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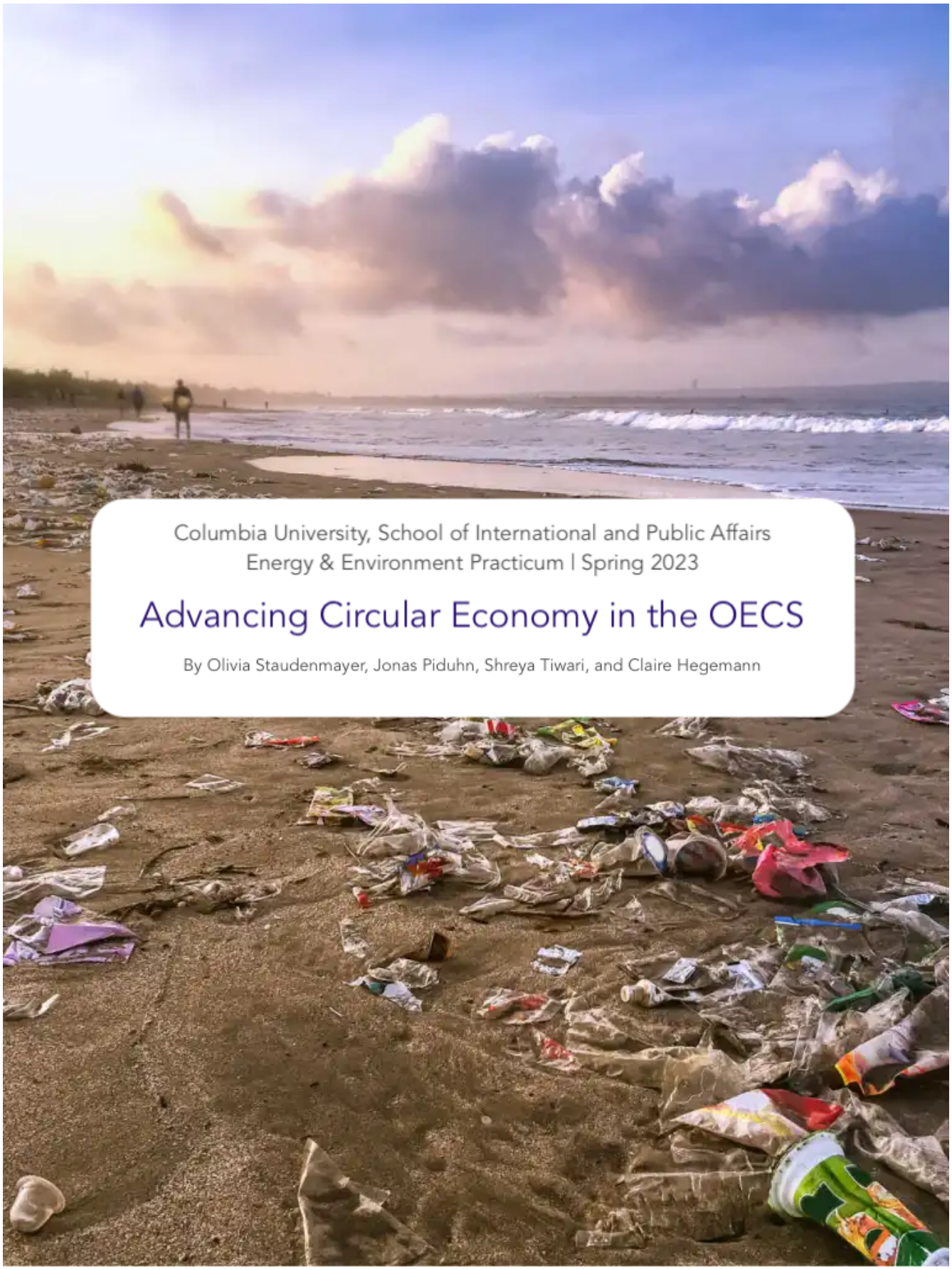

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Advancing Circular Economy in the OECS

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EE Practicum:

Advancing Circular Economy in the OECS

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ii. Executive Summary

The RecycleOECS project aims at **advancing the circular economy** across the OECS. Currently, the circular economy in the OECS is mainly in the stage of waste management. This report looks at Saint Lucia as a pilot project for advancing the circular economy. The focus of this report is on PET and HDPE plastic.

The waste produced on the island is handled by a cooperation of the Saint Lucia Solid Waste Management Authority, its private waste collection sub-contractors and two big private sector waste management companies. The waste that is collected mainly ends up in the local landfill, or is exported by the private recycling companies using a single broker. To advance the circular economy, private actors such as Unite Caribbean have joined forces with the government. The RePlast project is a successful precedent as more than 2% of the population actively participated in it. Standardization on the one side and community engagement by businesses such as hotels and restaurants on the other sides are incremental to the advancement of the circular economy industry.
The fluctuating **global plastic market for PET and HDPE** does not always allow for a lucrative export of small quantities of waste from Saint Lucia. As a share of total exports, Saint Lucia is the country in the world with the highest share of polyethylene exports of total exports.

Global **best practices** shall be used as a guide for advancing the circular economy. First, **monetization** of waste has to be taken into account. Already in the RePlast pilot project, the voucher system incentivizes people to bring plastic bottles to the collection points. A governmental or private-public levy system could achieve these results on a large scale. Experiences from Saint Vincent and the Grenadines and Germany can be taken as guiding examples. Second,

standardization of waste management categorizations and treatments across the OECS and CARICOM have to be considered to drive the circular economy forward. In particular, bio-hazard and cruise ship waste related aspects have to be considered. Third, further best practices from **plastic baling and sorting** have to be considered. To serve PET, HDPE and LDPE global markets efficiently and profitably, specific bale size, density and wiring standards have to be fulfilled.

The advancements of the circular economy have to be accompanied by advanced **monitoring**. Case studies from Japan, Sweden and Germany can be taken as long-term goals. Through digital implementation of monitoring techniques, transparency can be achieved.

1. Introduction

Implementation of Circularity Initiatives in the SIDS Context

As defined by the Ellen MacArthur foundation, the circular economy is a regenerative system in which resource input, waste, emission, and energy leakage are minimized by slowing, closing, and narrowing energy and material loops (Ellen MacArthur Foundation, 2015). The implementation of circularity presents particular challenges for Small Island Developing States (SIDS) globally, as well as those located in the Caribbean. These nations face unique circumstances that influence the development of circularity initiatives in their contexts. Especially also regarding waste management, the circular economy is dealing with the three health pillars of sustainable development: environmental & human health, and economic progress. Main issues regarding circular initiatives are population growth, changes in consumption patterns, and increasing urbanization. Especially as islands are dependent on imports to meet consumption needs, there is an equal import of packaging and non-biodegradable materials (Elgie et. al, 2021).

One of the primary challenges for circularity implementation in SIDS is their size and limited economies of scale. With small populations and limited markets, SIDS often face higher costs in establishing and operating circular economy projects. The small scale of their economies may result in limited investment and funding opportunities, making it challenging to finance and sustain circularity initiatives. The remoteness and isolation of many SIDS, such OECS countries, can pose logistical challenges in terms of transportation and access to markets for recycled materials, further complicating circular economy efforts.

SIDS also face policy and regulatory challenges in implementing circularity. Limited policy frameworks, weak enforcement mechanisms, and lack of coordination among relevant government agencies can hinder the adoption of circular economy practices. There may also be legal and regulatory barriers related to waste management, recycling, and resource recovery that need to be addressed in order to enable relevant initiatives.

Despite these challenges, circularity offers significant benefits to SIDS, in the OECS and elsewhere, including reducing waste generation, conserving natural resources, creating local employment opportunities, and enhancing resilience to climate change impacts. To overcome the challenges, it is essential to foster partnerships and collaborations among governments, local communities, businesses, and international organizations. Capacity building, awareness raising, and policy reforms should also be prioritized to enable the transition towards circularity in SIDS and ensure a sustainable future for these vulnerable island nations. This report will apply these issues to Saint Lucia.

The paper is structured as follows. Section 2 introduces the basic assumptions underlying the analysis. Section 3 provides an analysis of the circular economy situation in Saint Lucia. Section 4 presents the different types of plastic and their recycling potential while section 5 introduces the macroeconomic analysis of plastics markets. Section 6 will provide best practices in the area of monetization, standardization and operational matters before section 7 looks at the monitoring options for a circular economy. Finally, section 9 provides a summary and the implementable next steps.

2. Basic Assumptions

Assumption 1: Waste data extrapolation is correct.

Saint Lucia is divided by the Saint Lucia Solid Waste Management Authority into 11 waste collection zones (Annual report, 2014-15). To receive a picture of the situation of plastic waste in Saint Lucia, the SLSWMA conducted a solid waste characterization study of two collection zones, Gros Islet and Anse La Raye/Canaries in 2018. Based on the 2015 numbers, these zones make up 16% and 5% respectively of the total waste collected in Saint Lucia, with Gros Islet being an urban collection zone and Anse La Raye/Canaries a rural zone. Together, they make up 21% of Saint Lucia's monthly waste. Extrapolating the figures from the 2018 report by the factor 4.7619 and annualizing the monthly results therefore leads to the following approximate results:

Component	Percent	Waste Quantity for two collection zones monthly (tons)	Waste Quantity for entire island monthly (tons)	Waste Quantity for entire island annually (tons)
Paper & Paperboard				
Newspaper	1.1	0.53	2.52	30.29
Cardboard	70.4	37	176.19	2114.28
Magazines/catalogs	2.4	1.3	6.19	74.29
Office paper	3.7	2	9.52	114.29
Other/ miscellaneous	22.4	12	57.14	685.71
TOTAL	100	52.8	251.43	3017.14
Glass				
Clear beverage containers	43.4	8	38.10	457.14
Green beverage containers	17.5	3	14.29	171.43
Amber beverage containers	9.8	2	9.52	114.29
Clear food containers	10	2	9.52	114.29
Green Food Containers	1.2	0.2	0.95	11.43

Amber Food Containers	1.3	0.2	0.95	11.43
Remainder/composite glass	16.9	3	14.29	171.43
TOTAL	100	18.4	87.62	1051.43
Metal				
Tin/steel beverage	13.6	2	9.52	114.29
Tin/steel food	36.7	5	23.81	285.71
Aluminum beverage	13.5	2	9.52	114.29
Aluminum food	6.5	1	4.76	57.14
Other ferrous metal	11.1	2	9.52	114.29
Other non-ferrous metal	8.5	1	4.76	57.14
Other	10.3	1.3	6.19	74.29
TOTAL	100	14.3	68.10	817.14
Plastics				
Clear (PET) beverage	12.2	11.8	56.19	674.29
Green (PET) beverage	2.1	2	9.52	114.29
Other PET containers	3.2	3	14.29	171.43
HDPE containers	8.4	8	38.10	457.14
Film Plastic	47	46	219.05	2628.57
Styrofoam	3.6	3	14.29	171.43
Other PET containers	23.5	23	109.52	1314.28
TOTAL	100	96.8	460.95	5531.42

Figure 1: Waste data of Saint Lucia (Saint Lucia Solid Waste Management Authority, 2018) (Saint Lucia Solid Waste Management Authority, 2015)

Assumption 2: Currently, the waste that is not collected by the RePlast project entirely ends up in landfills or is exported, no waste-to-energy use on Saint Lucia or in the OECS exists.

Assumption 3: No coordinated effort for a common (plastic) waste transportation system by the OECS exists.

Assumption 3.1: There is no communication about joining forces.

Assumption 4: The RecycleOECS project aims at establishing robust waste separation systems in the short run that enable large scale recycling in the medium run.

Assumption 5: A RecycleOECS solution that is not yet self-sustaining but government subsidized in the medium to long term is possible.

Assumption 5.1: The project is supposed to be economically self-sufficient.

Assumption 6: The efforts between RecycleOECS, private recycling companies and the local Solid Waste Management Authorities are not yet fully synchronized and standardized. There is no current communication on how to synchronize.

Assumption 7: RePlastOECS is currently on hold and the incentivizing of the population has proven difficult after Covid.

Assumption 8: The new project focuses on improving the Saint Lucia pilot project and on exporting the idea to another island.

Assumption 9: Regarding the export of waste, the goal is transporting the plastic from Saint Lucia to a different location in order to be recycled, not to build a full recycling plant on Saint Lucia.

Assumption 10: All available quantitative data available about the RePlastOECS project was given to the team.

3. Situation analysis

The circular economy in Saint Lucia is currently mainly on the stage of waste management. The waste produced on the island is handled by a cooperation of the Saint Lucia Solid Waste Management Authority, its private waste collection sub-contractors and two big private sector waste management companies. In this project we mainly focus on the establishment of a circular economy system for the plastics waste flow.

Waste management structure

The private recycling companies do not only collect plastic (PET and HDPE) but also glass, wood pallets, cardboard and electronics. Using vertical balers instead of horizontal ones, the PET and cardboard waste is compressed to bails that can easily be exported. Vertical balers press the respective material from above, leading to worse results than horizontal balers pressing horizontally. A horizontal baler can typically process higher quantities of plastic and make denser bales. Their cost of procurement is also significantly higher as compared to vertical balers. When deciding on the right bailing system, the exact dimensions of shipping containers should be taken into account in order to allow for the most profitable and efficient export of waste. No PET shredding machines exist on the island of Saint Lucia, which complicates the export. When shipping a container of compressed plastic bottles overseas, the container is categorized as transporting waste. This classification is not the most favored freight for shipping companies to transport. The shredding of PET bottles would allow the container to be classified as resources, simplifying the shipping procedures. With shredded PET, no spare space would be left in the entire container. The local recycling companies store most of their collected PET for a longer period of time, waiting for the right moment to sell it depending on world market prices. Currently, the

private recycling companies rely on one monopolistic company to export their plastic to the global market. Apart from exporting, the recycling companies also work together with local businesses through reuse arrangements. Additionally to the main recycling actors mentioned, twenty informal recyclers collect materials such as metals and wires without formal coordination.

Photo Collage 1: Local Recycling companies

The Saint Lucia Solid Waste Management Authority in Saint. Lucia is responsible for the pick-up waste from households across the island. The authority is a statutory body of the Government of Saint Lucia. It is partly directly funded by the government, partly through taxes that tourists have to pay when arriving on the island. The island is divided into eleven waste management zones. The waste management for some zones was contracted to private waste management companies through a competitive bidding process of different contractors.

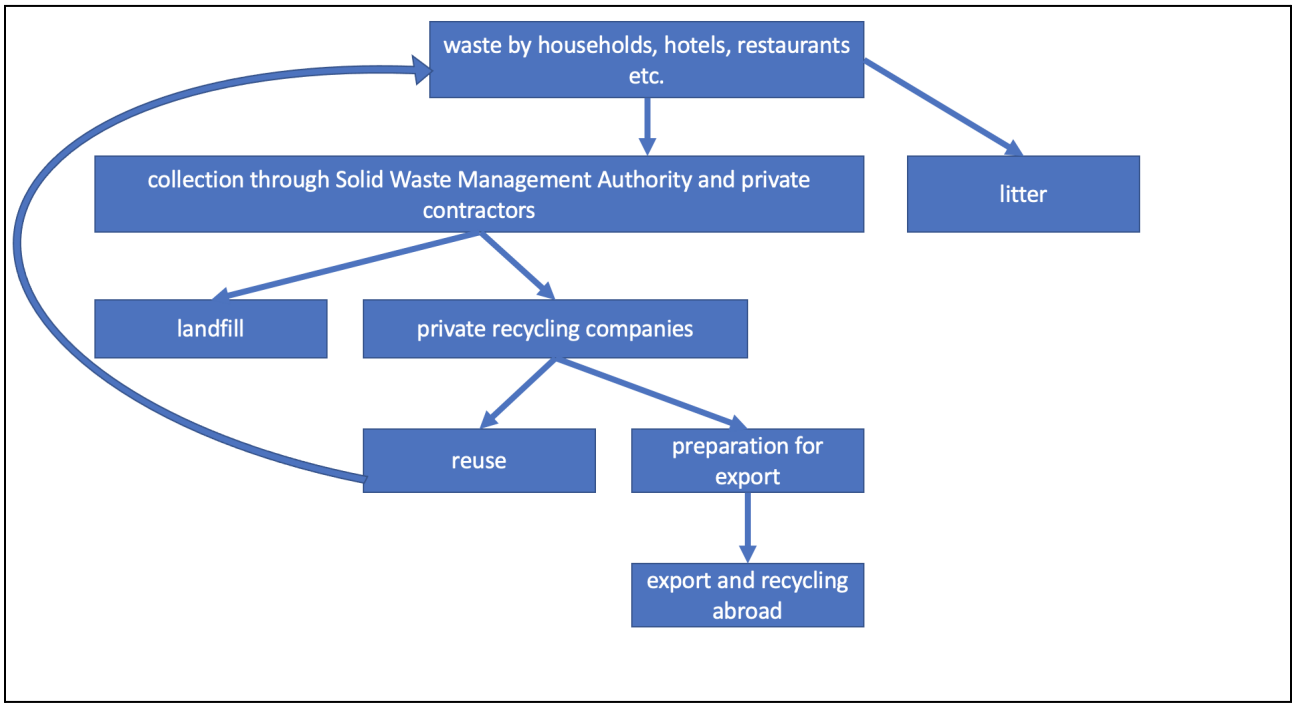

Figure 2: Waste management schematic structure Saint Lucia

The only disposal site of non-recycled waste on the island is the Deglos Sanitary Landfill. Constructed in 2003, it was initially supposed to have a lifespan of twenty years. Now, through enlargement and new calculations, it has a remaining lifespan of at least ten years. The waste collected in Southern Saint. Lucia is first collected at a transfer site in Vieux Fort before being

transported to the landfill in Northern Saint Lucia. On the landfill itself, e-waste is disposed, biomedical waste is autoclaved, shredded, and deep buried and tires are shredded and used as an intermediate cover at the landfill. According to the Saint Lucia Waste Management Authority, 50% of the daily waste that arrives at the landfill is bio waste. Therefore, the landfill has started its own composting program. Due to the overall composition of the waste that arrives at the landfill, waste to energy is not a viable option.

Photo collage 2: Saint Lucia Solid Waste Management Authority and Deglos Landfill

Private efforts to streamline waste management

Our local partner Unite Caribbean has organized the Pilot Recycling Plastic Waste in the OECS project (RePlast OECS) that happened between 2018 and 2021 in Saint Lucia. The projects set out

on a mission to establish an OECS-wide plastic waste collection and recycling system. This project successfully exited the pilot phase in 2022. Six RePlast collection points were established in Saint Lucia, and 114,360 pounds of plastic bottles have been collected so far, of which 91,212 pounds were exported. The lessons learned on the collection and processing of plastic waste, the engagement of stakeholders, and community educational initiatives shall be applied to the new projects. The project ran Saturdays from 9am to 2pm on the respective collection points. Up to 1000 pounds of plastic were collected per weeks at the individual recycling points. Before the project, the awareness for recycling was not wide-spread across the island. Incentivizing the local population through a voucher and point collection system, an increasing number of people participated in the project, reaching 2% of the population as registered participants at the end of the RePLASTProject. The vouchers were provided free of charge by local businesses and could for example be redeemed at supermarkets, providing valuable incentives particularly in a developing nation. The Covid pandemic impacted the ability of companies to provide vouchers to the system. At the RePlast facilities, the plastic was separated by volunteers and prepared for the pickup through local recycling companies.

Government initiatives

The Government of Saint Lucia is committed to the green energy transition of the economy. In cross-departmental cooperation, issues such as green energy and recycling are dealt with. As representatives from most districts of Saint Lucia are included in the Government of Saint Lucia, a close local-national cooperation on green economy related issues is aimed at. City councils contribute to this nationwide effort through local community roundtables and initiatives raising awareness of the issue. An emphasis on responding to the respective local needs could be observed.

On the governmental side, standardization is a powerful tool to advance a comprehensive circular economy system. In Saint Lucia, the relevant standardization body is the Saint Lucia Bureau of Standards, with the Saint Lucia Standard Council being its highest decision making and advisory body. The bureau and council are statutory but independent bodies of the Saint Lucian government.

The average standardization process in Saint Lucia takes one to two years, from the initial initiative to the finalized standard. Standards can be divided into compulsory and voluntary ones. The issues most frequently covered by compulsory standards are health, safety and environment. The bureau enforces compliance with standards through market surveillance and respective compliance programs. A more recent addition to the bureaus tasks is the certification division, offering business certification in areas such as product certification.

The standards agreed on by the bureau only apply to Saint Lucia. Nevertheless, increasingly closer cooperation takes place between the Standard Bureaus in OECS and CARICOM countries. The bureau is a full member in the International Organization for Standardization (ISO).

Photo Collage 3: Meeting with Hon. Emma Hippolyte, Minister of Commerce, Manufacturing, Business Development, Cooperatives and Consumer Affairs

Community engagement

For a circular economy system to work, community buy-in is necessary. The community awareness for and education on recycling has not yet reached its potential. Community buy-in starts with education. That is why the Sir Arthur Lewis Community College is in the process of establishing a circular economy program. Educating future public leaders locally on the island-specific challenges of waste management and circularity is important to achieve long-lasting results. The college organizes seminars on the level of the Organization of American States. It's the only Community College in the region with a Circular Economy focus. The University of the West Indies has an intention to focus more on this area while in Barbados the focus of the local college is on Green Economy.

The Sir Arthur Lewis Community College strongly cooperates with private practitioners in the development of its circular economy courses. The courses will mainly focus on the issue of plastic

recycling and the import-related issues of waste. The intention is to sow the seeds for a broader circular economy approach in the region. On the college campus in Saint Lucia itself, students can gain practical experience on the use of renewable energies, reuse of products and waste-avoidance strategies.

Hospitality businesses

One of the main sources of waste production on the island is the tourism industry. Getting to know the approaches that restaurants and hotels on the island take to reduce waste was possible during the visits to Chef Orlando Satchell‘s restaurant „Orlando‘s“ and Lyton Lamontagne’s „Fond Doux Eco Resort“. Chef Orlando‘s restaurant was repeatedly voted as one of the best restaurants of the world. At Orlando‘s, he sources all his ingredients locally and adapts the daily five course menu to what he was able to buy at Soufriere‘s local market from local merchants. The Fond Doux Eco resort uses strategies of waste avoidance by banning single use plastic and styrofoam. Additionally, all wastewater is reused.

Photo collage 4: Litter on the side of the street and under water

4. Types of plastic and its recycling potential

There are many types of plastic. The type of plastic it becomes is mainly dependent on how it was created. There are two main differences in the creation of plastic, which are subdivided in thermoplasts and thermosets. Thermoplastic does not undergo a chemical change, when you heat it and can hence be remolded again. The main thermoplasts are polyethylene (PE), and can be subdivided in PET, HDPE, and LDPE. PET are mainly transparent drinking bottles, HDPE are milk and fruit juice bottles, washing up liquid bottles, and fabric conditioners. LDPE is used to make carrier bags and bin bags. Other thermoplasts are PP, PS and PVC. These are mainly used for chemical bottles or food. Thermosets can melt and take shape once; i.e. after solidification they stay solid. In the thermosetting process, a chemical reaction occurs that is irreversible. Polyurethane (PUR) is one of the most used thermosets. Recycling of thermosets is harder, and can only be done through a chemical process (Shen & Worrell, 2014) (Goodship, 2007). When comparing the effectiveness in the recycling process, PET and HDPE have the highest effectiveness. The other types of plastic have a low effectiveness of recycling or are not being recycled yet (Hopewell et al., 2019).

In order to recycle plastic, four steps have to be taken into account. First, the material has to be sorted, as the recycling process differentiates between types of plastic. Then, the material is shredded, washed, and dried. The last step is for the material to be melted and reprocessed to make pellets or direct products (Shen & Worrell, 2014).

5. Macroeconomic analysis of the plastics market

Plastic export from Saint Lucia

Plastic recycling in Saint Lucia is not always lucrative. Through a broker, the plastic gets shipped from Saint Lucia to either the Dominican Republic or Florida. The broker is the only exporter of plastic, he owns a monopoly on the business in the Caribbean. He does not only export plastic from Saint Lucia, but works as a broker also from many other Caribbean countries.

The broker states that the prices he gives to the recyclers on the islands are dependent on the plastic prices worldwide. Hence, he carries less of the fluctuation risk himself, instead the local recyclers carry that risk. As the islands do not have enough plastic to fill up a whole container, Steve Hammond lowers the prices, as he is the only one who through economies of scale is able to fill the containers. He argues for his prices as he is the only one who buys the not full plastic containers.

The plastic recyclers on Saint Lucia hence experience economic uncertainty without having a lot of bargaining power, as they are unable to fill up containers. As plastic recycling is not yet advanced in the OECS, there is future potential to fill containers and hence gain more bargaining power.

To increase the bargaining power of local plastic recyclers, information about world market prices is necessary.

Prices of PET plastic

The chart below shows the PET plastic prices per kilogram. The graph shows that the PET prices are highest in the United States and lowest in India. It also shows that the prices are fluctuating in

accordance with the overall prices worldwide, as there was an important drop during COVID-19.This leads to a great potential for the Caribbean regarding the prices for PET, as they have the opportunity to sell to the US, which is geographically near by.

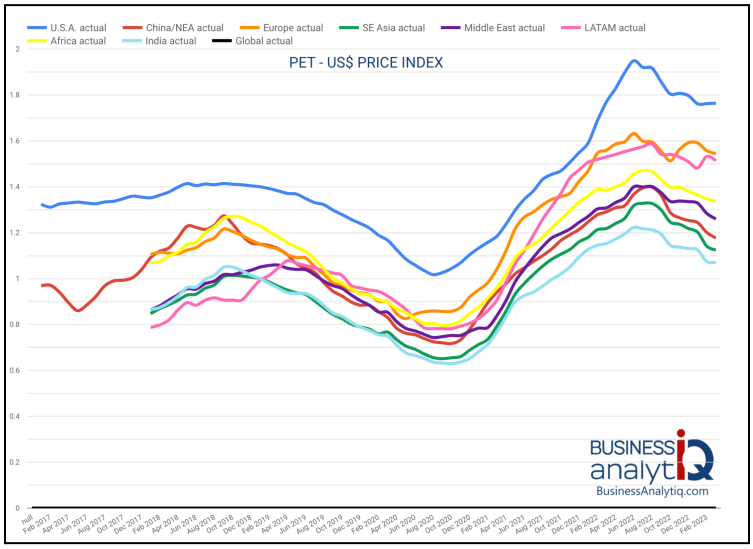

Figure 3: PET US$ Prices per kilogram (Business Analytiq, n.d.)

HDPE Price Index

The chart below shows the HDPE plastic prices per kilogram. The graph shows that the HDPE prices are highest in India and lowest in the Middle East.

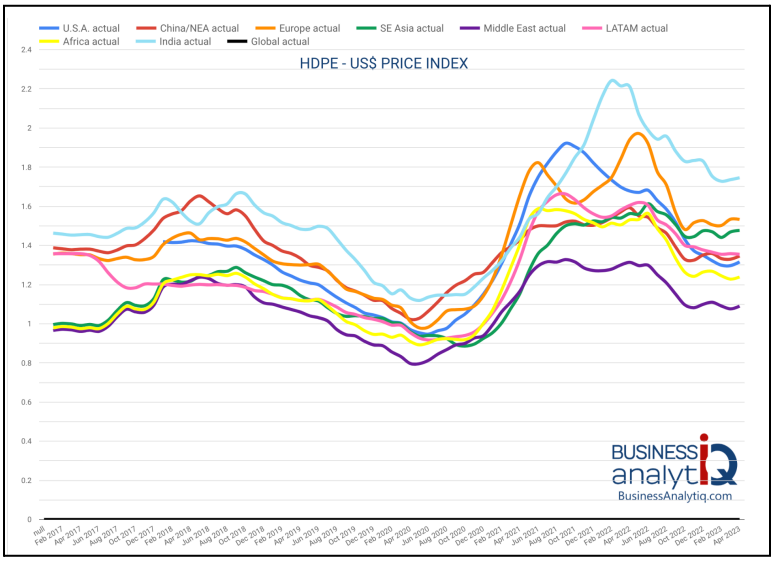

Figure 4: HDPE US$ Prices per kilogram (Business Analytiq, n.d.)

While the prices are important for exporters, there are other factors that need to be taken into consideration. For instance, there are countries that import or export more plastic.

Imports of PET plastic

The chart below shows the percentage of the world market regarding imported plastic per country in 2021. China is the leader in imports of PET plastic. As the prices of PET in China are relatively low (see graph above), this could potentially lead to problems for exports from the Caribbean, especially as transportation costs are currently high due to high oil prices. Unfortunately for the Caribbean, the

United States only has 3% of world imports regarding PET and HDPE combined.

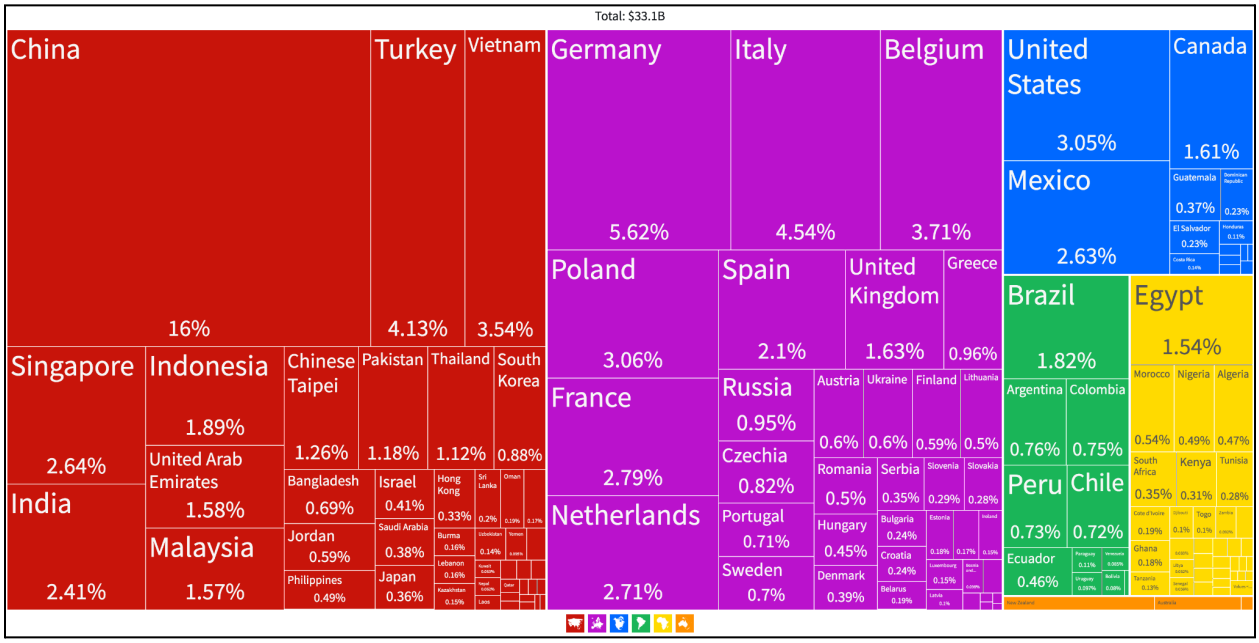

Figure 5: Imports of cumulative market shares regarding PET and HDPE (Observatory of Economic Complexity, n.d.)

Furthermore, a chart of Net Trade (2021) shows which countries export or import more PET. Each country is colored based on the difference in exports and imports of PET during 2021.

In 2021, the countries that had a larger trade value in exports than in imports were Saudi Arabia, USA, Qatar, Iran, and the Netherlands. In 2021, the countries that had a larger trade value in imports than in exports of PET were China, Turkey, Italy, Vietnam, and Poland.

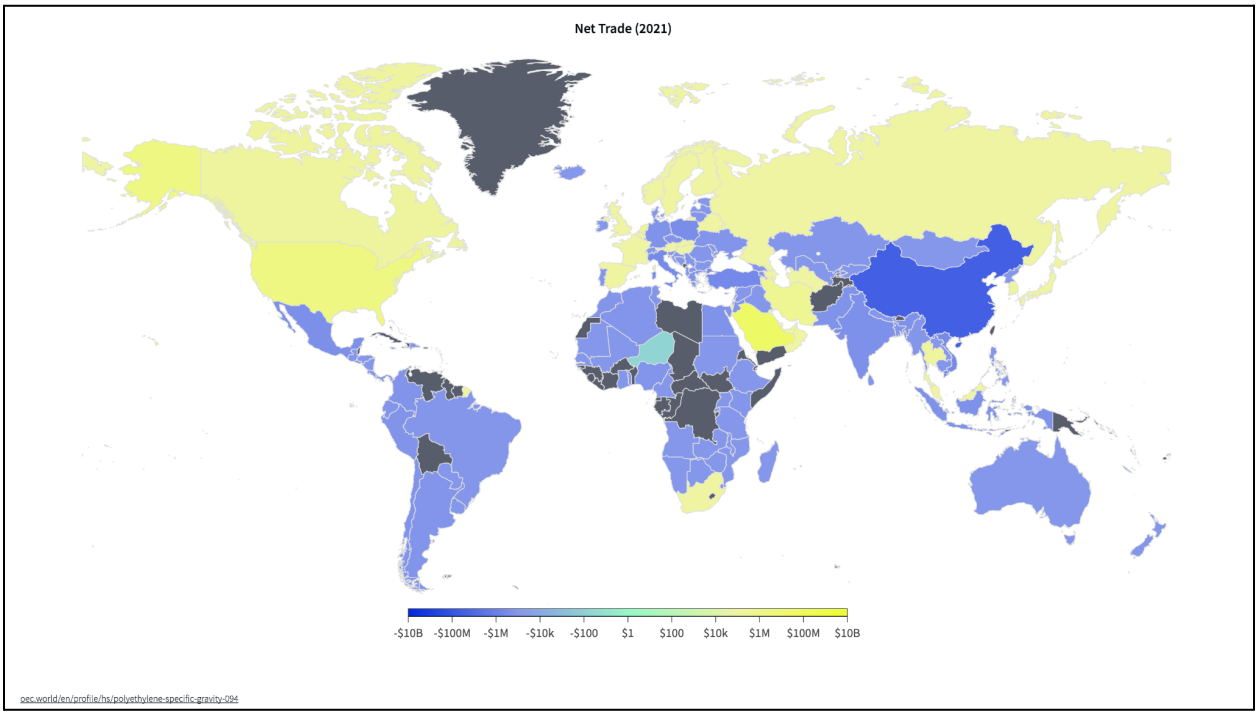

Figure 6: Net Trade of PET and HDPE (yellow: net exporter, blue: net importer) (Observatory of Economic Complexity, n.d.)

An aspect, where Saint Lucia is interestingly leading the world market, is when comparing exporters of PET and HDPE by percentage of total exports. While it is admirable that Saint Lucia is leading in this, especially also when comparing to other Caribbean islands, interpreting this graph shows that the total exports in Saint Lucia are generally low. When talking to Unite Caribbean, there is mainly one ship per month that is departing from Saint Lucia with exports. This does not only make it difficult to export the plastic, as the ship is always full, but as the plastic is not shredded yet, and it counts as trash, it does not have the priority in this situation. This leads to much plastic staying in Saint Lucia instead of being shipped and recycled.

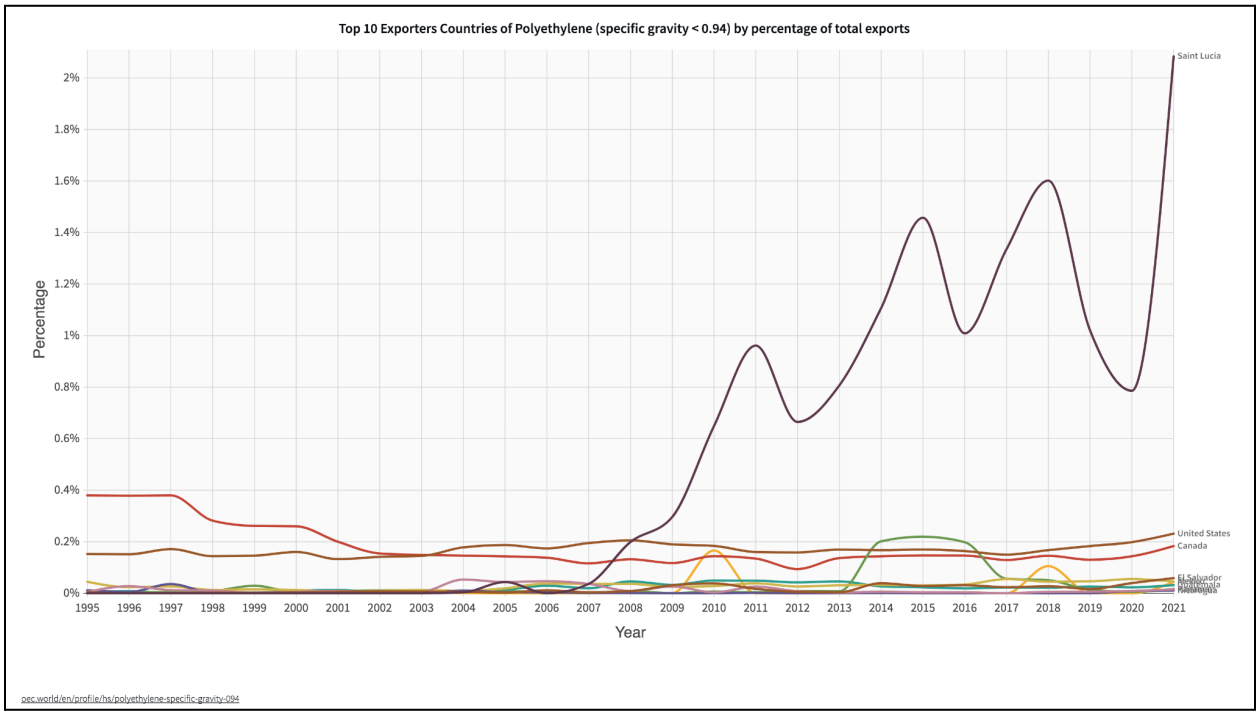

Figure 7: Top 10 Exporters Countries of Polyethylene (specific gravity < 0.94) by percentage of total exports (Observatory of Economic Complexity, n.d.)

To conclude, Saint Lucia has the potential to export to the US, for higher prices or to China, as they have the highest imports.

6. Best practices

6.1. Monetization

Background – Replast Project

During the Replast project, the initial stimulus for plastic collectors was free lunch and vegetables, provided as a goodwill to the volunteers. However, this system was overhauled after a few weeks, as it was not very well taken up by the participants, and created a considerable amount of food waste. The second incentive approach implemented was a system of vouchers that collectors would receive. A monetary, non-cash incentive, the vouchers were provided free of charge by participating local businesses, such as supermarkets, ice cream shops, and massage parlors. Collectors would earn points for each drop-off of bottles, which would then convert into a price reduction at e.g. the supermarket. The system was contingent both on a digital platform, where participants could check on their accrued points, and on the interpersonal interaction between the collectors and Replast staff at the bottle drop-off point. The project at the time was funded mainly by the Government of France. Later, other private and institutional sponsors such as OECS Commission and Heineken came onboard. Community buy-in was significant, with over 2500 locals participating in the plastic collection, with the lion share participating due to the incentive program. However, this system was phased out at the end of Replast, as there was no financing to continue the project. The follow-up project by UniteCaribbean, RecycleOECS does not offer incentives for plastic collectors, due to a lack of buy-in from big corporate sponsors. Additionally, the Saint Lucian government is in the process of planning their own plastic recycling system. Following the expected mutual agreements between the government and RecycleOECS, friction can be avoided in this small island environment with shared stakeholders. The new approach for RecycleOECS is to seek more

cooperation with the St Lucia Solid Waste Management Authority (SLSWMA), to ensure that there will be continuation of the project once the pilot finishes.

Momentum for a levy system

The government is now considering implementing a levy system for glass and plastic containers. On Saint Lucia, the implementation of such a system has been in discussion for the past 12 years, but it has recently gained momentum with the election of the current government in 2021. The government has made the levy more of a priority agenda item, which is why there is the possibility that the levy system could commence with glass and PET bottles by the end of the year.

Given the local context, we have identified two levy – based monetization opportunities:

1. Government intervention, with inspiration to be taken from the existing governmental system on OECS neighbor St Vincent
2. A privatized system, such as the more advanced mechanism in Germany

Case Study: St Vincent and the Grenadines

St Vincent and the Grenadines enacted the Environmental Levy Act in 1991 (Government of Saint Vincent and the Grenadines, 1991), which has since been revised 8 times, most recently in 2006. The act imposes a deposit levy on certain beverages in non-returnable bottles. The system is set up in a way that the levy is placed onto products as they enter the State of St Vincent, or at the point of production if produced on the island. The levy is paid and collected by the Comptroller of Customs. As of 2006, the levy includes beer, stout, malt, ale, aerated drinks juices and water bottles, with a 50 cents levy for each bottle.

The system also has a refund provision built into it: if the depositor of the bottles re-exports them, or if bottle disposal arrangements are made by the depositor in a way that is acceptable to the respective St Vincent authorities, then the deposit levy is paid back to the depositor. This provision holds if such disposal or re-export happens within six months of the payment of the initial levy. The mechanism therefore provides financial incentive for the producers of the waste problem to act to alleviate it.

The Environmental Levy act also provides the basis for a private public partnership between Saint Vincent's Solid Waste Management Unit and private company All Islands Recycling Inc (AIR Inc), established in 2013. The partnership provides financial incentives to plastic bottle collectors, and has resulted in more than 38 Million containers (plastic bottles and aluminum tins) to be collected. The system provides a financial opportunity for primarily lower income individuals on the islands, with approx. 300 collectors selling containers to AIR Inc. 60% of these collectors are women (Millar-Findley & Belmar, 2021).

From 2021 to 2022 the country also ran a two-year project to reduce land-based sources of marine pollution by increasing local recycling of plastic waste, implemented by the Sustainable Development Unit of St Vincent, the Fisheries Division, and the Solid Waste Management Unit with funding by the OECS Commission. The program run under the "Building Resilience in the Eastern Caribbean through Reduction in Marine Litter" (*Reducing Marine Pollution in the Eastern Caribbean (ReMLit)*, n.d.) Project (ReMLit), which is funded by the government of Norway. ReMLit is active in six OECS member states: Saint Vincent, Antigua and Barbuda, Dominica, Grenada, Montserrat, and Saint Lucia. On Saint Lucia the project was a planned 5-month micro

haulers solid waste collection initiative in 2021, trying to improve storage and collection services in unplanned developments in the Castries Basin (Organization of Eastern Caribbean States, n.d.). The initiative in St Vincent, expanding on the existing private-public partnership there, mentions opportunities to collaborate with the RePlast-OECS project in Saint Lucia (Millar-Findley & Belmar, 2021).

Case Study: Germany

Germany has an established and robust recycling system for plastic and glass bottles, known as the "Einwegpfand" or "one-way deposit" system. The system was introduced in 2003, based on the German Packaging Ordinance (Lemke, n.d.), which in turn has been in existence since 1991. The ordinance is a federal law that regulates the handling of packaging waste in Germany. While regulated by the government, the one-way deposit system is implemented by private companies who are responsible for managing the deposit-refund scheme. The scheme works as follows:

1. Bottle Purchase: When a plastic or glass bottle is purchased in Germany, a deposit is levied, typically ranging from 15 to 25 cents, and is included in the bottle's purchase price.
2. Bottle Use: After the bottle has been used, the consumer has the option to return it for recycling or retain it. If the decision is made to return the bottle, it can be done at any grocery store or supermarket that sells beverages. Most stores provide designated automated machines or manual collection points for bottle returns.
3. Bottle Return: The bottle is inserted into the automated machine or handed over to store staff at the manual collection point for processing. The automated machine scans the

barcode on the bottle, verifies its eligibility for recycling, and generates a refund receipt. The store staff may also conduct checks to ensure that the bottle is eligible for recycling.

4. Refund: Upon successful acceptance, the consumer is refunded the deposit amount in the form of a voucher or cash, equivalent to the initial deposit paid at the time of purchase. The refund voucher can be used towards future purchases or exchanged for cash at the store.
5. Recycling: The returned bottles are collected, sorted, and transported to recycling facilities. Glass bottles are cleaned and melted down to produce new glass containers, while plastic bottles are shredded, washed, and processed into plastic flakes that can be used in the production of various plastic products.

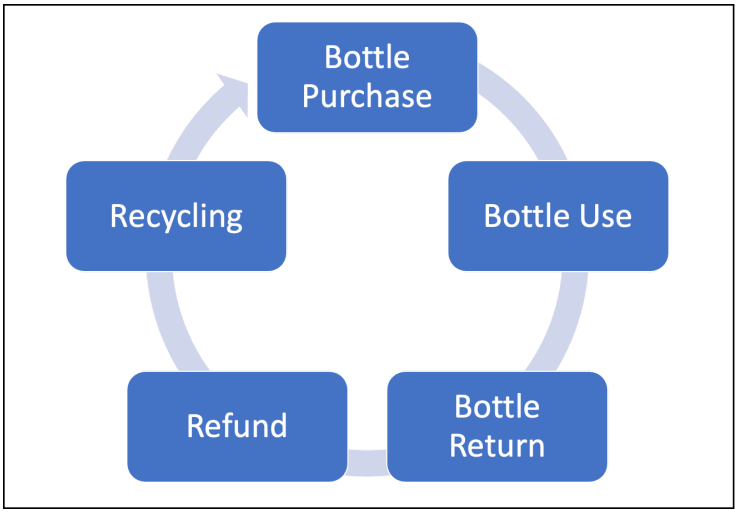

Figure 8: The closed loop system of bottle recycling in Germany

The stakeholders involved in this system are the producers and distributors of beverages, the retailers, the consumers, waste management companies who play a role in the collection, sorting and processing of returned bottles, recycling facilities that process returned bottles into reusable materials, the government that regulates the system through the packaging ordinance, and the

central agency packaging register (Zentrale Stelle Verpackungsregister, n.d.), a government appointed entity, which oversees the system as a whole. Community buy-in into the system is generally large and it is common practice to see citizens leave their empty bottles around public trash cans, to be collected and returned by lower income individuals. Implementing an equivalent system in the OECS context is not feasible as of now, the widespread usage of reverse vending machines for example is cost-prohibitive.

However, the current proposal for a national policy on the disposal of plastic beverage containers, which has the "creation of incentives for local stakeholders to properly dispose of plastic beverage container waste" as one of its policy objectives, is cause for optimism. The draft policy outlines the establishment of a return/deposit system to facilitate revenue collection as one of the ways to incentivize effective waste recycling in Saint Lucia.

Challenges

As demonstrated above, monetization and incentive structures of circular economy initiatives such as plastic recycling present a significant challenge. How to bring the private sector on board is a key lever that needs to be addressed in order to be able to design a program that is both sustainable in the long term and scalable. Given Saint Lucia's local context, without private sector buy-in, achieving recycling rates beyond 10 – 15% will not be feasible. Unlocking economies of scale through cooperation with other OECS states forms part of the solution, however with greater collaboration comes greater risk of the spread of biohazards, which given the region's pristine and vulnerable nature, and its reliance on tourism, is a significant concern.

6.2. Standardization

Standardization in the OECS

Currently, no specific standard on waste separation exists. General environmental management standards cover this area. An area that is not yet standardized is the waste classification and monetization of cruise ship waste.

Our proposals:

1. Start an OECS and CARICOM wide cooperation between Standard Bureaus on cross-border waste separation, transportation, and recycling standards. A particular issue of cross-border waste transportation in the OECS region is the bio-hazard aspect and potential negative impact of imported hazards on the fragile small island ecosystem. A standardized OECS and CARICOM wide approach to this issue would lead to more clarity for recycling companies and increase economic activity across the OECS and CARICOM.

2. Standardize the treatment and prizing of cruise ship waste across the OECS. A single country does not have the power to increase the prices it charges cruise ships for entering the harbor and managing its waste. Cooperating with the different Standard Bureaus across the OECS would increase the leverage of individual islands and allow for better OECS wide waste management following the respective countries' strengths in managing and recycling certain waste flows.

6.3. Other Best Practices - Industry Standards for Plastic Bales

The bailing process on the island is still at a nascent stage. To be competitive and in the future, have the ability to directly transport plastic to recyclers without the involvement of a broker, meeting industry standards and adopting best practices is important. This section provides typically accepted market-wide industry standards for PET, HDPE and LDPE. It is possible for individual buyers to have their own specifications that are either more stringent or lax than the ones provided below (The Association of Plastics Recyclers, 2022).

PET Industry Standards

- Bale size and minimum shipping weight - Bales should be a minimum of 30”x42”x48”. Bale sizes should allow a minimum of 35,000 pounds to be shipped on 53-foot trailer
- Bale Density - 15-18 lbs/cubic ft
- Bale Wire - Bales should be held together with 10-12 gauge, non corrosive galvanized metal wire, with all bale wires wrapped in one direction
- Allowable contaminants and PET Bale Grade - These contaminants are allowed at tolerable levels (not exceeding 2% by weight individually). HDPE, LDPE, PP rigid packaging, Clear thermoformed PET, loose paper/cardboard, liquid residues, aluminum cans. Total contamination should be below 6% by weight for the bale to classify as Grade A, below 17% for Grade B and below 27% for Grade C.

HDPE Industry Standards

- Bale size and minimum shipping weight - Bales should be a minimum of 30”x42”x48”. Bale sizes should allow a minimum of 35,000 pounds to be shipped on 48-foot trailer

- Bale Density - 15-20 lbs/cubic ft
- Bale Wire - Bales should be held together with 10-12 gauge, non-corrosive galvanized metal wire, with all bale wires wrapped in one direction
- Allowable contaminants: These contaminants are allowed at tolerable levels (not exceeding 2% by weight individually). Injection molded HDPE, some non-HDPE rigid plastic, loose paper/cardboard, liquid residues, aluminum cans. Total contamination should be below 5% by weight.

LDPE Industry Standards

- Bale size and minimum shipping weight - Bales should be a minimum of 30”x42”x48” or 30”x48”x60”. Bale sizes should allow a minimum of 38,000 pounds to be shipped on 53-foot trailer
- Bale Density - 15 lbs/cubic ft or the minimum to achieve 38,000 pounds in a trailer load.
- Bale Wire - Bales should be held together with 10-12 gauge, non-corrosive galvanized metal wire, with all bale wires wrapped in one direction
- Allowable contaminants: These contaminants are allowed at tolerable levels (not exceeding 2% by weight individually). HDPE film, labels, Plastic Strapping and rubber bands, rigid or foam LDPE, loose paper/cardboard, moisture residues. Total contamination should be below 5% by weight for coloured film and Grade A clear film, and below 10% for Grade B clear film.

6.4. Other Best Practices - Industry Standards of Sorting

Best practices associated with the sorting of plastic. Below is a chart showing the current accepted industry standards.

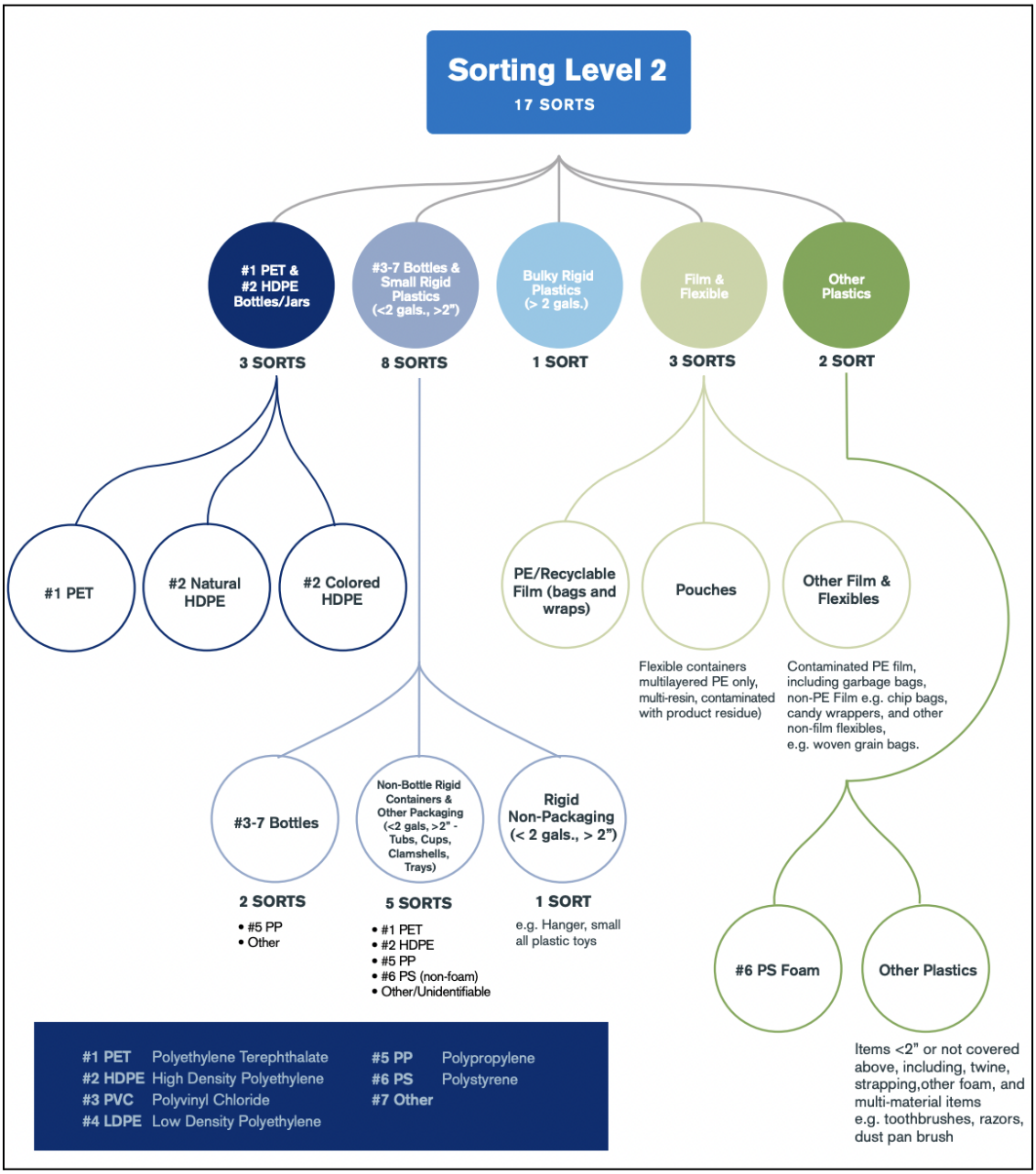

Figure 9 : Industry standard on sorting of plastic (The Association of Plastic Recyclers)

7. Monitoring

Case Study - Japan:

In April 1997, the *Law for the Promotion of Sorted Collection and Recycling of Containers and Packaging* (Government of Japan, 1997) was introduced in order to decrease the amount of glass containers, plastic containers and packages, and paper containers and packages that were being wasted.

The waste is pre-sorted at the hands of the consumers and is then collected by the local municipal authorities. Municipalities aggregate the sorted waste from all the sources, track the amount being collected and are consequently responsible for delivering the sorted waste to recyclers.

The general practice of recycling involves hiring the Japan Container and Package Recycling Association (JCPRA) to handle the process (Ministry of Economy, Trade and Industry of Japan, 2003). The general practice of recycling involves hiring the Japan Container and Package Recycling Association (JCPRA) to handle the process (Ministry of Economy, Trade and Industry of Japan, 2003). The association selects a recycling business entity from a pre-registered list of recycling businesses through a public bidding process at each designated storage site in local municipalities. This is paid for by a recycling fee from the manufacturers and businesses that use or produce containers and packages and other recyclable waste. The recycling business entity then takes the waste to a recycling facility and delivers the recycled product for profit to the user.

Payment is made to the recycling business entities by the JCPRA after verifying a receipt or delivery report from the user of the recycled products to ensure that the waste was indeed delivered for recycling. The reporting system ensures that waste is not disposed of without being recycled.

Each year, the government conducts a survey to determine the amount of containers and packaging used or produced by specific businesses, as well as the types of materials, uses, and shapes involved. Manufacturers and businesses that use containers and packages must uphold reporting standards that estimate the amount of recyclable waste that will be generated by their business on an annual basis.

Planned amount of sorted collection is also announced by the Ministry of the Environment every fiscal year based on the figure for the planned amount of sorted collection submitted from each municipal government. Using this information, the government calculates the total amount of recycling that is required, and the fee that must be levied on manufacturers or users of recyclable waste.

Case Study - Sweden:

The Swedish Environmental Protection Agency (SEPA) monitors waste recycling in Sweden. The producers have ownership of the material, the infrastructure, and the financing of the systems.

There are currently EPR schemes for the following seven product groups: packaging, newsprint, electrical and electronic products (EEE), batteries, tires, end-of-life vehicles, and pharmaceuticals. Producers who either use, import, manufacture or otherwise sell these products in Sweden have to

be registered with the SEPA and share an annual report with information on quantity by weight, specified for each included material (Swedish Environmental Protection Agency, n.d.). Imports of the products under the EPR scheme must also be reported to SEPA. This ensures that all the recyclable waste that is either produced or brought into the country is accounted for. Nonetheless, determining the quantities of products that are introduced into the Swedish market poses challenges due to unreported private imports and the presence of significant amounts of plastic in complex goods with varying plastic proportions, which are not adequately documented by the SEPA. Consequently, the volume of plastic contained in products that enter the market is frequently underestimated. (Swedish Environmental Protection Agency, 2020).

Producers typically collaborate with one another to fulfill their extended producer responsibility by establishing or affiliating with Producer Responsibility Organisations (PROs). In practice, these producers have a highly structured system in place for collecting and managing waste that falls under the EPR category. The majority of PROs partner with municipalities in Sweden to facilitate the convenient disposal of EPR products for households once they are no longer in use. (Swedish Environmental Protection Agency, 2020).

In certain countries, the official waste statistics are derived from strict regulations mandating the submission of comprehensive administrative data. However, in Sweden, such legislation is absent for both generated and treated waste. Consequently, the SEPA relies on data sourced from other contexts, including information provided by PROs, sector-specific authorities known for their high-quality data, and data obtained from environmental reports that licensed facilities are obliged to submit to the authorities annually. Additionally, SEPA conducts surveys of selected companies to

supplement their data. The SEPA regularly scrutinizes the reported data for accuracy and completeness. (Swedish Environmental Protection Agency, 2020).

SEPA has created a digital platform to streamline the centralization of data, which includes a feature that consolidates statistical data for specific product categories. This platform also enables both producers and PROs to submit their respective data. Producers who fulfill their producer responsibility independently, without being linked to a material company, must directly provide the relevant data to SEPA. (Swedish Environmental Protection Agency, 2020).

Each municipality is required to establish a local waste regulation that governs the provision of waste management infrastructure and outlines how households and individuals should source, sort, and manage waste in their respective communities. The local waste regulation is determined by politicians who serve on the municipal council. Municipalities are also responsible for submitting their waste-related data to SEPA. (Swedish Environmental Protection Agency, n.d.).

Case Study - AvaL Standard in Europe and Germany

The German AvaL Standard (Austausch von auftragsbezogenen Leistungsdaten Standard, n.d.) was initiated by the German Association of the Recycling and Circular Economy Industry through an open process in cooperation with industry partners. It is focused on standardizing the exchange of order-specific data between different recycling partners.

The recycling industry consists of a highly complex network of transactions between different recycling companies and consumers. In most companies, these transactions were initiated through

exchanges on paper or via email instead of being processed through a special IT system. These transactions usually happen in multiple steps and include information on the operating time and the number and weight of containers. Existing intersection points for standardized digital exchanges of information were not connected with each other and not comprehensive enough. This situation leads to costly inefficiencies for companies.

The AvaL Standard tackles these issues. It provides a holistic digital solution for the exchange of order specific data. A coherent data structure with unified core data and a universal intersection point is established. This single industry-wide intersection point is the only tool necessary for contact between customers, contractors, recycling companies, facilities, and vehicles. The standard allows for broad automatization of processes and monitoring.

8. Conclusion and Next Steps

Levy System:

Support the national efforts towards a levy system within the current legislative period to make use of the political momentum. The current policy proposal for a levy system for glass and plastic containers in Saint Lucia provides new momentum and opportunity for the implementation of such a system. A national levy policy could provide the foundation for the implementation of a private-public partnership model, such as in Germany, in efforts to create a comparable closed loop system. Due to the technology-intensive system that is utilized in the German system, setting up an equivalent model in the OECS context is not currently feasible, as the technology involved is cost-prohibitive. However, exchanging with Saint Vincent to learn more about their system which lends itself more to adaptation to the Saint Lucian context could be helpful. Capturing the key takeaways from Saint Vincent's experience and applying them to Saint Lucia could prove an advantage in the establishment of a similar model. Additionally, private sector buy-in is crucial to design a sustainable and scalable program, and cooperation with other OECS states may provide part of the solution.

Standardization:

Cooperate with the Saint Lucia Standards Council to design and implement the new OECS wide standards within the next two years. A standardization of OECS specific approaches and categories of waste management provides the groundwork for advancing the circular economy throughout the region. Continue to support local recycling businesses in the implementation of international standards as well as baling and sorting systems.

Monitoring:

Start talks with the Saint Lucian public and private recyclers on how to best implement a waste management monitoring system following Sweden's example as a pilot for the OECS. For the implementation of a monitoring system, Sweden's system would be the most relevant to the OECS context, as Japan's system relies heavily on the pre-sorting of waste by consumers and the German Aval Standard aims to standardize a complicated system of order specific data between different recycling partners. Learning from Sweden, the OECS could begin with data collection on two fronts. Firstly, by monitoring the quantity of plastic that is being produced or entering into the islands. This can be achieved by establishing reporting standards for businesses that import or produce plastic, such as manufacturing companies, resorts, restaurants, supermarkets, and other wholesalers, as well as for the waste sent in by cruise ships. Secondly, developing reporting standards for private recyclers to monitor the amount of plastic collected and exported. Some learnings can also be adopted from Japan, with the reporting of expected waste which will enter into the system in the next fiscal year.

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