021	Average value per recycled TV set
4.7 to 5.3 thousand	~15	70 to 79	~US \$49,000 - \$54,000	~US \$10

Source: TMG

3.4. Transition to digital terrestrial television

According to the Census Report of 2010, 75% of St. Lucia’s households have cable television, which means the transition to digital terrestrial television (DTT) will impact 25% of households. The other 75% will continue to receive the broadcasted TV signal through their cable TV provider using the set-top-box from said provider. Around 15,000 households that have at least one TV set will be affected by the DTT transition. Typically, the DTT takes several years to be fully implemented, *i.e.*, for the analogue switch-off to take place, thus, we can expect a DTT transition of at least five years.⁴⁶ If we assume a five year DTT transition and the replacement of almost all analogue TV sets, *i.e.*, a very low adoption of digital-to-analogue converters, on average, around 3,000 TV sets will need to be replaced each year during this five year period. These 3,000 TV sets per year

⁴⁵ Source: <http://ewasteguide.info/weight>.

⁴⁶ DTT transition periods vary among different countries. In some cases, it takes more than a decade for the analogue switch-off (ASO), in others around 5 years or even less (See: <http://en.dtvstatus.net/>). The ASO depends in several factors such as the number of households that depend only on broadcasting signal to receive TV content, and how fast do these households implement a solution, *e.g.*, replace their TV set, purchase a cable TV subscription, or buy a digital-to-analogue signal converter. Based on the high cable TV penetration in St. Lucia, we believe that a 5-year transition period would be reasonable.

should be added to the e-waste estimations once the DTT migration has been completed. Note that, based on rough numbers, the DTT transition will increase the annual e-waste from TV sets by near 40%.

Given that for the moment there is no decision on the digital standard to be implemented in St. Lucia,⁴⁷ and no DTT migration is currently in place, we will not include e-waste related to the DTT transition in the overall impact.

3.5. Summary

Table 10 summarizes the e-waste generation from mobile phones, PCs, and TV sets in St. Lucia for the next five years (2017 to 2021) based on the assumptions and estimations presented in the sections above. Between 990 and 1,152 tons of e-waste for the 5-year period will be generated with a total value of US \$1.5 to US \$1.9 billion. Between 369,000 and 482,000 devices, *i.e.*, mobile phones, PCs, and TV sets, will be disposed of during this period. In per population terms, between 1.0 to 1.2 kg per person per year of e-waste will be generated, with a value of US \$1.7 to US\$ 2.0 per person per year.⁴⁸

However, currently, only 30 tons per year, around 14% of total estimated annual e-waste per year, are being collected by recyclers, therefore between 170 and 200 tons of e-waste will either be improperly stored or dumped in incorrect locations in the following years if there is no an e-waste policy in place.

Table 10: E-waste generation from mobile phones, PCs, and TV sets for 2017-2021, summary

Type of e-waste device	E-waste devices per year average (000)*	Weight per e-waste device (kg)	Tons per year of e-waste	Value per year From 2017 to 2021 (US\$)	Average value per e-waste device (US\$)
Mobil phones	57 to 77	0.11	6.1 to 8.4	106,000 – 143,000	2
PCs	12 to 24	Desktops: 24 Laptops: 3.5	122 to 143	163,000 – 190,000	14
TV sets	4.7 to 5.3	15	70 to 90	49,000 – 54,000	10
Total	74 to 96	-	198 to 230	318,000 – 387,000	-

* Range depends on the life cycle, for mobile phones is between 3 to 4 years, for PCs from 6 to 7 years, and for TV sets from 10 to 12 years.
 Source: TMG

⁴⁷ “Review of International practices relating to the control of imports/production of TV devices and e-waste management practices and standards in the Caribbean,” TMG, Inc., 2015.

⁴⁸ According to the Global E-waste Monitor from the United Nations University, St. Lucia generated 2,000 tons of e-waste in 2014 (e-waste including lamps; small IT such as PCs, mobile phones; screens; temperature exchange equipment such as refrigerators; large equipment such as washing machines, stoves; and small equipment such as appliances), that is, 9.9 kg per persona in 2014.

4. E-waste Policy framework for Saint Lucia

The first three chapters of this report set the stage for an e-waste policy framework created to address and resolve St. Lucia's e-waste problem. E-waste generation in St. Lucia continues to increase as technological devices such as mobile phones, PCs, and TV sets are updated with next generation technologies and as new people embrace this change. With this in mind, this chapter will consist of options and proposals for an e-waste take-back system.

The first section proposes an e-waste definition specific to St. Lucia's situation and requirements. Following this, a general approach to developing the e-waste take-back system is presented. Next, different financing models related to the general approaches are described. In the final sections, recommendations on education and awareness activities, e-waste collection and storage, and monitoring, auditing and licensing practices are presented.

4.1. E-waste definition

Although not all nations define e-waste, those that do have varying definitions. Parameters involved in defining e-waste include equipment type, electricity usage, environmental impact, and ability to be reused. Using a combinations of these factors, countries establish definitions that best suit their environmental challenges and overall policy goals. Throughout the world, two definition frameworks have emerged: 1) all-encompassing and broad, and 2) focused on specific products.

4.1.1. Broad Definition

One of the broadest e-waste definitions comes from the European Union (EU), as established in its 2012 Directive on e-waste. This definition includes all equipment dependent on electric currents or electromagnetic fields, contingent on it having a voltage rating of less than 1,000 Volts AC or 1,500 Volts DC.⁴⁹ For the EU's purposes, this general definition is meant to promote recycling throughout the electronics industry and improve environmental accountability from all angles. Additionally, by not making the definition technology specific, the EU is taking a long-term approach, by covering electronic equipment it currently cannot specify. The United Nations has taken the same far-reaching approach to defining e-waste, noting that any item with "circuitry or electrical components with power or battery supply," qualifies as e-waste.⁵⁰

Although the EU utilizes an all-encompassing definition, for the sake of setting recycling recovery targets, reporting figures, and helping recyclers create business models, it splits up e-waste products into 10 categories (see Table 10). The most relevant to this piece are categories 3, IT and Telecommunications Equipment, and 4, Consumer Equipment and Photovoltaic Panels. These cover everything including TV sets, laptops, cellular phones, and video cameras and many of the minimum recycling targets are the same for each product. Cathode ray tubes (CRTs) and liquid crystal displays are not given a special category, but are designated as

⁴⁹ European Parliament, Directive 2012/19/EC on Waste of Electrical and Electronic Equipment (WEEE), July 4, 2012, <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012L0019&from=EN>.

⁵⁰ Step Initiative, United Nations, Solving the E-Waste Problem (Step) White Paper, 03, June 2014, http://www.step-initiative.org/files/step_documents/StEP_WP_One%20Global%20Definition%20of%20E-waste_20140603_amended.pdf.

requiring selective treatment, due to their hazardous nature. For this reason, a literature survey reveals that in the EU, e-waste is generally sorted into five groups, one of which is equipment containing CRTs.⁵¹

Table 11: E-waste Categories in the EU

Number	Category	Examples
1	Temperature exchange equipment	Refrigerators, Freezers, Equipment which automatically delivers cold products, Air conditioning equipment, Dehumidifying equipment, Heat pumps, Radiators containing oil and other temperature exchange equipment using fluids other than water for the temperature exchange.
2	Screens, monitors, and equipment containing screen having a surface greater than 100 cm ²	Screens, Televisions, LCD photo frames, Monitors, Laptops, Notebooks.
3	Lamps	Straight fluorescent lamps, Compact fluorescent lamps, Fluorescent lamps, High intensity discharge lamps - including pressure sodium lamps and metal halide lamps, Low pressure sodium lamps, LED.
4	Large equipment (any external dimension more than 50 cm)	Household appliances; IT and telecommunication equipment; consumer equipment; luminaires; equipment reproducing sound or images, musical equipment; electrical and electronic tools; toys, leisure and sports equipment; medical devices; monitoring and control instruments; automatic dispensers; equipment for the generation of electric currents. This category does not include equipment included in categories 1 to 3.
5	Small equipment (<u>no</u> external dimension more than 50 cm)	Household appliances; consumer equipment; luminaires; equipment reproducing sound or images, musical equipment; electrical and electronic tools; toys, leisure and sports equipment; medical devices; monitoring and control instruments; automatic dispensers; equipment for the generation of electric currents. This category does not include equipment included in categories 1 to 3 and 6.
6	Small IT and telecommunication equipment (no external dimension more than 50 cm)	Mobile phones, GPS, Pocket calculators, Routers, Personal computers, Printers, Telephones.

Source: EU Directive 2012/19/EC on Waste of Electrical and Electronic Equipment

4.1.2. Narrow Definition

Hawaii, the small United States (US) Pacific island state, has a much narrower and prescriptive e-waste definition, aimed at what it calls “covered electronic devices (CEDs)” and TV sets. In its Electronic Waste and Television Recycling and Recovery Act, Hawaii defines CEDs as “a computer, computer printer, computer monitor, or portable computer with a screen size greater than four inches measured diagonally,” and goes on

⁵¹ United Nations Environment Programme, “E-Waste Volume III, WEEE/E-Waste ‘Take Back System’”, 2012, http://ewasteguide.info/files/UNEP_2012_EwasteManual3.pdf

to exclude screens in vehicles, refrigerators, and other secondary products.⁵² By not bloating the definition with other equipment that Hawaii may want to eventually regulate, it keeps the law focused and its objectives well defined.

Planning ahead, Australia built mechanisms into its environmental policy framework that allow it to expand and change the scope of the framework every year. The Product Stewardship Act, implemented in 2011, uses a combination of voluntary, co-regulatory, and mandatory measures to encourage “good product stewardship,” which includes increasing recycling rates, recovering valuable resources, preventing harmful materials from entering the environment, and more.⁵³ Every year Australia’s Department of the Environment and Energy (DEE) publishes a list of products being considered for coverage by the legislation. The first products covered by the legislation included televisions and computers, and in subsequent years other products covered included waste architectural and decorative paint and end-of-life handheld batteries. As previously noted, this legislation affects all types of waste, not just e-waste, but this flexible legislation allows the government to react to stakeholder concerns on a yearly basis.

In fact, as an immediate amendment to the Product Stewardship Act, Australia also established the National Television and Computer Recycling Scheme, which establishes a permanent recycling program structure for TVs and computers. With an independent program dedicated to TVs and computers and yearly changes to waste definitions, Australia is able to regularly expand the scope of its recycling programs if the need arises. The Product Stewardship Act also avoids the “one size fits all” approach by utilizing a combination of voluntary actions, mandatory requirements, and co-regulatory schemes.

British Columbia in Canada completely transitioned from a narrow definition to a static, all-encompassing definition of e-waste. In 2004 British Columbia established the Environmental Management Act Recycling Regulation with only three categories of e-waste, *i.e.*, computers, desktop printers, and TVs.⁵⁴ Since its creation, the regulation has been amended nearly every year, but with no changes to the e-waste definition. Finally, in 2012, the regulation was amended and now includes an exhaustive e-waste definition.⁵⁵

4.1.3. Additional definitions

The given examples are only a small sample of countries that have e-waste regulations. Table 12 contains other examples and their e-waste definitions:

Table 12: Example E-waste Definitions

Country	E-Waste Definition
Colombia	Colombia’s guidelines on e-waste, law 1672 of 2013, defines e-waste as electrical and electronic equipment, <i>i.e.</i> , all equipment operating with electric current or electromagnetic fields or equipment for the generation, transfer or measurement of such currents and fields, that have been discarded by the consumer.

⁵² State of Hawaii, Department of Health, Electronic Waste and Television Recycling and Recovery Law, 2009, <http://health.hawaii.gov/ewaste/files/2013/06/339D-2016.pdf>

⁵³ Australian Department of the Environment and Energy, “Product Stewardship Act 2011 No. 76, 2011”, 2011, <https://www.legislation.gov.au/Details/C2011A00076>.

⁵⁴ BC Regulation 449/2004, Environmental Management Act Recycling Regulation, August 7, 2007, <http://canlii.ca/t/jknj>.

⁵⁵ BC Regulation 449/2004, Environmental Management Act Recycling Regulation, July 1, 2012, <http://canlii.ca/t/52985>.

Country	E-Waste Definition
Ghana	Ghana’s Hazardous and Electronic Waste control and Management Bill (2016) defined e-waste as: discarded electronic equipment inclusive of all components, subassemblies and consumables which are part of the product at the time of discarding.
[The State of] Illinois, US	Illinois’ Electronic Products Recycling and Reuse Act defines electronic devices covered by the act as specific products such as “computer monitor, television, printer, electronic keyboard, etc.” and goes on to list specific items excluded from the list.
India	India’s E-Waste Management Rules (2016) define e-waste as: electrical and electronic equipment, whole or in part discarded as waste by the consumer or bulk consumer as well as rejects from manufacturing, refurbishment and repair processes.
Peru	Follows the EU’s definition
Province of Buenos Aires, Argentina	Follows the EU’s definition

Source: TMG

4.1.4. Recommendation

The scope of an e-waste definition often comes down to the ability of a nation to handle the logistics of a recycling program and developing nations rarely have the adequate facilities, machinery, or ability to implement necessary financing mechanisms to handle all EEEs. For this reason, the Solving the E-waste Problem (STEP) Initiative recommends developing nations use a phased approach, similar to British Columbia or Australia’s.⁵⁶ Considering this recommendation, and St. Lucia’s situation as a developing nation, it will undoubtedly benefit from a more narrow definition, allowing it to be expanded in the future as the capacity to collect and handle e-waste increases.

Presently, St. Lucia aims to curb the environmental impact of high growth EEE devices such as mobile phones, consumer electronics, and in particular CRT TVs, on account of the impending digital TV transition. In order to maintain a level of international harmony, its definition should be based on the EU’s definition. Following this broad language, the legislation should specify categories of products the regulator aims to target.

After a narrow e-waste definition is established, St. Lucia may expand it once market conditions and public consensus allow for a more expansive definition. The narrow definition allows for the gradual addition of categories covered in the legislation until the category clause is removed altogether, and the definition encompasses all e-waste. At that point, the legislation will still include categories for products, in order to facilitate their different treatment and recycling goals, but they will only appear in the requirements section, just as they are in the EU’s E-waste Directive.

⁵⁶ StEP, “E-waste Prevention, Take-back System Design and Policy Approaches” February 13, 2015, <http://www.step-initiative.org/?file=files/step-2014/Publications/Green%20and%20White%20Papers/Step%20Green%20Paper%20Prevention%26Take-back%20System.pdf>.

Table 13: Recommendation on e-waste definition⁵⁷

Electrical or electronic equipment definition:

Equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer or measurement of such currents and fields and designed for use with a voltage rating not exceeding 1,000 volts for alternating current and 1,500 volts for direct current.

Broad E-waste definition:

Any electrical or electronic equipment, which the holder discards or intends or is required to discard, including all components, sub-assemblies, and consumables which are part of the product at the time of discarding, provided they belong to one or more of the following categories, as defined in the ANNEX III of the EU-WEEE Directive:

1. Temperature exchange equipment;
2. Screens, monitors, and equipment containing screens having a surface greater than 100 cm²;
3. Lamps;
4. Large equipment (any external dimension more than 50 cm) including, but not limited to: Household appliances; IT and telecommunication equipment; consumer equipment; luminaires; equipment reproducing sound or images, musical equipment; electrical and electronic tools; toys, leisure and sports equipment; medical devices; monitoring and control instruments; automatic dispensers; equipment for the generation of electric currents. This category does not include equipment included in categories 1 to 3;
5. Small equipment (no external dimension more than 50 cm) including, but not limited to: Household appliances; consumer equipment; luminaires; equipment reproducing sound or images, musical equipment; electrical and electronic tools; toys, leisure and sports equipment; medical devices; monitoring and control instruments; automatic dispensers; equipment for the generation of electric currents. This category does not include equipment included in categories 1 to 3 and 6;
6. Small IT and telecommunications equipment (no external dimension more than 50 cm).

Narrow E-waste definition for St Lucia:

Any electrical or electronic equipment, which the holder discards or intends or is required to discard, including all components, sub-assemblies, and consumables which are part of the product at the time of discarding, provided they belong to one or more of the following categories, as defined in the ANNEX III of the EU-WEEE Directive:

1. Screens, monitors, and equipment containing screens having a surface greater than 100 cm² (UNU-KEYS 0303, 0 0308, 0309, 0407, 0408);
2. Small IT and telecommunications equipment (no external dimension more than 50 cm). (UNU-KEYS 0301-0302, 0304-0306, 0702).

E-waste definition expanded:

⁵⁷ Based on Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE) <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012L0019>.

Once the take-back system for e-waste belonging to the categories recommended above is in place and working correctly, *i.e.*, e-waste volume targets are achieved, the e-waste definition must be expanded to include all EEE in of the EU e-waste directive.

Future studies and legislative actions looking to implement take-back systems for the other categories of e-waste included in the EU E-waste Directive should include said definitions in this expanded definition section. Additionally, such studies should rely on the experience of the prospective take-back system for categories 2 and 6, respectively screens and small IT, of ANNEX III of the EU-WEEE Directive.

Note: These definitions are based on those of the EU, modified to suit the needs of Saint Lucia.

4.2. Strategy to develop an e-waste take-back system

In constructing an e-waste take-back policy, consideration should first and foremost be given to determining which stakeholder is in charge of establishing and maintaining the overall e-waste take-back system, *i.e.*, approval of e-waste collectors and recyclers, collection of payments to finance the take-back system, reimbursing collectors, and enforcement, among others.⁵⁸

In both cases, establishing and maintaining the e-waste take-back system, the government should establish a waste management authority to act as a point of contact for all stakeholders and to oversee the e-waste process. As a key consideration in this project, St. Lucia has already established a solid waste management system and a solid waste management authority, SLSWMA, which could act as the point of contact and handle new responsibilities in the e-waste take-back system.

As highlighted in the Solving the E-waste Problem (StEP) document,⁵⁹ the first approach to establishing and maintaining the overall e-waste take-back system entails the government handing control of the take-back system over to a third party organization (TPO), made up of private sector members. Contrasting a government controlled system, one run by a TPO has much greater flexibility and can develop relationships with its members more easily. Additionally, business incentives such as cost reduction and potential revenue increases more directly motivate swift and effective action. TPOs also have their downsides as well, as a lack of enforcement mechanisms and a focus on its members, rather than the overall goal, may steer the e-waste programs away from their original intent.

In the second proposed approach, the waste management agency controlled by the government, in this case SLSWMA, will directly select the recyclers and impose its chosen financing mechanism, which has the benefit of preventing conflicts of interest within the private sector. Additionally, a government-established e-waste take-back system can be incorporated into any existing or future solid-waste recycling program. Unfortunately, as with most government-run programs, this type of framework may be inherently rigid, as governments naturally act slowly and prescriptively. Not only this, but considering the tight margins that the entire recycling industry faces, the possibility of stifling innovation must be weighed against the benefits of more strict control.

⁵⁸ StEP, Green paper, "E-waste Prevention, Take-back System Design and Policy Approaches," February 2015, available at: http://www.step-initiative.org/files/step-2014/Publications/Green%20and%20White%20Papers/Step%20Green%20Paper_Prevention&Take-backy%20System.pdf.

⁵⁹ StEP, Green paper, "E-waste Prevention, Take-back System Design and Policy Approaches," February 2015.

Table 14 outlines the pros and cons of the two aforementioned options based on StEP’s “E-waste Prevention, Take-Back System Design and Policy Approaches” paper.

Table 14: Pros and Cons of Options for Overall Take-back System Management

Management	Pros	Cons
Government in charge	<ul style="list-style-type: none"> • Have powers of enforcement <ul style="list-style-type: none"> ○ Can levy fines ○ Can ban noncompliant producers • No potential conflict of interest 	<ul style="list-style-type: none"> • Not always most efficient economically, as this can lead to additional layers of administration • Can stifle (quick) innovation • Money flowing into and out of government departments can be problematic
Third party organization in charge	<ul style="list-style-type: none"> • More flexible – can adjust rules and outcomes more easily • Easier for TPO than government to develop relationship with members • Business incentive as costs and program can more easily be controlled and influenced 	<ul style="list-style-type: none"> • Potential lack of enforcement mechanism • Can focus too much on their members and not have the wider community and environment as interested stakeholders • Potential conflict of interest

Source: StEP, “E-waste Prevention, Take-back System Design and Policy Approaches”

In the following subsections we describe a TPO-centric and government-centric approach to establishing and maintaining the overall e-waste take-back system in St. Lucia.

4.2.1. TPO-centric

Although the TPO-centric approach focuses on placing control of the take-back system in the hands of a TPO, St. Lucia’s government must determine which private sector companies should constitute its membership. Our proposal for this approach is for SLSWMA to do so by creating a list of EEE importers and give them the necessary authority to establish and run an e-waste take-back system. The reason to include importers instead of EEE retailers or any other stakeholder in the value chain, is because importation is the first commercial stage for EEE in St. Lucia, thus this will guarantee that all EEE included in the e-waste definition is accounted for.

Importers of EEE included in the e-waste definition must organize a non-for-profit association and set the rules by which the association will be governed, with the objective of establishing a take-back system that will collect e-waste according to the definition proposed in section 4.1 and hand the waste over to the existing recyclers in St. Lucia. EEE importers will have a specific timeframe in which they can design and present the association design and take-back system work plan. Such a design and work plan must present at least the following topics:

- a. Rules by which the association will be governed
- b. Organogram of the association and responsibilities of administrative personnel
- c. Method to finance the take-back system, *e.g.*, based on revenue market share of each importer, etc.
- d. Develop a plan to collect e-waste, via door-to-door, specific drop-off locations, specific collection fairs on specific dates, etc., either by themselves or by contractors, detailing the infrastructure that will be required in the process
- e. Initial goals of e-waste collection measured in tons per year
- f. Plan whereby the current licensed e-waste recyclers in St. Lucia will be included in the overall plan

- g. Awareness strategy to educate the consumer on responsible e-waste disposal methods
- h. Location and contact information

Once the work plan is finalized, it must be presented to SLSWMA for approval based on transparency, fairness, and feasibility. The design of the work plan should take no more than 4 months. The approval of the plan by SLSWMA can take 2 additional months, including the time to make the necessary modifications suggested by SLSWMA.

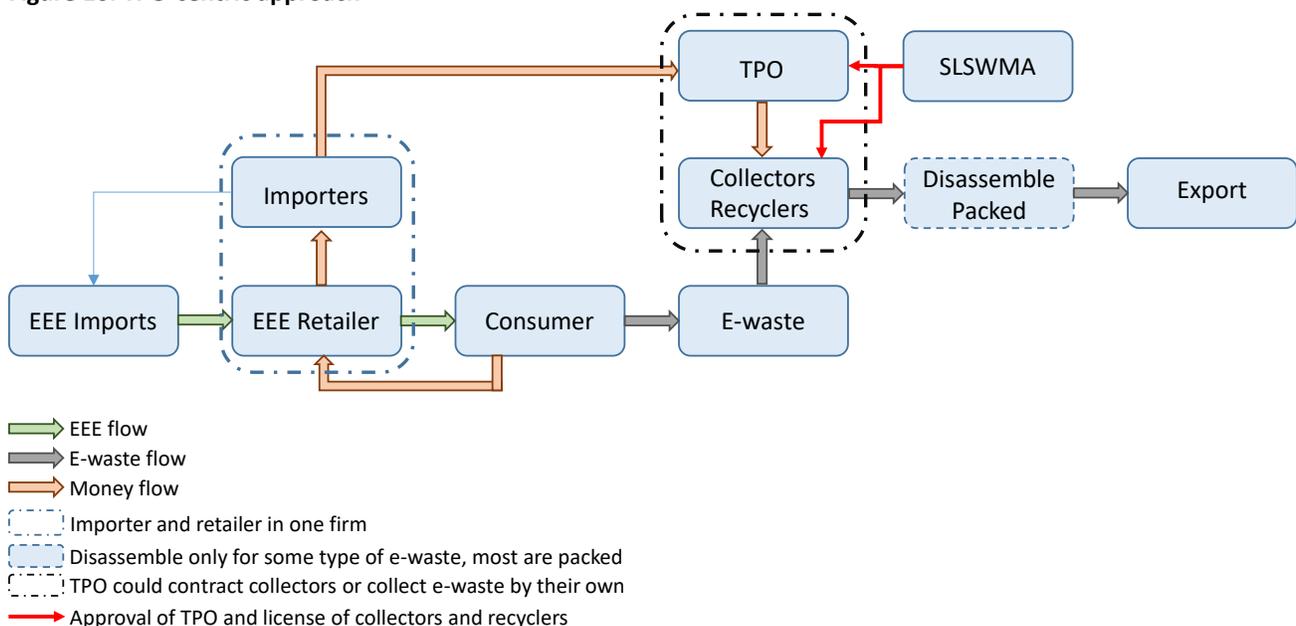
If e-waste collection will include external contractors, we suggest that transparent tenders be required, e.g., open bidding processes whereby any collector or recycler, licensed by SLSWMA, has the chance to participate. Allowing the collectors and recyclers to bid against each other with market forces guiding the selection process will make the resulting system more economically and logistically efficient.

Although the government does not influence the process directly, as a safeguard and monitoring measure, any company that wishes to bid must receive a license from SLSWMA. This license will prove that the collector or recycler has the necessary equipment, infrastructure, scalability, and overall ability to establish proper collection points to meet St. Lucia’s demands.

The association will determine amongst its members, the financing model and rates to be paid by each of its members. The SLSWMA’s approval of the financing model and rates should be based on fairness, i.e., importers with higher market share of EEE imported, by revenue, quantity, weight and/or volume, will proportionally have higher rate to finance the model. That said, the importers may find a different distribution method suits their needs better; their ability to make such changes is a direct result of a TPO-centric system. However, the method must be presented and supported to SLSWMA for approval.

Finally, SLSWMA will determine if the work plan is feasible, i.e., if the goals and the activities set in the plan are reasonable based on the experience of SLSWMA.

Figure 16: TPO-centric approach



Note: Although collectors and recyclers are in the same box, they are not necessary the same person/firm.

Source: TMG

In the TPO-centric approach, SLSWMA will be responsible of licensing collectors and recyclers and enforcing and oversight, and the TPO will be responsible of collecting payments from householders and reimbursing collectors and recyclers.

The financing of this type of e-waste take-back system, as well as with any other approach, rests on the consumer. The costs assumed by the importers to realize the TPO are transferred to the retailers increasing the price of EEE and in turn, retailers increase the price of these products to the end user. However, the price increase is optimized because it will reflect more precisely the cost of the take-back system.

Once e-waste recycling begins, SLSWMA will incur a new set of responsibilities. In addition to investing in educational and outreach activities, SLSWMA must track e-waste being collected and recycled, monitor the correct functioning of the TPO, and act as a primary point contact for both the private sector and civil society. Two reporting criteria provisions should be submitted to SLSWMA: 1) requiring the TPO to report detailed import lists by member along with how much it collects from member and pays its selected recyclers, expenses in education and awareness programs, among others, and 2) requiring that the recyclers, *i.e.*, exporters of e-waste, submit the receipts of its exports and management processes. This allows the government to monitor the entire process from start to finish.

Note that, to some extent, the TPO-centric approach follows the extended producer responsibility (EPR) principle. Although the TPO-centric approach proposed does not require that manufacturers be responsible for the EoL treatment of the EEE they produce, mainly because there are no EEE manufacturers in St. Lucia and they do not import and sell their products to St. Lucia directly, it does require the importers of EEE to be responsible as alternative.⁶⁰

4.2.2. Government-centric

In contrast to the TPO-centric approach, the government-centric approach creates a specific agency responsible for establishing and maintaining the overall e-waste take-back system. We are proposing SLSWMA to be this agency. SLSWMA has experience in establishing and maintaining the solid waste system and currently is collecting bulk waste, including “large size” e-waste, once a month, door-to-throughout the island, as explained in section 1.2. In addition, SLSWMA licenses the collectors and recyclers of waste in St. Lucia, including e-waste recyclers. Therefore, we believe that SLSWMA has the capacity and could acquire the knowledge quickly to manage the e-waste take-back system.

In the government-centric approach, the government is the sole controller in developing and running the e-waste take-back system. Rather than create a separate system to manage e-waste, SLSWMA can incorporate e-waste pickup into its solid waste management plan, taking advantage of the current once a month collection of bulk waste. However, this approach must include some changes due to the specificities of e-waste collection, as follows:

- a. Bulk waste and e-waste should not be collected the same day. The reason for this is that handling different types of waste may create unintentional accidents in which bulk waste handling, such as refrigerators, washing machines or furniture, etc., may break CRT screens for example, which are highly hazardous to human health (Note that some bulk waste items, such as refrigerators and washing machines, may also be considered e-waste under a broader definition).

⁶⁰ StEP, Green paper, “E-waste Prevention, Take-back System Design and Policy Approaches,” February 2015.

- b. Unlike bulk waste, e-waste should not be picked up once a month. Requiring monthly door-to-door e-waste collection is not advisable. Households do not generate e-waste this frequently, and the cost of going door-to-door once a month would greatly outweigh the value in collecting it.

Based on the above observations, we recommend that e-waste be collected as follows:

- a. Via door-to-door pickup every four months, *i.e.*, three times per year, and completely separately from bulk waste. By collecting it separately, no additional costs will be added to the bulk waste collection fee. In addition, door-to-door pickup alleviates the need for individuals to drop their items of at designated locations, which can present a financial problem for those in developing nations, who typically have lower household incomes.
- b. We suggest a day at the end of January or beginning of February, as the first day of the year to collect e-waste, as many households upgrade their EEE in December, thus, there will be a peak point in e-waste generation. (see Table 15)

Table 15: Proposed frequency for e-waste collection

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Ago.	Sep.	Oct.	Nov.	Dec.
E	B	B	B	E	B	B	B	E	B	B	B

E = e-waste; B = Bulk waste.

Source: TMG

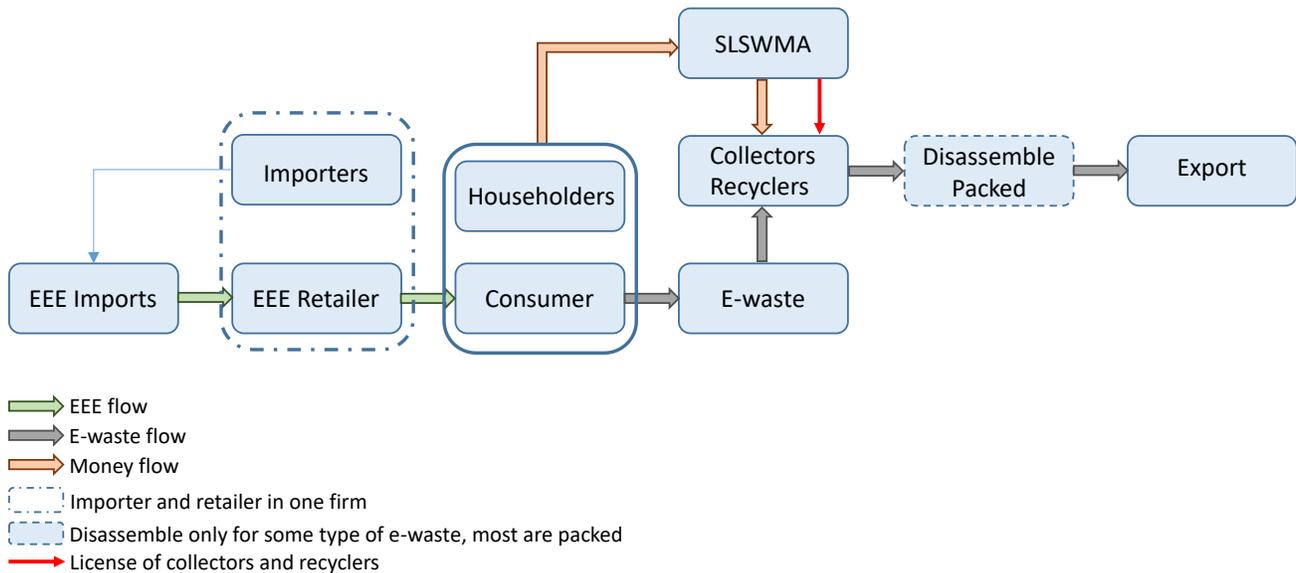
- c. The vehicle in which e-waste will be collected may be the same vehicle used for bulk waste, however, it will need to be modified as described in section 4.5.3.
- d. Citizens should be notified well in advance of the specific dates in which e-waste will be collected and informed of kind of e-waste will be collected.

One must note that this government-centric approach is a public-private partnership in which the government allocates the resources needed for the project, *i.e.*, e-waste collection, and the private sector develops the project. Resources are allocated through inverse auctions, in which the winner is the bidder that requires the fewest resources to collect waste on a door-to-door basis with the appropriate tools. The financing model will be discussed in section 4.3, but for the moment is sufficient to say that a monthly household fee, similar to that collected for solid waste, will be imposed. This fee will not only finance e-waste collection, but also the education and awareness programs on e-waste, and the overhead for managing SLSWMA.

Unlike in the TPO-centric approach, the role of collectors is simply to collect, not to recycle the waste they pick up. Collectors of e-waste will be the same collectors of bulk waste and solid waste that are already being collected. After e-waste is picked up on the designated days, the collectors will deliver it to SLSWMA location, where e-waste will be stored separately from the other landfill trash. From there, licensed recyclers will be admitted to pick up the e-waste, on a first-come first-served basis for free and return it to their own facilities. Recyclers will export the e-waste for additional treatment and processing.

In this scenario recyclers will still be required to obtain e-waste recycling licenses from SLSWMA. SLSWMA will also need to perform monitoring and auditing duties in this case, but it only needs to focus on the amounts of e-waste being delivered to recyclers for statistical purposes.

Figure 17: Government-centric approach



Note: Although collectors and recyclers are in the same box, they are not necessary the same person/firm.
 Source: TMG

As demonstrated in Figure 17, in a government-centric approach, SLSWMA will be responsible of licensing collectors and recyclers, collecting payments from householders, reimbursing collectors and recyclers, and enforcing and oversight.

4.2.3. Recommendation

Both options present unique benefits and challenges, and in the right circumstances either may be viable options. In the beginning stages, the TPO-centric approach appears to benefit St. Lucia the most, as it is a market driven solution with minimal government interference. The overall cost of the program will be decreased as the importers will want to lower their costs as much as possible in order to have as little of an impact on the price of EEE for consumers as possible. Otherwise, demand may be greatly reduced.

However, one of the most important drawbacks for this option is the high levels of alternative e-waste importation. As mentioned in section 1.1, people in St. Lucia travel overseas and buy EEE for personal use or buy EEE through online commerce to avoid paying taxes. Thus, importers should not be responsible for e-waste obtained through different channels, especially when it holds a significant share of the market. In short, it would be unfair and unreasonable to make importers pay for the large amounts of e-waste that they are not responsible for. Given that it would be impossible to differentiate at the moment of pickup which EEE were sold through the importer channels and which were not, the take-back system would need to include all e-waste regardless of the initial source.

The government-centric approach, although it requires more government involvement and management to oversee to run the reverse auction and collect the relevant fee from households, it meshes perfectly with the government's existing SLSWMA. By adding specific e-waste pickup dates to an existing schedule, all waste management can be addressed by the existing contractors. In addition, the initial increase in oversight will allow SLSWMA to establish its own internal mechanisms for monitoring and evaluating e-waste take-back while the auction and negotiations with contractors take place. Moreover, orphan e-waste will be included in

the take-back system more easily. On account of these factors, we believe a government-controlled take-back system, is the best approach for St. Lucia.

4.3. Financing models

E-waste disposal and recycling efforts, including education and awareness programs, are generally financed by one or two of the following groups: society as a whole, consumers, or producers. Table 8 provides a list of the three models and their full definitions.

Table 16: Financing Models

Finance Model	Description	Level of Government Involvement Required
Society	a. Requires general tax revenues to be diverted to meet the costs associated with the take-back system.	High
	b. A fee is charged to all households.	High
Consumers	Mandates that the consumer either pay to discard the product or pay a fee when purchasing the new product, which would be collected in a centrally-managed fund.	High
Producers/importers	Requires producers/importers to meet the costs associated with the solution.	Low

Source: TMG Research and StEP, "E-waste Prevention, Take-back System Design and Policy Approaches" February 13, 2015. Option society (b) is included by TMG based.

4.3.1. Society

In the first model, all citizens finance waste management, by either (a) diverting existing tax revenue, or (b) paying a flat fee, to cover all of the costs. Under both of these variations, even those who do not produce the same amount e-waste as others end up paying for waste management services, distributing the burden over a greater number of people, effectively lowering the individual impact. Version (a) requires government commitment to allocate the necessary resources to establish and maintain the take-back system. In some cases, government spending may have other priorities, causing them to redirect the resources intended for e-waste collection, therefore defunding the system.

Version (b) does not depend on the government's general tax revenue and priorities to finance the take-back system, instead it solely depends on the fee charged to all households to manage not only e-waste, but other types of waste as well, including solid waste. However, the calculations to estimate the fee to be charged to all households is not an easy task as it could be under or overestimated. Thus, in the initial years of the project, some adjustments will be necessary to reach the point of equilibrium, *i.e.*, revenues from the household fee match the costs of implementing the take-back system.

Note that based on the statistics of TV sets in St. Lucia from the 2010 census report, a very high percentage of households own at least one TV set (86% in 2010) and the percentage of households with PCs has been growing continuously. At some point in time, all households will make use of the e-waste take-back system. Therefore, a model in which the whole society collaborates to finance the system is justified.

4.3.2. Consumers

The second financing model entails taxing solely EEE products, moving the burden to only those contributing to the problem; this is based on the “polluter pays principle”⁶¹. With regards to “fairness,” this scheme works well, as one must opt-into the tax and just as with pollution taxes, those producing waste are charged. That said, because EEE products benefit society in economic, innovative, and social ways, increasing the price of those goods puts them out of reach for many more individuals, particularly in developing nations. This case is highly dependent upon the economic situation in the country, as well as the long-term goals of the government, particularly if promulgating the use of EEEs is a high priority.

In addition, estimating the fee to be included in the price at the moment of purchase of EEE is not an easy task. Similar to the household fee, the resources collected to finance the take-back system may be over or underestimated for several years before reaching the equilibrium point. Therefore the fee would need to be modified on a yearly basis until equilibrium is reached. Notice however, that due to changes in demand for EEE to which the tax is applied, it would be even more difficult to estimate a fixed fee in this case compared with version (b) of the first model, where the number of households is either constant or increasing at an estimated, small rate every year.

4.3.3. Producers/importers

The third financing method is linked to the EPR principle mentioned in section 4.2.1 and to the TPO-centric approach in the sense that producers, and in this case importers, are responsible for financing the take-back system, removing the regulator from the financing duties of e-waste management. As mentioned before, this financing method does not necessarily relieve the end users of any financial responsibility since producers, importers and retailers will transfer the cost downstream until it reaches the consumer, who will end up paying a higher price for EEE. In other words, the costs to manage the take-back system are internalized in the end user price. However, if the TPO-centric system is optimized, the change in price should be very low.

Jointly with this financial method, regulators generally require a minimum volume of e-waste to be recycled.⁶² The U.S. state of Illinois has employed this method since 2008, when it established its Electronic Products Recycling and Reuse Act.⁶³ The law requires manufacturers recycle certain amounts of e-waste, based on percentages of total weight of EEE sold. Financing models are not mentioned at all in the legislation, leaving it up to manufacturers, recyclers, and collectors to manage it amongst themselves. Illinois continues to employ this method, and has even increased the required recycling amounts to 80 percent (from 50 percent) of the total weight of EEE sold by manufacturers in the state.

A fourth funding model, essentially branching off of the third, would impose environmental taxes on producers or importers to finance the take-back system. St. Lucia has previously utilized a levy on imported EEE goods. In 1999 Saint Lucia passed the Environmental Protection Levy Act, imposing levies on a wide range of EEE products from motor vehicles and tires to refrigerators and plastic containers.⁶⁴ Although the schedule

⁶¹ United Nations Environment Programme, “E-Waste Volume III, WEEE/E-Waste ‘Take Back System’”

⁶² In general for any take-back system, is advisable to set targets of volumes of e-waste to be collected or recycled.

⁶³ Illinois General Assembly, Electronic Products Recycling and Reuse Act, September 17, 2008,
<http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=2998&ChapterID=36>

⁶⁴ Saint Lucia, Environmental Protection Levy Act, Act 15 of 1999,
<http://www.caribbeanenvirolaw.org/sites/default/files/Environmental%20Protection%20Levy%20Act%201999.pdf>

contained within the Act specified various categories of products, they were broad and discriminatory, as the language did not discern between the goods' origin and did not address product re-exportation.⁶⁵ However, recently the levy was repealed and a value added tax (VAT) was established to finance all the government programs, including environmental programs.

4.3.4. Recommendation

The financing model is highly dependent upon the chosen general approach to e-waste collection and the factors surrounding it. Based on the government-centric approach recommended in section 4.2, the most suitable financing method is a fixed fee directly imposed on all households. It is important to consider that currently the government is analysing the possibility of imposing a fee on all households to cover the solid waste collection and proper disposal costs. As of today, the government is financing SLSWMA and the solid waste collection system through general tax revenues. If the fee imposed on all households for solid waste management is implemented, it would be a prime opportunity to add a fee for e-waste management. The revenue received from this fee would go directly to SLSWMA to finance the e-waste take-back system along with the solid waste collection system. The proposed fixed-household fee would borrow aspects from a non-visible EPR model, as the waste management fee would encompass both traditional solid waste and e-waste, without a separate category for each. As such, just as consumers would not see the additional fee added to the price of EEE in a non-visible EPR model, households would only see one fee associated with waste management instead of two separate categories.

4.4. Recommendations on education and awareness

There are several different ways to educate and create awareness about responsible disposal of e-waste. The coordination of activities and regulation related to education and awareness should be led by SLSWMA. In addition, education should be provided to avoid, reduce, reuse and recycle EEE so that e-waste is not generated as quickly. We recommend the following activities to be implemented in St. Lucia.

4.4.1. EEE retailers

EEE retailers such as mobile providers/retailers, TV sets retailers, PCs and PC accessory retailers, etc., can implement a variety of initiatives in coordination with SLSWMA:

- a. Encourage customers to drop-off their e-waste products when replacing exchanging them for new ones, *i.e.*, when upgrading their mobile phones or laptops.
- b. Allocate space for bins of reasonable size at point-of-sale locations so customers can easily drop-off e-waste and schedule pick-up dates either directly with an e-waste collector or during the dates established by SLSWMA.
- c. In coordination with SLSWMA, design and distribute educational pamphlets that answers what is e-waste, the negative effects of manipulating e-waste on human health are, ways to dispose e-waste responsibly, etc.

⁶⁵ Anderson, Winston. *Anderson's Principles of Caribbean Environmental Law*. Washington, DC: Environmental Law Institute, 2012, 372.

- d. Increase awareness through different means, *e.g.*, information on websites, instore billboards, etc., on the risks of mishandling e-waste, *e.g.*, hoarding e-waste products, sending e-waste to the landfill, etc.

4.4.2. SLSMWA

SLSMWA should be extremely active in education and awareness activities. It should develop and share guidelines on how to handle e-waste, not only designed for consumers, but also for retailers to help them fulfil their initiatives. These guidelines should also be shared with schools and higher education centres, released on SLSMWA website and sent to commercial and business entities throughout St. Lucia, either by regular mail or by digital means. The risks associated with hoarding e-waste should be emphasized heavily. These guidelines should include topics such as, but not limited to:

- a. What is e-waste?
- b. Definition of e-waste
- c. Examples of e-waste
- d. Why is important for St. Lucia to handle e-waste properly
- e. Risks involved when e-waste is not handled properly
- f. What to do in case of having e-waste at home
- g. Locations to drop-off different types of e-waste
- h. Dates on which e-waste will be picked up
- i. Contact information in case of any additional questions

As previously noted, the biggest hurdle that the Saint Lucian government will need to overcome is people's tendency to hoard EEE products, as is especially the case in developing nations. To address this, awareness campaigns and events should emphasize the "worthless" nature of e-waste and its detriment to society. By explaining how little worth e-waste has, people will be much more likely to dispose of it. At the same time, bringing the same educational programs into schools will create organic movements, whereby children learn about the benefits of recycling e-waste and then pass that knowledge onto their families.

4.4.3. Government entities

The government must establish educational programs within its different branches and offices. To begin, the government should lead by example, setting guidelines on when and how to discard e-waste. These guidelines should be made publicly available so that businesses can follow a similar approach. Specifically on the governmental side, this process will help clear the storerooms filled with old e-waste. SLSMWA and the IT Department of the government should be jointly responsible of developing these guidelines. The IT Department is just as important in this case, as it will play a large role in outlining at what point EEE can clearly be considered e-waste.

4.4.4. Radio and TV advertisement

In its budget, SLSMWA must account for radio and TV advertisement to deliver its message to the audience during peak hours. Such messages must include contact information for SLSMWA or the waste collectors so the public can easily ask questions.

4.5. Recommendation on e-waste collection and storage

In order to maintain an effective take-back system, multiple channels of waste collection need to be formally established and monitored. The three key stakeholders, the government, recyclers, and retailers must fully engage in the collection processes in order to give the public as many recycling options as possible to maximize program effectiveness. Table 17 provides a summary of key stakeholders and the collection methods they should implement. Following the table, each collection method will be expanded upon below.

Table 17: Key stakeholders and collection methods

	Informal	Government	Retail	Commercial	Manufacturer
Permanent drop-off location	Located in specific markets or informal business locations	Co-located with offices or other waste drop-off locations	Located at retail stores	Located at company facilities	In Saint Lucia's situation, manufacturers cannot provide a viable collection method.
Special drop-off event	N/A	A one or two day event dedicated to e-waste generators dropping of e-waste at a location affiliated with the stakeholder			
Door-to-door pickup	Collection from general public directly	Resident door to door collection	Collection upon delivery of new appliances	Direct pick-up, especially from other commercial entities	

Source: StEP, "E-waste Prevention, Take-back System Design and Policy Approaches"

4.5.1. Permanent drop-off locations

Permanent drop-off locations constitute the most widely used collection method, as people prefer them because they do not need to wait for specified pick-up days or schedule them separately. In most cases these locations simply contain bins or containers set up at stores so that customers buying new EEE goods can easily drop-off e-waste. Simply keeping an e-waste collection bin in a store may even boost general foot traffic and possibly sales. Also, governments can easily incorporate permanent drop-off locations into their own facilities, by placing them right outside government buildings. Aside from convenience on the public's side, the low pick-up and maintenance rates allows for scheduled and infrequent pick-ups on the collector's end.

4.5.2. Drop-off events

Special drop-off events are generally hosted one or two days each year in specific locations such as parking lots, public areas, outside government buildings, or even at retail locations. In addition to providing pop-up e-waste disposal services, these events act as educational opportunities, gaining public attention and interest. With a digital TV migration likely being implemented in the near future, special events leading up to the switch-over can be held for those looking to get rid of their CRT TVs and/or learn more about the digital migration. Combining these two goals will produce a much more effective outcome.

4.5.3. Door-to-door pick-up

The last method, door-to-door pick up, is the most valuable practice in the proposed take-back system, as was briefly discussed in section 4.2.2. Expanding on this, SLSWMA needs to license the e-waste collectors and

make sure that the equipment used is suitable for this purpose. For instance, the vehicles to pick-up e-waste should be required to:⁶⁶

- a. Include protection against all types of weather
- b. Prevent unauthorized persons from accessing the e-waste load during transportation, in order to prevent the addition or loss of e-waste parts or pieces without supervision
- c. Properly pack, accommodate, stow, stack, secured and cover e-waste during loading in such way as not to present any danger to human life or the environment
- d. Transport EEE of medium and small size in wood boxes, cardboard boxes or metal crates
- e. Carry a minimum of two (2) multipurpose fire extinguishers, one in the cabin and the other one near the e-waste load, in an easily accessible place

Figure 18: Examples of proper e-waste transportation



Source: <http://www.theverge.com/2016/6/22/11991440/eri-e-waste-electronics-recycling-nyc-gadget-trash>

It is important to reduce the risk of accidentally breaking e-waste during transportation. In event this happens, measures should be in place to avoid any kind of substance leak that may enter the environment, especially when transporting screens. For example CRT TVs and screens need to be intact and unbroken during transportation due to the highly toxic material it contains, *e.g.*, lead. CRT TVs and screens should be correctly stacked in wood boxes, cardboard boxes or metallic crates.

4.5.4. Storage

In St. Lucia, recyclers store e-waste until they collect a large enough volume to export. Storage facilities must also comply with specifications to minimize the likelihood of environmental pollution. Sites for storage should have:⁶⁷

⁶⁶ Ministry of Environment, Colombia, "Technical Guidelines to Manage E-waste," 2010, available at: http://www.residuos electronicos.net/wp-content/uploads/2012/03/Guia_RAEE_MADS_2011-reducida.pdf.

⁶⁷ United Nations Environment Program, "E-waste Volume III Take-back System," 2012.

- a. Impermeable surface to avoid spills from entering the soil
- b. Spillage collection facilities in the event of one. This includes impermeable pavement and sealed drainage system.
- c. Weatherproof covering to avoid extreme weather
- d. Metallic crates or wood boxes to store e-waste

Figure 19: Examples of proper storage of e-waste



Source: <http://www.theverge.com/2016/6/22/11991440/eri-e-waste-electronics-recycling-nyc-gadget-trash> and United Nations Environment Program, "E-waste Volume III Take-back System," 2012

The criteria for determining the adequacy of facilities and the collectors as a whole should be based on Annex 4 of the United Nations' (UN) "E-Waste Volume III, WEEE/E-Waste 'Take Back System,'" which establishes best practices for design and technical specifications of e-waste collection points. These best practices are a combination of features included in the EU directives related to e-waste management⁶⁸ and the United Kingdom's "Guidance on Best Available Treatment, Recovery and Recycling Techniques (BATRRRT)"⁶⁹ document.

4.6. Monitoring and licensing

4.6.1. Recommendations on Monitoring

The process of monitoring the e-waste management system is important for a successful outcome, which generally entails collecting the target volumes of e-waste and ensuring that it is treated properly. There are specific methods and indicators used to monitor the different activities and steps involved in the e-waste take-

⁶⁸ Including: European Parliament, Directive 2012/19/EC on Waste of Electrical and Electronic Equipment (WEEE)

⁶⁹ United Kingdom, Department for Environment, Food and Rural Affairs, Guidance on Best Available Treatment, Recovery and Recycling Techniques (BATRRRT) and treatment of Waste Electrical and Electronic Equipment (WEEE), November 2006, <http://webarchive.nationalarchives.gov.uk/20130402151656/http://archive.defra.gov.uk/environment/waste/producer/electrical/documents/weee-batrrt-guidance.pdf>.

back process. We have split-up these activities and steps, along with their monitoring methods, for St. Lucia as follows:

- Education and awareness: Generation of e-waste begins with the consumer. A non-educated consumer will not properly dispose of e-waste, which is why such importance must be on education and awareness programs. Additionally, these programs should be designed so they can reach as many people as possible. One way to monitor whether or not these programs are meeting their targets and having a positive impact, is through surveys. We recommend the SLSMWA develop surveys for the general public and distribute them at least once a year to assess if the education/awareness programs are having the desired impact, specifically in regards to if:
 - a. The desired number of people are being reached
 - b. Consumers understand how improperly disposing of e-waste negatively affects the environment
 - c. Consumers understand how to properly dispose of e-waste
 - d. Other objectives set by the education and awareness programs are fully being met

Surveys will not only monitor the success of e-waste education programs, but they will also serve as feedback that can be applied to improve upon the existing programs in the future.

- E-waste collection: Section 4.5 presents the different means by which e-waste should be collected. For each of these methods, the SLSWMA should perform periodic monitoring to check if e-waste is being properly collected and managed, *e.g.*, that vehicles for e-waste pick-up comply with the technical specifications required, drop-off bins are properly situated in retailer or at specific locations and drop-off events are being properly managed and comply with technical requirements and standards.
- E-waste Recyclers: Similar to e-waste collection, the SLSWMA should periodically evaluate whether or not e-waste recyclers comply with the technical requirements and standards related to e-waste storage in their facilities (see section 4.5.4). Licensees should be subject to these technical compliance requirements.
- EEE Imports and e-waste exports: The SLSWMA should track both, EEE imports and e-waste exports. This is important to set e-waste collection and treatment targets, and to determine if such targets are being met. In section 3 we projected the future generation of e-waste in St. Lucia. Based on these estimations we propose the following targets of e-waste collection and treatment for the following 3 years:

Table 18: E-waste target collection for the following 5 years (in tons)

2017	2018	2019	2020	2021
40	80	120	160	200

Source: TMG

In five years, the take-back system should manage all of the e-waste generated for that year, based on previous estimates. In other words, we propose a mechanism to gradually increase the collection target until 100% of e-waste is collected and treated in five years. Note that for 2017, the target is similar to the volume of e-waste recyclers are collecting today (30 tons). This takes into account that during 2017, the take-back system is launched jointly with the education and awareness programs; therefore we do not expect to have a high immediate impact on e-waste collected. We also recommend periodically modifying e-waste forecasts, possibly every year, in order to adjust for new variables and update existing ones.

The SLSWMA should monitor the volumes of e-waste collected through the different collection methods in order to compare which method is most efficient and later put more resources in successful methods. Accordingly, SLSWMA should monitor the e-waste collection stream at different points, including when collectors bring the waste to their facilities, when it is picked up, brought to exporter facilities, etc.

4.6.2. Recommendation on licensing

As noted earlier, any recycler or company wishing to become one may apply for a recycling license with SLSWMA. In order to qualify for a license, a recycler must meet specific technical specifications as the ones noted in section 4.5.4. In addition, the area of the facility should be enough as to manage the volumes of e-waste the recycler is considering in his business plan. Any significant modifications to the facility should have the authorization of the SLSWMA. Similarly, licensing should be provided to the collectors of e-waste so that vehicles comply with technical specifications (section 4.5.3). License should have a due date, e.g., 5 years. Before that due date the licensee must begin the process of renewal with the SLSWMA.

Only e-waste recyclers and collectors with the corresponding license should be allowed to storage and collect e-waste.

4.7. Transboundary flow of e-waste

Currently all e-waste generated in St. Lucia is being exported to international refineries for further treatment. As described in section 1.1, St. Lucia does not technically recycle any e-waste generated, and instead exports it to the aforementioned facilities. Given the forecast of e-waste estimated, we do not believe that these volumes will be sufficient enough to make implementing additional procedures beyond manual disassembly of certain e-waste items financially sustainable. Thus, the e-waste policy for St. Lucia should be to export any e-waste generated.

Given that today transboundary flows of e-waste are a concern to many countries, it is important that St. Lucia complies with international treaties, mainly with the Basel Convention, which entered into force in St. Lucia in 1994.⁷⁰ This treaty was designed to reduce the movement of hazardous waste between countries.⁷¹

⁷⁰ Source: <http://www.basel.int/Countries/StatusofRatifications/PartiesSignatories/tabid/4499/Default.aspx#KN>.

⁷¹ Source: <http://www.basel.int/TheConvention/Overview/tabid/1271/Default.aspx>.

As a primary policy principal, e-waste exports from St. Lucia should be sent to legally established e-waste recycling companies and refineries overseas, meaning they comply with all international regulations. We recommend that the government monitor and enforce legal e-waste exportation under strict compliance of the international regulations like the Basel Convention. Penalties for violating these regulations should be enforced.

Annex 1: Definition of EEE according to the Harmonized Commodity Description and Coding System

The Harmonised Commodity Description and Coding System (H.S. code) is comprised of 5,000 commodity groups, each labelled with a six digit code. This internationally recognised system is used by more than 200 countries, and allows for economic and statistical data to be collected and compared. Additionally, among other purposes, governments and private organisations can use the information gathered for taxing purposes, monitoring controlled goods, price monitoring, quota controls, and more.

In the context of Saint Lucia’s e-waste, the EEE of interest all have corresponding H.S. codes. First, mobile phones belong to 85.17, which includes smart phones and traditional cellular phones. This category is broad enough to cover any type of mobile phone for the foreseeable future. Next, CRT monitors, colour TV sets, and other computer monitors fall in the 85.28 code, as it includes monitors and projects regardless of whether they receive broadcast signals. Lastly, laptops and desktops computers fall into two categories 84.713000 and 84.714900 respectively.

Table 19: Description of EEE related to computers, mobile phones, TV sets, CRT monitors, etc. according to the Harmonised Commodity Description and Coding System (H.S. code)

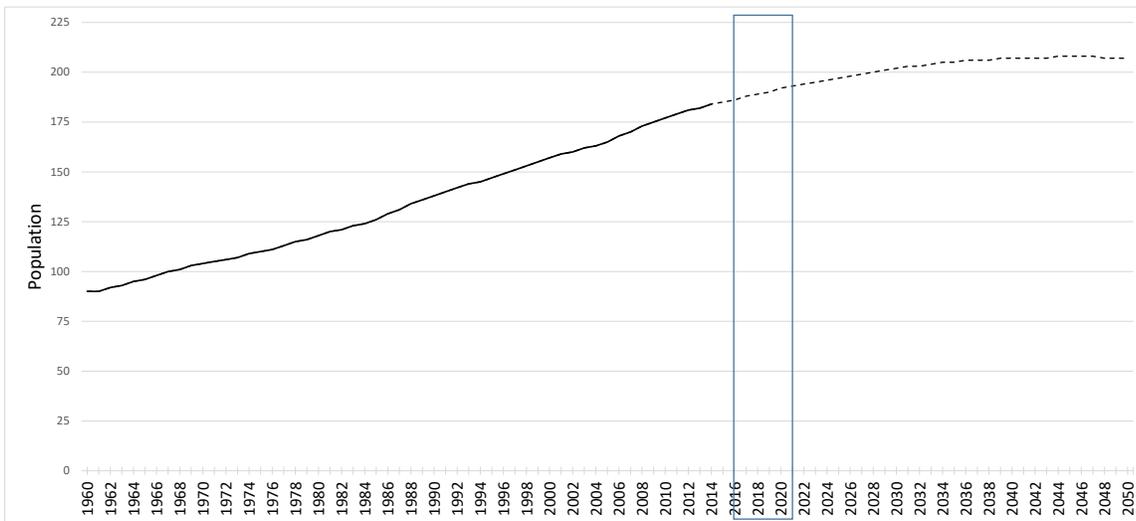
#	H.S. Code	Description	Duty rate	Commercial examples
	84.71...	Automatic data processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, not elsewhere specified or included.		Personal computers (laptops, desktops), tablets, related parts and accessories, etc.
1	...3000	Portable automatic data processing machines, weighing not more than 10 kg, consisting of at least a central processing unit, a keyboard and a display.	Free	Laptops, tablets
2	...4900	Other automatic data processing machines presented in the form of systems.	Free	Desktops
	85.17...	Telephone sets, including telephones for cellular networks or for other wireless networks; other apparatus for the transmission or reception of voice, images or other data, including apparatus for communication in a wired or wireless network (such as a local or wide area network), other than transmission or reception apparatus of heading 84.43, 85.25, 85.27 or 85.28.		Mobile phones
3	...1210	Telephone sets, including telephones for cellular networks or for other wireless networks and portable radio-telephones.	20%	Mobile phones (feature phones and smartphones)
	85.28...	Monitors and projectors, not incorporating television reception apparatus; reception apparatus for television, whether or not incorporating radiobroadcast receivers or sound or video recording or reproducing apparatus.		Monitors and TV sets (CRT and non CRT)
4	...4100	Cathode-ray tube monitors: Of a kind solely or principally used in an automatic data processing system of heading 84.71.	Free	CRT monitors for personal computers
5	...4900	Other cathode-ray tube monitors.	20%	CRT monitors
6	...5100	Other monitors of a kind solely or principally used in an automatic data processing system of heading 84.71.	Free	Monitors for personal computers
7	...5910	Other monitors incorporating television reception apparatus.	20%	Monitors for personal computers that

#	H.S. Code	Description	Duty rate	Commercial examples
				include TV reception apparatus
8	...5990	Other monitors	20%	Monitors for personal computers
9	...7200	Reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus: Other, colour.	20%	Colour TV sets

Source: 2012 Common External Tariff of the Caribbean Community, Based on the Harmonised Commodity Description and Coding System (H.S.)

Annex 2: Population forecast

Figure 20: Population forecast for Saint Lucia –highlighted the period 2016-2021- in thousands



Source: <https://knoema.com/>.