WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (E-WASTE) ASSESSMENT REPORT FOR THE REPUBLIC OF SURINAME

Developed under the project:
RG-T3726: Management of E-Waste in Guyana, Suriname and Trinidad and Tobago

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Waste Electrical & Electronic Equipment (E-Waste) Assessment Report for The Republic of Suriname

Executed by:

Basel Convention Regional Centre for Training and
Technology Transfer for the Caribbean (BCRC-Caribbean)

Under the project:

RG-T3726: Management of E-Waste in Guyana, Suriname and

Trinidad and Tobago

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EXECUTIVE SUMMARY

E-Waste contains hazardous components which can result in negative impacts to human health and the environment if electrical and electronic equipment (EEE) are improperly disposed of at the end of their life. It is also noted that the Caribbean's technical and infrastructural capacity for the handling of E-Waste is limited. Thus, to address these challenges, the Inter-American Development Bank (IDB) Water and Sanitation Division is funding a project entitled "Management of E-Waste in Guyana, Suriname and Trinidad and Tobago", with the aim of supporting the sustainable management of E-Waste in the Caribbean at a sub-regional scale.

The project has four components, which are being jointly executed by the Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean (BCRC-Caribbean) and the University of Natural Resources and Life Sciences, Vienna (BOKU). The project components are:

- Component 1: To develop updated reports on the current E-Waste management practices in the project countries
- Component 2: To propose a sub-regional approach for the management of E-Waste in the Caribbean
- Component 3: To develop a business plan for the proposed management solution
- Component 4: To disseminate results and findings of the project through publications and workshops.

This report documents the outcomes of an assessment executed by the BCRC-Caribbean on E-Waste in the Republic of Suriname under Component 1 detailed above. This study attempted to identify the local stakeholders involved in the generation of E-Waste and its management, the relationships between these stakeholders and the contribution that these stakeholders make to the overall E-Waste generation and management in Suriname. It also sought to highlight current management practices to deal with E-Waste as well as the extent of stakeholder knowledge and data management with regards to this waste stream within the local context. The assessment is a collaboration with other project countries Guyana and Trinidad & Tobago and the results will help determine which approach would be most appropriate for the management of E-Waste, a sub-regional approach or a more localized one.

In the execution of this assessment, import and export data for EEE were analyzed and interviews were conducted with distributors and consumers of EEE, waste collectors,

and recyclers of E-Waste, and the respective agencies involved. Data was also collected through the dissemination of questionnaires. The data collected was analyzed,

summarized, and assessed to examine the flows and management of these equipment. The assessment found that 31.8 kiloton (kt) of EEE were put on the market from 2015 to 2019, while 21.6 kt of E-Waste were generated. It was found that gaps in knowledge and practices exist across different sectors and that there are significant weaknesses in this respect as it relates to EEE consumption and E-Waste generation.

As part of the assessment, an economic model for setting up a dismantling facility in Suriname was developed. The model is aimed to be helpful for policy makers to understand the economic framework conditions for E-Waste treatment in Suriname and sub-region comprising the three (3) project countries. In addition, the model brings advantages to decision makers as it gives detailed background data which is useful when designing an E-Waste policy framework. It can further provide support to entrepreneurs planning to set-up an E-Waste dismantling facility to get a good overview of the expected costs and revenues. For established facilities, this tool is helpful to identify options for improvement in the current process to optimize their dismantling operations.

The economic assessment provides different scenarios based on collection rates. It estimates incomes from selling recovered materials. Associated human resources, equipment and operational costs are also considered, including transboundary movements of E-Waste among the project countries. In addition, options for generating other sources of revenue or reducing some costs were presented. From studying the model, it can be concluded that, regardless of the collection scenario, the economic result of the treatment facility is positive. Higher collection rates result in a better economic result due to the economies of scale achieved.

An assessment to ascertain the economic feasibility (incentives/disincentives) of the current scenario was also developed. Regrettably, during the preparation of this report, it was not possible to gather information on the quantities, methods and destinations of E-Waste and materials handled through existing private initiatives and thus, it was not possible to conduct a detailed economic assessment of the current situation in Suriname. In addition, an assessment on gaps, barriers, and opportunities to E-Waste management operations based on the current situation is presented.

The feasibility of setting up a sub-regional dismantling facility was assessed through the model. The first alternative was to locate it in Trinidad and Tobago, due to the high E-Waste generation and level of industrialization of the country, in comparison to Guyana

and Suriname. The second alternative was to locate it in Suriname, due to the lower labour and rental costs. Positive economic results are achieved when the sub-regional facility is in Suriname. To make any sub-regional approach possible, user agreements must be in place among countries so that E-Waste can move among them. The political and social impact of such a measure should be taken into consideration as well.

Based on the findings of this assessment, the following recommendations which if addressed can significantly aid in the achievement of the environmentally sound management of E-Waste in Suriname. Some of these recommendations are:

- To improve governance to ensure the enforcement of existing environmental legislations and policies. As well as the inclusion of E-Waste into these legislations and policies to ensure all sectors of society are involved in the management of this waste stream.
- To create and bolster synergies between the waste management companies and the Government of Suriname, with all being aware of their role and responsibilities.
- To execute well-developed awareness and public education campaigns, which can initially target key stakeholders involved in the life cycle management of EEE and E-Waste followed by a broader public awareness campaign.
- To establish a dismantling facility in the country to formally bridge the gap between the generators and downstream dealers involved in the recycling of E-Waste or the use of E-Waste components.

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List of Acronyms

ABS	General Bureau for Statistics
BCRC-Caribbean	The Basel Convention Regional Centre for Training and technology Transfer for the Caribbean Region
BOKU	University of Natural Resources and Life Sciences, Vienna
EEE	Electrical and electronic equipment
E-Waste	Electrical Waste
EPR	Extended Producer Responsibility
ESM	Environmentally Sound Management
EU	European Union
EWG	E-Waste Generated
H&S	Health and Safety
HS	Harmonized commodity description and coding system
GS	Geharmoniseerd Systeem (Dutch translation of HS)
GEF	Global Environmental Facility
IDB	Inter-American Development Bank
kg	kilograms
MEA	Multilateral Environmental Agreement
MSW	Municipal Solid Waste
NGO	Non-Governmental Organisation
NPA	National Project Assistant
NWG	National Working Group
NIMOS	National Institute for Environment and Development in Suriname
OW	Ministry of Public Works
POPs	Persistent Organic Pollutants
ROM	Ministry of Spatial Planning and Environment
SSB	Suriname Standards Bureau
SDGs	Sustainable Development Goals
UEEE	Used electrical and electronic equipment
UPOPs	Unintentional Persistent Organic Pollutants

1. INTRODUCTION AND BACKGROUND

1.1. Project Background and Introduction

According to the European Commission[1] the amount of Waste Electrical and Electronic Equipment (widely known as WEEE or E-Waste) generated every year is increasing rapidly. It is now one of the fastest growing waste streams. This type of waste contains a complex mixture of materials, some of which are hazardous, which can cause major environmental and human health problems if the discarded devices are not managed properly. Table 1 details some of the human health impacts caused by the hazardous contents of E-Waste.

Additionally, modern electronics contain rare and expensive resources, which can be recycled and re-used if the waste is effectively managed. Improving the collection, treatment, and recycling of Electrical and Electronic Equipment (EEE) at the end of their life can:

- Improve sustainable production and consumption,
- Increase resource efficiency, and
- Contribute to the circular economy.

Table 1: Impact of E-Waste on Human Health[2]

Hazardous E-Waste material	Potential health problems
Lead	Changes in lung function
Mercury	Respiratory and respiratory effects
Nickel	DNA damage
Brominated flame retardants (Persistent Organic Pollutants)	Impaired thyroid function
Polycyclic aromatic hydrocarbons (PAHs)	Chronic diseases (cancer, cardiovascular disease

According to recent studies[3], there will be around 70 billion electronic devices connected just to the internet worldwide by the end of 2025, as compared to the existing

[1] European Commission: Waste from Electrical and Electronic Equipment (WEEE)
[2] World Health Organization: Impact of E-Waste on human health

35.8 billion devices. The global generation of E-Waste will reach 110 million tonnes by the end of 2050. A better understanding and more data on E-Waste will contribute to the achievement of several goals of the 2030 Agenda for Sustainable Development. It will help address the SDGs related to environmental protection and health and address employment and economic growth, since the sound management of E-Waste can create new areas of employment and drive entrepreneurship. A better understanding and management of E-Waste is closely linked to Goal 3 (Good health and Well-being), Goal 6 (Clean water and Sanitation), Goal 8 (Decent Work and Economic Growth), Goal 11 (Sustainable Cities and Communities), Goal 12 (Responsible Consumption and Production) and Goal 14 (Life Below Water) as highlighted in Figure 1 below.[4]

Figure 1: The SDGs that will benefit from to Sustainable E-Waste Management

1.2. Project Overview, Scope, and Objectives

The hazardous components contained in EEE can result in negative impacts to human health and the environment if improperly disposed. It is noted that the Caribbean's technical and infrastructural capacity for the handling of E-Waste is limited. To address these challenges, the Inter-American Development Bank (IDB) Water and Sanitation Division is funding a project entitled "Management of E-Waste in Guyana, Suriname and

[3] Muhammad Umaid Bukhari et al., 2022. Waste to energy: Facile, low-cost and environment-friendly triboelectric nanogenerators using recycled plastic and electronic wastes for self-powered portable electronics

[4] Global-E-waste Monitor 2017

Trinidad and Tobago", with the aim of supporting the sustainable management of E-Waste in the Caribbean at a sub-regional scale. The project has four (4) components, which are being jointly executed by the Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean (BCRC-Caribbean) and the University of Natural Resources and Life Sciences, Vienna (BOKU). The project components are:

- Component 1: To develop updated reports on the current E-Waste management practices in the project countries
- Component 2: To propose a sub-regional approach for the management of E-Waste in the Caribbean
- Component 3: To develop a business plan for the proposed management solution
- Component 4: To disseminate results and findings of the project through publications and workshops.

The specific objectives under this project include:

1. Collect data on E-Waste generation and composition, identify stakeholders and existing pathways of disposal and market conditions for the recovery of recyclable material.
2. Develop updated assessment reports for Guyana, Suriname, and Trinidad & Tobago.
3. Design a sub-regional E-Waste Management plan, including training modules for the staff that will run the plan, and a business plan for the proposed management solution.

1.3. Scope of the E-Waste inventory

To identify the quantity, composition, and sources of EEE and E-Waste, an inventory is important. The development of the inventory in this project was guided by the Basel Convention guidance document, *Practical guidance for the development of inventories of waste electrical and electronic equipment*[5] (hereinafter called the guidance document). The categories of EEE that were used during inventory development are presented in Table 2. For this project, it was important to analyse trends to predict E-Waste generation to develop a sound management plan, through either a regional or local treatment approach.

[5] Practical guidance for the development of inventories of waste electrical and electronic equipment. Draft by the Secretariat of the Basel, Rotterdam and Stockholm Conventions

Table 2: EEE Categories

Category	Abbreviation	Examples
Large household appliances	LHA	Stoves, washing machines, dryers, ACs
Small household appliances	SHA	Fans, irons, vacuum cleaners, blenders
IT and telecom equipment	ITE	Laptops, printers, desktops, mobiles
Consumer equipment	COE	Speakers, headphones, cameras, TVs
Lighting equipment	LIE	Lamps, bulbs
Electrical and electronic tools	EET	Drills, electrical saws
Toys, leisure and sports equipment	TLE	Musical instruments, game consoles
Medical devices	MED	Dialysis machines
Monitoring and control instruments	MCI	Smoke Alarms
Automatic dispensers	ADE	Vending machines

1.4. Approach to E-Waste inventory and methodology

This project involved developing an E-Waste assessment, highlighting trends in EEE consumption and E-Waste generation, as well as identifying of legislative, policy and economic developments with regards to E-Waste management. To complete the E-Waste inventory, intense data gathering from key stakeholders which included governmental organisations related to waste management and waste generation, recyclers, consumers, and distributors was undertaken. Interviews, field visits, online meetings, online research, and questionnaire surveys were used as methods to collect relevant data to complete the assessment report.

Two methodologies were provided in the guidance document [5], the one which allowed the estimation of E-Waste generation based on EEE put on the market was used as the guidance document stated this methodology was appropriate for developing E-Waste inventories in unsaturated EEE markets, which are usually found in developing countries, such as Suriname. The methodology comprises the following steps:

- Estimation of EEE put on the market for the most relevant equipment categories based on import/export statistics, and
- Calculation of E-Waste generated based on an average lifespan of each equipment category.

The lifespan of EEE plays a key role in estimating the amount of E-Waste generated. Table 3 below provides a lifespan overview of some EEE, while Figure 2 gives an illustration of the mass flow of EEE and E-Waste that will be considered in the E-Waste framework and inventory in this assessment report [5].

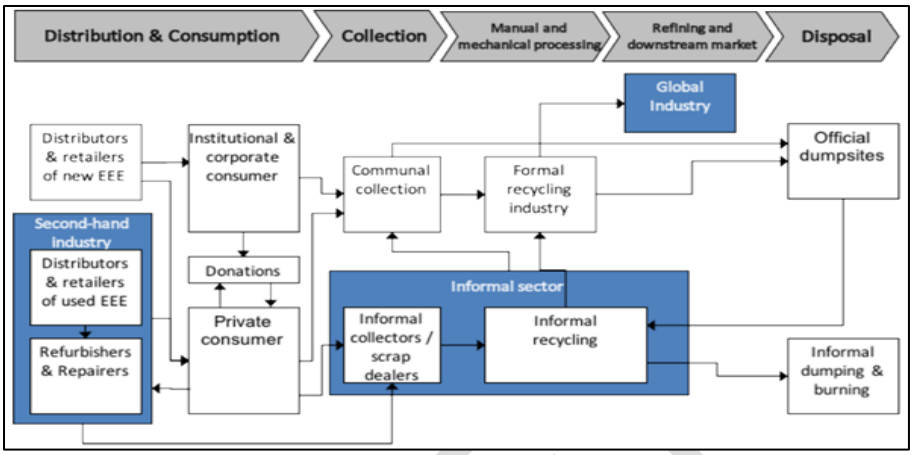

Figure 2: Example of EEE, and E-Waste flow diagram

Table 3: Sample Data for Average Lifespan of EEE Categories[6]

EEE category	Average lifespan (years)
Camera	3.8-10.4
TV (Cathode Ray Tube)	11.2-12.8
TV (Flat Panel)	7.3-11.3
Desktop Computer	4.0-10.7
Laptop Computer	2.9-7.0
Mobile Phone	1.5-9.0
Printer	4.0-10.5
Radio/ Hifi	9.0-13.8
Video Equipment	4.1-9.5
Microwave	5.2-8.3
Fridge/ Freezer	9.5-12.3
Washing Machine	7.6-10.0
Oven	8.3-11.1

[6] Sample Data provided in the Guidance Document

2. COUNTRY OVERVIEW

2.1. Profile of Suriname

Suriname, officially known as the Republic of Suriname, is a country on the north-eastern Atlantic coast of South America. It is bordered by the Atlantic Ocean to the north, French Guiana to the east, Guyana to the west, and Brazil to the south. At just under 165,000 km^2, it is the smallest sovereign state in South America. In 2020, Suriname has a population of approximately 586,634[7], most of whom live on the country's north coast, in and around the capital and largest city, Paramaribo.[8] Figure 3 presents the ten (10) districts in Suriname along with their approximate surface area.[9]

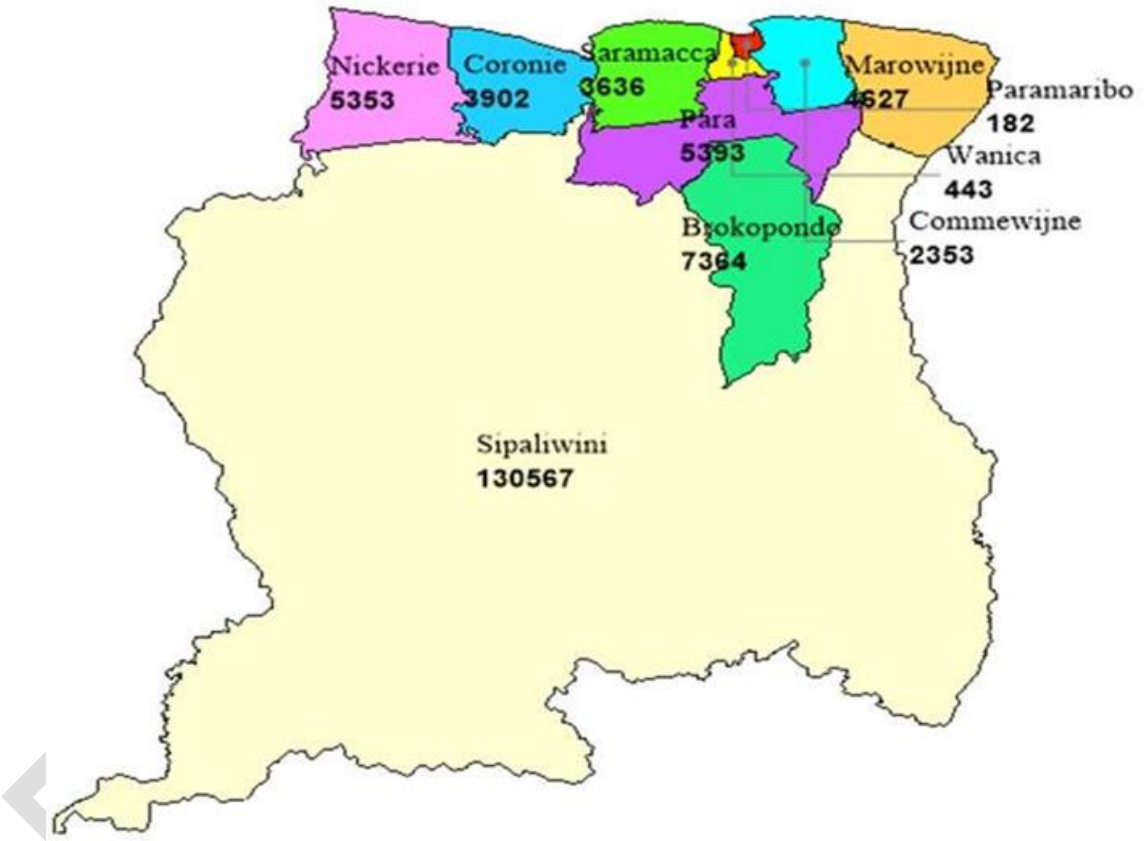

Figure 3: Districts of Suriname with approximate surface area in km^2

[7] https://data.worldbank.org/country/SR
[8] https://artsandculture.google.com/entity/suriname/m06nnj?hl=en
[9] General Bureau for Statistics (Algemene Bureau voor Statistieken (ABS))

According to the censuses completed in 2004 and 2012, the Surinamese population is experiencing exponential growth (Table 4). This growth has been confirmed, looking at data from Worldometer from 2016 till 2020 as shown in Figure 4 below.[10]

Table 4: Population Census in 2004 and 2012

District	Population census year		Population	
	2004	2012	Growth/decline	% growth/decline
Brokopondo	14,215	15,909	1694	11.9
Commewijne	24,649	31,420	6771	27.5
Coronie	2,887	3,391	504	17.5
Marowijne	16,642	18,294	1652	9.9
Nickerie	36,639	34,233	-2406	-6.6
Para	18,749	24,700	5951	31.7
Paramaribo	242,946	240,924	-2022	-0.8
Saramacca	15,980	17,480	1500	9.4
Sipaliwini	34,136	37,065	2929	8.6
Wanica	85,986	118,222	32236	37.5
Total	**492,829**	**541,638**	**48809**	**9.9**

Figure 4: Population Growth in Suriname from 2015-2020

[10] https://www.worldometers.info/world-population/suriname-population/

Statistically, Suriname is a growing nation and as the population of the nation grows, so does its generation of waste. Over the period 2015 to 2018, Suriname experienced a growth rate of approximately 3.4%, and an increase in households with electricity of 3.2%, with an estimated population of 381,817 persons, and 97,639 households with electricity as of 2018[11]. Such an increase can be indicative in a general increase in the use of large electrical and electronic appliances. Furthermore, an increase in the usage of electronic devices as people move towards working virtually in the face of the COVID-19 pandemic could play a significant role in the volume of E-Waste generation. It is therefore very important to have a management plan in place to ensure a sustainable future for Suriname.

2.2. Overview of Relevant Stakeholders

For this project, various stakeholders were identified to assist with data and information gathering. A National Working Group (NWG)[12] was also established to support with the national execution of the project. An overview of the stakeholders, including the NWG, who participated in the project can be seen in Appendix 2. Stakeholder engagement was conducted primarily using interviews, field visits, online meetings, and questionnaire surveys.

Four (4) survey questionnaires[13] were developed and distributed according to the categories of target groups which are listed and described in Table 5.

Table 5: Overview of Questionnaires

Questionnaire	Target group	Description
1	Consumers of EEE	For the general public
2	Distributors of EEE	For companies who sell and or distribute EEE
3	Government (non-governmental) organizations	For the public sector
4	WEEE management	For companies who operate in waste management

[11] https://statistics-suriname.org/wp-content/uploads/2020/05/Huishoudens_Households-in-Suriname-2015-2018v1.pdf
[12] A project mechanism implemented where a range of key national stakeholders are engaged to function as the key support for the project.
[13] Questionnaires can be found in Appendix 3.

2.3. Data Sources and Methodology

For the calculation of the E-Waste Generated (EWG), it is important to have data regarding the imports and exports of EEE. The Ministry of Economic Affairs, Entrepreneurship and Technological Innovation (Ministry of EZ) and the General Bureau for Statistics (ABS) were contacted. The Ministry of EZ could only provide data from 2017 to 2021, however, a minimum of 10 years of data is needed to give a good overview on the EWG, if the average lifespan of EEE in Suriname is considered. Therefore, to streamline the data resources with the other project countries, it was decided that the relevant data from the UN Comtrade Database[14] would be more appropriate for this assessment and data for 2007 to 2019 was obtained. The UN Comtrade Database uses Harmonized System (HS) codes[15]. For comparison, import and export data from 2010 to 2020 data from the General Bureau for Statistics was also obtained. The ABS provided data for Geharmoniseerd Systeem (GS) codes[16] of EEE, where Geharmoniseerd Systeem translates from Dutch to Harmonized System in English.

[14] https://comtrade.un.org/
[15] See Appendix 7 for HS codes obtained from UN Comtrade database
[16] See Appendix 8 for the codes obtained by ABS

3. RESULTS OF E-WASTE INVENTORY (MASS FLOW ANALYSIS) AND E-WASTE MANAGEMENT PRACTICES IN SURINAME

3.1. Overview of Responses

The following subsections highlight an overview of the responses and response rate for the various categories of stakeholders involved with E-Waste Generation in Suriname.

3.1.1 Consumers of EEE

As indicated in the methodology, a survey was conducted electronically, through the dissemination of online questionnaires [11] and shared with the general public in Suriname, via social media and emails. This garnered responses from 189 participants[17]

3.1.2 Distributors of EEE

To determine an overview of the amount of EEE on the market in Suriname, sellers, retailers, refurbishers and repairers were contacted. The questionnaire[18] for distributors was sent electronically to 32 companies[19], and the response rate was very low, at 6.25%, as two (2) [Harsons N.V. and Torarica] of the 32 companies responded. As such, the data collected for the distributors section of EEE in Suriname is insufficient for analyses on EEE distribution and trends on the market in Suriname. It is necessary for the contributing factors for the low response rates to be analysed in the future to obtain a better overview of EEE in this sector.

3.1.3 Government and Non-Governmental Organisations

A questionnaire[20] was developed to address the public sector of Suriname to obtain data on existing legislations and policies regarding EEE management. This questionnaire obtained 19 responses, which were mostly from Government Organisations[21].

3.1.4 E-Waste Management

In Suriname, there are few companies which are involved in waste management, and fewer who recycle E-Waste. A questionnaire[22] was developed to specifically target E-Waste Managers in Suriname, for which, eight (8) waste companies were contacted,

[17] See Appendix 4 for responses from participants.
[18] See Appendix 3c for Questionnaire to EEE Distributors
[19] See Appendix 5 for a detailed listing on the companies which were contacted for responses on the distributor's questionnaire.
[20] See Appendix 3b for Public Sector (Government and Non-Governmental Organisations) Questionnaire
[21] See Appendix 6 for responses from the Government and Non-Governmental Sector Questionnaire.
[22] See Appendix 3a for Questionnaire to WEEE Managers

however, only three (3) provided responses. This response rate was also relatively low, at 37.5%. The roles of the three (3) respondents are outlined in Table 6.

Table 6: Waste Management Companies Contacted in Suriname and Roles in Waste Management

Company	Waste Management Role				
	Recycler	Collector	Disposer	Scrap dealer	Repairer
Bux Engineering	x	x	x	x	x
Green Circle Recycling N.V.	x		x		
SuReSur		x			
SUWAMA Foundation					
COBO					
B.A.P Waste Management					
AMRECO					
Kairos Solutions N.V.					

The results of the questionnaire provided data on which districts are served by each of the three (3) waste management companies which responded. While Green Circle Recycling N.V. only operates in Saramacca, Bux Engineering and SuReSur operate in at least five (5) districts.

Table 7 below provides details received from the three (3) waste management companies which responded to the questionnaire. It was noted only two (2) of the three companies (Green Circle Recycling N.V. and Bux Engineering) also collect E-Waste.

Table 7: Waste Collected by Waste Management Companies

Company	Types of waste collected	Amount of Waste Collected Annually (ton)
Green Circle Recycling N.V.	Plastics, aluminium, glass, cardboard, E-Waste	250 (Plastic)
Bux Engineering	PC equipment, Appliances, Tools, Phones	3-9
SuReSur	Plastics, glass, cardboard, aluminium cans	165 (Plastic)
		6 (Aluminium Cans)
		100 (Cardboard)
		150 (Glass Bottles)

The waste management companies did not provide data on the amount of waste for all waste streams collected. Each company highlighted different methods for processing of the materials they collect. Table 8 provides further information on Green Circle Recycling N.V. and Bux Engineering based on their responses to the Waste Management questionnaire and a follow-up consultation with Green Circle and the BCRC-Caribbean.

Table 8: Waste Management Processes of Waste Management Companies

Topic	Green Circle Recycling N.V.	Bux Engineering
Waste collection procedures	Sort and process material by type in house and then export for recycling[23]	Reuse and repair, processing and [chemical] neutralization, separation
E-Waste specific procedures	Collect, dismantle, and separate materials from the E-Waste	Dismantling and separation, usable parts collected for reuse/resale, recycling, and landfilling[24]
Fee charges	Currently, no fee is charged. In the future, a fee will be charged for E-Waste, due to the dismantling process.	No
Export regions for E-Waste collected	Company has not exported E-Waste yet.	Company does not export E-Waste but does work with others who export E-Waste and scrap metal to China.
E-Waste percentage of total waste collected	-	2.5-5%
E-Waste collection and what type of E-Waste is collected the most	No[25]	PC equipment
E-Waste collection on regular basis	No (see footnote 25)	On request[26]
Main disposal treatment for E-Waste	Recycling	Landfill
Major clients	Large companies in Suriname	Muhaarib Security and many smaller clients
Local E-Waste management potential	Yes	Yes, but special tools are needed as well as increased separation and collection of E-Waste
Employees	-[27]	5

[23] In a consultation with Green Circle Recycling N.V., it was learned that the company have not exported any E-Waste for recycling yet. They are collecting and processing E-Waste, which is dropped at their facility by their clients.

[24] In their questionnaire response, Bux Engineering estimated that they repair approximately 0.5 ton of EEE and repair about 50 PCs yearly.

[25] Based on a consultation with Green Circle Recycling N.V., it was learned their clients currently drop E-Waste at their facility, rather than the company, providing a pick-up/collection service, which would come at a cost to clients.

[26] Bux Engineering noted that clients also drop E-Waste off to their facility.

[27] Attempts to obtain the number of employees at Green Circle were not fruitful.

The significant lack of data from the waste management companies was noted, along with the low response rate. For future, the reasons for these data gaps should be addressed to develop solutions to deal with this issue. It may be necessary to implement a reporting system to encourage waste management companies to accurately record their information to properly track the movement of E-Waste in Suriname.

3.2. Estimation of EEE Put on the Market (POM) (imports and exports)

To estimate EEE put on the market in Suriname data from two sources was acquired. Said data is presented in this section.

3.2.1. UN Comtrade Data on EEE imports and exports

To calculate the E-Waste generated (EWG), import and export data[28] is required, which was obtained from the UN Comtrade Database. Figure 5 gives a summary of the total imports and exports from 2007 to 2019 from the Comtrade database.

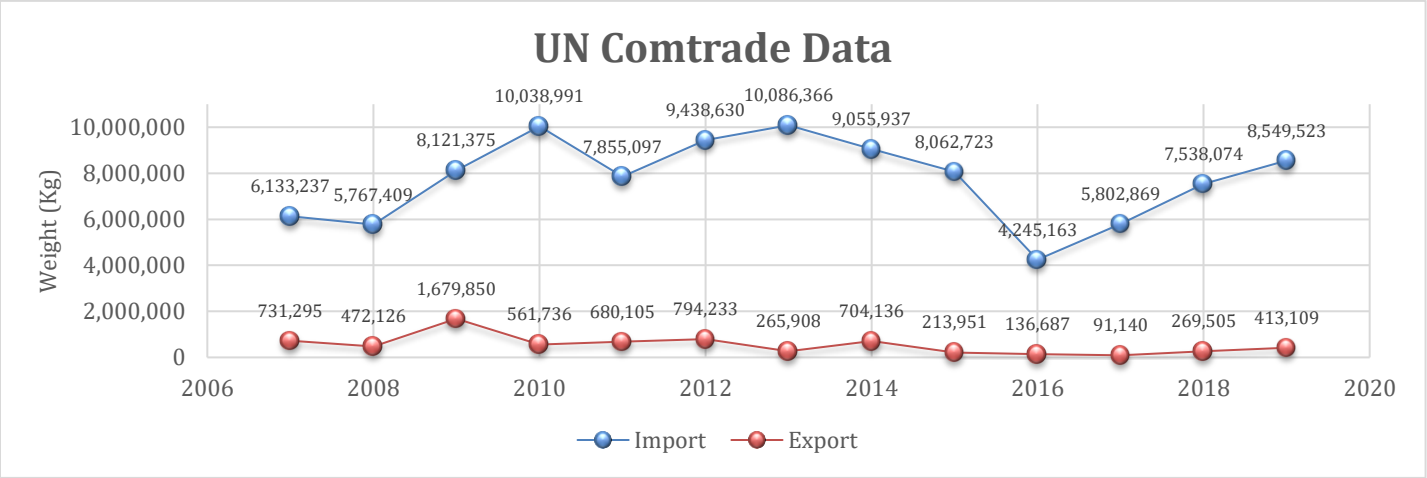

Figure 5: UN Comtrade Data for Total Imports and Exports for Suriname from 2007 to 2019

[28] See Appendix 10 for import and export datasets from UN Comtrade database for 2007 to 2019.

3.2.2. General Bureau for Statistics (ABS) Data on EEE imports and exports

The General Bureau for Statistics (ABS) also provided import and export data[29] regarding EEE from 2010 to 2021. Figure 6 provides an overview of the total amount of imports and exports per year, as recorded by the ABS.

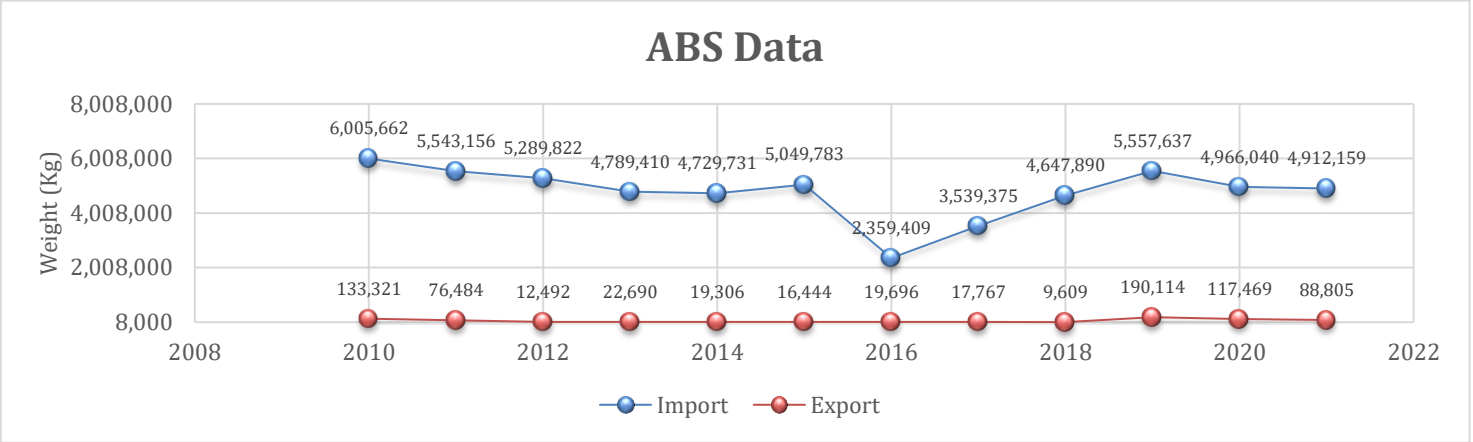

Figure 6: ABS Data for Total Imports and Exports for Suriname from 2007 to 2019

In Figures 5 and 6, a drop in the import of EEE was noted in both the UN Comtrade and the ABS data. The reason for this decline may be due to the economic recession that hit Suriname after 2015[30], which could have resulted in less EEE being imported.

As shown in Figures 7 and 8 below, large household appliances accounted for the largest proportion of imports by weight for the period 2010 to 2019, for both datasets, from the UN Comtrade database and the ABS, with 36% and 60% respectively. Notably, there was no data for certain categories by the ABS, particularly for lighting equipment, toys/ leisure equipment, medical equipment, and automatic dispensers.

[29] See Appendix 10 for import and export datasets from ABS for 2007 to 2019.
[30] Based on the draft Suriname Single Use Plastic Waste Inventory developed by the Suriname Waste Management Foundation, there was a drop in single use plastic items put on the market in 2016. They noted this drop may have been due to the economic recession that hit Suriname after 2016.

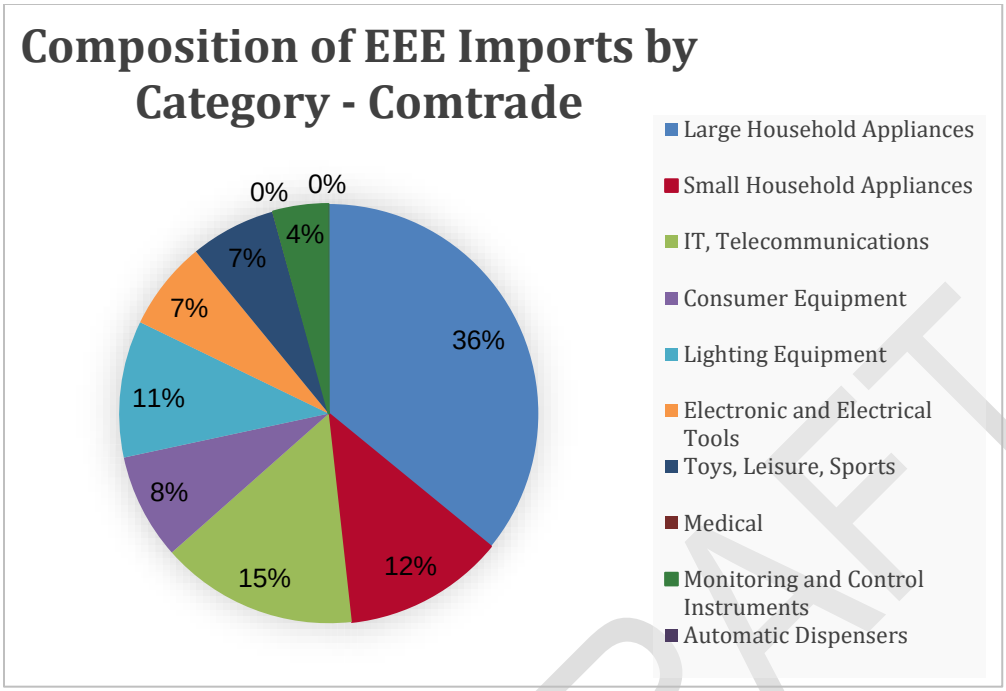

Figure 7: Composition of EEE Imports for 2010-2019 from UN Comtrade Database[31]

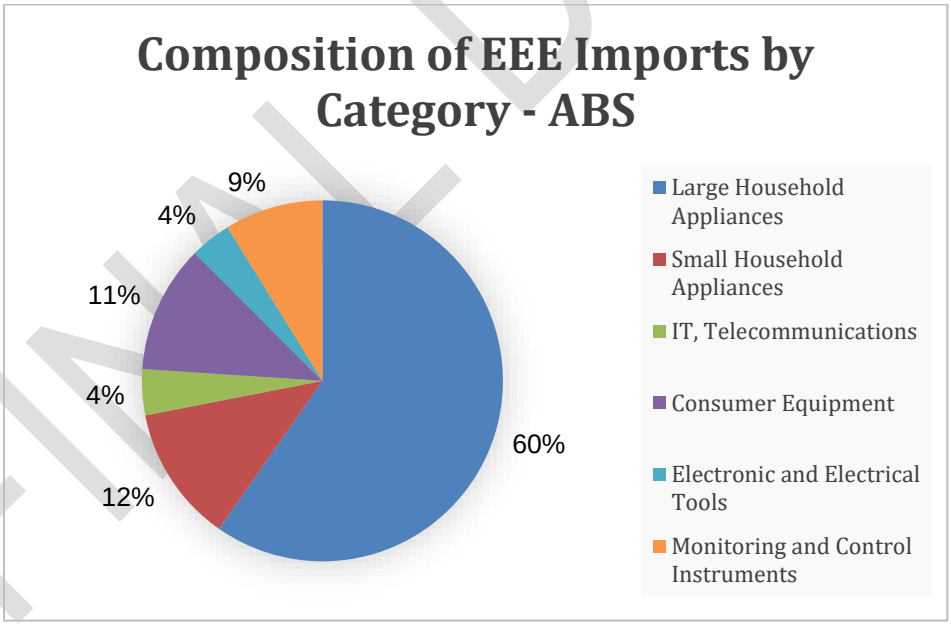

Figure 8: Composition of EEE Imports for 2010-2019 from ABS

[31] The Medical and Automatic Dispensers categories appear as 0% on the chart, however, please note their import values were 54,261 kg and 13,040 kg respectively.

2019 represents the last year for which import data from UN Comtrade and the ABS was available. Table 9 below presents the total imports in kg for each EEE category based on the two datasets obtained for 2019. The import data for each EEE category from 2010-2018 can be found in Appendix 10.

Table 9: Import data by EEE Category in 2019

EEE Category	UN Comtrade	ABS
	Import (Kg)	Import (Kg)
LHA	3,130,768	3,489,546
SHA	1,242,232	751,069
ITE	380,041	229,244
COE	675,221	635,172
LIE	1,123,153	-
EET	565,124	115,490
TLE	979,676	-
MED	6,238	-
MCI	447,070	337,116
ADE	-	-
Total	**8,549,523**	**5,557,637**

After initial analysis of the UN Comtrade and ABS data, it was decided the assessment would further examine only the UN Comtrade data. This decision was made as the ABS dataset did not provide information for all the EEE categories being examined and because differences in the import and export values provided by both datasets were noted. The ABS indicated that they receive their data from the Ministry of EZ and as such, they are not responsible for the raw data collected. Thus, the differences noted could be due to the quantities of raw data collected by the Ministry of EZ and possible errors in reporting.

3.3. Estimated E-waste Generation

To calculate the E-Waste Generated (EWG), the following equations are used for the derivation of the final formula, as provided in the guidance document [5].

1. Estimation of EEE Put on the Market (POM) based on import and export data of each equipment category. This will be represented by $POM_{(t)}$, where t is the year being examined as is as follows:

$$POM_{(t)} = Import_{(t)} + Domestic\ Production_{(t)} - Export_{(t)}$$

The POM value is determined by subtracting the mass of exports of EEE per given year from the total input of EEE into the country per given year. The total input of EEE in the country for a given year is found by summing the imports of EEE and domestic productions of EEE for that given year. In Suriname however, there is no production of EEE, therefore domestic production can be considered as negligible and is therefore removed from the equation, allowing the derivation of the following equation:

$$POM_{(t)} = Import_{(t)} – Export_{(t)}$$

Therefore, for Suriname, the total EEE put on market for a given year is the difference of import to export for that year.

2. Calculation of E-Waste Generated (EWG) using the average lifespan of each equipment. The EWG for a given time is found using the POM values. The average lifespan of the equipment is subtracted from the time for which the EWG is to be calculated, and the corresponding POM value is then found.

$$EWG_{(t)} = POM_{(t – \text{average lifespan of equipment})}$$

The guidance document [5] outlines typical lifespans for EEE. However, in the case of these calculations, the average lifespan of equipment refers to the data obtained in the Consumer Survey [6]. This data was obtained by asking the respondents about the lifespan of the various equipment and how often they replace such equipment, which provided responses as shown in Figure 9.

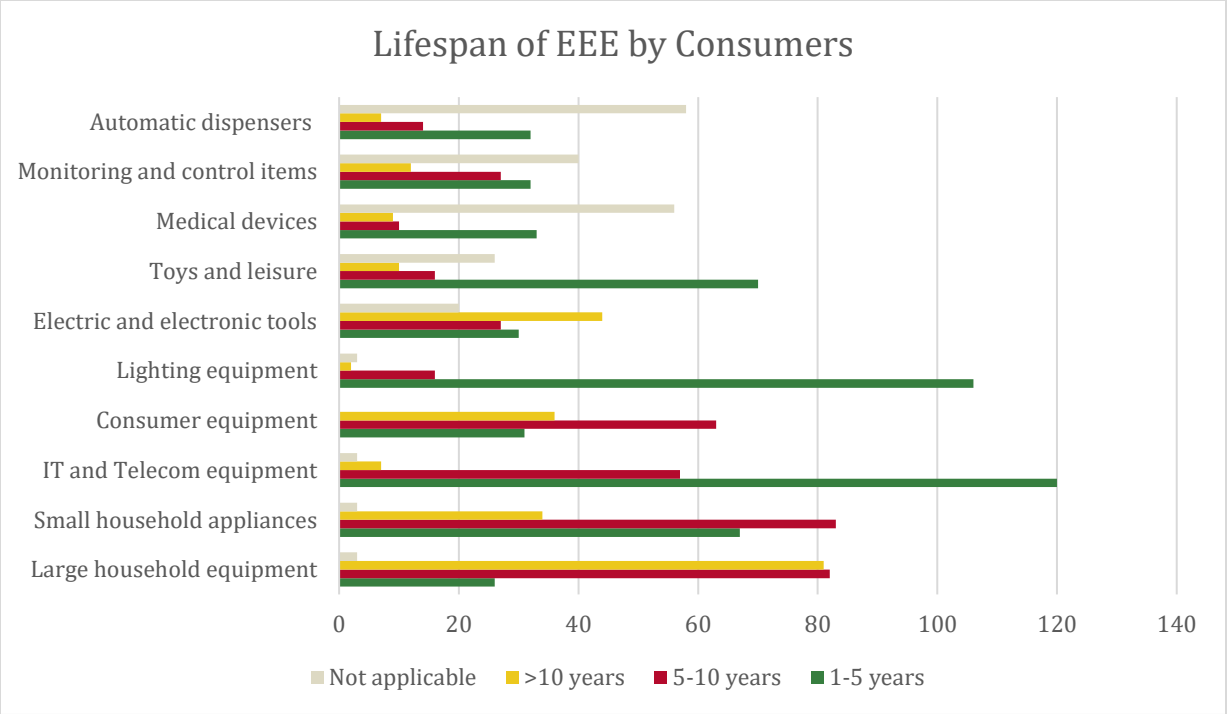

Figure 9: Lifespan of EEE Based on Consumer Responses

Based on consumer responses, the average lifespan for EEE in Suriname was then determined as shown in Table 10.

Table 10: Average Lifespan of EEE Categories Based on Consumer Responses

EEE category	Average lifespan (years)
Large household equipment	10
Small household appliances	10
IT and Telecom equipment	5
Consumer equipment	10
Lighting equipment	5
Electric and electronic tools	10
Toys and leisure	5
Medical devices	5
Monitoring and control items	5
Automatic dispensers	5

3.3.1. Calculation of EEE Put on the Market

Using the relevant equations detailed above, EEE POM for each EEE category was calculated using import and export data from 2007 to 2019. After the EEE POM was calculated, outliers in some of the EEE categories were noted. To correct for these

outliers, the average and median values was calculated and after discussions with BOKU, it was decided that the median should be used in place of the outliers. Table 11 below presents the adjusted EEE POM after the median was included. The total EEE POM for each category from 2007 to 2019 is also included in Table 11.

Table 11: Adjusted EEE POM (in kg) for each EEE category

Adjusted EEE POM for each EEE category using UN Comtrade Data											
	LHA	SHA	ITE	COE	LIE	EET	TLE	MED	MCI	ADE	**Total**
2007	2,607,249	936,815	366,066	252,073	581,835	425,944	449,723	2,003	180,302	-	**5,802,010**
2008	3,118,258	978,462	295,175	257,844	636,472	322,733	449,723	3,679	178,229	-	**6,240,574**
2009	2,341,324	930,149	947,181	786,598	766,927	329,882	449,723	2,931	303,557	45	**6,858,317**
2010	3,642,233	1,168,241	366,066	316,603	609,705	659,880	434,177	8,781	250,598	3,434	**7,459,718**
2011	2,169,987	980,677	366,066	609,425	619,366	802,177	435,911	1,223	254,927	3,123	**6,242,882**
2012	3,892,722	971,999	366,066	465,163	601,466	702,739	364,543	6,331	242,894	4,368	**7,618,291**
2013	3,090,704	1,082,521	366,066	295,178	781,357	800,842	344,698	3,679	242,393	858	**7,008,296**
2014	3,280,586	1,066,165	366,066	373,637	636,472	500,155	540,673	2,132	125,738	556	**6,892,180**
2015	2,783,679	1,058,119	366,066	316,603	636,472	446,405	601,253	3,679	333,476	-	**6,545,752**
2016	1,240,824	1,012,364	780,300	316,603	878,051	200,290	331,307	4,426	242,393	-	**5,006,558**
2017	2,393,697	759,783	936,292	122,144	653,578	216,734	463,534	4,601	161,366	-	**5,711,729**
2018	3,042,087	1,012,364	333,462	284,911	636,472	604,039	769,092	2,081	202,791	-	**6,887,299**
2019	3,130,768	1,242,232	328,000	338,502	636,472	562,576	978,009	6,238	426,936	-	**7,649,733**
					Total						**85,923,337**

As presented in Table 11, from 2007 to 2019, a grand total of 85,923,337 kg of EEE was put on the market in Suriname.

3.3.2. Calculation of the EWG

The adjusted POM values were then used to calculate the EWG for each category of EEE using equation 2.

The EWG, in kg, for each EEE category is presented in Appendix 10. In calculating the EWG, a projection of the E-Waste generation was also calculated for future years based on the data that was obtained.

After the EWG was calculated for each EEE category, those results were used to calculate the total EWG, in metric tons, for 2017 to 2022, by finding the total EWG for each category of EEE for each year:

$$EWG_{(t)} = LHA_{(t)} + SHA_{(t)} + ITE_{(t)} + COE_{(t)} + LIE_{(t)} + EET_{(t)} + TLE_{(t)} + MED_{(t)} + MCI_{(t)} + ADI_{(t)}$$

The total EWG for 2017 to 2022 using UN Comtrade data is presented in Table 12 below and presented graphically in Figure 10.

Table 12: Calculated total EWG using UN Comtrade data for 2017 to 2022

Year	EWG (Kg)	EWG (metric tons)
2017	5,807,749	5,808
2018	6,416,348	6,416
2019	6,059,590	6,060
2020	7,727,903	7,728
2021	6,798,743	6,799
2022	8,251,994	8,252

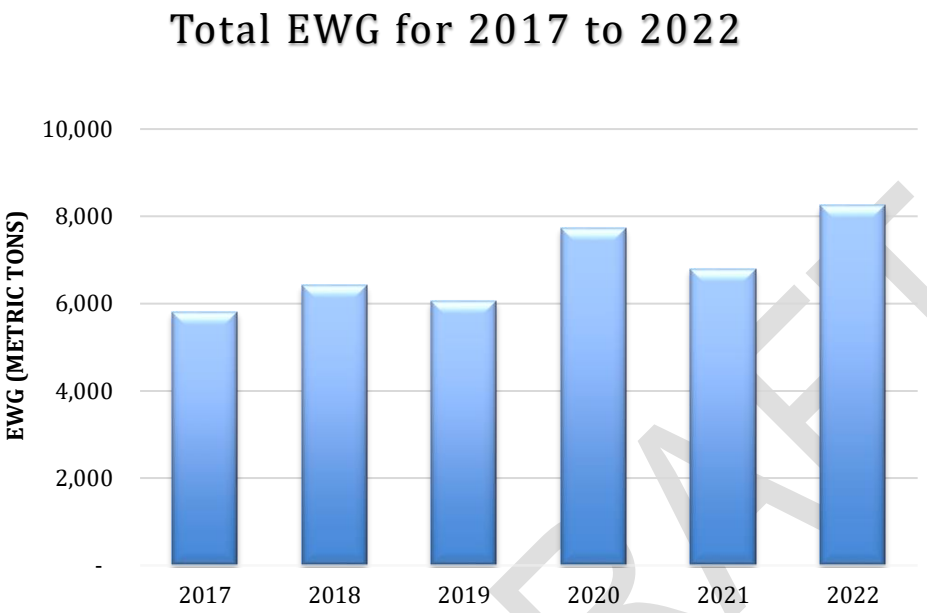

Figure 10: Total EWG Calculated using UN Comtrade Data for 2017 to 2022

Based on the above, in 2021, Suriname generated a total of 6,798,743 kg of E-Waste, which corresponds to 11.59 kg/capita/year when 2020 population data from the World Bank is used [7].

3.4. Future Trends of EWG

A forecast of future trends of EWG was calculated as the necessary data was obtained for the calculations. Figure 11 illustrates the expected trend based on the current data, which show a general decline in EWG.

Given the COVID-19 pandemic, a further decline in EWG may be expected due to global supply chain disruptions, which would have reduced the import of EEE during this time, therefore reducing future EWG. Contrary to this, the onset of increased virtual communication due to social distancing because of the pandemic could have also resulted in an increase in the demand for EEE, and as such, future EWG statistics are left to be seen.

It should also be noted that there are gaps in the total projected EWG values presented in Figure 11. These gaps occurred in the ITE, LIE and AD EEE categories as the required data was unavailable from the UN Comtrade database. The most recent year of data provided by the UN Comtrade database was 2019 and based on the average

lifespans of the ITE and LIE categories (5 years), there is insufficient data with which to do the projections for 2025 to 2027 for these two (2) categories. With regards to the AD category, as shown in Appendix 10, only data from 2009 to 2014 was available once again preventing any projections from being done.

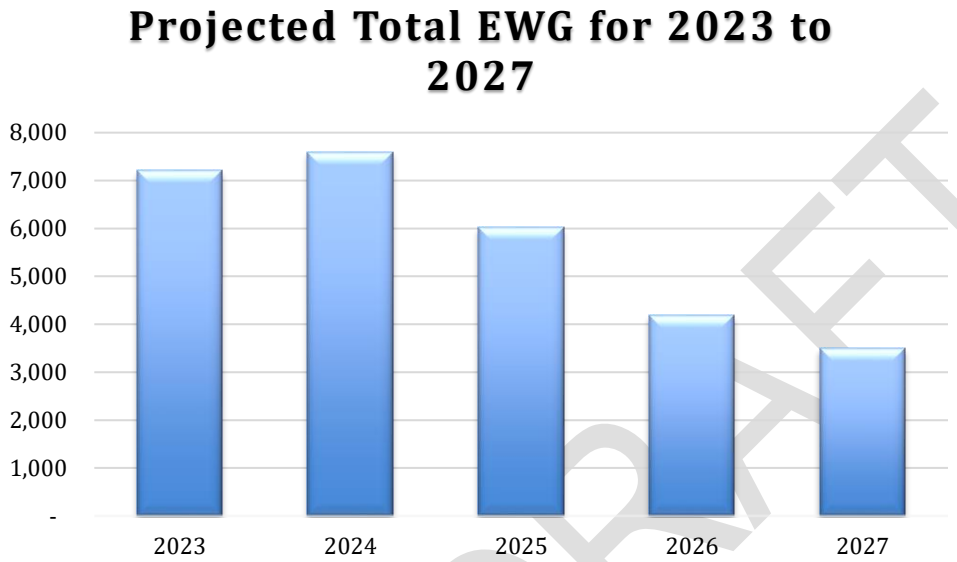

Figure 11: Projected Total EWG Calculated (in metric tons) for UN Comtrade Data for 2023 to 2027

3.5. Mass Flow Analysis

The mass flow analysis for a five-year period, from 2015 to 2019 was done using the UN Comtrade data.

For the data obtained from the UN Comtrade Database, the mass flow analysis, as shown in Figure 12, begins with a total of approximately 31.8 kt of EEE POM from 2015 to 2019. The share of EEE POM that are new and used are unknown, and data for estimates of quantities of EEE that are directed to households and institutions are also unknown. This data could be obtained in future to further analyse the movement of EEE in Suriname. The EWG calculated for this period is estimated at 21.6 kt, leaving 10.2 kt of EEE unaccounted for. Since all phases of the mass flow are not accounted for, it is difficult to determine what happens to the remaining EEE as well as calculate the mass flow for a particular year.

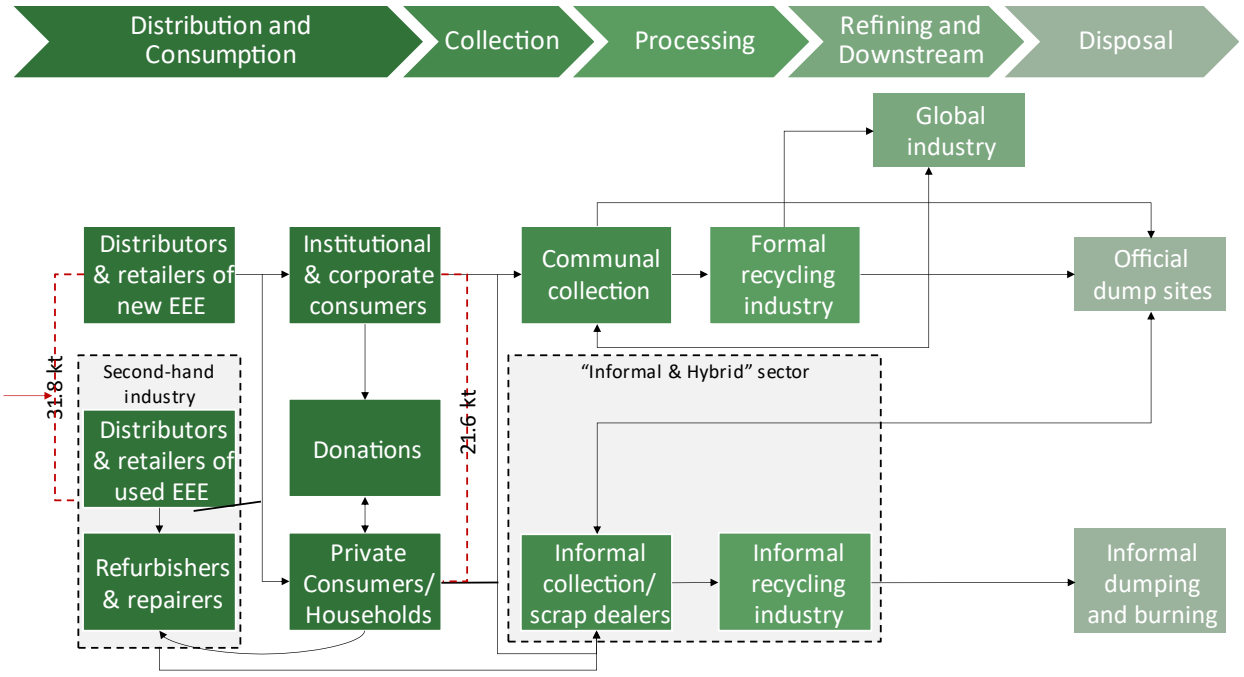

Figure 12: Mass Flow Analysis using Comtrade Data

With the lack of data, using the results from the consumer questionnaires, the largest number of respondents, approximately 36% indicated that end-of-life EEE is dumped. It should be noted some respondents noted that if they are unable to repair the EEE, it item is then dumped (5 out of the 189 respondents noted this). Approximately 2.6% of the respondents noted that EEE is recycled at end-of-life, however, it should also be noted that only one (1) respondent who noted they recycle their E-Waste was also aware of companies involved the recycling of E-Waste. As such, there may have been misinterpretation with what was meant by recycling of E-Waste by the respondents and the percentage of respondents who in fact recycle may be lower.

Figure 13 below presents the distribution of responses to the question on how EEE is treated at the end-of-life included in the consumer questionnaire.

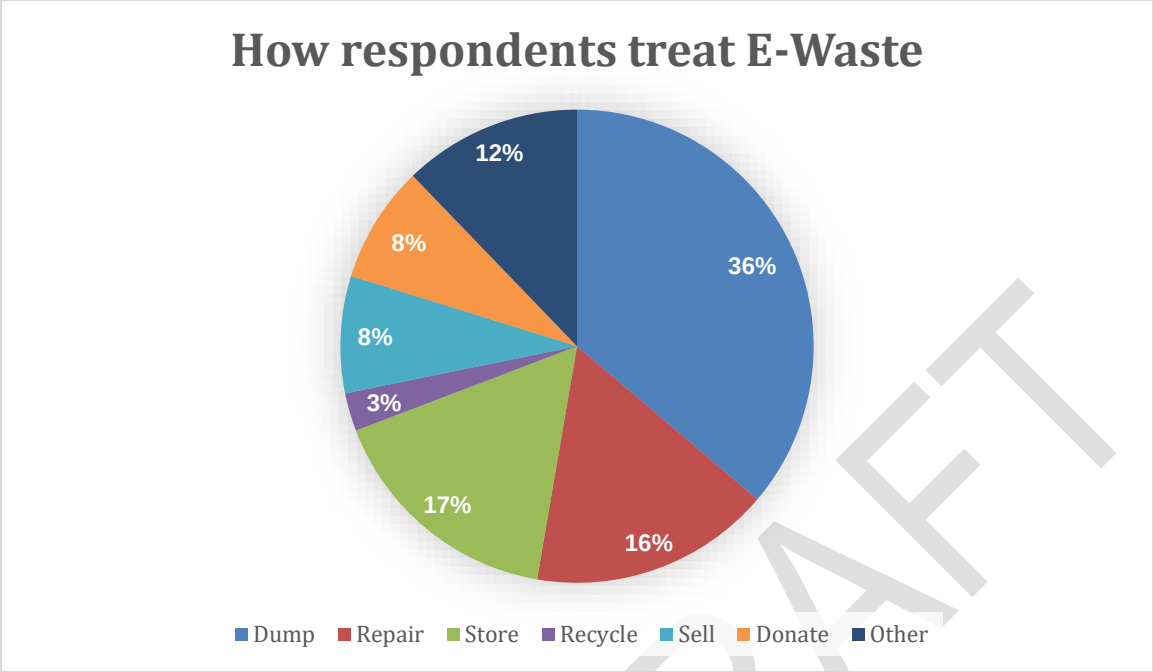

Figure 13: Distribution of the responses to how E-Waste is treated by Consumers in Suriname

With reference to the disposal of E-Waste in Suriname, two (2) of the three (3) respondents indicated that they are involved in E-Waste management. As presented in Table 8, both companies are involved in the dismantling and separating of E-Waste after it is either collected or delivered to their respective facilities.

Of the distributors which responded to the questionnaire, only one (1) indicated that recycling of E-Waste is done, particularly for printers and toners.

Ultimately, it can be noted that the recycling of E-Waste in Suriname is particularly low. When considering factors that may affect the low rate of recycling of E-Waste, the cost and public awareness are to be considered, along with the number of companies involved in E-Waste recycling and/or collection as well as logistics to facilitate the shipment of E-Waste to countries that facilitate its recycling. Most respondents to the consumer questionnaire were unaware of companies which recycle E-Waste (86%). A total of 31 respondents noted that they store their E-Waste, with 6 of them (19%) noting they prefer to wait for collectors to purchase the E-Waste as opposed to having to pay for its disposal, which indicates that the general public considers price as an important factor. Of those 31 respondents, the largest portion of respondents who store E-Waste indicated that these items are stored for their parts which may be useful (42%), which was closely followed by those who believed that the items are repairable (39%).

Added to this is there is no take-back system which are predominant in developed nations such as the United States, which allow customers to drop off or mail in their used or end-of-life devices[32], which is typically sent for recycling or disposal in an environmentally sound manner, and in some instances, if the device is in working condition and at a certain standard, can be traded in for cash value towards the purchase of another device[33]. It should be noted, however, that most respondents to the consumer questionnaire stated they are willing to pay for the treatment of E-Waste, which bodes well for future management of E-Waste in Suriname (only 47 out of the 159 respondents who answered the question on willingness to pay were unwilling to pay (30%)).

Generally, the low response rate for the various categories of questionnaires poses a challenge, as the data obtained is too little to be representative for the entirety of Suriname, but the general trends can be noted.

3.6. Local E-Waste Collection (Including Transportation and Storage)

3.6.1. The Directorate of Public Green and Waste Management

The Directorate of Public Green and Waste Management falls under the Ministry of Public Works and has the following objective:

- The protection of the environment in general and the improvement of the physical living environment as well as monitoring compliance with legal provisions relating to environmental matters.

The Directorate's tasks with regards to waste management consists of the following:

- Household waste collection and processing at the waste dump "Ornamibo".
- Cleaning up illegal dumps in Paramaribo and Wanica.
- Cleaning up litter in Paramaribo and other districts.
- Collection of fines for environmental violations by the "Environment Police" according to the Police Criminal Code ("Politiestrafwet").
- Cleaning up carcasses.

[32] https://www.epa.gov/recycle/electronics-donation-and-recycling
[33] https://www.apple.com/shop/trade-in

- Tree maintenance (pruning/felling) in public places and for private individuals for a fee.
- Collection of bulky waste from private individuals for a fee.

As mentioned, there are 10 districts in Suriname (Figure 5). According to the Directorate of Public Green and Waste Management there are multiple landfill sites spread out in Suriname. The Directorate noted there are no engineered landfills in the country. Table 13 below provides an illustration.

Table 103: Landfill Site Location per District

District	Landfill site location
Brokopondo	Within district
Commewijne	Ornamibo landfill
Coronie	Within district
Marowijne	Within district
Nickerie	Within district
Para	Ornamibo landfill
Paramaribo	Ornamibo landfill
Saramacca	Ornamibo landfill
Sipaliwini	Within district
Wanica	Ornamibo landfill

Ornamibo is the largest landfill site in Suriname and receives waste from five (5) districts. The means of transportation is either by dump trucks or pickup vehicles. Examples of such vehicles are presented in Figures 15 to 19. These dumping trucks vary from 20 m^3 to 27 m^3 waste volume potentially being transported.

Table 14: Waste disposed by the Directorate Public Green and Waste Management at the Ornamibo landfill site (units in m^3)

Waste categories	Potential E-waste	2017	2018	2019	2020	2021
Household	Yes	14,384	6,620	2,190	9,348	7,847
Agriculture	Yes	4,303	2,371	613	2,622	5,480
Industry	Yes	7,671	7,502	11,570	30,374	28,587
Expired foodstuff	No	589	266	78	153	199
Hospital	Yes	2,619	1,367	879	1,985	3,030
Glass	No	83	27	8	2	19
Asbestos	No	38	67	32	56	33
Waste of fish and meat	No	721	867	1,043	3,989	2,571

Tires	No	346	393	166	1,061	2,402
Total		**30,754**	**19,480**	**16,579**	**49,412**	**42,321**

The Directorate of Public Green and Waste Management also hires local contractors to collect and transport waste, Table 15 provides an overview of the amount of waste disposed of at the Ornamibo landfill site by the local contractors. While it was not confirmed with the Directorate, it is assumed that these local contractors are hired to collect all types of waste streams. Based on the 9th Environmental Statistics Publication 2015-2019[34] that was developed by the ABS, the most prevalent waste stream is household waste followed by industrial and agricultural waste, as such, the greatest quantities of waste collected by the local contractors may be household waste.

Table 15: Amount of Waste Collected and Transported by Local Contractors (volume in m^3)

2017	164,466
2018	172,694
2019	180,851
2020	188,687
2021	178,062

Table 16 provides an illustration of the total amount of waste that was dumped at the Ornamibo land fill site from 2017-2021 by the Directorate of Public Green and Waste Management and hired local contractors. E-Waste in Suriname is not collected separately and as such, which is why it gets mixed in the total waste.

Table 16: Total Amount of Waste Dumped at the Ornamibo Landfill Site (volume in m^3)

2017	195,220
2018	192,174
2019	197,430
2020	238,099
2021	220,383

The data in Table 16 is graphically presented in Figure 14 below.

[34] https://statistics-suriname.org/wp-content/uploads/2021/03/Final-9th-environment-pub-2020.pdf

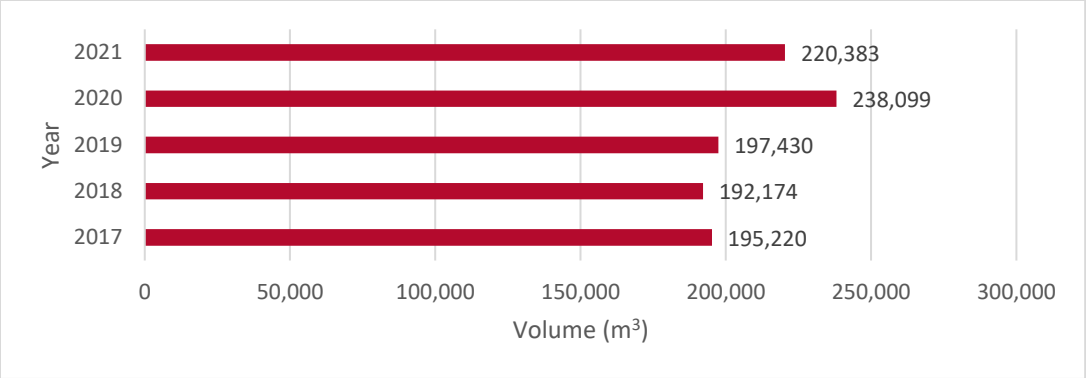

Figure 14: Waste volume trends from 2017-2020 at landfill site Ornamibo

Figure 15: Dump Truck (Coronie)

Figure 16: Dump Truck (Nickerie)

Figure 17: Dump Truck (Ornamibo)

Figure 18: Dump Truck (Brokopondo)

Figure 19: Dump Truck (Local Contractors)

3.6.2. Bux Engineering

Bux Engineering is an engineering company dedicated to starting and supporting small and medium industries. Their goal is to create long term and eco-conscious industries for the Surinamese and Caribbean population.

Figure 20: Container Puncturing to Prohibit Re-Use

Figure 21: Personnel Preparing the Discharge Ramp

Bux Engineering provides a range of services to deal with the management of both hazardous and non-hazardous waste. With regards to their management of E-Waste, as described in section 3.1.4, Bux Engineering collects, dismantles, and separates E-Waste and its components. The company also provides repair service for computers and appliances. Bux Engineering noted that they receive and/or collect 3-9 tons of E-Waste annually and items collected include PC equipment, appliance, phones, and tools. Any usable parts obtained during the dismantling and separation process are reused and resold, the E-Waste components are then sent for recycling and what cannot be recycled is sent to the landfill.

To dismantle and separate E-Waste Bux Engineering noted that they use grinders, saws, drills, torches, and hydraulic cutters. The company also informed that from the E-Waste they collect, they obtain about 100 kg of hazardous waste per year, which is encapsulated once removed from the E-Waste. Unfortunately, it is not clear if the company encapsulates the hazardous waste at their facility or if it is sent elsewhere in Suriname.

3.6.3. Green Circle Recycling N.V.

Green Circle Recycling N.V. collects, processes and trades the waste streams of paper, cardboard, foils, plastics, drink cans and rubber. The services of Green Circle range from waste management at the source of contamination to the installation of waste bins. They are a household name when it comes to waste management in Suriname. Figures 22 to 24 highlight the waste management equipment used at the Green Circle Recycling facility as well as the separation of different waste streams including E-Waste.

Figure 22: Waste Management Machines

Figure 23: Waste separation

Figure 24: E-Waste separation

Their mission is to offer the most feasible and affordable solution for the processing of different waste streams. They want to be recognized as the best service-providing waste processor in Suriname and the Caribbean. And all this in combination with the responsible and efficient handling of waste with regards to people and the environment.

For them, corporate social responsibility means making conscious choices to achieve a balance between commercially sound business operations and taking responsibility for people, the environment and society. They try to encourage companies to separate their waste and they have come up with an easy and cheap solution for this by placing bins so that plastic that is separated can be collected and processed.

With regards to E-Waste, the company noted that clients currently deliver E-Waste to their facility for processing. Doing this, avoids Green Circle Recycling from having to charge their clients a few to collect E-Waste. The company also noted the E-Waste they have received thus far includes items, such as computers, printers, microwaves, fridges, and stereos. Since getting more involved in E-Waste management, Green Circle Recycling has not exported any of their E-Waste yet; right now, they are in the process of collecting, dismantling, and separating materials from the E-Waste until they have sufficient materials for export. Green Circle Recycling also noted that some of the materials they receive comes from the scrap dealers who have no use for the material. In 2021, Green Circle estimated that they received ~21 tons of material from scrap dealers, which included stainless steel, aluminium, household equipment, smart phones, and steel.

Green Circle Recycling intends to recycle E-Waste within Suriname in the future instead of collecting E-Waste to be exported to foreign markets to be recycled. They noted the company has connections in Germany from whom they can receive assistance from for the set-up and operation of an E-Waste recycling facility.

3.6.4. Kairos Solutions N.V.

Kairos Solutions N.V. is a subsidiary of Van't Wel Schroothandel N.V. (scrap metal trade) and was established on 2 March 2017. The main activities of Kairos Solutions N.V include:

- The import, export, and distribution of all kinds of goods, so far as legally permitted.
- Buy and second hand buy of all metal sorts including iron, copper and aluminium so far as legally permitted.
- The import and export of metal sorts, also trading so far as legally permitted.
- The cooperation and participation with other companies who have the same goals so far as legally permitted.

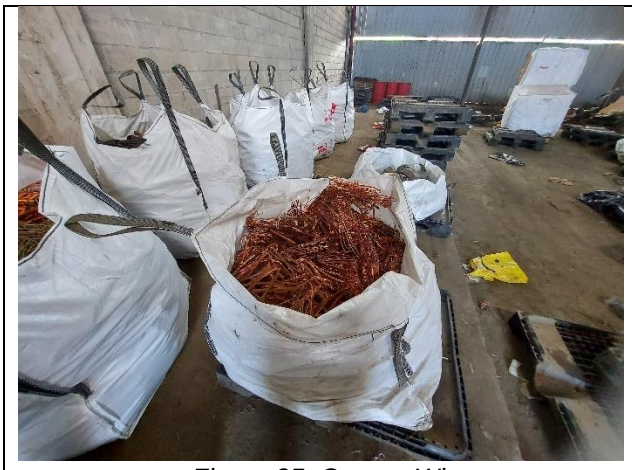

Figure 25: Copper Wire

Figure 26: Aluminium Wire

Figure 27: E-Waste (circuit boards)

Figure 28: Collected scrap components

Currently, Kairos Solutions focuses on the collection and storage of scrap metals, including copper, iron, and aluminium. The company does not specifically collect E-Waste, but they do accept items like circuit boards (Figure 27) from E-Waste if the E-Waste has been dismantled. Kairos Solutions tends to store its scrap metals until the company has enough material, which can be sold at for a good price. Storage periods can be up to two (2) years. The company does not export its collected scrap metals, but rather, sells it to merchants who usually export the scrap to smelters[35] in Europe. Unfortunately, no further details regarding the merchants were obtained. The company notes it is willing to start collecting E-Waste if there is a market for it in the future.

[35] During the data collection process, the NPA learned that there are no smelters in use in Suriname currently. There was an aluminium smelter in the past linked to the bauxite mining industry.

Figure 29: Scrap metals to be exported

Figure 30: Waste collector

Kairos Solutions uses metal collection buckets to transport materials and they also process some materials on-site.

Figure 31: Scrap Metal

Figure 32: Metal Waste Dismantler

3.6.5 Informal Sector

As with landfills all around the world, informal workers, or waste pickers can be found at the landfills in Suriname. Currently, there is not a great deal of information on the informal sector, however, through consultations with stakeholders the following was obtained:

- The Directorate of Public Green and Waste Management noted that waste pickers at Ornamibo landfill collect metal scraps and items which can be

sold. The Directorate also noted that there is a monitoring unit at Ornamibo which often prohibits waste pickers from entering the landfill.

- The Amazona Recycling Company (AMRECO) noted that some companies pay the waste pickers to collect items, such as metals and parts for machinery from Ornamibo. AMRECO also noted that the waste pickers usually collect materials from trucks as they carry materials into Ornamibo.
- Green Circle Recycling N.V. noted that waste pickers drop material off to the company's facility and estimated that they receive about 3-5 tons of E-Waste and other recyclables from the waste pickers per quarter.
- Kairos Solutions N.V. also receives materials collected by waste pickers. The company noted they receive approximately 100 kg of aluminium and copper daily, which is sometimes taken from landfill sites.

Due the paucity of data available regarding the informal sector, no figures were available to be included in the mass flow analysis presented in section 3.6.

3.7. E-waste Disposal (Local Practices/Solutions)

3.7.1 Local Waste Practices/Solutions

In Suriname there is not yet a clear legislation about E-Waste management. Some people tend to dump their E-Waste with their household waste which is usually taken to landfill sites. While others tend to leave their E-Waste on the curb or along the roadside. Appendix 9 provides an overview of the kinds of waste dumped at the ten (10) landfill sites in Suriname. Figure 33 provides an overview of the approximate locations of well-known landfill sites in Suriname.

Figure 33: Overview of most landfill sites in Suriname

Table 17: Area overview of 10 landfill sites in Suriname

#	Area ≈ (m^2)	Location	Use	Disposal Fee	District	E-Waste disposal
1	44,973	Charles Burg	Private	Yes	Paramaribo	Yes
2	136,466	Charles Burg	Private	Yes	Paramaribo	Yes
3	260,918	Ornamibo	Public and government	Yes	Wanica	Yes
4	61,899	Km 85 from Atjoni	Public and government	No	Brokopondo	Yes
5	162,037	Km 57 after Brownsweg	Public and government	No	Brokopondo	Yes
6	87,662	Moengo	Public and government	No	Marowijne	Yes
7	105,819	Albina	Public and government	No	Marowijne	Yes
8	10,681	Cocoslaan	Public and government	No	Coronie	Yes
9	22,638	Soekhoeweg	Government	No	Nickerie	Yes
10	125,169	Southdrain	Public and government	No	Nickerie	Yes

The landfill sites at Charlesburg are privately owned properties, people can pay a fixed fee to dispose their waste, but household waste is not allowed for disposal. At the site, mostly inorganic waste consisting of construction waste and end-of-life household appliances, such as refrigerators, stoves, and washing machines can be disposed.[36] At the Ornamibo landfill there is a station of the Waste Disposal and Processing Unit where the general public needs to explain what they want to dump at the site and there is a disposal fee. According to the Directorate of Public Green and Waste Management, disposal fees at the Ornamibo landfill site are 7.50 SRD per m^3 (US$0.36 per m^3). It is unknown if the cost to dispose of particular waste streams is different.

The landfill site at the Soekhoeweg in the district Nickerie is a government owned landfill site but it is not open for the public due to the waste overflowing and getting carried away to Guyana by the river near to the landfill site. People can dump their household waste at the Southdrain landfill site under guidance of the Waste Disposal and Processing Unit stationed there.

The landfill sites at Albina, Moengo, Brokopondo are open and there are no control mechanisms in place.

3.7.1.1 Private Sector Local E-Waste Handlers/ Management

E-Waste management in Suriname is mostly absent with limited management is typically handled by the private sector comprising a few recyclers and collectors who deal with the disposal or recycling of E-Waste.

Within the private sector there are also refurbishers of EEE in Suriname, one being Mobile Repair Specialist who operates within the Commewijne district. Mobile Repair Specialist noted that on a weekly basis, they usually receive approximately thirty (30) mobile phones, three to five (3 to 5) tablets and at least one laptop for repair. The manager noted that upon receiving equipment, an analysis is carried out to see if the equipment can be repaired. The business noted its rate of successful repairs is between 80 and 90% and if a device cannot be repaired, they offer to buy the device from the customer and then use parts from the device. The business noted they do not throw away devices, nor do they export materials.

[36] Draft Suriname Single Use Plastic Waste Inventory developed by the Suriname Waste Management Foundation.

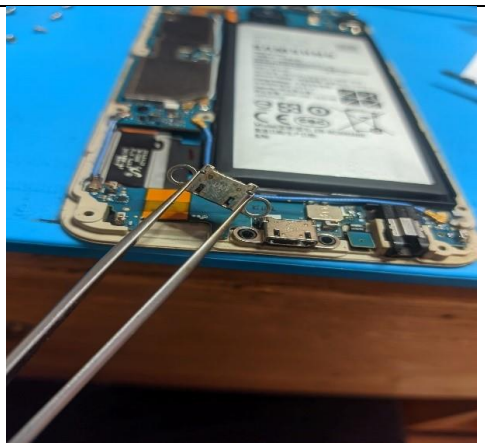

Figure 34: Cell phone repair at Mobile Repair Specialist

Green Circle Recycling also mentioned that there are a number of phone shops in Suriname that repair smart phones. They noted during the repair process any E-Waste produced is thrown in the garbage. Green Circle hopes to step up an E-Waste collection from these phone stores in the future.

3.7.1.2 Public Sector Local E-Waste Handlers/ Management

In Suriname, there are institutes and organizations who use international guidelines for waste management practices. Some of these organizations are:

1. The National Institute for Environment and Development in Suriname (NIMOS)

NIMOS was established on 15 March 1998 as the executive body of the National Environmental Council (NMR). The NMR and NIMOS were the answer to negative environmental development. Suriname was confronted with environmental problems such as:

- Poor drainage systems for waste water;
- Inadequate collection and disposal of waste;
- Uncontrolled shell and sand excavations;
- Mercury pollution of soil and waterways; and
- Uncontrolled discharge of industrial waste.

2. The Ministry of Spatial Planning and the Environment (Ministerie van Ruimtelijke Ordening en Milieu (ROM))

The Ministry of ROM was established by presidential decree on July 16, 2020, in response to the call for more attention to spatial planning and a more decisive environmental policy. Some of the main responsibilities from the Ministry include:

- Creating and promoting the conditions necessary for the protection of nature and for the preservation of the ecological balance;
- The preparation of an environmental policy plan;
- Preparing national environmental legislation and updating existing environmental (related) laws;
- Overseeing the implementation and compliance with the obligations of the environmental treaties; and
- Coordinating and monitoring the implementation of the national environmental policy, this in collaboration with the relevant ministries and authorities.

3. The Suriname Standards Bureau (SSB)

The Surinamese Standards Bureau (SSB) aims to create an adequate, healthy standards infrastructure to stimulate economic activities, to protect the environment, the safety and health of humans, as well as to protect the life and health of plants and animals, by means of establishing, adopting, developing, maintaining, and promoting the application and use of standards and technical regulations.

The SSB develops standards, one which is the Garbage collection and handling standard Part 1. This standard sets out how the collection of Household, Medical, Industrial and Bulky Waste and Separate Collection should be carried out.

3.7.2 Exports of E-Waste

There is very little information regarding the exports of E-Waste in Suriname. During the data collection process for this Assessment Report, many organizations and institutes were contacted for data, but efforts were unfortunately not fruitful. The ABS, however, was able to provide an overview of waste that is being exported from Suriname, including E-Waste, through the 9th Environmental Statistics Publication 2015-2019. That overview is presented in Table 18 below.

Table 18: Overview of Scrap Exports from 2015 to 2019[37]

	Year (tons)				
Type of metal	**2015**	**2016**	**2017**	**2018**	**2019**
Iron	16,916	4,014	7,950	1,820	8,011
Aluminium	869	740	601	653	838
Copper	217	74	113	362	432
Lead	503	187	642	1,430	1,906

[37] https://statistics-suriname.org/wp-content/uploads/2021/03/Final-9th-environment-pub-2020.pdf

Computer parts	-	-	-	12	-
Stainless steel	-	-	14	5	21
Total	18,505	5,015	9,320	4,282	11,208

3.8. E-waste Disposal (Regional/International Practices/Solution)

As mentioned before, there are institutes and organizations like the NIMOS and the Ministry of Spatial Planning and Environment who oversee the management of hazardous waste and their disposal in Suriname.

The Ministry of ROM also follows the guidelines of the Basel Convention as since 2011 Suriname has been a party to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes. The Ministry also serves as the national Focal Point for the Convention.

The NIMOS has built up a reputation within society and the government as an independent, technically competent, professional, and progressive partner in the regulation and structuring of the various sectors in charge of the environment. Furthermore, NIMOS uses the Basel Convention as it is, for applications for the export and transit of hazardous waste, including E-Waste. Under this treaty, technical guidelines for E-Waste have been adopted that apply to all parties.

3.9. Summary Comparison to 2016 Suriname E-Waste Assessment Report

An E-Waste assessment was conducted previously in 2016, which highlighted E-Waste trends for a five-year period from 2007 to 2011. Similar to this assessment, the previous report highlighted waste management in Suriname at a national level, touching on policy and framework and the institutional arrangements for the management of waste. The imports and exports of EEE over this time period was analysed, to gather data on EEE that was put on market and the amount of E-Waste generated.

With respect to the analysis on the institutional framework. In the time of the previous reporting (2016), NIMOS was the organization responsible for environmental management, with support from advisory groups such as Inter-Ministerial Advisory Committee (IMAC) and National Council for the Environment (NCE), in collaboration with the Ministry of Natural Resources (MNH), Ministry of Trade and Industry (MHI) and the Ministry of Agriculture, Animal Husbandry and Fisheries (MLVV). In the current reporting, it was noted that the Ministry of Spatial Planning and Environment is charged with the responsibility for environmental matters within Suriname. Within the ministry, is the Directorate of the Environment (DOE), which is directly responsible for environmental protection. The DOE is also currently both the competent authority and focal point for the Basel Convention in Suriname. The NIMOS, which also falls within the remit of the Ministry of Spatial Planning and the Environment, is an autonomous government foundation, which is the technical working arm of the Ministry, tasked with the development of national legal and institutional framework and policy. From the previous assessment to present, it seems as though environmental affairs has been streamlined to one ministry, with support, where necessary and applicable from other ministries. This streamlining can assist in the overall development and implementation, when addressing environmental issues, since through increased collaboration and coordination, and less redundancy throughout various arms and organisations of the government.

From the time of the previous report to present, there has been the introduction and implementation of the National Environmental Framework Act, which acts as a basis for the dealing with environmental matters, where one of the six (6) implementation regulations which was decided as most important, deals directly with Hazardous Substances. This progress can be built upon in future, considering the recommendations made in this report.

The previous study had the key objective of establishing a national E-Waste management body for the effective management of E-Waste in Suriname. The study also aimed to implement public awareness and public education campaign to engage the general public of Suriname in the management of E-Waste. It also sought to establish regulations and legislation to support proper management through formal collection systems, national reporting, capacity development of informal collectors and the establishment of a facility for dismantling, and recovery. The current assessment has similar aims but engenders and sub-regional approach for training and in general, the management of E-Waste, as it considers the state of E-Waste in Suriname, Trinidad and Tobago and Guyana, and to also develop a business plan for the proposed management solution.

In both instances, there has been a general increase in imports of EEE to Suriname, with which, came a general increase in the EEE present in the market, and therefore E-Waste that was generated. In both assessments, large household appliances accounted for the largest proportion of imports of the period analysed in each report. From the data obtained, there has been a significant increase in the imports of large household waste by 103% according to the data obtained from the UN Comtrade Database, and 99% using the data from ABS, when compared to the total mass of imported large household appliances for the period 2007 to 2011 and recorded in the 2016 report.

The comparison of both assessments results in a single clear message, which directly reflects the need for proper management of E-Waste and adequate reporting and record keeping of the movement of EEE throughout Suriname. The need for legislation and guidance to the public and policy makers is evident from the assessments of the state of E-Waste as seen by the lack of waste separation and facilities for the environmentally sound management (ESM) of E-Waste, and where possible, the safe recovery and dismantling of such waste.

4. LEGISLATIVE CONSIDERATIONS FOR E-WASTE MANAGEMENT IN SURINAME

As outlined in detail, the implications of E-Waste on the safety of humans and the environment, its careful management is integral. In Suriname, there is a framework law, that can be used to further provide regulations to command a regime regarding the management of E-Waste, but this must be acted upon, to draft and implement legislation and policies with a focus specific to E-Waste management.

This chapter, through the analysis of the legal aspects of the current E-Waste management framework in Suriname and the institutional capacity presents an overview of the roles of competent authorities in the management and administration of matters related to E-Waste and their effectiveness. The full assessment report of Suriname's legal and institutional capacity for E-Waste management can be found in Annex 1.

4.1. Current E-Waste Legal & Institutional Framework

4.1.1 International Agreements

Suriname has signed on to various international agreements, to which Suriname is obligated to address issues that relate to the ESM of E-Waste, as listed in Table 19.

Table 19: International Agreements to which Suriname has Joined

Convention	Date of Accession (A)/Ratification (R)
Basel Convention	*September 20 2011(A)*
Stockholm Convention	*September 20 2011 (R)*
Rotterdam Convention	*May 30 2000 (A)*
Minamata Convention	*August 2018 (A)*
Montreal Protocol	*October 14 1997*
Trade Facilitation Agreement of the World Trade Organisation	*Not yet ratified*
International Convention for the Prevention of Pollution from Ships	*October 28 1983*
Cartagena Convention	*March 27 2008*

These International Agreements deal with different aspects or components of E-Waste, since the various components of E-Waste may contain different hazardous materials. As such, the significance of these International Agreements is highlighted in Table 20.

Table 20: Significance of the International Agreements Relative to E-Waste in Suriname

Convention	Importance	Focal Point
Basel Convention	As it pertains to E-Waste, the Basel Convention addresses its environmentally sound management, prevention of illegal traffic to developing countries and capacity building of the management of E-Waste. The Prior Informed Consent (PIC) procedure for the movement of hazardous chemicals was developed under the Basel Convention, which applies to the transboundary movement of E-Waste, components of E-Waste or those that contain harmful chemicals.	Ministry of Spatial Planning and Environment
Stockholm Convention	The Stockholm Convention on Persistent Organic Pollutants (POPs) aims to protect human health and the environment from the harmful effects of POPs. Parties to the Stockholm Convention are required to ensure the safe management of POPs contaminated waste and minimise exposure to POPs. Components of E-Waste, which include printed circuit boards, plastic casing, cables, insulation foam, cooling agents, flame retardants, cathode ray tubes, capacitors, activated glass and screen phosphors and Ni-Cad batteries, were identified as likely to be POPs containing[38]. As an obligation to the Convention, Parties are expected to complete (where applicable), or update their National Chemical Profile and National Implementation Plan, which for Suriname were updated in 2011 and 2019 respectively.	Ministry of Spatial Planning and Environment

[38] https://www.gov.uk/guidance/dispose-of-waste-containing-persistent-organic-pollutants-pops

Convention	Importance	Focal Point
Rotterdam Convention	The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade helps Parties to protect themselves against unwanted imports of hazardous chemicals, through a global system, that allows the exchange of information of hazardous chemicals. The Prior Informed Consent (PIC) procedure for hazardous waste includes the transboundary movement of E-Waste, components of E-Waste or those that contain harmful chemicals. The Rotterdam Convention expressly excludes waste, therefore the hazardous chemicals that may be contained in E-Waste will fall under the remit of the Basel Convention, however, the chemicals present in EEE and used EEE will apply, where the technical guidelines will apply to the distinction between waste and non-waste.	Ministry of Spatial Planning and Environment (Official Contact Point)
Minamata Convention	The Minamata Convention on Mercury aim of this global treaty is to protect human health and the environment from anthropogenic and other releases of mercury and mercury compounds. Many electrical and electronic devices and its components contain mercury, however, even in small concentrations, its exposure to humans have dire consequences, which, consequently, led to the feasible reduction, and where applicable elimination of mercury in such products, and others which contain mercury. Suriname, as a Party to the Minamata Convention, completed its Minamata Initial Assessment (MIA) in 2015, which was approved for implementation in 2016.	Ministry of Spatial Planning and Environment and NIMOS

Convention	Importance	Focal Point
Montreal Protocol	The Montreal Protocol on Substances that Deplete the Ozone Later, with respect to E-Waste, addresses ozone-depleting substances that may be present in EEE such as refrigerators, freezers and other cooling equipment. The Montreal Protocol deals with management and disposal and reducing the production of such substances. Suriname also acceded to the Vienna Convention for the Protection of the Ozone Layer.	Ministry of Spatial Planning and Environment
Trade Facilitation Agreement of the World Trade Organisation	The World Trade Organisation addresses the rules of trade between organisations[39]. Under the WTO General Agreement of Tariffs and Trade (GATT), mention is made on an import ban of E-Waste, as a measure to protect human health and the environment. While Suriname has not yet ratified the Trade Facilitation Agreement, Suriname has banned the import of wasted into its jurisdiction.	
International Convention for the Prevention of Pollution from Ships (MARPOL)	The International Convention for the Prevention of Pollution from Ships deals with the prevention of pollution of the marine environment by ships from operational or accidental causes[40]. E-Waste was added as a category to the *2012 Guidelines for the Implementation of MARPOL* Annex V, where the Committee subsequently adopted revisions of this annex, which added E-Waste as a new category of garbage in the Garbage Record Book (GRB).	

[39] https://www.wto.org/english/thewto_e/whatis_e/whatis_e.htm
[40] https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx#:~:text=The%20International%20Convention%20for%20the,2%20November%201973%20at%20IMO

Convention	Importance	Focal Point
Cartagena Convention	The Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, obligates its Member Parties to take all appropriate measures to prevent, reduce, and control pollution caused by discharges from ships, dumping (from ships, aircraft or manmade structures at sea), land-based sources, sea-based activities, and airborne pollution[41].	

[41] https://iwlearn.net/documents/legal-frameworks/cartagena-convention

4.1.2 Domestic Legislation

Legislation in Suriname were assessed, in terms of its role in the management of E-Waste. The following documents were analysed.

Table 21: Table of Documents Related to E-Waste Management in Suriname

Legislation	Assessment Documents
National Environmental Framework Act 2020	*Suriname Waste Electrical and Electronic Equipment (WEEE) Assessment 2016*
State Order "Task Descriptions Ministries", (S.B. 1991 no. 58 last amended by S.B. 2017 no. 22)	
State Order Negative List S.B. 2003 no 74/ S.B. 2006 no 100	
Suriname Bureau of Standards Act (S.B. 2006 no. 30).	

Table 22 provides an outline of the relevant legislation and their significance to E-Waste management.

Table 22: Significance of the Legal Framework Relative to E-Waste in Suriname

Document	Significance to E-Waste in Suriname
National Environmental Framework Act 2020	This Act provides Suriname with a mechanism for creating a legal basis for how to deal with the environment. The new Environmental Framework Law also creates the legal basis for Strategic Environmental and Social Assessments as well as Social and Environmental Impact Assessments. There were 21 implementation regulations that can be formulated under the Act, but not all are needed to facilitate its implementation. Of the 21, six (6) were decided as most important[42] by NIMOS, to be implemented first, which include:

[42] https://nimos.org/en/portfolio/implementation-regulations/

Document	Significance to E-Waste in Suriname
	1. EIA Activities 2. EIA Procedure 3. Environmental Permit 4. Hazardous Substances 5. Environmental Fund 6. Rules and Procedures for the Environmental Controllers.
Act on the movement of goods S.B. 2003 no 58- Act on the Movement of Goods and State Order Negative List	The Act on the Movement of Goods deals with international trade and generally, the movement of goods to and from foreign countries is unrestricted, except for the goods listed in the State Order Negative list. There is no specific reference to E-Waste under this legislation, however, the importation of waste in general is prohibited.[43]
State Order Negative List S.B. 2003 no 74/ S.B. 2006 no 100	This list falls under the Act on the movement of goods, which regulates goods of which the import and export is under restriction and divided into the three categories (prohibited, license, special treatment). Certain types of metal waste were placed on this list, as requiring a license to export, and consultations indicated that there are no restrictions of the export of E-Waste from Suriname.
Suriname Bureau of Standards Act (S.B. 2006 no. 30).	The Suriname Bureau of Standards (SSB) was established by this Act, to develop, adopt, maintain and promote the application of standards and technical specifications. Mandatory standards may be established, however, the adoption of said standards is currently voluntary.
Assessment of Waste Electrical and Electronic Equipment for the Republic of Suriname Final Project Report (2016)	Similar to this current report, an assessment of E-Waste in Suriname was previously conducted, which outlined E-Waste generation and management in Suriname. The lack of infrastructure and

[43] St. Hill (2020) Legal and Institutional Report - IMPLEMENTING SUSTAINABLE LOW AND NON-CHEMICAL DEVELOPMENT IN SMALL ISLAND DEVELOPING STATES (ISLANDS) PROJECT PREPARATION GRANT PHASE - Extended Producer Responsibility (EPR) ASSESSMENT – Final Report – May 2020

Document	Significance to E-Waste in Suriname
	legal framework to address the issue of E-Waste was highlighted.

4.1.3 Institutional Framework

There are various authorities and organisations in Suriname which deal with the supervision and administration of considerations relating to E-Waste, as presented in Table 23.

Table 23: Institutional Capacity Framework

Stakeholder	Type of institution	Rationale for inclusion
Directorate of Environment	State agency within the Ministry	Agency tasked with environmental protection
Ministry of Spatial Planning and Environment	Government	Ministry with responsibility for environmental matters
National Institute for Environment and Development (NIMOS)	Department within the Ministry	Technical working arm of the Ministry

4.1.3.1 Directorate of the Environment

The Directorate of the Environment (DoE) is the state agency tasked with environmental protection in Suriname. This Directorate falls under the Ministry of Spatial Planning and the Environment. The DoE is also the competent authority for a number of environmental matters, and acts as the Competent Authority and Focal Point for Suriname for the Basel Convention.

It was indicated during consultations that legislation is in the process of being prepared, and there is some information in draft in relation to hazardous waste, as well as E-Waste. The legislation being prepared is based on the Basel Convention itself. As previously mentioned, Suriname cannot import waste, as this is part of the negative import list. However, by use of the Basel Convention's Prior Informed Consent Procedure (PIC), export of waste is possible.

4.1.3.2 Ministry of Spatial Planning and the Environment

The Ministry of Spatial Planning and the Environment is the parent Ministry of the Department of the Environment. In addition to also being the parent Ministry of NIMOS, the Ministry also has a Chemicals and Waste Unit, which coordinates projects related to chemicals and waste.

4.1.3.3 NIMOS

NIMOS has been described as the technical working arm of the Ministry of Spatial Planning and the Environment. NIMOS is an autonomous government foundation, with the aim of developing national legal and institutional framework for policy and management, for sustainable development[44]. It was revealed during consultations, with NIMOS that there are persons who export scrap metal and other different types of waste from Suriname, of which permission can be sought by way of a submission to NIMOS; however, approval must come from the Ministry as it is the focal point and competent authority under the Basel Convention.

At the time of writing, NIMOS has indicated that there were no applications specifically for the export of E-Waste in Suriname.

The Environmental Monitoring and Enforcement (EME) Office, within NIMOS, is established to monitor other government agencies, projects and industries with regard to their impacts on the environment. In addition, the EME office should monitor the implementation of mitigation measures agreed in the Environmental Impact Assessments (EIAs) and provide guidance to civil enforcement activities related to air, soil and water pollution, hazardous substances and waste.

The main duties of the EME Office include:

- providing environmental advice to licensing authorities for economic activities;
- development of environmental guidelines and conditions for small and medium enterprises;
- collaboration with other government agencies to monitor and supervise compliance with environmental laws and regulations;
- dealing with environmental complaints brought to our attention by the public;
- establishing and monitoring environmental standards and norms;
- initiating environmental research.

4.2. Recognised Gaps and Barriers

Firstly, there is no specific legislation currently promulgated which deals with E-Waste Management in Suriname. Although the National Environmental Framework Law (2020) is present, this is a gap towards the effective administration of an E-waste management regime. It can be said that Electrical and electronic equipment (EEE) have become part

[44] https://nimos.org/en/about-us/

of our daily life. They are necessary (and even essential) in areas such as mobility, medicine, security, communications, among other fields. At the same time, this exponential development has caused negative environmental impact because of the increasing tonnage of Waste Electrical and Electronic Equipment (E-Waste) generated year after year in the world including computers, tablets, cell phones, televisions and household appliances of all types and sizes. [45]

Next, there is no policy related to E-Waste in Suriname. The information, legislation, and assessed policies do not have much focus on disposal and management of E-Waste, thus providing another gap in guiding the drafting and application of any such E-Waste and used electrical and electronic equipment (UEEE) related legislation. This gap also presents a significant barrier in terms of presenting a road map for related agencies to follow in terms of increasing compliance by relevant stakeholders and citizens of Suriname towards proper E-waste management without the initial targeted document that provides policy guidance towards dealing with such waste, particularly differentiations within the EEE life cycle.

Regarding the institutional framework, the barriers would be related to the need for guidance to implement any such laws or policies, particularly to the stakeholders. There may be a need for various incentives to get those involved in private waste disposal further involved in the process.

Some constraints commonly identified in SIDS (such as limited availability of suitable land for treatment and storage facilities, and landfills; dependency on viability of exporting recovered materials and hazardous wastes or low level of consumption rates to facilitate investments) could be addressed through implementing a regional approach where economies of scale would facilitate investments and space requirements would be reduced due to larger collection rates and more frequency of exports.[43]

Finally, failure to handle equipment properly can have negative impacts and often entails disposal when parts are replaced and discarded. The lack of clarity in defining when used equipment is waste and when it is not has led to several situations where such equipment is mishandled, or exported to, in particular, developing countries ostensibly for reuse but where a large percentage of the exported equipment is in fact

[45] Acosta and Corallo - IMPLEMENTING SUSTAINABLE LOW AND NON-CHEMICAL DEVELOPMENT IN SMALL ISLAND DEVELOPING STATES (ISLANDS) PROJECT PREPARATION GRANT PHASE - Extended Producer Responsibility (EPR) ASSESSMENT – Final Report – May 2020 p6

not suitable for further use or is not marketable and must be disposed of as waste in recipient countries.[46]

As previously stated, consultations also indicated that there were no policies regarding E-Waste in Suriname. This is a large gap, as the policy is intended to provide the overarching framework for the implementation of the E-Waste regime.

Further, consultations have also indicated that since the 2016 Assessment, there has not been much progress in terms of implementation of the recommendations of the assessment; however, there were some positives in terms of the passage of the Environmental Framework Act, the draft regulations on hazardous waste, intention to create a future plant and improve legislation, and draft decrees on hazardous substances and the environment.

It is in this light, that several recommendations will be made, in order for Suriname to adequately progress its work with regard to providing an adequate framework for the management of E-Waste, particularly through the use of direct policy, updated legislation and various incentives.

In having provided an assessment into the legal and institutional capacity of Suriname in relation to E-waste management, the findings of this Report will provide the foundation of a Recommendations Report, which will present a further analysis into the potential barriers and opportunities for the life cycle management of EEE in Suriname. This Recommendations Report will also contain Legal Strategies towards the Environmentally Sound Management of EEE in the project countries.

[46] Acosta and Corallo - IMPLEMENTING SUSTAINABLE LOW AND NON-CHEMICAL DEVELOPMENT IN SMALL ISLAND DEVELOPING STATES (ISLANDS) PROJECT PREPARATION GRANT PHASE – Trade Flow Assessment – Final Report – April 2020 p 5

5. ECONOMIC EVALUATION AND CONSIDERATIONS FOR E-WASTE MANAGEMENT IN SURINAME

Below represents a summary of the economic evaluation and consideration for E-Waste management in Suriname.

An economic model was developed for its application in the project countries, with the aim to be helpful for policy makers to understand the economic framework conditions for E-waste treatment in their country and the sub-region including the three (3) project countries. In addition, the model brings advantages to decision makers as it gives detailed background data which is useful when designing an E-Waste policy framework. It can further provide support to entrepreneurs planning to set-up an E-Waste dismantling facility with a good overview of the expected costs and revenues. For established facilities, this tool is helpful to identify options for improvement in the current process to optimize their dismantling operations.

The economic model focuses only on the treatment portion of an E-Waste management system. This means that the following stages of E-Waste management are not being considered: disposal, collection, transport, export, and disposal. While these stages are not considered, recommendations related to the whole life cycle management of E-waste are provided.

When it comes to treatment, different levels of technology can be applied, and consequently, a higher or lesser recovery rate of valuable materials and export value can be obtained. This model proposes setting up facility for the manual dismantling of E-Waste. Again, different levels of dismantling can be achieved. For the project, a more superficial dismantling is suggested, where only hazardous components and high valuable components, like printed circuit boards, are removed and the remaining parts are destined to be landfilled or mechanical separation/recycling.

Considering the type of treatment to be given and the required one for each E-Waste fraction, the model includes only the manual treatment of the following categories:

- Large Household Appliances (LHA)
- Small Household Appliances (SHA)
- Screens: Flat Screen monitors (FSm) and Flat Screen TVs (FStv). *Originally, CRTs were planned to be included, but when running the model, it was decided that the amount that could be collected did not justify the investment in specific equipment needed for its treatment.*

The model is Excel-based for the calculation on an annual basis of a manual dismantling facility in the project countries and at the sub-regional level. The core source of the tool is the Business-Plan-Calculation-Tool for Manual Dismantling Facilities developed by The Solving the E-waste problem (Step) Initiative that has an open-source version.

For this assessment, the composition of the output fractions after dismantling the four (4) selected E-Waste streams (LHA, SHA, FSm, and FStv) has been analysed for three (3) different collection rate scenarios (30%, 50%, 80%). The average times for dismantling these appliance groups was provided by BOKU.

For each output fraction, the destination for further treatment (i.e., recycling or disposal) must be chosen. The model considers the cost estimation of output fractions at dismantling facility.

To use the model some essential data must be provided. This data includes the following:

- Gross Monthly Minimum Wage in the country – based on the Global Wage Report 2020-21 (ILO, 2020)
- Average rental cost – obtained though web research
- Purchase prices for investment of equipment and infrastructure – obtained through web research
- Achievable revenues or disposal costs for each output fraction - provided by BOKU
- Generation for E-Waste fractions for a certain year – provided by NPA and based in Comtrade[47]
- Average times for dismantling each E-Waste fraction - provided by BOKU

Depending on the inputs and the chosen scenario concerning collection, the model automatically calculates the following on an annual basis:

- Quantities of produced output fractions
- Required staff, investments, and equipment
- Required space for administration, dismantling, storage, etc.
- Expected revenues and operational costs
- Treatment cost or revenue per ton of input E-Waste

[47] https://comtrade.un.org/

The following costs are not included due to lack of information available at the time of running it:

- Utilities and Internet
- Annualized costs for setting up and maintaining the facility: fire extinguisher system, painting, electric wiring, etc.
- External services: Health and Safety (H&S), accounting, training, communication, etc.
- Administration and financing costs: fees & taxes, insurances, banks, interests, etc.
- Office and cleaning/sanitary supplies.

The model is designed in such a way that they can be included when and if the information is collected.

The model consists of an Excel file containing 7 sheets:

1. SUR model: The model per se
2. SUR material comp and revenue: Material composition per E-Waste stream, revenue expected per output material, estimation of dismantling workers needed according to dismantling times provided by BOKU per E-Waste stream
3. Material revenues: average revenues per output materials, provided by BOKU
4. EWG SUR: Calculates 2020 EWG for the selected E-Waste streams
5. Comtrade SUR: raw data on imports and export of selected EEE streams
6. SUR equip and fac rental: estimated costs for equipment and facility rental, gathered through web research. When possible, information was obtained from local suppliers. Otherwise, information was gathered from suppliers abroad.
7. Assumptions: set of assumptions used, namely:
    a. minimum wage,
    b. working hours and days of the facility,
    c. tons loaded in average in a 20´container and freight costs (used only for the sub-regional approach)

Data is marked according to the following criteria of colours:

- To be filled by used
- Used for calculation basis (should be modified by user in case needed)
- Calculation for the Scenario A, depending on other cells.
- Calculation for the Scenario B, depending on other cells.
- Calculation for the Scenario C, depending on other cells.

The model sheet calculates, for each collection scenario (A: 30%, B: 50%, and C: 80%) the following:

- total input quantities and per E-Waste stream
- total staff required and staff required at each of the following categories:
    - Skilled dismantling workers
    - Unskilled dismantling workers
    - Forklift drivers
    - Scale operator
    - workers for sorting
    - Department manager
    - General Manager
    - Administrative staff
- Staff costs per year, per staff category and totalized
- Total tons recovered and tons recovered per year of the following material categories:
    - Hazardous components
    - Iron and steel
    - Aluminium
    - Copper
    - Cables
    - Plastics
    - Printed Circuit Boards
    - Compounds / mixed materials
    - Other materials
- Revenues per material category and totalized. It is worth mentioning that for some categories, namely hazardous wastes, compounds/mixed materials and other materials, there is a cost associated to their treatment rather than revenue.
- Total space required and space requirements according to the following sectors:
    - Recreation and sanitary room
    - Administrative department
    - Dismantling working station
    - WEEE receiving area
    - Storage
- Total rental costs
- Total containers required and containers required according to the following categories:
    - Container for LHA
    - Container for SHA
    - Container for screens

    - Container for scrap
- Equipment requirements of the following types:
    - Forklift
    - Pallet jack
    - Scale (4500 kg)
    - Pallet
    - Collection box
    - Ventilator
    - HSA (shoes, helm, gloves, etc.)
    - Working tools
    - Administrative working place (computer, table, chair)
    - Dismantling working station (table, chair)
    - Containers
- Cleaning, Maintenance and Repair (CMR) costs
- Other costs not included in the present model due to lack of information:
    - Utilities and internet
    - Annualized costs for setting up and maintaining the facility: fire extinguisher system, painting, electric wiring, etc.
    - External services: H&S, accounting, training, communication, etc.
    - Administration/financing costs: fees & taxes, insurances, banks, interests, etc.
    - Office and cleaning/sanitary supplies

The following table shows the results obtained when running the model for Suriname:

Table 24: Results obtained when running the economic model for Suriname

		Escenario A	Escenario B	Escenario C
Percentage of e-waste collected	100%	30%	50%	80%
Total annualized fixed costs		**-$ 243,516**	**-$ 397,253**	**-$ 622,362**
Total Equipment costs		-$ 1,117,240	-$ 1,833,168	-$ 2,908,369
Total equipment costs annualized according to lifespan		-$ 64,246	-$ 104,582	-$ 164,317
Total rental costs per year		-$ 179,270	-$ 292,671	-$ 458,045
Total other fixed costs		$ -	$ -	$ -
Total Variable costs and revenues		**$ 331,870**	**$ 581,362**	**$ 975,335**
Total CMR costs per year		-$ 63,062	-$ 101,258	-$ 159,818
Total staff costs per year		-$ 117,600	-$ 171,600	-$ 231,600
Total materials revenues and costs per year		$ 512,532	$ 854,221	$ 1,366,753
Total Other variable costs		$ -	$ -	$ -
Total input quantities (tons/year)		1604	2674	4278
Annualized economic result (revenues - costs)		$ 88,354	$ 184,109	$ 352,972
Total treatment cost/ton		$ 55	$ 69	$ 83

From studying the model, a set of conclusions can be achieved:

1. Regardless the collection scenario, the economic result of the treatment facility is positive. As the collection rates increase, the economic result increases due to economies of scale being achieved.
2. The costs that are having the biggest impact are: rental and staff costs. If the rental cost was avoided, for example, through subsidizing it, the economic result for the three scenarios would be as presented in Table 25:

Table 25: Results obtained when running the economic model for Suriname considering no rental cost is needed

		Escenario A	Escenario B	Escenario C
Percentage of e-waste collected	100%	30%	50%	80%
Total input quantities (tons/year)		1604	2674	4278
Annualized economic result (revenues - costs)		$ 267,624	$ 476,781	$ 811,018
Total treatment cost/ton		$ 167	$ 178	$ 190

3. When considering new sources of income, an option would be to charge a fee for E-Waste treatment. This fee could be paid by generators, though household and small commercial generators would be reluctant to do so, causing possible deviations of E-Waste through informal channels or Municipal Solid Waste (MSW) disposal. Another preferred option would be for EEE importers and producers -if an EPR mechanism is in place- to subsidize the operation by paying a fee per ton treated to the dismantling facility operator This fee should be equivalent to at least the total treatment cost/ton in each scenario to reach economic equilibrium.
4. In terms of equipment, the containers needed for storage and transport of output fractions have, by far, the biggest economic impact (about 93% of total equipment costs). Due to the low E-Waste quantity, one of the primary goals was to make the facility as flexible as possible, capable of accumulating materials before the threshold value for export is reached. As such, the model considers an amount equivalent to 50% of total containers needed to store a full annual capacity. The remaining 50% of containers are assumed to be owned by scrap buyers. It is recommended to revise this strategy with scrap buyers and to evaluate which would be the export thresholds for each fraction, to obtain a more accurate calculation. If the need of containers is reduced, then the storage area required should be revised as well, and consequently, rental costs would be lowered. For example, if only 10% of containers are needed and consequently 40% of storage area required is reduced, the following would be the results achieved:

Table 26: Results obtained when running the economic model for Suriname considering a reduction in containers and storage area needed

		Escenario A	Escenario B	Escenario C
Percentage of e-waste collected	100%	30%	50%	80%
Total input quantities (tons/year)		1604	2674	4278
Annualized economic result (revenues - costs)		$ 204,459	$ 375,664	$ 658,233
Total treatment cost/ton		$ 127	$ 140	$ 154

5. Finally, it is worth mentioning that the model considers the sound treatment of the hazardous wastes obtained. In addition, it is considered a fee equivalent to USD 35/ton for the disposal of materials destined to landfill.

In addition, Tables 27 to 30 show the costs and revenues of treating each of the fractions solely:

Table 27: Results obtained when running the economic model for Suriname considering only the SHA fraction

		Escenario A	Escenario B	Escenario C
Percentage of e-waste collected	100%	30%	50%	80%
Total input quantities (tons/year)		350	584	935
Annualized economic result (revenues - costs)		-$ 37,111	-$ 17,366	$ 25,443
Total treatment cost/ton		-$ 106	-$ 30	$ 27

Table 28: Results obtained when running the economic model for Suriname considering only the LHA fraction

		Escenario A	Escenario B	Escenario C
Percentage of e-waste collected	100%	30%	50%	80%
Total input quantities (tons/year)		1093	1821	2914
Annualized economic result (revenues - costs)		$ 45,468	$ 126,891	$ 238,894
Total treatment cost/ton		$ 42	$ 70	$ 82

Table 29: Results obtained when running the economic model for Suriname considering only the FSm fraction

		Escenario A	Escenario B	Escenario C
Percentage of e-waste collected	100%	30%	50%	80%
Total input quantities (tons/year)		41	68	108
Annualized economic result (revenues - costs)		-$ 60,541	-$ 57,882	-$ 50,883
Total treatment cost/ton		**-$ 1,494**	**-$ 857**	**-$ 471**

Table 30: Results obtained when running the economic model for Suriname considering only the FStv fraction

		Escenario A	Escenario B	Escenario C
Percentage of e-waste collected	100%	30%	50%	80%
Total input quantities (tons/year)		121	201	322
Annualized economic result (revenues - costs)		-$ 51,935	-$ 45,662	-$ 28,210
Total treatment cost/ton		**-$ 431**	**-$ 227**	**-$ 88**

It can be concluded that the E-Waste category with highest positive outcomes is LHA, and in second place, SHA. Finally, the best economic result can be achieved when different E-Waste streams are treated, achieving economies of scale that would justify the investments required.

5.1. Current economic feasibility (incentives/disincentives)

Incentives

As presented previously in section 3.3.2 of the report, E-Waste generation in Suriname is estimated at 6,844 tons in average per year (2017-2022). E-Waste contains valuable and scarce materials and recovery of these materials as secondary resources can alleviate mining of virgin materials and is oftentimes much more economically efficient compared to mining. Therefore, business opportunities, and “green jobs” can be created and enabled (Cyrcle Consulting, 2015). According to UNEP (2007), using averages, it was estimated that E-Waste produced annually is worth over $62.5 billion (WEF and PACE 2019). If a proper formal system is put in place for the collection and treatment of E-Waste, the potential amount of revenue from material recovery would be an incentive to set up the necessary businesses and infrastructure to ensure sound management. In their study of the circular economy potential of E-Waste in five (5) Caribbean Islands, Mohammadi et al. (2021) projected that between the years 2020 and 2025, more than 317 kilo tons (kt) of valuable resources can be recovered from E-Waste. This represents an estimated economic value of US $546 million in just these five (5) islands, which

possess only 11% of the Caribbean population. Should this potential be realised from the entire Caribbean E-Waste industry, it is estimated that a total of US $6 billion in revenue can be generated. According to the economic model, if 100% of E-Waste generated was treated in the dismantling facility (equivalent to 5,348 ton in 2020), the value of the output materials, considering the disposal costs of the non-recyclable-fractions, would be approximately USD 1,700,000.

It is highlighted that in the current situation, without high collection rates or government subsidies, waste related businesses are already up and running and are supposed to be lucrative (see sections 3.1.4 and 3.7). These private initiatives identified that currently conduct activities related to E-Waste management are a source of information and experience that can be helpful in the design of a wider E-Waste management system.

Current practices (private initiatives and informal activities, e.g. waste pickers) used to extract precious and strategic metals result in the release of, among other contaminants, Unintentional Persistent Organic Pollutants (UPOPs), regulated by the Stockholm Convention on Persistent Organic Pollutants, such as Polychlorinated dibenzo-p-dioxins (PCDD) and dibenzofurans (PCDF); Polybrominated diphenyl ethers (PBDEs) contained as flame retardants in plastics of TV and computer casings; and, Polychlorinated Biphenyl (PCBs). It is estimated that brominated flame retardant-containing plastics make up approximately 20% of the total plastics contained in the E-Waste stream. As electronic goods also contain a wide variety of other hazardous substances (arsenic, cadmium, mercury, bromides, lead, phosphorus pentachloride; among others) these are also often released during unsafe dismantling, recovery, and recycling practices. As such, a major incentive for the implementation of the ESM of E-Waste would be these releases being reduced or mitigated.

It is mentioned in the report that fines related to environmental violations are collected by the environmental police and deposited at the Directorate of Public Green and Waste Management. These funds are then deposited at the Central Bank of Suriname. The Ministry of Public Works informed that in 2021, a total number of 62 violations were registered for a total of SRD 17,850. Since an environmental offense is considered to be any crime or violation of a legal provision issued within the framework of the environment, in the case that an E-Waste legislation is put forward, this mechanism would be an interesting precedent, considering funds collected could be used for subsidizing the E-Waste management scheme in place.

Another incentive would be to implement a regional approach for E-Waste management and thus generate economies of scale that would facilitate investments and reduce space requirements due to larger collection rates and greater frequency of exports.

Disincentives

One of the major disincentives is that there is almost no in-country capacity to manage/treat, recycle and dispose of this waste stream properly. Almost all E-Waste generated ends up in dumpsites or in landfills, which are not properly equipped to receive this waste stream.

In addition, as mentioned in section 3.6.5 informal workers, or waste pickers can be found at the landfills in Suriname that pick through or scavenge the landfill under inadequate conditions in terms of environmental and health safety for dumped EEE that may contain valuable components, mostly metals, and selling them to recycling companies or scrap dealers. Waste pickers represent the weakest link of the chain from an economic point of view, they might be paid four (4) times less than the international market value and their working conditions are poor in many respects with waste pickers generally working and living in highly polluted environments, without any form of protection, and having no access to social benefits (Bisschop, L. & Coletto, 2017). Integrating them in the formal system presents several challenges that must be faced with a multidisciplinary approach, considering social, economic, labour, health and education aspects, and that usually there is reluctance from the “formalized” private sector to integrate them. The expert working group on environmentally sound management of the Basel Convention collected several case studies to provide practical examples of measures used to enhance environmentally sound management in the informal sector.

Currently, users in Suriname are authorized to dispose of E-Waste according to their own will, consequently, typically it is disposed and collected commingled with MSW. There is no official differentiated collection of E-Waste except some private E-Waste operators that conduct their collection of E-Waste. This is a major disincentive since a minimum and consistent inflow of material is required to ensure the economic feasibility of a dismantling facility. Otherwise, it is difficult to justify investments in equipment and infrastructure as the volumes needed for export are difficult to achieve, causing a direct impact on cash flow.

Other constraints identified, characteristic to SIDS, are limited availability of suitable land for treatment and storage facilities and landfills; dependency on the viability of exporting recovered materials and hazardous wastes; and low level of consumption rates to facilitate investments.

In terms of promoting investment and creating a confident environment for businesses to conduct their activities properly, the lack of specific legislation and enforcement

related to E-Waste management and the absence of legal definitions of EEE, used EEE and E-Waste are considered disincentives. A clear legal framework is a basic requirement to promote an economically feasible ESM of E-Waste. On one hand, it must be clear whether an object is used EEE or E-Waste (distinguishing if it is hazardous or not), and what are the owner´s responsibilities regarding its management. On the other, the legal framework should give clarity in terms of how to conduct the transport, storage, treatment, and disposal operations, aspects required to conduct and economic evaluation. The lack of clear procedures hinders traceability of E-Waste, making it difficult to promote penalties in cases of non-compliance, and obstructs the internalization of treatment costs by EEE producers or waste owners.

In many cases the costs of proper collection and recycling E-Waste might exceed the revenues generated from the recovered materials and as such, a proper financing mechanism, tailored to the societal context of the country needs to be defined first and enforced afterwards (Cyrcle Consulting, 2015).

Also, a challenge raised by Piranha International, a company based in Trinidad and Tobago, is that some shippers do not want to handle hazardous wastes, so the only viable solution would be to classify waste “in-correctly” (Acosta and Corallo, 2020); an aspect that can be assumed also affects waste handlers in Suriname and needs governmental involvement and support to be solved.

In addition, no economic or fiscal incentives or disincentives have been identified to be in place, such as EPR schemes, or by taxing the importation of EEE for funding WEEE management. Also, fiscal programmes to incentivize sustainable investments have not been identified. Some economic incentives identified in the region by Acosta and Corallo (2020) that could be taken into consideration for the design of the system are exemption of duties fees, subsidies (e.g., for fuel or electricity), land use, or cession permit, arrangements of exclusivity, and collection campaigns.

5.2. Existing operator models for E-Waste management

As presented in sections 3.1.4 and 3.7, in Suriname there are E-Waste brokers, such as Bux Engineering, which act as intermediaries to facilitate the consolidation and transfer of E-Waste to international markets. However, the amounts collected for treatment are still at modest levels. Most of these companies do not offer a comprehensive service, since they are concentrated on valuable components such as printed circuit boards, neglecting the proper disposal of other components such as cathode ray tubes (CRTs) that are not economically valuable, and represent a risk for health and the environment. Also, companies that handle E-Waste are currently facing challenges in finding more

adequate methods for the processing and recovery of materials in a world where new types of equipment and technology are continuously emerging (Acosta and Corallo, 2020).

Regrettably, during the preparation of this report it was not possible to gather information on the quantities, methods and destinations of E-Waste and materials handled though these initiatives.

Given that further information on the existing operator models was not provided, it is not possible to conduct a detailed economic assessment of the current situation.

5.3. Gaps, barriers, and opportunities to E-Waste Management operations

E-Waste contains valuable materials that can be recovered for recycling, including iron, aluminium, copper, gold, silver, platinum, palladium, indium, gallium, and rare earth metals, and thereby contributes to sustainable resource management since the extraction of these metals from the Earth has significant environmental impacts. Also, in many cases E-Waste can be repaired or refurbished, extending its lifespan, contributing even more to sustainable development. By extending the life of equipment, reuse reduces the environmental footprint of the resource-intensive processes involved in producing the equipment. Reuse may also facilitate the availability of equipment to groups in society that otherwise would not have access to it since the cost of used equipment is lower than that of new equipment.

A main gap in the current operations is the lack of a mandatory framework and formal management system for E-Waste. When compliance costs are high and there are no penalties for non-compliance, usually, proper handling and treatment will be avoided.

The lack of separate disposal and collection systems suggests that all E-Waste ends up in non-fit-for-purpose landfills or dumpsites. On the other hand, there is almost no in-country capacity to manage/treat and dispose of this waste stream properly. Of particular concern are the current practices that are being used to extract precious and strategic metals, resulting in the release of UPOPs, regulated by the Stockholm Convention on Persistent Organic Pollutants, such as Polychlorinated dibenzo-p-dioxins (PCDD) and dibenzofurans (PCDF); Polybrominated diphenyl ethers (PBDEs) contained as flame retardants in plastics of TV and computer casings; and Polychlorinated Biphenyl (PCBs). Once these contaminants are released, it is quite impossible to address them adequately. Severe consequences to the environment and human health can be expected, consequently, the social and economic impact generated by the improper management of E-Waste can be expected to be relatively

high. To address these issues, a precautionary approach should be implemented that aims to collect as much E-Waste as possible.

Also, as identified in the surveys conducted, most respondents (37%) indicated that they store E-Waste. Given the popularity of in-house storage, it would be profitable and logical to create a more formalized collection system to address these stored quantities on a larger scale.

Implementing ESM of E-Waste would not only attenuate the negative impacts, but it would also promote the establishment of businesses that would generate work and revenue, extend the lifespan of final disposal sites, contribute to the reduction of greenhouse gas emissions when adequate technologies and methods are applied, and promote the compliance with multilateral environmental agreements (MEAs) and other relevant instruments to which the country is Party. Given the lack of capacity to manage/treat and dispose of E-Waste locally, there is a need to export it, in compliance with the Basel Convention for the Transboundary Movements of Hazardous Wastes and their Disposal.

According to Acosta and Corallo (2020) the following initiatives would be necessary to promote the sound management of E-Waste: mechanisms for cooperation and coordination among the key stakeholders, a generalized separate collection system, citizens' behaviour favouring recycling initiatives, policies or incentives for the reuse or recycling, and adequate treatment facilities for all waste streams. On the other hand, given the economic value of the recoverable materials in E-Waste, some private initiatives that deal with small amounts could be used as a basis for implementation, by improving their capacity and processes, and feeding them with more material to treat. A relevant aspect to take into consideration is that there is an informal sector involved in the collection of these materials as a means of subsistence, which must be addressed when designing any system.

One of several challenges for implementing ESM of E-Waste is covering the sufficient financing needs. Investments in infrastructure and costs relating to the operation and maintenance of facilities require a sustainable flow of financing. There is no doubt that it is desirable for society to recover valuable materials and ensure adequate treatment and disposal of hazardous wastes. These types of projects often do not have positive net outcomes in terms of revenues, considering all investments and operative costs required for implementing sound management. Unfortunately, what represents a positive externality or an avoided cost for the community is not considered in a flow of private funds. Taking also into account the current low separation collection rates, the high idle capacity of investments, the low productivity of employees – as few tons

processed per year per capita – it is necessary to consider incentives to raise interest by private actors. Based on findings from the Suriname Waste Electrical and Electronic Equipment Assessment (2016), the private sector states that the market is not sufficient to attract entrepreneurs to relieve the pressures from the government with the main economically limiting issues being labour and freight prices, complexities of materials, low market price and challenges with the informal sector. Therefore, usually, these operations need some type of compensation or subsidies from the State.

Transparency on the real recycling costs should be pursued also to increase the awareness of the consumers and the society at large on the financial requirements of a proper E-Waste management (Cyrcle Consulting, 2015).

Implementing a regional approach for E-Waste treatment and facilitating economies of scale could be a recommended approach for the Caribbean Region, due to the limited availability of suitable land on small islands for treatment and storage facilities, and landfills; the high dependency on exporting recovered materials and hazardous wastes for making the recycling business economically viable; and the small consumption rates in less populated countries that would facilitate investments. No previous experiences of a regional approach in waste management policies were identified. According to Acosta and Corallo (2020), a distinctive feature is that many of the same EEE importers operate within the Caribbean Region. This would facilitate a regional approach, such as the establishment of a recycling facility that acts as a regional hub, receiving E-Waste from the different countries, improving operational costs, and benefiting from becoming an economy of scale.

6. RECOMMENDATIONS AND NATIONAL STRATEGY FOR THE ENVIRONMENTALLY SOUND MANAGEMENT OF E-WASTE (THROUGHOUT ITS LIFECYCLE) IN SURINAME

From the preparation of this Assessment report, it is clear that Suriname has potential for the sound management of E-Waste. Over time, with the correct guidance Suriname can become a very sustainable country.

Key issues and challenges encountered:

- Time constraints – for a project of this magnitude at least six (6) months should be the minimum to plan, coordinate and carry out the objectives.
- Commencement period – It is generally not advised to begin projects which require intensive data gathering methodology at the end of the year (November-December). Typically, many stakeholders, companies and government institutions have lower capacity due to the holiday season, which results in difficulty in acquiring the necessary data which directly feed into the assessment.
- Stakeholder responses – low to medium responses and willingness from stakeholders and companies, therefore more time is needed to individually set up meetings. The COVID-19 pandemic also affected the response rate, since meetings were mostly planned virtually, however, it is believed that the data required for this report, would have been better acquired through personal meetings.
- E-Waste is a very niche sector in Suriname. Waste management, in general, is done at a very slow pace. This could be due to the lack of correct policies in place and the willingness of the general public as there are not any major incentives.
- Data – the data obtained from the UN Comtrade database and the General Bureau for Statistics (ABS) showed vast variations for all datasets. The data obtained from the UN Comtrade database was significantly higher than that of the ABS. This discrepancy could be due to error in reporting but resulted in difficulty in gauging the accurate figure for the calculations needed for this report.

6.1. Technical and Institutional Capacity

Additional human, technical and financial resources need to be made available for Suriname to effectively manage the EEE lifecycle and by extension the E-Waste and UEEE considerations which come with it.

This will also likely call for training, as well as stakeholder sensitisation towards the necessity in dealing with such; in that stead, this can be developed in an improved environmental or technologically/communications policy, thus illustrating the link between electronics and environmental protection.

Secondly, there will also likely be a need for incentives, to illustrate to private waste disposal entities, the mechanisms in which this waste can be managed and disposed of, as well as to also assist in any relevant training.

Based on the suggested recommendation from the Practical Guide for the systemic design of WEEE management policies in developing countries[48], the stages of a systemic design approach for designing E-Waste management policies are:

1. Preparation phase
2. Design of the problem situation
3. Identification of structural causes
4. Participatory strategy design
5. Design of action plan & monitoring plan
6. Final approval of the policy
7. Implementation, monitoring, and adjustments

Based on the findings of the Suriname Waste Electrical and Electronic Equipment Assessment (2016), the BCRC-Caribbean developed a series of recommendations which, if addressed, can significantly aid in the achievement of the ESM of E-Waste in Suriname. Some of these recommendations, presented in order of priority, include the following:

1. The establishment of a national E-Waste management coordinating body comprising of membership from the various stakeholder groups with roles throughout the life cycle management of EEE.
2. Roll-out of a well-developed awareness and public education campaign. The campaign can initially target key stakeholders involved in the life cycle management of EEE and E-Waste followed by a broader public awareness campaign.
3. The development of appropriate regulations and standards either stand alone or under any enacted national environmental or waste management legislation.

[48] https://sustainable-recycling.org/wp-content/uploads/2017/10/Mendez_2017_Guide-WEEE-Policy_EN.pdf

4. The establishment of formal collection systems to support the timely and sound collection of E-Waste from commercial entities and households. This can include the development of formalised take-back programmes among retail and distribution stakeholders.
5. Development of a national data capture and management system for imported EEE products and flows in the country, with a view towards supporting monitoring and enforcement and decision-making.
6. Capacity development of the informal collectors, salvagers, and scrap dealers to improve existing practices and ensure the ESM of valuable, non-valuable and hazardous components of E-Waste.
7. The establishment a dismantling facility in the country to formally bridge the gap between the generators and downstream dealers and users of metals.
8. The consideration of further development recovery operations to support the recovery of precious metals from E-Waste supported by existing skills and experience in the population due to participation in the local gold mining industry.

Regarding the strategy for disposal and collection of E-Waste, it is recommended to ensure a consistent inflow of materials to the treatment facility. Identifying different strategies for the different sources of input (households, businesses, public administration offices, etc.) is advisable.

For deciding on the E-Waste streams to be collected for treatment at the dismantling facility, it is recommended to select a combination that can ensure a net positive economic outcome. Components with high valuable fractions should be combined with those containing removable hazardous components through manual dismantling practices. A phased approach can be decided on, starting with a simpler combination of appliances, and widening the scope as experience is gained and disposal and collection mechanisms are perfected.

For each of the produced output fractions of the dismantling facility, downstream partners must be found. Some of the fractions, like copper, steel and aluminium can usually be commercialised locally. For other fractions like printed circuit boards a global market with quite volatile characteristics exists where prices offered for the same fraction can vary up to 40% within one year.

Depending on the location of the facility transport costs for the output fractions to the different downstream partners (material recovery or disposal facilities) on national, regional and international level may significantly reduce the potential revenues.

A licensing or certification to national or international standards should be encouraged. The application of a simple and effective licensing or certification system is key to ensure all recyclers (and collectors) are known to the authorities and are appropriately authorized to carry out specific activities. Aspects related to treatment operations should be aligned with international best practices (such as the EN 50625-series of standards or the PACE Guidelines on computers and mobile phones under the Basel Convention) as much as possible. The licensing system should appropriately address the environmental and health risks associated with the activities undertaken. The treatment facility should be licensed or certified to receive, dismantle, sort, treat and store E-Waste and output material for final recycling.

Finally, it is recommended to ensure that all stakeholders involved in E-Waste collection and recycling are aware of the potential impacts on the environment and human health as well as possible solutions for environmentally sound treatment of E-waste. Further awareness of serious environmental threats will encourage proper E-Waste handling by generators and collectors, sound management and disposal of hazardous materials by recyclers, and it will stimulate the development cleaner technologies to manage these residues.

6.2. Policy and Legislation

There is a need to update legislation and policy to include international best practices in this area, (particularly the Practical Guide), taking into consideration the unique needs of Suriname in this area. During the final validation workshop with the NWG, a stakeholder from NIMOS noted that the National Environmental Framework Act states an implementing regulation on waste should be included. While the regulation is yet to be drafted, E-Waste will not be excluded from it and consultations to under understand how technical and international guidelines can be incorporated into the implementing regulation will be undertaken.

The use of incentives could also be legislated, with considerations towards tax breaks being a mechanism which can be actively considered without having to actively pay out capital to private waste disposal entities.

More on incentives will be developed in the next sub-section.

A clear legislation, with adequate definitions and the roles and obligations of stakeholders creates a safer environment for promoting private investments. A clear definition of who is responsible for financing the E-Waste collection and recycling must

be included in legislation. On one hand, it must be clear whether an object is UEEE or E-Waste (distinguishing if it is hazardous or not), and what are the owner´s responsibilities regarding its management. The legal framework should also provide clarity of how to conduct the transport, storage, treatment, and disposal operations of E-Waste, which are all aspects required to conduct an economic evaluation.

Introducing extended producer responsibility (EPR) to ensure producers[49] finance the collection and recycling of E-Waste is recommended. The widely accepted method is applicable in dealing with E-Waste and has proven effective in achieving high recycling rates when implemented. Economic instruments are the most widely used EPR instruments. An example of this is the requirement to finance waste management costs (including collection and recycling) through taxes or a centralized fee structure.

Enforcing legislation for all stakeholders and strengthening monitoring and compliance mechanisms across the country is required to ensure a level playing field. Enforcement will ensure that all stakeholders (e.g., collectors, recyclers, and producers) meet the requirements of the legislation, so no company can gain a financial benefit from not meeting these requirements. Without enforcement, stakeholders that do meet the legislative requirements may be at a financial and operational disadvantage compared to companies that do not comply with the requirements; non-compliant companies can offer their products and services for a lower price by ignoring environmental, health and safety standards. A clear list of criteria and sanctions can help send a strong signal to stakeholders that noncompliance will not be tolerated, and enforcement of legislation is a priority. A lack of enforcement creates the risk that more and more stakeholders will choose not to comply with the legislation’s requirements, and this can eventually lead to a total failure of the legislation. As such, enforcement is critical to the success of E-Waste legislation.

6.3. Economic Incentives/ Improvements

As discussed, implementing ESM of E-Waste would not only attenuate the negative impacts, but it would also promote the establishment of businesses that would generate work and revenue, extend the lifespan of final disposal sites, contribute to the reduction of greenhouse gas emissions when adequate technologies and methods are applied,

[49] In the case of Suriname, where there are no producers of EEE, the importers and distributors of EEE could finance the collection and recycling of E-Waste.

and promote the compliance with MEAs and other relevant instruments to which the Suriname is Party.

One of several challenges for implementing ESM of E-Waste is covering the sufficient financial needs. In many cases the costs of proper collection and recycling E-Waste might exceed the revenues generated from the recovered materials. There is no doubt that it is desirable for society to recover valuable materials and ensure adequate treatment and disposal of hazardous wastes. Unfortunately, what represents a positive externality or an avoided cost for the community is not considered in the flow of private funds. Therefore, a proper financing mechanism, tailored to the societal context of the country needs to be defined first and enforced afterwards. From a broader perspective, there are three main stakeholders who could bear financial responsibility for end-of-life management of any kind of waste (i) entire society, (ii) waste holders or (iii) producers.

To finance the ESM of E-Waste, one of the possible instruments that governments may wish to implement is EPR. In principle, the producers and importers of a product are held responsible for the collection and disposal of that product once it has become waste. Producers and importers are free to include these costs in the pricing of their products. A distinctive feature is that many of the same EEE importers operate within the Caribbean Region, thus facilitating a regional approach. Another alternative would be to charge E-Waste generators for its transport and operation, though it was identified that this would be the less-preferred option by stakeholders surveyed. In addition, different mechanisms could be set up to subsidize certain aspects of the operations: fees paid by the government per ton received or as a guarantee in case the minimum amount of E-Waste required is not collected, collection financed by the government, subsidies for goods and services (such as gas, electricity, fuel, others), exemption of duty fees, land use or cession permit, establish the principle of “non-taxable revenue” for access to waste contributions paid to individuals of entities delivering the waste to the formal collection points could create a positive incentive to channel material to the formal channel, etc.

The set up and management of a recycling solution that prioritizes resource extraction may be more expensive than landfilling or other alternatives. Various financing models have been implemented around the world to combat that financial disincentive, including a small price increase on products at the time of purchase, to a fee when the product is dropped off for recycling. When a consumer is unaware of the recycling system or the environmental benefits of recycling, they may be unwilling to pay the increase. Thus, it becomes crucial to create awareness on the environmental benefits of recycling among consumers.

Favourable investment conditions for qualified recyclers must be created to bring the required technical expertise to the country. It is essential to provide investors with stable market conditions, including fair competition among peers rather than unfair competition from informal players. These conditions can be both economic and regulatory. They may be created by providing tax relief for investors who possess technical expertise or entering public-private partnerships. Favourable investment conditions shall not benefit only the E-Waste recycling sector, but also the recycling industry as a whole.

It is recommended to ensure that costs to operate the system are transparent and stimulate competition in the collection and recycling system to drive cost effectiveness. Transparency on the actual recycling costs should be pursued to increase the consumers' and the general public's awareness of the financial requirements needed for proper E-Waste management. Fair competition between logistics providers and recyclers should be established to ensure the system's long-term cost effectiveness. In addition, irrespective of the financing model adopted (EPR-based or not), it is paramount that the funds secured for E-Waste management are used to cover the technical costs for E-Waste management only and not diverted for other purposes to ensure the system's cost effectiveness.

Informal collection systems currently in place should be used to collect E-Waste and ensure E-Waste is sent to licensed recyclers through incentives. Waste pickers represent the weakest link of the chain from an economic point of view. Integrating them into the formal system presents several challenges that must be faced with a multidisciplinary approach, however, is possible. To push existing flows of E-Waste to regulated recyclers, it may be necessary to increase awareness and offer incentives to consumers (business, government, and the general public) and collectors. The incentive could be offered by the producer, government or treater, and this needs to be defined. The incentive would typically need to be more attractive than the payment by informal recyclers and encourage the collection of whole products over cherry-picked and partly dismantled items. The informal collection and treatment network would shrink significantly over time, as the collectors enter formal collection contracts with licensed recyclers. In addition to offering an incentive to collectors, informal collectors must receive access to training and safety equipment to start operating under environmental, health and safety standards.

6.4. Preliminary Recommendations at a Local Level

Recommendations for future endeavours at the local level include:

The management of E-Waste should be in alignment with the UN's SDGs, in all aspects where applicable, to ensure responsible production, consumption and disposal, and ensure safety to both humans and the environment, as well as foster opportunities for employment, economic growth and sustainability.

The promotion of a circular economy would be beneficial in curbing the E-Waste generated but must be guided by environmental policies to address the negative impacts of E-Waste. The collaborative approach by all relevant stakeholders, inclusive (but not limited to) government organizations and policy makers, distributors, consumers, and waste management personnel would aid in the development of a holistic plan for the sound management of E-Waste in Suriname, allowing it to be beneficial to all parties, and protecting human health and the environment. It is therefore beneficial to address the gaps that currently exist, such as inadequate reporting and availability of data to correctly track the movement of EEE in Suriname, economic strategies, and policy, legislation and implementation going forward. These are detailed in the subsequent sections.

Collaboration with other national projects within the waste management field, for example, the Integrated Waste Management Plan which is being developed through a project led by ILACO N.V., a Surinamese consultancy and engineering firm. The project has two phases, the first of which involved identifying the current situation in Suriname with regards to waste management and the current policies. For the second phase, ILACO is working closely with the Ministry of Spatial Planning and Environment, and together they will be working with other stakeholders to simplify policies with regards to waste management in Suriname with the focus on cleaner technologies and implementations. E-Waste is one of the waste streams to be incorporated into the Integrated Waste Management Plan thus the findings from this assessment may be beneficial during the development of the Integrated Waste Management Plan.

As stated previously, a licensing or certification to national or international standards should be encouraged. In terms of collection, at a minimum, all collection points must be licensed or in compliance with national regulations to receive, manage, sort and store E-Waste. Collection points should work with their collectors and instruct them on how to handle E-Waste.

It is vital to create awareness on the environmental benefits of recycling among consumers. All waste collection programmes start with consumers (individual households or organizational entities), as consumers decide when and how to dispose

of a product. It is therefore critical that consumers decide to utilize licensed recycling facilities instead of sending their waste to landfill, substandard treatment or incineration.

In Suriname, no local end-processing facilities exist for any E-Waste category, thus, it is imperative to ensure good and easy access to international licensed treatment facilities. These plants usually process a large amount of these materials to achieve economies of scale; they can only operate at a profit by processing high volumes of this material, which is impossible on the national level. This means that in order for the system to run efficiently and economically, it is essential that countries allow specific material fractions to be exported and imported to these facilities and that this process is not heavily burdened with time-consuming bureaucracy. It must be ensured that legal requirements like the Basel Convention are met but do not lead to long delays or make it impossible to export waste fractions to these licensed international treatment facilities. A close monitoring of waste streams is necessary to ensure that they arrive in the specialised facilities for treatment.

6.5. Preliminary Recommendations at a Sub Regional Level

Harmonisation of policy and legislation[50] regionally would provide a step in the right direction and can assist in the adequate use of resources in this area; however, the will of the various Governments would be key in bringing attention to this area.

On the other hand, E-Waste often contains valuable materials that can be recovered for recycling, including iron, aluminium, copper, gold, silver, platinum, palladium, indium, gallium, and rare earth metals, and thereby contribute to sustainable resource management, since the extraction of these metals from the Earth has significant environmental impacts.

Under this scenario, environmental policies can be developed to attenuate the negative impacts that E-Waste may cause. The recovery and use of such materials as raw materials after they have become waste can extend the lifespan of final disposal sites contributing to reduction of greenhouse gas emissions when adequate technologies and methods are applied.

[50] The full recommendations report entitled Legal Recommendations and Considerations Associated with the Establishment of a Sub-Regional E-waste Management Solution can be found in Annex 2 to this document.

Direct reuse of equipment or reuse after repair or refurbishment can contribute even more to sustainable development. By extending the life of equipment, reuse reduces the environmental footprint of the resource-intensive processes involved in producing the equipment.

Reuse may also facilitate the availability of equipment to groups in society that otherwise would not have access to it, since the cost of used equipment is lower than that of new equipment. For managing these types of wastes, developed countries have implemented management systems based on the principle of EPR.

Within the EPR framework, the producer, importer, or seller is responsible for the appropriate handling of the equipment from its design to its final disposal. Due to the implementation of the EPR model as well as appropriate incentives, there have been annual increases in the rate of E-Waste treated in formal systems following proper processes and practices.[51]

Other constraints identified, characteristic to SIDS, are limited availability of suitable land for treatment and storage facilities and landfills; dependency on the viability of exporting recovered materials and hazardous wastes; and low level of consumption rates to facilitate investments. Implementing a regional approach for E-Waste management and thus generating economies of scale would facilitate investments and reduce space requirements due to larger collection rates and more frequency of exports.

A unified approach to E-Waste management in the sub-region would likely be a suitable strategy to ensure sound benefits and market capture, as supported by Mohammadi, Singh and Habib (2021) who concluded that owing to the typical small economies of scale of SIDS, regional cooperation would be critical if the Caribbean is to move towards not only a circular economy but to maintain a sustainable framework. Therefore, considerations for E-Waste management at a sub-regional level is required and should entail the collective assessment of country practices to identify opportunities and benefits, such as increased employment and strengthened GDP and determine the feasibility of a sub-regional E-Waste management solution.

To adhere to this recommendation, Components 2 and 3 of this project will investigate the feasibility of a sub-regional dismantling or recycling centre. In this project, the results

[51] Acosta and Corallo - IMPLEMENTING SUSTAINABLE LOW AND NON-CHEMICAL DEVELOPMENT IN SMALL ISLAND DEVELOPING STATES (ISLANDS) PROJECT PREPARATION GRANT PHASE – Trade Flow Assessment – Final Report – April 2020 p 5

from the three (3) project countries, Guyana, Suriname and Trinidad and Tobago, are collectively being analysed to determine the optimal mechanism for sub-regional E-Waste dismantling facility. In this regard, a data-driven strategy can be formulated, and can involve regional bodies to encourage technical cooperation and ease of implementation. Depending on the feasibility of a dismantling centre in the sub-region, further studies and agreements can occur within the wider region to determine if additional E-Waste can be directed to the centre to achieve greater productivity with the realisation of a joint vision in the region towards E-Waste management.

The first suggestion to locate the sub-regional dismantling facility would be Trinidad and Tobago due to the high E-Waste generation and level of industrialization of the country, compared to Guyana and Suriname. To assess the economic feasibility of this alternative, the economic model presented in section 5 was run with some adjustments:

- Input E-Waste considers the sum of E-Waste generated in the three countries. The model still shows three scenarios of collection, which would be equivalent among the three countries: 30%, 50%, and 80%.
- The costs of transboundary movements were included, considering freight costs between Suriname and Trinidad and Tobago informed by a logistics provider based in Suriname. Due to lack of specific information, it was assumed the same freight costs for Guyana-Trinidad and Tobago.

Table 31 shows the results obtained:

Table 31: Results obtained when running the economic model for the sub-regional approach based in Trinidad and Tobago

		Escenario A	Escenario B	Escenario C
Percentage of e-waste collected	100%	30%	50%	80%
Total annualized fixed costs		**-$ 1,156,210**	**-$ 1,914,518**	**-$ 3,041,876**
Total Equipment costs		-$ 3,139,110	-$ 5,212,931	-$ 8,311,906
Total equipment costs annualized according to lifespan		-$ 191,645	-$ 317,285	-$ 504,512
Total rental costs per year		-$ 964,565	-$ 1,597,233	-$ 2,537,365
Total other fixed costs		$ -	$ -	$ -
Total Variable costs and revenues		**$ 721,850**	**$ 1,277,680**	**$ 2,113,547**
Total CMR costs per year		-$ 195,259	-$ 320,839	-$ 514,091
Total staff costs per year		-$ 793,440	-$ 1,255,824	-$ 1,939,824
Total materials revenues and costs per year		$ 2,016,380	$ 3,360,633	$ 5,377,012
Total Freigh Rate		-$ 305,830	-$ 506,290	-$ 809,550
Total Other variable costs		$ -	$ -	$ -
Total input quantities (tons/year)		4544	7573	12117
Annualized economic result (revenues - costs)		-$ 434,360	-$ 636,838	-$ 928,329
Total treatment cost/ton		**-$ 96**	**-$ 84**	**-$ 77**

As it can be seen from the model, the economic result of the sub-regional model is negative for the three collection rates scenarios. It could also be expected, given the larger quantities handled through this alternative, a reduction in the need of containers and storage areas. For example, if only 10% of containers are needed and consequently 40% of storage area required is reduced, the following would be the results achieved:

Table 32: Results obtained when running the economic model for the sub-regional approach based in Trinidad and Tobago considering a reduction in containers and storage area needed

		Escenario A	Escenario B	Escenario C
Percentage of e-waste collected	100%	30%	50%	80%
Total input quantities (tons/year)		4544	7573	12117
Annualized economic result (revenues - costs)		-$ 47,181	$ 5,048	$ 106,207
Total treatment cost/ton		**-$ 10**	**$ 1**	**$ 9**

This reduction would imply that for the 50% and 80% collection scenarios, the economic output turns positive.

Additionally, if rental costs are eliminated through subsidies from the government, the following would be the positive economic outputs of each collection scenario:

Table 33: Results obtained when running the economic model for the sub-regional approach based in Trinidad and Tobago considering no rental costs

		Escenario A	Escenario B	Escenario C
Percentage of e-waste collected	100%	30%	50%	80%
Total input quantities (tons/year)		4544	7573	12117
Annualized economic result (revenues - costs)		$ 530,205	$ 960,395	$ 1,609,036
Total treatment cost/ton		$ 117	$ 127	$ 133

On the other hand, a second alternative was tested. Given the lower labour and rental costs, Suriname would be the suggested location for the sub-regional dismantling facility. In this case, the results would be:

Table 34: Results obtained when running the economic model for the sub-regional approach based in Suriname

		Escenario A	Escenario B	Escenario C
Percentage of e-waste collected	100%	30%	50%	80%
Total annualized fixed costs		**-$ 768,808**	**-$ 1,273,015**	**-$ 2,022,784**
Total Equipment costs		-$ 3,139,110	-$ 5,212,931	-$ 8,311,906
Total equipment costs annualized according to lifespan		-$ 191,645	-$ 317,285	-$ 504,512
Total rental costs per year		-$ 577,163	-$ 955,729	-$ 1,518,272
Total other fixed costs		$ -	$ -	$ -
Total Variable costs and revenues		**$ 1,207,983**	**$ 2,048,262**	**$ 3,308,661**
Total CMR costs per year		-$ 173,755	-$ 287,047	-$ 458,795
Total staff costs per year		-$ 348,000	-$ 550,800	-$ 850,800
Total materials revenues and costs per year		$ 2,016,380	$ 3,360,633	$ 5,377,012
Total Freigh Rate		-$ 286,641	-$ 474,524	-$ 758,756
Total Other variable costs		$ -	$ -	$ -
Total input quantities (tons/year)		4544	7573	12117
Annualized economic result (revenues - costs)		$ 439,175	$ 775,248	$ 1,285,877
Total treatment cost/ton		**$ 97**	**$ 102**	**$ 106**

It can be concluded that locating the facility in Suriname would imply that the economic result of the dismantling facility is positive in all the collection scenarios.

To make any sub-regional approach possible, user agreements must be in place among countries so that E-Waste can move among them. The political and social impact of such measure should be taken into consideration, especially in the light that both hazardous fractions and fractions destined to landfill would be generated from treatment at the sub-regional facility, though a large part of input E-Waste would have originated abroad. These impacts should be estimated to evaluate the need of establishing a treatment fee and estimating its value.

The next steps of the project in Component 2 would include the identification of the best location for a dismantling centre, with further research into material streams identification, legal considerations such as the transboundary movement of materials and technical requirements including transportation, treatment, and storage. In Component 3, a business plan for the proposed solution will consider cost factors throughout the value chain of E-Waste recycling, identify markets for the sale of recyclable materials and estimate the financial demand of a dismantling centre. Therefore, final recommendations and tangible steps with regards to the management

of E-Waste at a sub-regional level can be made after the implementation of Components 2 and 3.

7. CONCLUSION

The finalisation of this report signifies the achievement of two (2) project objectives, which deal with data collection on E-Waste generation, identification of stakeholders and existing pathways of disposal and market conditions for the recovery of recyclable material, as well as the development of an updated assessment report for Suriname. A mixed-methodology approach was utilised through literature reviews, in-depth interviews, and online surveys to facilitate the achievement of objectives and provide recommendations on the way forward.

Through analysis of trade data, it was determined that approximately 8,550 tons of EEE was imported and 413.1 tons of EEE exported, based on data from the UN Comtrade database for the year 2019. In general, from 2010 to 2019, large household appliances accounted for the largest proportion of imports at 36% based on the UN Comtrade data. Further analysis of this data showed that approximately 6,060 tons of E-Waste was generated for Suriname for 2019. It should be noted that the COVID-19 pandemic may have incurred additional import of EEE, with the rapid onset of a virtual world, therefore increasing the demand for electronic devices to facilitate communication, learning and work from home environments, which in turn, can lead to an increase in EWG in the future.

It was noted that the data collection process was difficult, as there was low response rate, and some hesitancy shown, particularly by waste management organisations, in disclosing some data. This contributed to the lack of information to include the completed mass flow analyses, as the flow of EEE could not be adequately accounted for to give a full overview of the movement of EEE in Suriname.

A key factor in the low rate of recycling of E-Waste in Suriname, is attributed to the fact that many respondents were not aware of the recycling organisations that deal with E-Waste. This lack of public awareness therefore shows the dire need for proper public awareness and education campaigns to not only inform the general public of the implications of unsafe E-Waste disposal, but also the facilities that are present. It is also evident that the economic aspect of sustainably disposing E-Waste needs to create an incentive for the general public as well as recyclers, due to the costs attached to the safe disposal of E-Waste. The cost was also mentioned by some of the consumers as a barrier to recycling their E-Waste.

Through the project, an economic model for a dismantling facility in Suriname was developed to help policy makers, entrepreneurs, and established E-Waste management facilities. From studying the model, it can be concluded that, regardless the collection

scenario, the economic result of the treatment facility is positive. As the collection rates are increased, the higher the economic result is due to the economies of scale being achieved.

The feasibility of setting up a sub-regional dismantling facility was assessed through the model. The first alternative was to locate it in Trinidad and Tobago, due to the high E-Waste generation and level of industrialization of the country, in comparison to Guyana and Suriname. The second alternative was to locate the facility in Suriname, due to the lower labour and rental costs. Positive economic results are achieved when the sub-regional facility is in Suriname. To make any sub-regional approach possible, user agreements must be in place among countries so that E-Waste can move among them. The political and social impact of such measure should be taken into consideration as well.

The need for a national E-Waste strategy, integrated management systems, incorporation of a circular economy, legislation and awareness and education were identified in the move towards the ESM of E-Waste in Suriname. Additionally, the proposed training programmes and business plan, to be developed under Components 2 and 3 of the project, will contribute significantly to the development of a sub-regional approach, which would benefit citizens of Suriname, and, by extension, the Caribbean, economically and environmentally.

8. REFERENCES

1. Acosta, Alejandra, Ana Corallo. 2020. Implementing Sustainable, Low and Non-Chemical development in Small Island Developing States (Islands) Project Preparation Grant Phase, Extended Producer Responsibility (EPR) Assessment Final Report. Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean.

2. Acosta, Alejandra, Ana Corallo. 2020. Implementing Sustainable, Low and Non-Chemical development in Small Island Developing States (Islands) Project Preparation Grant Phase, Trade Flow Assessment Final Report. Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean.

3. Anton de Kom Universiteit van Suriname (Anton de Kom University of Suriname (AdeKUS)). http://www.uvs.edu/

4. Basel Convention, 2019., "Basel Convention Technical Guidelines, 2019: Technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment, in particular regarding the distinction between waste and non-waste under the Basel Convention.", Accessed January 2022. http://www.basel.int/Implementation/TechnicalMatters/DevelopmentofTechnicalGuidelines/TechnicalGuidelines/tabid/8025/Default.aspx

5. Directorate of Public Green and Waste management (Directoraat Openbaar Groen). https://publicworks.gov.sr/over-ministerie/organisatie-structuur/openbaar-groen/

6. European Commission: Waste from Electrical and Electronic Equipment (WEEE). Accessed January 2022. https://ec.europa.eu/environment/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en

7. General Bureau for Statistics (Algemene Bureau voor Statistieken (ABS)). Visited January 2022. https://statistics-suriname.org/

8. General Bureau for Statistics (Algemene Bureau voor Statistieken (ABS)). Accessed January 2022. https://statistics-suriname.org/wp-content/uploads/2019/05/Publicatie-Census-8-Volume-3-Huishoudens-Gezinnen-en-Woonverblijven-Milieu-Criminaliteit.pdf

9. General Bureau for Statistics (Algemene Bureau voor Statistieken (ABS)). Accessed January 2022. https://statistics-suriname.org/wp-content/uploads/2021/03/Final-9th-environment-pub-2020.pdf

10. Global-E-waste Monitor 2017. Accessed January 2022. https://collections.unu.edu/eserv/UNU:6341/Global-E-waste_Monitor_2017__electronic_single_pages_.pdf

11. Global Wage Report 2020–21. Wages and minimum wages in the time of COVID-19. International Labour Organization (ILO). December 2, 2020.

https://www.ilo.org/global/research/global-reports/global-wage-report/2020/lang--en/index.htm

12. Guiding Principles to Develop E-waste Management Systems and Legislation", Solving the E-Waste Problem. StEP White Paper. January 18, 2016

13. J. Clerc y otros, "Economía circular y valorización de metales: residuos de aparatos eléctricos y electrónicos", serie Medio Ambiente y Desarrollo, N° 171 (LC/TS.2021/151), Santiago, Comisión Económica para América Latina y el Caribe (CEPAL), 2021. https://repositorio.cepal.org/handle/11362/47429

14. Magalini, Federico. 2015. Financing models for sound e-waste management in Ethiopia. Cyrcle Consulting for UNIDO – GEF. May 29, 2015.

15. Muhammad Umaid Bukhari et al., 2022. Waste to energy: Facile, low-cost and environment-friendly triboelectric nanogenerators using recycled plastic and electronic wastes for self-powered portable electronics

16. Ministry of Public Works (Ministerie van Openbare Werken). http://publicworks.gov.sr/

17. Ministry Of Spatial Planning and Environment (Ministerie van Ruimtelijke Ordening en Millieu (ROM)).

18. Mohammadi, Elham., Shimron Jit Singh, Komal Habib. 2021. "How big is circular economy potential on Caribbean islands considering e-waste?", Journal of Cleaner Production, volume 317, Science Direct.

19. National Institute for Environment and Development in Suriname (NIMOS). https://nimos.org/en/

20. Practical guidance for the development of inventories of waste electrical and electronic equipment. Draft by the Secretariat of the Basel, Rotterdam and Stockholm Conventions. Accessed January 2022. http://www.basel.int/Countries/NationalReporting/Guidanceoninventoryofhazardouswastes/tabid/8755/Default.aspx

21. StEP (Solving the E-waste Problem). 2022. "About Us>Organisation". Accessed January 08, 2022. https://www.step-initiative.org/organisation-rev.html

22. Suriname Standards Bureau (SSB). Visited January 2022. https://www.ssb.sr/

23. Suriname Standards Bureau (SSB), Garbage collection and handling standard Part 1. https://www.ssb.sr/

24. United Nations Environmental Programme (UNEP). 2007. *E-waste Volume I: Inventory Assessment Manual*. E-Waste Manual: UNEP. Accessed February 02, 2022.

25. United Nations Environmental Programme (UNEP), Basel Convention. 2016. *Methdological Guide for the Development of Inventories of Hazardous Wastes and Other Wastes Under the Basel Convention*. UNEP: Basel Convention, Basel Convention>Implementation > Publications > Guidance Manuals. Accessed January 5, 2022. http://www.basel.int/Implementation/Publications/GuidanceManuals/tabid/2364/Default.aspx#

26. UWI (University of the West Indies). 2016. "Manufacturing Profiles 12: E-Waste." In *The Development of Project Profiles for the Manufacturing Sector of T&T*. InvesTT: University of Trinidad and Tobago St. Augustine Campus. Accessed January 20, 2022. http://www.t.investt.co.tt/12-E-WASTE.pdf

27. "Waste Pickers in the Informal Economy of the Global South: Included or Excluded?", by Bisschop, L. & Coletto, published in 2017 in the International Journal of Sociology and Social Policy

28. World Health Organization: Impact of E-Waste on human health. Accessed January 2022. https://www.who.int/teams/environment-climate-change-and-health/settings-populations/children/e-waste

9. APPENDICES

9.1. Appendix 1: Phases of Project Component 1

The updated report on the current E-waste management practices in three project countries	
Phase 1	**Finalization of formal arrangements with country Focal Points (FPs) and the recruitment and mobilization of resources to support project activities**
Activity 1.1	Develop and transmit initial communication and project initiation documents to FPs and Competent Authorities (CAs).
Activity 1.2	Plan and facilitate the regional virtual kick-off meeting.
Activity 1.3	Hire consultants in accordance with IDB procurement rules and regulations. Suitable National Project Assistants (NPAs), Legal Consultant(s) and Environmental Economics Consultant(s) will be hired by the BCRC Caribbean.
Activity 1.4	Update or create an initial listing of key stakeholders in the generation, management, and data collection of E-Waste nationally.
Activity 1.5	Prepare questionnaires for interviews with pre-identified stakeholder groups.
Phase 2	**Initiation of Project Activities and mobilization of resources on the national level**
Activity 2.1	Host national project kick-off virtual meeting with FP, CA, consultants and pre-identified stakeholders.
Activity 2.2	Finalize listing of key stakeholders in the generation, management and data collection of E-Waste nationally.
Activity 2.3	Collection of existing data sets and information on the imports, existing amounts, disposal and/or exports of for the various categories of EEE and/or e-waste at the national and/or sectoral level
Phase 3	**Data Collection and Analysis**
Activity 3.2	Schedule and perform stakeholder interviews and site visits.
Activity 3.3	Collate and organize data and information from interviewed stakeholders.
Activity 3.4	Legislative and Institutional Capacity Review - Environmental Economist Evaluation.

Phase 4	**Consolidation of the data collection and analysis phase to provide the overall diagnostic reports**
Activity 4.1	Prepare, finalize, and submit draft E-Waste assessment reports, including recommendations for sound e-waste management nationally, to respective project focal points.
Activity 4.2	Host national validation virtual meeting with stakeholders and present the final outcomes of the assessment and recommendations for sound E-Waste management nationally.
Activity 4.3	Finalize E-Waste assessment reports, which will include the policy and legislative review, and existing and possible pathways and markets for treatment, recycling, and disposal.

9.2. Appendix 2: Stakeholder listing

National Working Group			
Name	**Organization**	**Job Title/ Position**	**Email address**
Ms. Tiffany van Ravenswaay	Ministry of Spatial Planning and Environment	Environmental Policy Officer	tiffany.vanravenswaay@gov.sr
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9.3. Appendix 3: Questionnaires

This section presents the finalized questionnaires, which were used to determine the quantities of different categories of E-Waste generated in Suriname and to understand the country's E-Waste management practices.

As with the stakeholder listing, the BCRC-Caribbean provided the NPA with a preliminary questionnaire for different stakeholder groups. To finalize the questionnaires, the NPA met with the Legal and Environmental Economics Consultants to discuss the data that needs to be collected for the project. The NPA also received assistance from the NPA for Trinidad and Tobago and Guyana on their finalized questionnaires.

Below, the finalized questionnaires for the following stakeholder groups are presented:

I. WEEE Management (Waste Collectors, Waste Disposers, Recyclers, Repairers/ Refurbishers, Scrap Dealers)
II. Public Sector (Government and Non-Governmental Organisations)
III. Private Sector (EEE Distributors)
IV. Private Sector (EEE Consumers)

Appendix 3a: E-Waste Management (Waste Collectors, Waste Disposers, Recyclers, Repairers/ Refurbishers, Scrap Dealers)

1. Company or Organisation Name
2. Address
3. Email address
4. Phone Number
5. Company or organisation website link
6. Under which category/categories does your company or organization fall for WEEE management?
    - Recycler
    - Disposer
    - Repairer/ refurbisher
    - Scrap dealer
    - Collector
7. In which district(s) do you operate in Suriname?
    - Brokopondo
    - Commewijne
    - Coronie
    - Marowijne
    - Nickerie
    - Para
    - Paramaribo
    - Saramacca
    - Sipaliwini
    - Wanica

COLLECTORS

8. How much waste do you collect on a yearly basis? (please provide an estimate in units and weight)
9. What types of waste do you collect?
10. Is there a fee charged for the collection of waste? If yes, how is this fee determined?
11. What is usually done with the waste that is collected by your company or organization?
    - Sent to a landfill for disposal
    - Sold to another company or organization for recycling
    - Exported
    - Other:
12. If exported, to which countries?
13. Is any of the waste intercepted by informal players between collection and final treatment/disposal?
14. If you collect WEEE and other types of waste, what percentage of the total waste collected is WEEE? please provide an estimate

15. Do you collect WEEE? If yes, what types of WEEE do you collect?
16. Are there any specific types of WEEE that are collected more than others? If yes, which ones?
17. Do you collect WEEE on a regular basis or on request/demand?
18. What is usually done with WEEE that is collected?
    - Sent to a landfill for disposal
    - Sold to another company or organization for recycling
    - Exported
    - Other:
19. If exported, to which countries?
20. Do you have knowledge of the local markets for the components of dismantled WEEE? If yes, please elaborate
21. Do you believe there are opportunities for potential recycling or re-use of WEEE as opposed to landfill dumping?

DISPOSERS

22. Is there a fee charged for disposal? If yes, how is this fee determined?
23. Do you have any data on the average annual quantities of WEEE collected?
24. Have any trends been observed on the types and quantities of WEEE being sent for disposal?
25. Is any of the waste intercepted by informal players between collection and final disposal?
26. Do you work with any other local companies or organizations to ensure that the WEEE is disposed of properly (or recycled)? If yes, which ones? Why were they chosen?
27. Are you aware of what happens to the WEEE after it has been sent to this company or organization?
28. Do you have knowledge of alternative treatment or disposal procedures/facilities for WEEE in the country?
29. Do you have knowledge of the local markets for the components of dismantled WEEE?
30. Please indicate the main disposal treatments used for e-waste in Suriname
    - Landfill
    - Open site disposal
    - Incineration
    - Open burning
    - Other:
31. Please provide an estimate of WEEE disposal on a yearly basis (in units and weight)

RECYCLERS

32. Who are your major clients? If you prefer not to say, please tell us in which sectors/industries are your clients involved?
33. Are there service charges for WEEE generators? if yes how are they determined?
34. What method is used to attract clients?
35. Why was Suriname selected as a location site for the company or organization?
    - High WEEE generation rates
    - Strategic location: hub-point
    - Government incentives
    - Local demand
    - Own initiative
    - Other:
36. Do you believe there is potential for expansion of the WEEE treatment market locally or is it still a niche sector?
37. Do you use any WEEE categorization methods? If yes, which one?
38. What kind of different types of WEEE do you collect?
39. How do you collect WEEE?
40. How much WEEE do you collect on a yearly basis? (please provide an estimate in units and weight)
41. What kind of treatment methods for WEEE do you use?
42. Do you manage the WEEE manually or are there also mechanical machines being operated? if so, what kind of machines?
43. What are the different kind of destinations for WEEE after treatment?
44. How much of hazardous waste do you collect from WEEE? (please provide an estimate in units and weight)
45. What do you do with the hazardous waste once removed from WEEE?
46. At what price do you sell WEEE before and after treatment? (please provide an estimate per volume per category)
47. How many employees work for the company or organization?
48. Please provide a short description of the different employee profiles
49. Do you receive any assistance from the Government or funding/grants in your operations?
50. Does your company or organization have any environmentally-related certifications? if yes which ones?

REPAIRERS/ REFURBISHERS

51. What WEEE activities does the company carry out?
    - Collection
    - Refurbishment
    - Sale of refurbished products
    - Repair
    - Dismantling/Recycling

- Export
- Other:

52. What types of EEE do you repair/refurbish?
53. Could you provide an estimate of EEE to be refurbished/repaired? (in units and weight)
54. By which strategies and channel does your company receive WEEE?
    - Customers bring in for themselves their damaged EEE to be refurbished/repaired
    - Customers call the company who then dispatches transport to collect the item(s) to be refurbished/repaired
    - Other:
55. From whom do you receive most of the products to be refurbished?
    - Industries
    - Private businesses
    - Government
    - Households
    - Other:
56. What is done with parts or products which cannot be repaired or used for refurbishment?

SCRAP DEALERS

57. From where do you obtain/collect your WEEE/scrap material?
58. Do you import any scrap material to be sold locally? If yes, from which country/countries and in what quantities?
59. What types of WEEE/scrap material does your establishment receive and sell?
60. What is the current price for buying, selling WEEE/scrap materials? (please give an estimation)
61. What activities are carried out at your establishment?
    - Scrap purchase
    - Sorting
    - Dismantling
    - Recovery
    - Sale of useable components to repair shops
    - Sale to other scrap dealers
    - Export
    - Other:
62. On average, what weight and quantity of material is collected/ received? (per year)
63. On average, how much do you offer to pay (per unit/per kg) for the WEEE/scrap material that you receive? (Please separate according to types of scrap material where possible)
64. What factors determine how much you pay for the scrap material?

- Condition of the material
- Market price
- Market demand
- Other:

65. What factors determine the prices at which you sell the scrap material?
    - Condition of the material
    - Market price
    - Market demand
    - Other:
66. On average, what are the selling prices (per unit/per kg) of your locally sold scrap material?
67. Who is your main clientele?/Who are your regular WEEE partners/clients?
68. On average, what weight and quantity of material is sold locally? (per year)
69. Do you export WEEE/scrap?
    - Yes
    - No
70. If yes, to which country/countries?
71. If no, do you work with other companies who do export scrap metal? To where?
72. What are the main challenges that your company faces as a scrap metal business?
    - Lack of markets/low demand for certain scrap materials
    - Low or unstable market prices for certain materials
    - Local competition
    - Competition from overseas
    - High operational costs
    - High shipping costs
    - Obtaining certification
    - Other

Appendix 3b: Public Sector (Government and Non-Governmental Organisations)

1. What is your name? (or do you prefer not to say?)
2. What is your gender?
    - Male
    - Female
    - Prefer not to say
3. What is your email address? (or do you prefer not to give?)
4. Where do you work? (or do you prefer not to say?)
5. Please provide a short description of your work
6. Are you aware of any current national legislative instruments which govern the generation of WEEE in Suriname?
    - Yes
    - No
7. If yes, which one?
8. Are you aware of any current national legislative instruments which govern the management of WEEE in Suriname?
    - Yes
    - No
9. If yes, which one?
10. Are there any regional or international guidelines, which are followed by the government in the regulation of WEEE?
    - Yes
    - No
    - I don't know
11. If yes, which one?
12. Are there any regional or international guidelines, to which the government will refer WEEE recyclers in the private sector when asked for guidance?
    - Yes
    - No
    - I don't know
13. If yes, which one?
14. Are you aware of any companies who recycle WEEE?
    - Yes
    - No
    - I don't know
15. If yes, which one?
16. Is there a national database for EEE entering Suriname?
    - Yes
    - No
    - I don't know
17. If yes, which one?
18. Is there a national registration system for persons who import, manufacture and distribute EEE in Suriname?
    - Yes
    - No
    - I don't know

19. If yes, which one?
20. Is there a national registration system for persons who manage WEEE in Suriname?
    - Yes
    - No
    - I don't know
21. If yes, which one?
22. Are national records kept for WEEE imported into or exported from Suriname?
    - Yes
    - No
    - I don't know
23. Are there any legislative prohibitions against the import, transit or export of WEEE in Suriname?
24. This project is a collaboration with Guyana and Trinidad & Tobago, a management plan for E-Waste is also being done there. Are there any concerns about importing E-Waste from the other countries involved in this project?
25. Do you have any idea on average how much EEE is being procured by the public sector in Suriname on a yearly basis?
26. If yes, please give an estimation in quantity or weight. (Check that which applies)

	Quantity (units)			Weight (kg)			
	< 500	500-1000	> 1000	<500	500-10000	> 10000	Not applicable
Large items (fridge, AC, washing machines, ventilators)							
Small items (Irons, hairdryers, microwaves, vacuum cleaners, coffee machine, toasters)							
Telecom and IT (phones, mobiles, laptop, printers, scanners)							
Consumers (radio, TV, cameras, recorders)							
Tools (drills, saws, landscape machines)							
Lighting (lamps, bulbs)							
Toys, leisure and sport equipment (electric toys, video games							
Monitor and control (smoke detectors)							
Medical equipment							
Automatic dispenser							

27. Do you have any idea on average how much WEEE is being generated by the public sector in Suriname on a yearly basis?
    - Yes
    - No
28. If yes, please give an estimation in quantity or weight

	Quantity (units)			Weight (kg)			
	< 500	500-1000	> 1000	<500	500-10000	> 10000	Not applicable
Large items (fridge, AC, washing machines, ventilators)							
Small items (Irons, hairdryers, microwaves, vacuum cleaners, coffee machine, toasters)							
Telecom and IT (phones, mobiles, laptop, printers, scanners)							
Consumers (radio, TV, cameras, recorders)							
Tools (drills, saws, landscape machines)							
Lighting (lamps, bulbs)							
Toys, leisure and sport equipment (electric toys, video games							
Monitor and control (smoke detectors)							
Medical equipment							
Automatic dispenser							

29. Do you have any closing remarks or questions about this project?

Appendix 3c: Private Sector (EEE Distributors)

1. Name of the company or organization?
2. Address
3. Email address
4. Contact number
5. Company or organization website link (if applicable)
6. In what year was the company or organization established?
7. In which district(s) do you operate in Suriname?
    - Brokopondo
    - Commewijne
    - Coronie
    - Marowijne
    - Nickerie
    - Para
    - Paramaribo
    - Saramacca
    - Sipaliwini
    - Wanica
8. Does the company or organization participate in any form of recycling? If yes, please specify.
9. If recycling takes place, what is the estimated amount that goes for recycling / take back yearly? and any cost associated in the process?
10. Does the company or organization participate in WEEE recycling? If yes, please specify.
11. Does the company or organization have arrangements in place with suppliers for the take-back of products at its end-of-life? If yes, what arrangements do you currently have in place?
12. Does the company or organization distribute or sell second hand equipment? If yes to who?
13. Are you willing to pay for the treatment of WEEE generated by the company or organization? If yes, what are you willing to pay/ what conditions (pickup service etc.)?

LARGE ITEMS

14. Which of the following items does the company or organization distribute or sell?
    - AC
    - Washing machine
    - Dish washing machine
    - cooking (stove, oven)
    - Microwaves
    - Ventilators
15. Please provide an estimate of the yearly imported units of the items.

	AC	Washing machines	Dish washers	Cooking (stove, ovens)	Microwaves	Ventilators
0-5 units						
5-10 units						
10-50 units						
50-100 units						
> 100 units						
Not applicable						

16. Please provide a weight estimate of the imported items.

Mass (kg)	AC	Washing machines	Dish washers	Cooking (stove, ovens)	Microwaves	Ventilators
0-2500						
2500-5000						
5000-10000						
>10000						
Not applicable						

17. Please provide an estimate of the yearly unit items sold.

Units	AC	Washing machines	Dish washers	Cooking (stove, ovens)	Microwaves	Ventilators
0-5 units						
5-10 units						
10-50 units						
50-100 units						
> 100 units						
Not applicable						

18. Please provide a weight estimate of the yearly items sold.

Mass (kg)	AC	Washing machines	Dish washers	Cooking (stove, ovens)	Microwaves	Ventilators
0-2500						
2500-5000						
5000-10000						

>10000						
Not applicable						

19. What is the average lifespan of the items?

Years	AC	Washing machines	Dish washers	Cooking (stove, ovens)	Microwaves	Ventilators
1-5						
5-10						
>10						
Not applicable						

20. How often is your stock of these items replenished?

	AC	Washing machines	Dish washers	Cooking (stove, ovens)	Microwaves	Ventilators
never						
after 1 year						
after 1-5 years						
after 5-10 years						
after > 10 years						
Not applicable						

SMALL ITEMS

21. Which of the following items does the company or organization distribute or sell?
    - Vacuum cleaners
    - Toasters
    - Coffee machine
    - Electrical shavers
    - Electrical brushes
    - Hair dryers

22. Please provide an estimate of the yearly imported units of the items

Units	Vacuum cleaners	Toasters	Coffee machines	Electrical shavers	Electrical brushes	Hair dryers
0-5						
5-10						
10-50						

50-100						
> 100						
Not applicable						

23. Please provide a weight estimate of the yearly imported items

Mass (kg)	Vacuum cleaners	Toasters	Coffee machines	Electrical shavers	Electrical brushes	Hair dryers
0-2500						
2500-5000						
5000-10000						
>10000						
Not applicable						

24. Please provide an estimate of the unit items sold yearly

Units	Vacuum cleaners	Toasters	Coffee machines	Electrical shavers	Electrical brushes	Hair dryers
0-5						
5-10						
10-50						
50-100						
> 100						
Not applicable						

25. Please provide a weight estimate of the yearly items sold

Mass (kg)	Vacuum cleaners	Toasters	Coffee machines	Electrical shavers	Electrical brushes	Hair dryers
0-2500						
2500-5000						
5000-10000						
>10000						
Not applicable						

26. What is the average lifespan of the items?

Years	Vacuum cleaners	Toasters	Coffee machines	Electrical shavers	Electrical brushes	Hair dryers
1-5						
5-10						
>10						

Not applicable						

27. How often is your stock of these items replenished?

	Vacuum cleaners	Toasters	Coffee machines	Electrical shavers	Electrical brushes	Hair dryers
never						
after 1 year						
after 1-5 years						
after 5-10 years						
after > 10 years						
Not applicable						

IT AND TELECOM EQUIPMENT

28. Which of the following items does the company or organization distribute or sell?
    - Printers
    - Scanners
    - laptops
    - PC
    - Copying equipment
    - Telephones
    - Mobile phones
    - Answering machines

29. Please provide an estimate of the yearly imported units of the items

Units	Printers	Scanners	Laptops	PC	Copying equipment	Telephones	Mobile phones	Answering machines
0-5								
5-10								
10-50								
50-100								
> 100								
Not applicable								

30. Please provide a weight estimate of the yearly imported items

Mass (kg)	Printers	Scanners	Laptops	PC	Copying equipment	Telephones	Mobile phones	Answering machines
0-2500								
2500-5000								

5000-10000								
>10000								
Not applicable								

31. Please provide an estimate of the yearly sold items

Units	Printers	Scanners	Laptops	PC	Copying equipment	Telephones	Mobile phones	Answering machines
0-5								
5-10								
10-50								
50-100								
> 100								
Not applicable								

32. Please provide a weight estimate of the yearly sold items

Mass (kg)	Printers	Scanners	Laptops	PC	Copying equipment	Telephones	Mobile phones	Answering machines
0-2500								
2500-5000								
5000-10000								
>10000								
Not applicable								

33. What is the average lifespan of the items?

Years	Printers	Scanners	Laptops	PC	Copying equipment	Telephones	Mobile phones	Answering machines
1-5								
5-10								
>10								
Not applicable								

34. How often is your stock of the items replenished?

	Printers	Scanners	Laptops	PC	Copying equipment	Telephones	Mobile phones	Answering machines
never								
after 1 year								
after 1-5 years								
after 5-10 years								

after > 10 years								
Not applicable								

CONSUMER EQUIPMENT

35. Which of the following items does the company or organization distribute or sell?
    - Radios
    - Televisions
    - Video cameras
    - Photo cameras
    - Audio amplifiers

36. Please provide an estimate of the yearly imported units of the items

Units	Radios	Televisions	Video cameras	Photo cameras	Audio amplifiers
0-5					
5-10					
10-50					
50-100					
> 100					
Not applicable					

37. Please provide a weight estimate of the yearly imported units of the items

Mass (kg)	Radios	Televisions	Video cameras	Photo cameras	Audio amplifiers
0-2500					
2500-5000					
5000-10000					
>10000					
Not applicable					

38. Please provide an estimate of the yearly items sold

Units	Radios	Televisions	Video cameras	Photo cameras	Audio amplifiers
0-5					
5-10					
10-50					
50-100					
> 100					
Not applicable					

39. Please provide a weight estimate of the yearly items sold

Mass (kg)	Radios	Televisions	Video cameras	Photo cameras	Audio amplifiers
0-2500					
2500-5000					
5000-10000					
>10000					
Not applicable					

40. What is the average lifespan of the items?

Years	Radios	Televisions	Video cameras	Photo cameras	Audio amplifiers
1-5					
5-10					
>10					
Not applicable					

41. How often is your stock of these items replenished?

	Radios	Televisions	Video cameras	Photo cameras	Audio amplifiers
never					
after 1 year					
after 1-5 years					
after 5-10 years					
after > 10 years					
Not applicable					

LIGHTING EQUIPMENT

42. Which of the following items does the company or organization distribute or sell?
    - Luminaires lightbulbs
    - Fluorescent lamps
43. Please provide an estimate of the yearly imported units of the items

Units	Luminaires lightbulbs	Fluorescent lamps
0-5		
5-10		
10-50		
50-100		
> 100		
Not applicable		

44. Please provide a weight estimate of the yearly imported units of the items

Mass (kg)	Luminaires lightbulbs	Fluorescent lamps
0-2500		
2500-5000		
5000-10000		
>10000		
Not applicable		

45. Please provide an estimate of the yearly items sold

Units	Luminaires lightbulbs	Fluorescent lamps
0-5		
5-10		
10-50		
50-100		
> 100		
Not applicable		

46. Please provide a weight estimate of the yearly items sold

Mass (kg)	Luminaires lightbulbs	Fluorescent lamps
0-2500		
2500-5000		
5000-10000		
>10000		
Not applicable		

47. What is the average lifespan of the items?

Years	Luminaires lightbulbs	Fluorescent lamps
1-5		
5-10		
>10		
Not applicable		

48. How often is your stock of these items replenished?

	Luminaires lightbulbs	Fluorescent lamps
never		
after 1 year		
after 1-5 years		
after 5-10 years		
after > 10 years		
Not applicable		

ELECTRIC AND ELECTRONIC TOOLS

49. Which of the following items does the company or organization distribute or sell?
    - Drills
    - Saws

- Sewing machines
- Gardening equipment

50. Please provide an estimate of the yearly imported units of the items

Units	Drills	Saws	Sewing machines	Gardening equipment
0-5				
5-10				
10-50				
50-100				
> 100				

51. Please provide a weight estimate of the yearly imported units of the items

Mass (kg)	Drills	Saws	Sewing machines	Gardening equipment
0-2500				
2500-5000				
5000-10000				
>10000				
Not applicable				

52. Please provide an estimate of the yearly items sold

Units	Drills	Saws	Sewing machines	Gardening equipment
0-5				
5-10				
10-50				
50-100				
> 100				

53. Please provide a weight estimate of the yearly items sold

Mass (kg)	Drills	Saws	Sewing machines	Gardening equipment
0-2500				
2500-5000				
5000-10000				
>10000				
Not applicable				

54. What is the average lifespan of the items?

Years	Drills	Saws	Sewing machines	Gardening equipment
1-5				
5-10				
>10				
Not applicable				

55. How often is your stock of these items replenished?

	Drills	Saws	Sewing machines	Gardening equipment
never				
after 1 year				

after 1-5 years				
after 5-10 years				
after > 10 years				
Not applicable				

TOYS AND LEISURE

56. Which of the following items does the company or organization distribute or sell?
    - Electric toys
    - Video game consoles (Playstation, X-Box, etc.)

57. Please provide an estimate of the yearly imported units of the items

Units	Electric toys	Video game consoles (Playstation, X-Box, etc.)
0-5		
5-10		
10-50		
50-100		
> 100		
Not applicable		

58. Please provide a weight estimate of the yearly imported units of the items

Mass (kg)	Electric toys	Video game consoles (Playstation, X-Box, etc.)
0-2500		
2500-5000		
5000-10000		
>10000		
Not applicable		

59. Please provide an estimate of the yearly items sold

Units	Electric toys	Video game consoles (Playstation, X-Box, etc.)
0-5		
5-10		
10-50		
50-100		
> 100		
Not applicable		

60. Please provide a weight estimate of the yearly items sold

Mass (kg)	Electric toys	Video game consoles (Playstation, X-Box, etc.)
0-2500		
2500-5000		

5000-10000		
>10000		
Not applicable		

61. What is the average lifespan of the items?

Years	Electric toys	Video game consoles (Playstation, X-Box, etc.)
1-5		
5-10		
>10		
Not applicable		

62. How often is your stock of these items replenished?

	Electric toys	Video game consoles (Playstation, X-Box, etc.)
never		
after 1 year		
after 1-5 years		
after 5-10 years		
after > 10 years		
Not applicable		

MEDICAL DEVICES

63. Which of the following items does the company or organization distribute or sell?
    - Radiotherapy equipment
    - Cardiology equipment
    - Dialysis equipment
    - Pulmonary ventilators

64. Please provide an estimate of the yearly imported units of the items

Units	Radiotherapy equipment	Cardiology equipment	Dialysis equipment	Pulmonary ventilators
0-5				
5-10				
10-50				
50-100				
> 100				

65. Please provide a weight estimate of the yearly imported units of the items

Mass (kg)	Radiotherapy equipment	Cardiology equipment	Dialysis equipment	Pulmonary ventilators
0-2500				
2500-5000				
5000-10000				
>10000				
Not applicable				

66. Please provide an estimate of the yearly items sold

Units	Radiotherapy equipment	Cardiology equipment	Dialysis equipment	Pulmonary ventilators
0-5				
5-10				
10-50				
50-100				
> 100				

67. Please provide a weight estimate of the yearly items sold

Mass (kg)	Radiotherapy equipment	Cardiology equipment	Dialysis equipment	Pulmonary ventilators
0-2500				
2500-5000				
5000-10000				
>10000				
Not applicable				

68. What is the average lifespan of the items?

Years	Radiotherapy equipment	Cardiology equipment	Dialysis equipment	Pulmonary ventilators
1-5				
5-10				
>10				
Not applicable				

69. How often is your stock of these items replenished?

	Radiotherapy equipment	Cardiology equipment	Dialysis equipment	Pulmonary ventilators
never				
after 1 year				
after 1-5 years				
after 5-10 years				
after > 10 years				
Not applicable				

MONITORING AND CONTROL ITEMS

70. Which of the following items does the company or organization distribute or sell?
    - Smoke detector
    - Cooling/heating regulators
    - Thermostats
    - Measuring/weighing

71. Please provide an estimate of the yearly imported units of the items

Units	Smoke detector	Cooling/heating regulators	Thermostats	Measuring/weighing
0-5				
5-10				
10-50				
50-100				
> 100				

72. Please provide a weight estimate of the yearly imported units of the items

Mass (kg)	Smoke detector	Cooling/heating regulators	Thermostats	Measuring/weighing
0-2500				
2500-5000				
5000-10000				
>10000				
Not applicable				

73. Please provide an estimate of the yearly items sold

Units	Smoke detector	Cooling/heating regulators	Thermostats	Measuring/weighing
0-5				
5-10				
10-50				
50-100				
> 100				

74. Please provide a weight estimate of the yearly items sold

Mass (kg)	Smoke detector	Cooling/heating regulators	Thermostats	Measuring/weighing
0-2500				
2500-5000				
5000-10000				
>10000				
Not applicable				

75. What is the average lifespan of the items?

Years	Smoke detector	Cooling/heating regulators	Thermostats	Measuring/weighing
1-5				
5-10				
>10				
Not				

applicable				

76. How often is your stock of these items replenished?

	Smoke detector	Cooling/heating regulators	Thermostats	Measuring/weighing
never				
after 1 year				
after 1-5 years				
after 5-10 years				
after > 10 years				
Not applicable				

AUTOMATIC DISPENSER

77. Which of the following items does the company or organization distribute or sell?
    - Automatic dispensers for hot/cold drinks
    - Automatic dispensers for cold bottles and cans

78. Please provide an estimate of the yearly imported units of the items

Units	Automatic Dispensers	
	Hot/ Cold Drinks	Cold Bottles and Cans
0-5		
5-10		
10-50		
50-100		
> 100		
Not applicable		

79. Please provide a weight estimate of the yearly imported units of the items

Mass (kg)	Automatic Dispensers	
	Hot/ Cold Drinks	Cold Bottles and Cans
0-2500		
2500-5000		
5000-10000		
>10000		
Not applicable		

80. Please provide an estimate of the yearly items sold

Units	Automatic Dispensers	
	Hot/ Cold Drinks	Hot/ Cold Drinks
0-5		
5-10		
10-50		

50-100		
> 100		
Not applicable		

81. Please provide a weight estimate of the yearly items sold

Mass (kg)	Automatic Dispensers	
	Hot/ Cold Drinks	Hot/ Cold Drinks
0-2500		
2500-5000		
5000-10000		
>10000		
Not applicable		

82. What is the average lifespan of the items?

Years	Automatic Dispensers	
	Hot/ Cold Drinks	Hot/ Cold Drinks
1-5		
5-10		
>10		
Not applicable		

83. How often is your stock of these items replenished?

	Automatic Dispensers	
	Hot/ Cold Drinks	Hot/ Cold Drinks
never		
after 1 year		
after 1-5 years		
after 5-10 years		
after > 10 years		
Not applicable		

Appendix 3d: Private Sector (EEE Consumers)

1. In which district(s) do you operate in Suriname?
    - Brokopondo
    - Commewijne
    - Coronie
    - Marowijne
    - Nickerie
    - Para
    - Paramaribo
    - Saramacca
    - Sipaliwini
    - Wanica

2. What is your gender?
    - Male
    - Female
    - Prefer not to say
3. What is your age?
4. Please provide a short description of your occupation (work/student/other)
5. How many people live in your household?
6. Where do you typically buy your EEE?
    - Local store
    - Online
    - Other
7. What is the average lifespan of the following EEE in your household?

	1-5	5-10	> 10	Not applicable
Large items (fridge, AC, washing machines, ventilators)				
Small items (Irons, hairdryers, microwaves. vacuum cleaners, coffee machines, toasters)				
Telecom and IT (phones, mobiles, laptop, printers, scanners)				
Consumers (radio, TV, cameras, recorders)				
Tools (drills, saws, landscape machines)				
Lighting (lamps, bulbs)				
Toys, leisure and sport equipment (electric toys, video games				
Monitor and control (smoke detectors)				
Medical equipment				

Automatic dispenser				

8. How often do you need to replace the following EEE in your household?

	After 1-5 years of use	After 5-10 years of use	After more then 10 years of use	Not applicable
Large items (fridge, AC, washing machines, ventilators)				
Small items (Irons, hairdryers, microwaves. vacuum cleaners, coffee machines, toasters)				
Telecom and IT (phones, mobiles, laptop, printers, scanners)				
Consumers (radio, TV, cameras, recorders)				
Tools (drills, saws, landscape machines)				
Lighting (lamps, bulbs)				
Toys, leisure and sport equipment (electric toys, video games				
Monitor and control (smoke detectors)				
Medical equipment				
Automatic dispenser				

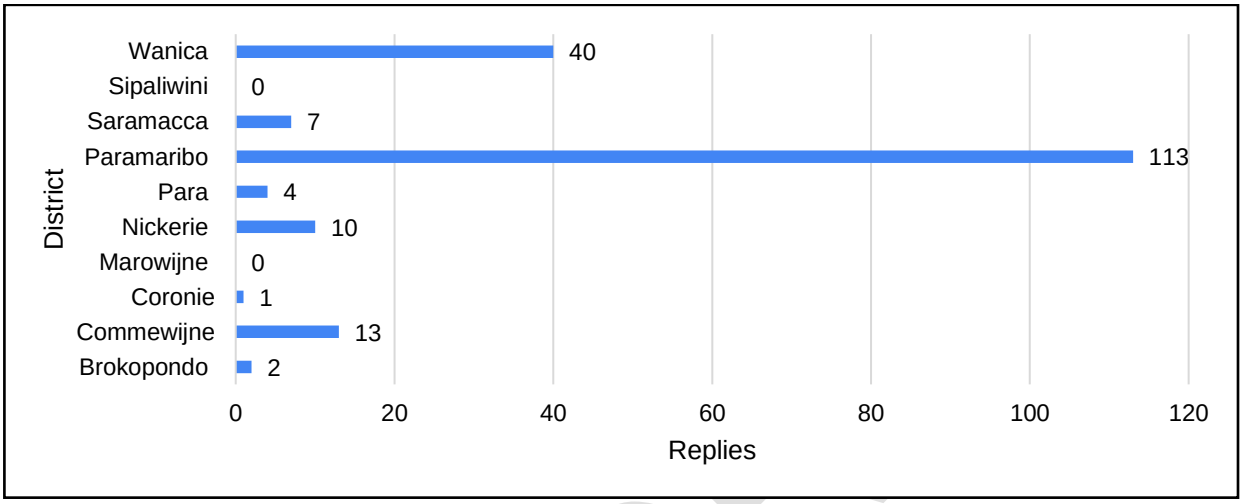
9. How much of the following EEE do you purchase on a yearly basis?

	Purchase once	Purchase 2-4 times	Purchase more than 4 times	Not applicable
Large items (fridge, AC, washing machines, ventilators)				
Small items (Irons, hairdryers, microwaves. vacuum cleaners, coffee machines, toasters)				
Telecom and IT (phones, mobiles, laptop, printers, scanners)				
Consumers (radio, TV, cameras, recorders)				

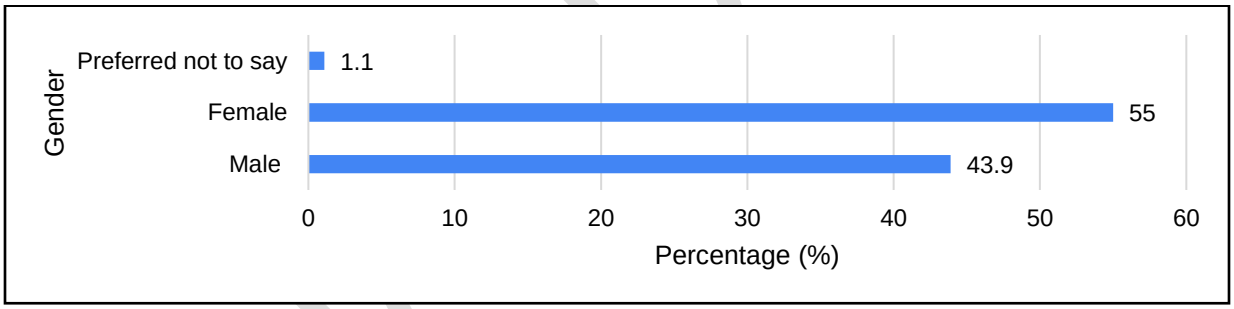
Tools (drills, saws, landscape machines)				
Lighting (lamps, bulbs)				
Toys, leisure and sport equipment (electric toys, video games				
Monitor and control (smoke detectors)				
Medical equipment				
Automatic dispenser				

10. What is the general procedure for EEE at the end of its lifespan in your household?
    - Stored
    - Dumped
    - Sold
    - Returned to originator
    - Repaired
    - Donated
    - Refurbished
    - Recycled
    - Other:
11. If you chose "stored" as an answer for the previous question, proceed to the following question. What are the main reasons for retaining WEEE?
    - Internal parts can be used
    - Belief that WEEE is repairable and can be functional
    - Waiting for collectors to purchase rather than paying for collection
    - Other:
12. Are you aware of any companies who recycle WEEE?
    - Yes
    - No
13. If Yes, which ones?
14. Are you willing to pay for the treatment of WEEE generated by your household? If yes, what are you willing to pay/ what conditions (pickup service, etc.)?
15. Have you ever heard about the Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean (BCRC-Caribbean)?
    - Yes
    - No
16. Do you have any closing remarks or questions about this project?

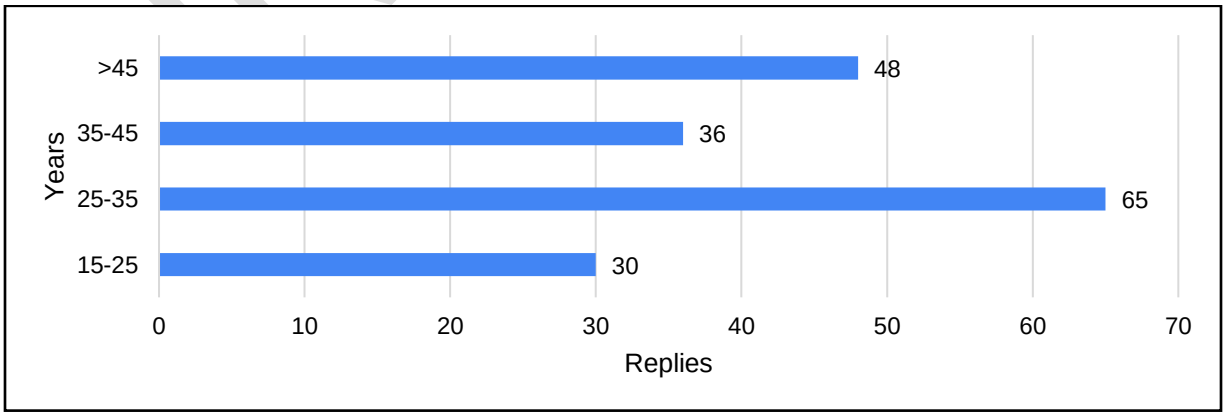
9.4. Appendix 4: Results of the EEE Consumers Questionnaire



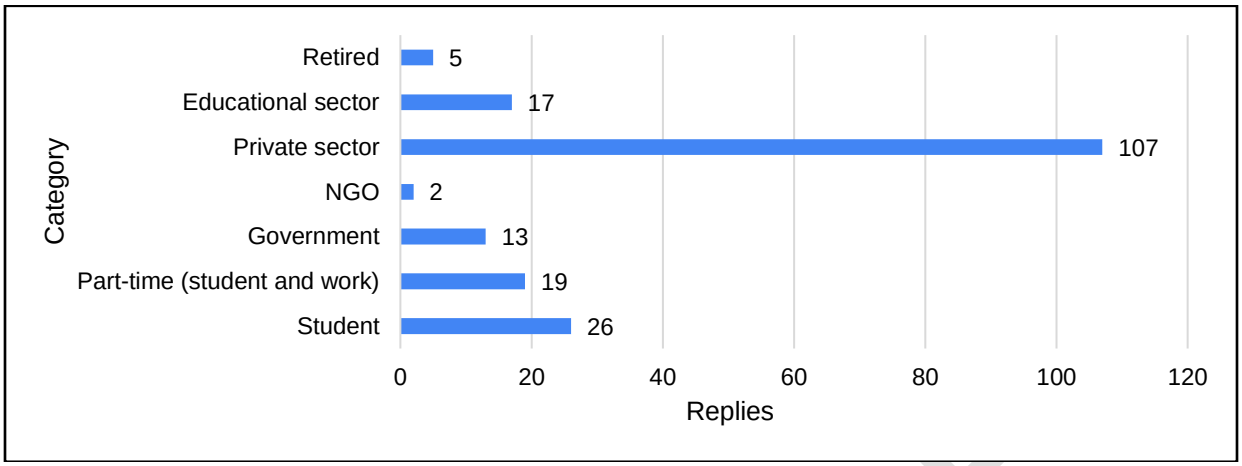
Appendix Figure 9.4-1: Replies from Consumers per District



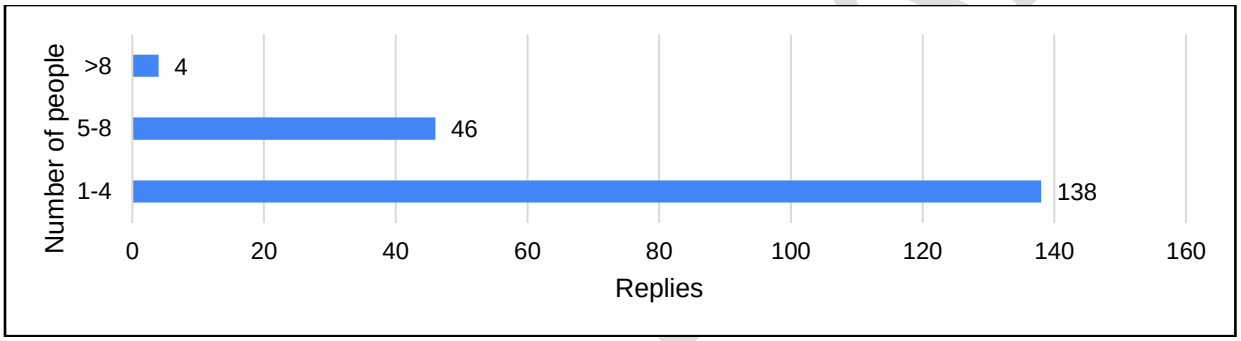
Appendix Figure 9.4-2: Gender Overview of Questionnaire Respondents



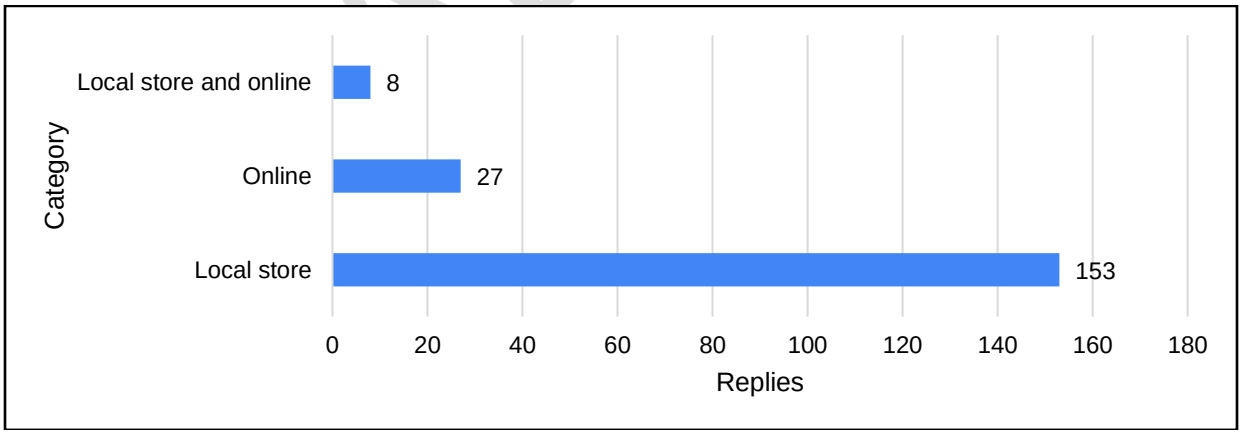
Appendix Figure 9.4-3: Age Range of Questionnaire Respondents



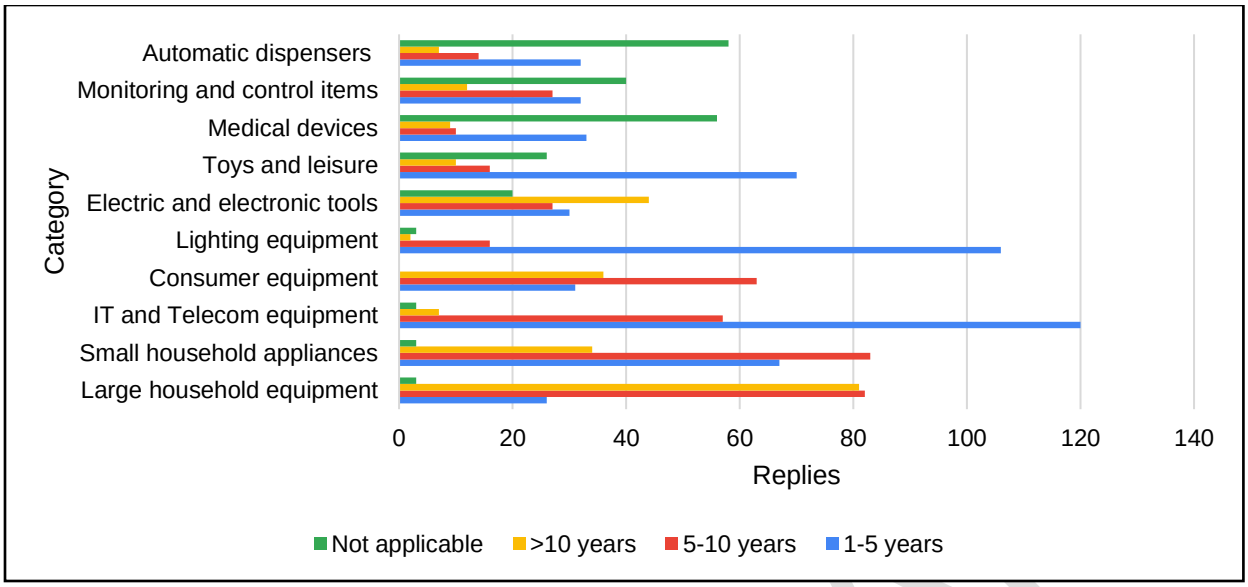
Appendix Figure 9.4-4: Occupation Overview of Questionnaire Respondents



Appendix Figure 9.4-5: Number of Household Members Provided by Questionnaire Respondents



Appendix Figure 9.4-6: Method of EEE Purchase



Appendix Figure 9.4-7: Lifespan of EEE Categories Provided by Questionnaire Respondents

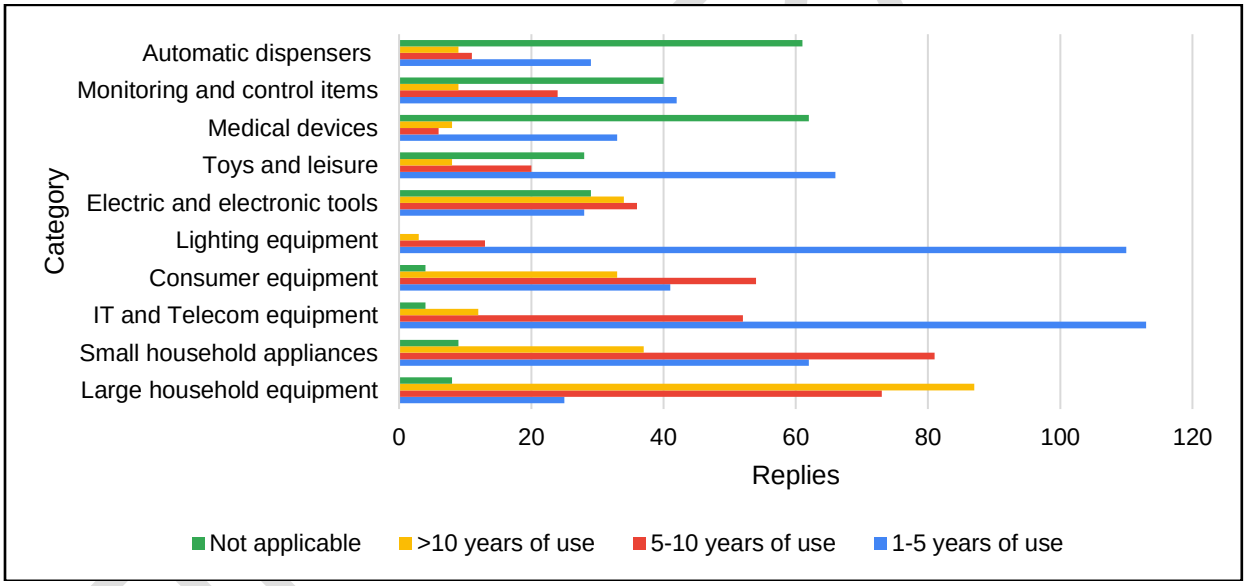
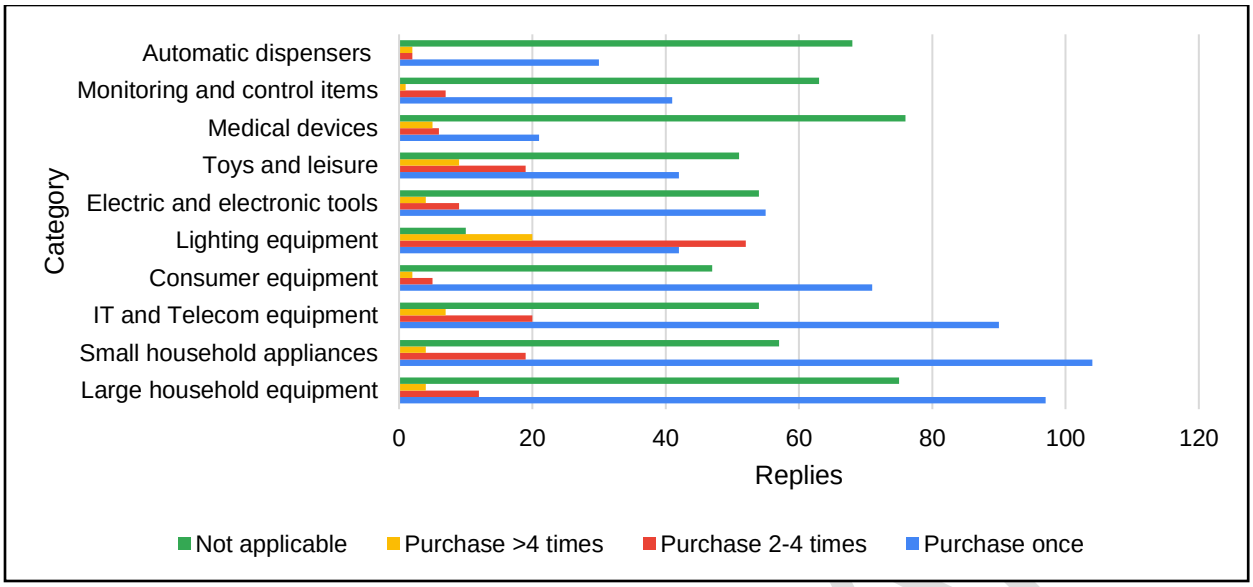
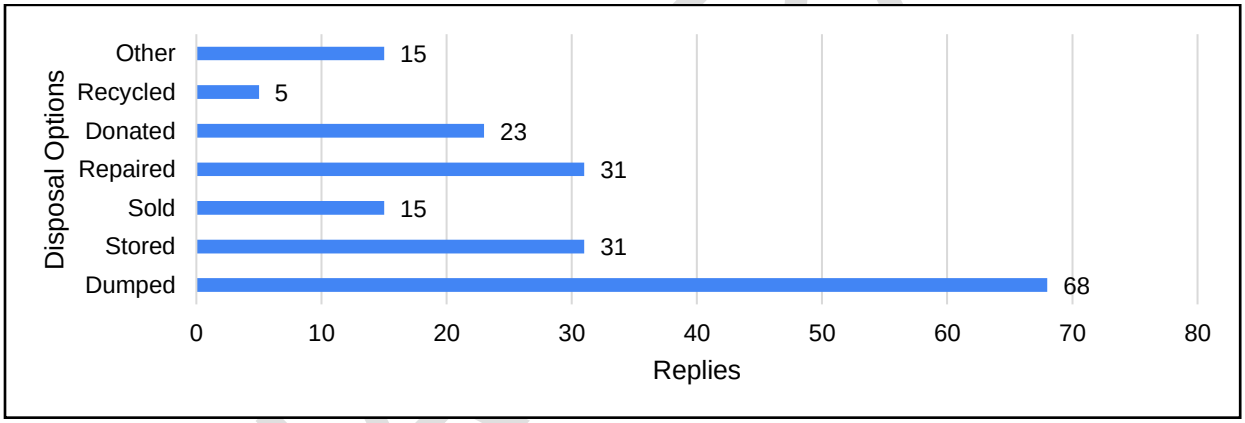


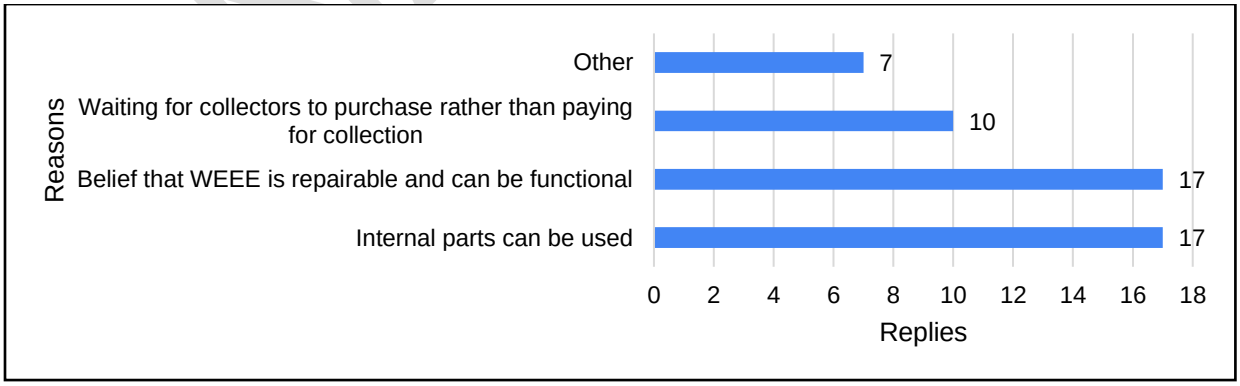
Figure 14: Number of years EEE is Used by Questionnaire Respondents



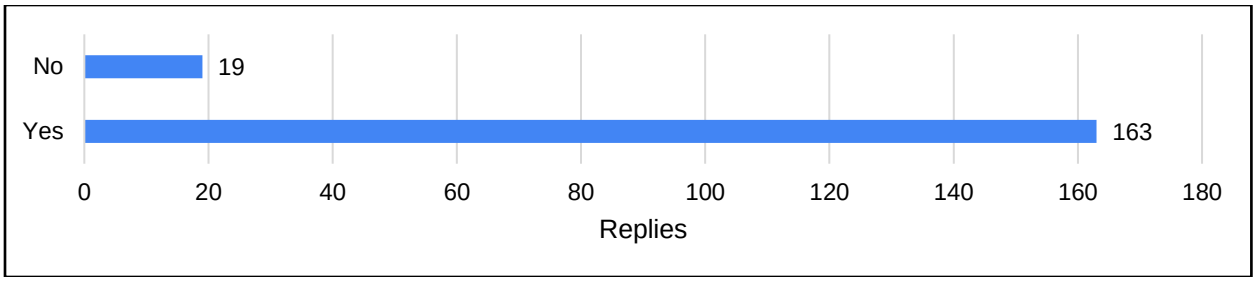
Appendix Figure 9.4-8: Number of EEE Purchases over Time



Appendix Figure 9.4-9:Responses to What Consumers Do with EEE at the End of Its Life



Appendix Figure 9.4-10: Reasons as to Why Consumers Store EEE at the End of its Life



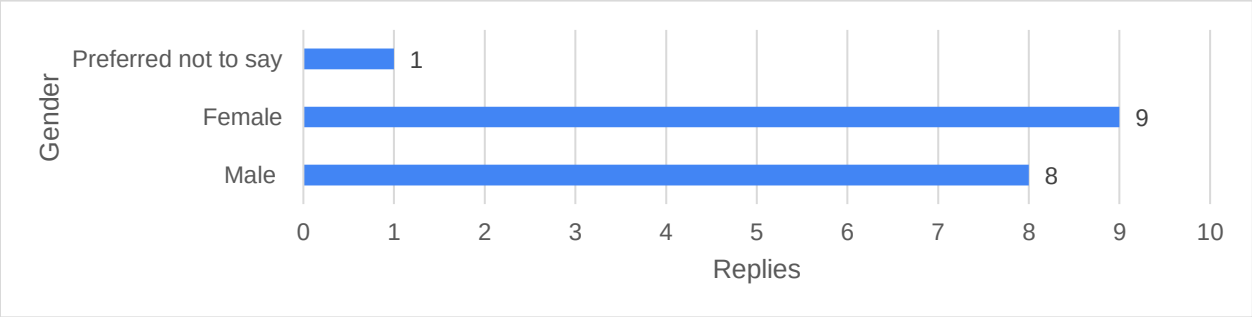
Appendix Figure 9.4-11: Awareness of Recycling Companies in Suriname

9.5. Appendix 5: Overview of EEE Distributors Contacted

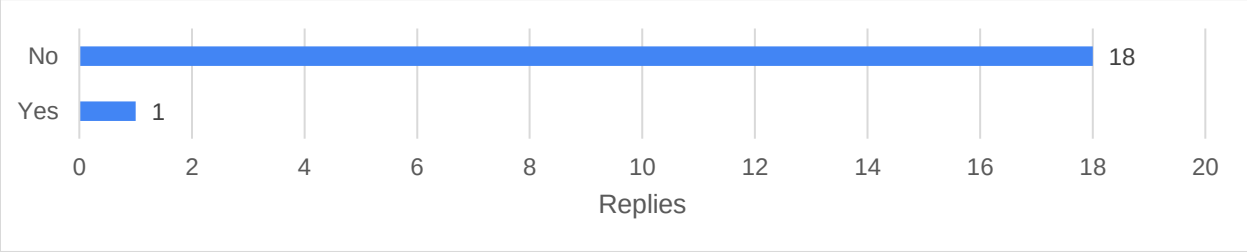
Company	Description	Reply	Website
Devinas N.V	Office supply store	-	https://www.nvdevinas.com/
Surigraphics	Printing and copy company	-	http://surigraphics.com/
Suritech	Electronics store	-	http://www.suritechnv.com/
Flex Phones	Electronics store	-	https://flex-phones.business.site/
Smart Connexxionz	Electronics store	-	https://www.smartconnexxionz.com/
Cell City	Electronics store	-	https://cellcity.sr/
Beta Group	Engineering company	-	https://betagroupnv.com/
Computronics	Electronics store	-	https://www.computronics.sr/
HSDS	Large retail store	-	https://www.hsdsonline.com/nl/
Luckystore	Large retail store	-	https://www.luckystore.com/
Kirpalani	Large retail store	-	https://www.kirpalani.com/en/
Prodimex	Office supply store	-	https://prodimex.net/
Benis group	Lighting store	-	https://benisgroup.com/en/lighting-decor/
Harsons N.V	Electronics retailer	x	https://www.harsons.com/
Shaike group	Lighting store	-	https://www.shaikelights.com/
Alginco	Engineering company	-	https://www.alginco.com/
Building Depot	Large retail store	-	https://buildingdepotsr.com/?v=8cb2010d27e1
Integrated Computer Solutions	ICT company	-	https://www.ics.sr/
Itrendzz	Electronics store	-	http://www.itrendzz.com/
Protrade	Large retail store	-	https://protradeinternationalnv.com/
Archer	ICT company	-	https://www.archer.sr/
VSH United	Large retail store	-	https://vshunited.com/
Telesur	Digital communication partner	-	https://www.telesur.sr/
Digicel	Digital communication partner	-	https://www.digicelgroup.com/sr/du.html
Wanica Technical Center	Large retail store	-	https://www.facebook.com/wanicatechnical.sr/
VK Office Supplies	Office supply	-	https://www.facebook.com/VKOfficeSuppliesNV/

	store		
MN International	Large retail store	-	https://www.mnisuriname.com/
Torarica	Hotel company	x	https://torarica.com/
Nanshe	Large retail store	-	https://nanshe.sr/
Zenobia N.V	Large retail store	-	https://www.facebook.com/ZenobiaNV/
Davinci Group	Group of companies	-	https://davincigroup.sr/home/
Djinipi	Printing and copy company	-	http://www.djinipi.sr/

9.6. Appendix 6: Results from Government and Non-Governmental Sector Questionnaire

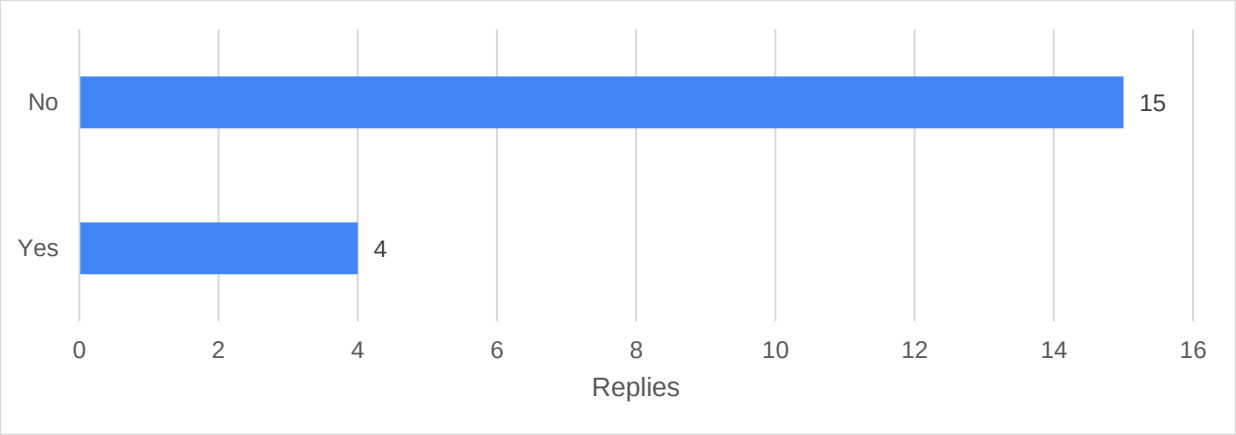


Appendix Figure 9.6-1: Gender Overview of Questionnaire Respondents



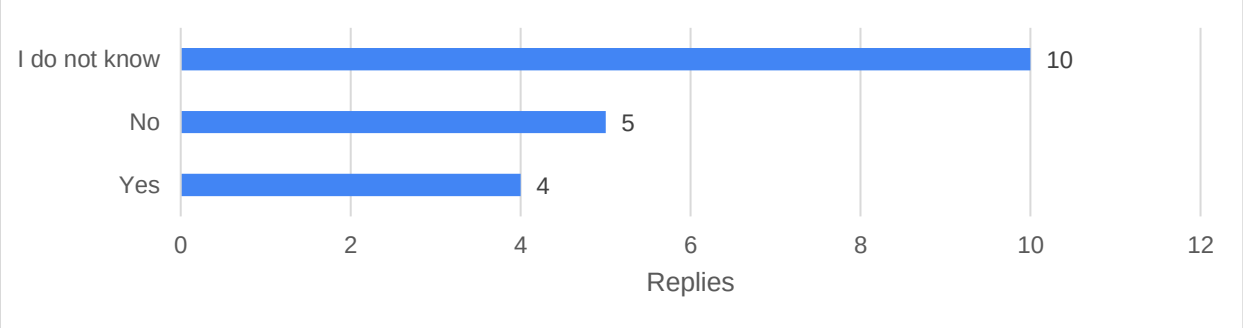
Appendix Figure 9.6-2: Awareness of National Legislative Instruments which Govern the Generation of E-Waste

One (1) respondent included knowledge about the Environmental, Safety and the Mining Act in Suriname.



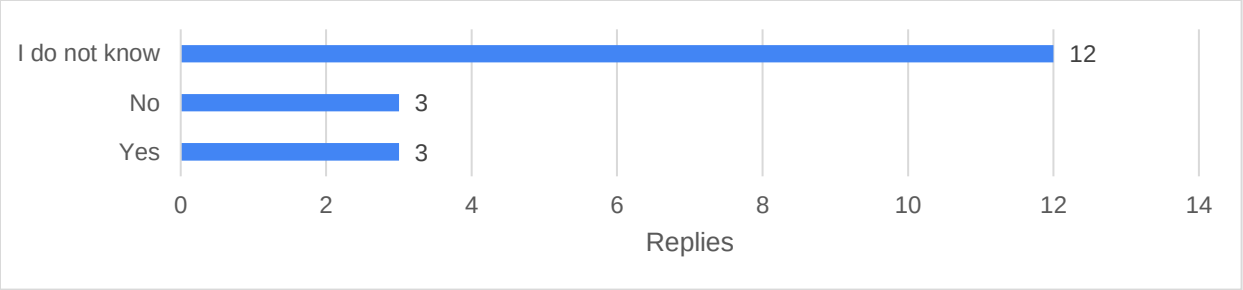
Appendix Figure 9.6-3: Awareness of National Legislative Instruments which Govern the Management of E-Waste

Four (4) stakeholders responded knowing the Ministry of Spatial Planning and Environment, the Environment and Waste Policy, NIMOS, and the Environmental Framework Act (2020) as national entities and legislative instruments that regulate waste management including E-Waste.



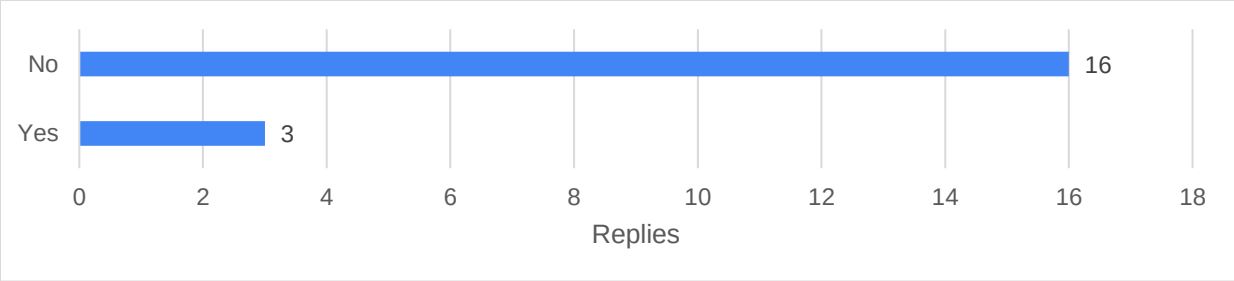
Appendix Figure 9.6-4:Awareness of regional or international guidelines, which are followed by the Government of Suriname in the regulation of E-Waste

Four (4) stakeholders responded knowing the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes (Basel Convention).



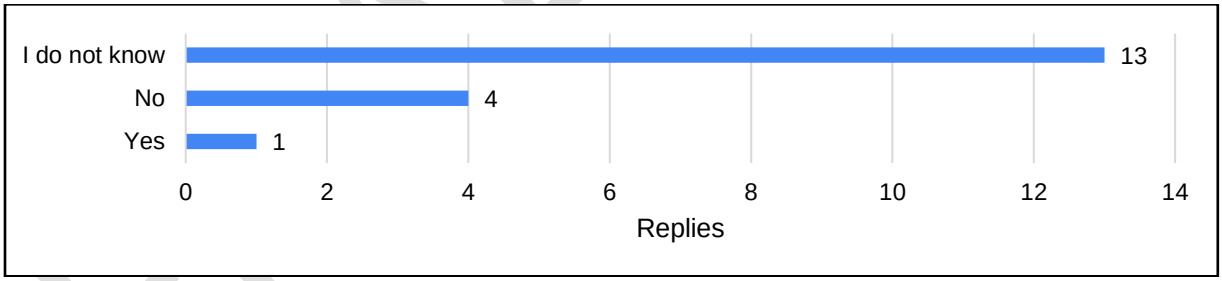
Appendix Figure 9.6-5: Awareness of Regional or International Guidelines, to which the Government Will Refer E-Waste Recyclers in the Private Sector when Asked for Guidance

Three (3) stakeholders responded with the guidelines under the Basel Convention



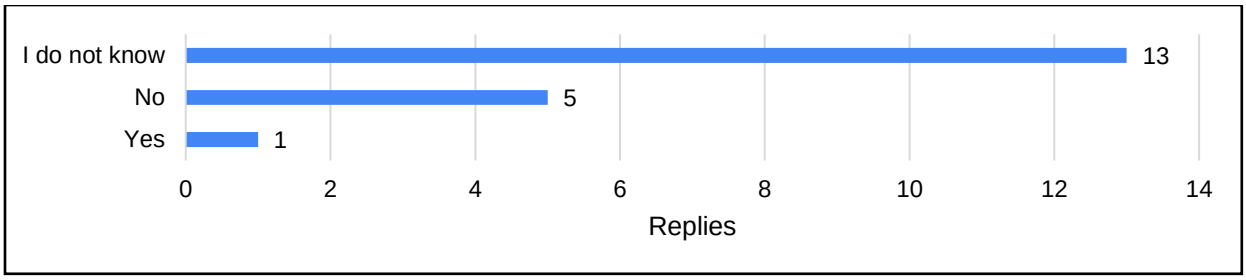
Appendix Figure 9.6-6: Awareness of Recycling Companies

Two (2) responses included knowing the BAP Waste Management Company and one (1) response included nondisclosed information.



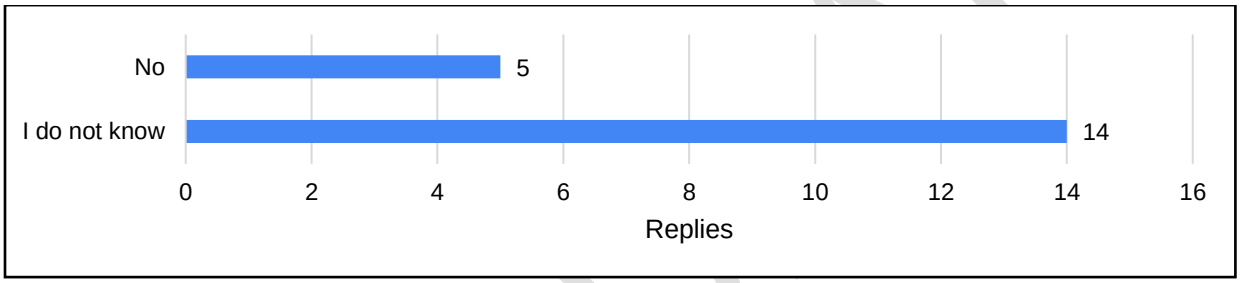
Appendix Figure 9.6-7: Awareness of a National Database of EEE Entering the Country

One (1) response included knowing the General Bureau for Statistics (Algemene Bureau voor Statistiek (ABS)).

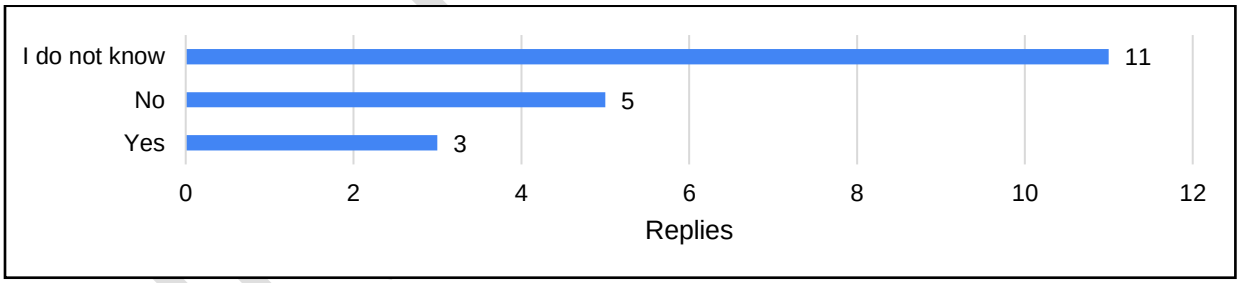


Appendix Figure 9.6-8: Awareness of National Registration System for Persons Who Import, Manufacture and Distribute EEE

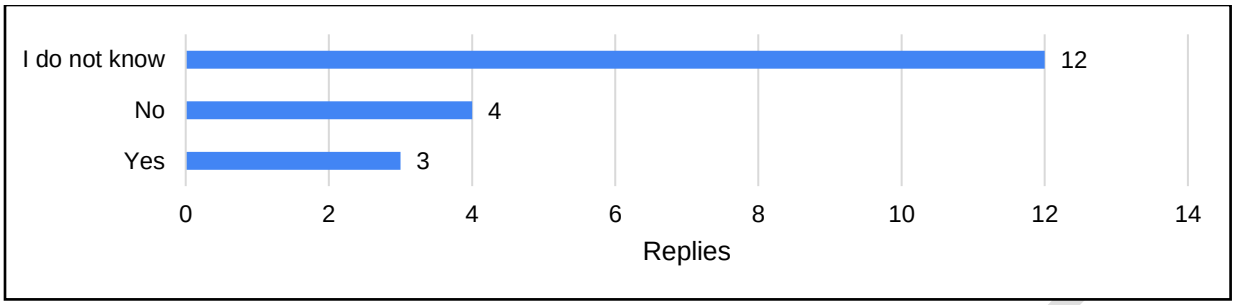
One (1) response included knowing the Ministry of Economic Affairs, Entrepreneurship and Technological Innovation (Ministry of EZ).



Appendix Figure 9.6-9: Awareness of National Registration System for Persons Who Manage E-Waste



Appendix Figure 9.6-10: Awareness of National Records Kept for E-Waste Imported into or Exported from Suriname



Appendix Figure 9.6-11: Awareness of Legislative Prohibitions against the Import, Transit or Export of E-Waste in Suriname

9.7. Appendix 7: HS Codes

In order to streamline the data gathering with the other NPA's from Guyana and Trinidad & Tobago, the UN Comtrade Database was used to get the import and export data of EEE.

HS Codes	Equipment
LARGE HOUSEHOLD APPLIANCES	
841460	Ventilating hoods having a maximum width < 120 cm
841510	Air conditioners window/wall types, self-contained
841581	Air conditioners nes with reverse cycle refrigeration
841582	Air conditioners nes, with refrigerating unit
841583	Air conditioners nes, without refrigerating unit
841821	Refrigerators, household compression type
841822	Refrigerators, household absorption type, electric
841829	Refrigerators, household type, including non-electric
841830	Freezers of the chest type, < 800 litre capacity
841840	Freezers of the upright type, < 900 litre capacity
841850	Refrigerator/freezer chests/cabinets/showcases
841861	Compression refrigeration equipment with heat exchange
841869	Refrigerating or freezing equipment nes
842112	Clothes-dryers, centrifugal
842211	Dish washing machines (domestic)
845011	Automatic washing machines, of a dry capacity < 10 kg
845012	Washing machines nes, capacity <10 kg, built-in drier
845019	Household/laundry-type washing machines <10 kg, nes
845020	Household or laundry-type washing machines, cap >10kg
845110	Dry-cleaning machines
845121	Drying machines, capacity <10 kg, except washer-drier
845129	Drying machines, nes
845130	Ironing machines and presses including fusing presses
851621	Electric storage heating radiators
851629	Electric space heating nes and soil heating apparatus
851650	Microwave ovens
851660	Electric cooking, grilling & roasting equipment nes
SMALL HOUSEHOLD APPLIANCES	
630110	Electric blankets of textile material
841451	Table, window, ceiling fans, electric motor <125 watts
842310	Personal weighing machines, baby & household scales
845210	Household type sewing machines
850930	Domestic kitchen waste disposers
850980	Domestic appliances, with electric motor, nes

HS Codes	Equipment
851640	Electric smoothing irons
910111	Wrist-watch, precious metal, battery, with hands
910112	Wrist-watch, precious metal, battery, opto/electric
910119	Wrist-watch, precious metal, battery, other
910191	Pocket-watch, precious-metal case, battery
910211	Wrist-watch, base-metal case, battery, with hands
910212	Wrist-watch, base-metal case, battery, opto/electric
910219	Wrist-watch, base-metal case, battery, other
910291	Pocket-watch, base-metal case, battery
910310	Clocks with watch movements, battery (except vehicle)
910390	Clocks with watch movements, nes (except vehicle)
910511	Alarm clocks, battery or mains powered
910521	Wall clocks, battery or mains powered
910591	Clocks, nes, battery or mains powered
910700	Time switches
910811	Assembled battery watch movement, mechanical display
910812	Assembled battery watch movement, opto-electric display
910819	Assembled battery watch movement, nes
910820	Watch movements, complete and assembled, auto-winding
910890	Watch movements, complete & assembled (excl. electrically operated), other ...
910911	Clock movements, complete and assembled, battery/alar
910919	Clock movements, complete and assembled, battery nes
850940	Domestic food grinders, mixers, juice extractors
851672	Electric toasters, domestic
851679	Electro-thermic appliances, domestic, nes
851610	Electric instant, storage and immersion water heaters
851671	Electric coffee or tea makers, domestic
850811	Vacuum cleaners, with self-contained electric motor, of a power not > 1,500 W & having a dust bag/other receptacle capacity not > 20 l
850819	Vacuum cleaners, with self-contained electric motor, other than of 8508.11
850860	Other vacuum cleaners, not with self-contained electric motor
850910	Domestic vacuum cleaners
851010	Shavers, with self-contained electric motor
851020	Hair clippers, with self-contained electric motor
851030	Hair-removing appl w/sel
851631	Electric hair dryers
851632	Electro-thermic hairdressing apparatus, nes
851633	Electro-thermic hand drying apparatus
IT AND TELECOMMUNICATION EQUIPMENT	
846900	Typewriters other than printers of heading 84.43; word-processing machines.
846911	Word-processing machines
846912	Automatic typewriters
846920	Typewriters, electric, nes

HS Codes	Equipment
846930	Typewriters, on-electric
847010	Electronic calculators operable with internal power
847021	Electronic calculators, printing, external power
847029	Electronic calculators, non-printing, external power
847110	Analogue or hybrid computers
847170	Storage units
847180	Units of auto data processing
847190	Automatic data processing
854389	Electrical machines and
847141	Dig auto data proc w/cpu
847149	Dig auto data proc units
847150	Digital process units wh
847130	Portable digital data pr
844331	Machines which perform two/more of the functions of printing, copying/facsimile transmission, capable of connecting to an automatic data processing machine/to a network
844332	Other printers, copying machines & facsimile machines, whether/not combined, exclude the ones which perform two/more of the functions of printing, copying/facsimile transmission; capable of connecting to an automatic data processing machine/to a network
851721	Facsimiles machines
851722	Teleprinters
851711	Line telephone sets, cord
851718	Other telephone sets, incl. telephones for cellular networks/for other wireless networks, other than 8517.11 & 8517.12
851719	Telephone sets, nes
851730	Telephonic or telegraphic switching apparatus
851750	Apparatus for carrier-cu
851769	Other apparatus for transmission/reception of voice, images/other data, incl. apparatus for communication in a wired/wireless network (such as a local/wide area network), other than 8517.61 & 8517.62
851780	Elect apparatus for line
852020	Telephone answering machines
852790	Radio reception apparatus nes
903040	Gain, /distortion and crosstalk meters, etc.
851712	Telephones for cellular networks/for other wireless networks, other than Line telephone sets with cordless handsets
851761	Base stations for transmission/reception of voice, images/other data, incl. apparatus for communication in a wired/wireless network (such as a local/wide area network)
851950	Telephone answering machines
852520	Transmit-receive apparatus for radio, TV, etc.
844312	Sheet fed, office offset printers, sheet < 22x36 cm

HS Codes	Equipment
844339	Other printers, copying machines & facsimile machines, whether/not combined, excl. 8443.31 & 8443.32
847040	Accounting machines
847050	Cash registers
847090	Postage franking, ticket-issuing machines, etc.
900911	Electrostatic photo-copiers, direct process
900912	Electrostatic photo-copiers, indirect process
900921	Photo-copying equipment with an optical system, nes
900922	Contact type photo-copying apparatus, nes
900930	Thermo-copying apparatus
852821	Colour video monitors
852822	B & w video monitors
852841	Cathode-ray tube monitors, of a kind solely/principally used in an automatic data processing system of heading 84.71
852851	Other cathode-ray tube monitors, not of a kind solely/principally used in an automatic data processing system of heading 84.71
852859	Other monitors, of a kind solely/principally used in an automatic data processing system of heading 84.71
853120	Other monitors, not of a kind solely/principally used in an automatic data processing system of heading 84.71
852851	Indicator panels incorporating electronic displays
CONSUMER EQUIPMENT	
847210	Office duplicating machines
847230	Machinery for processing mail of all kinds
847290	Office machines, nes
851762	Machines for the reception, conversion & transmission/regeneration of voice, images/other data, incl. switching & routing apparatus
851810	Microphones and stands thereof
851821	Single loudspeakers, mounted in enclosure
851822	Multiple loudspeakers, mounted in single enclosure
851830	Headphones, earphones, combinations
851840	Audio-frequency electric amplifiers
851850	Electric sound amplifier sets
851910	Coin or disc-operated record-players
851920	Apparatus operated by coins, banknotes, bank cards, tokens/by other means of payment
851921	Record-players without built-in loudspeaker, nes
851929	Record-players with loudspeakers, nes
851930	Turntables (record-decks)
851931	Turntables with automatic record changing mechanism
851939	Turntables, without record changers
851940	Transcribing machines
851981	Other sound recording/reproducing apparatus, using magnetic,

HS Codes	Equipment
	optical/semiconductor media, other than 8519.20, 8519.30, 8519.50
851989	Other sound recording/reproducing apparatus, other n.e.s. in Ch. 85.19
851992	Pocket-size cassette-player
851993	Sound repressing app, cassette
851999	Sound reproducing apparatus, non-recording, nes
852010	Dictating machine requiring external power source
852032	Magnetic tape rec digital
852033	Magnetic tape rec cassette
852039	Non-cassette audio tape recorders, sound reproducing
852090	Audio recording equipment without sound reproduction
852110	Video recording/reproducing apparatus, magnetic tape
852190	Video record/reproduction apparatus not magnetic tape
852530	Television cameras
852540	Still image video camara
852560	Transmission apparatus for radio-broadcasting/television incorporating reception apparatus
852580	Television cameras, digital cameras & video camera recorders
852712	Pocket-size radio-cassette
852713	Radio apparatus w/sound
852719	Radio receivers, portable, non-recording
852721	Radio receivers, external power, sound reproduce/record
852729	Radio receivers, external power, not sound reproducer
852731	Radio-telephony receiver, with sound reproduce/record
852732	Radio-telephony etc., receivers, nes
852739	Radio-broadcast receivers nes
852791	Other reception apparatus for radio-broadcasting, combined with sound recording/reproducing apparatus.
852792	Other reception apparatus for radio-broadcasting, not combined with sound recording/reproducing apparatus but combined with a clock.
852799	Other reception apparatus for radio-broadcasting, excl. 8527.91 & 8527.92
852812	Colour television receive
852813	B & W television receive
852830	Video projectors
852861	Projectors, of a kind solely/principally used in an automatic data processing system of heading 84.71
852869	Projectors, not of a kind solely/principally used in an automatic data processing system of heading 84.71
852871	Reception apparatus for television, Not designed to incorporate a video display/screen
852872	Other colour reception apparatus for television, whether/not incorporating radio-broadcast receivers/sound/video recording/reproducing apparatus,
852873	Other reception apparatus for television, whether/not incorporating radio-broadcast receivers/sound/video recording/reproducing apparatus, black &

HS Codes	Equipment
	white/other monochrome.
900661	Photographic discharge lamp flashlight apparatus
900669	Photographic flashlight apparatus, nes
900711	Cinematographic cameras for film <16mm wide
900719	Cinematographic cameras for film >16mm wide
900720	Cinematographic projector
900810	Slide projectors
900830	Image projectors, except slide/microform
900840	Photographic enlargers and reducers, other than cine
901010	Equipment for automatic development of photo film
901050	App & equip for ph labour
901060	Projection screens
903130	Profile projectors, nes
903149	Optical instruments
LIGHTING EQUIPMENT	
851210	Lighting/signalling equipment as used on bicycles
851310	Portable battery and magneto-electric lamps
853931	Fluorescent lamps, hot cathode
853932	Mercury or sodium vapour
853939	Discharge lamps, other than ultra-violet lamps, nes
853941	Arc-lamps
853949	Ultra-violet or infra-re
940510	Chandeliers, other electric ceiling or wall lights
940520	Electric table, desk, bedside and floor lamps
940530	Lighting sets of a kind used for Christmas trees
940540	Electric lamps, lighting fittings, nes
ELECTRONIC AND ELECTRICAL TOOLS	
843311	Mowers, powered, lawn, with horizontal cutting device
843319	Mowers, powered, lawn, nes
846721	Drills of all kinds, for working in the hand, with self-contained elec. mot ...
846722	Saws for working in the hand, with self-contained elec. motor
846729	Tools for working in the hand, with self-contained elec. motor (excl. drill ...
850810	Drills, hand-held, with self-contained electric motor
850820	Saws, hand-held, with self-contained electric motor
850880	Tools, hand-held, with electric motor, not drills/saw
850920	Domestic floor polishers
851511	Electric soldering irons and guns
851519	Electric brazing, soldering machines and apparatus ne
851521	Electric resistance welding equipment, automatic
851529	Electric resistance welding equipment, non-automatic
851531	Automatic electric plasma, other arc welding equipment
TOYS, LEISURE AND SPORTS EQUIPMENT	
920710	Keyboard instruments electrical/requiring amplifier

HS Codes	Equipment
920790	Musical instruments nes, electric/requiring amplifier
950300	Tricycles, scooters, pedal cars & similar wheeled toys; dolls' carriages; dolls; other toys; reduced size
950310	Electric trains, train sets, etc.
950350	Toy musical instruments, apparatus
950410	Video games used with a television receiver
950490	Articles for funfair, table and parlour games, nes
MEDICAL EQUIPMENT	
902140	Hearing aids, except parts and accessories
901811	Electro-cardiographs
901812	Ultrasonic scanning appr
901813	Magnetic resonance image
901814	Scintigraphic apparatus
901819	Electro-diagnostic apparatus, nes
901841	Dental drill engines
MONITORING AND CONTROL INSTRUMENTS	
853110	Burglar or fire alarms and similar apparatus
853180	Electric sound or visual signalling apparatus, nes
854340	Electric fence energiser
854370	Other machines & apparatus for electrical machines & apparatus, other than machines & apparatus for electroplating/ electrolysis/electrophoresis/signal generators/particle accelerators.
901730	Micrometres, callipers and gauges
902480	Machines for testing mechanical properties nes
902519	Thermometers, except liquid filled
902580	Hydrometer, pyrometer, hygrometer, alone or combined
902610	Equipment to measure or check liquid flow or level
902620	Equipment to measure or check pressure
902680	Equipment to measure, check gas/liquid properties nes
902710	Gas/smoke analysis apparatus
902780	Equipment for physical or chemical analysis, nes
903020	Cathode-ray oscilloscopes, oscillographs
903033	Other instruments & apparatus, for measuring/checking voltage, current, resistance/power, without a recording device, other than 9030.31 & 9030.32,
903039	Ammeters, voltmeters, ohm meters, etc., non-recording
903089	Electrical measurement instruments nes
903180	Measuring or checking equipment, nes
903210	Thermostats
901510	Rangefinders
901520	Theodolites and tacheometers
901530	Surveying levels
901540	Photogrammetrical surveying instruments, appliances
901580	Surveying, etc., instruments nes

HS Codes	Equipment
AUTOMATIC DISPENSERS	
847629	Automatic bev-vending machine
847689	Automatic vending machine
847621	Automatic bev-vend m heat/refr
847681	Automatic vending mach h/refr

9.8. Appendix 8: GS Codes from the ABS

The following GS Codes for EEE were provided by the ABS.

GS Code	Equipment Description
LARGE HOUSEHOLD APPLIANCES	
84151000	Of the type which is fixed to walls or windows, and which consists of a single unit or of the type, split system' (systems with separate elements)
84158100	Equipped with a refrigeration device and fitted with a valve for reversing its operation (reversible heat pumps)
84158200	Others, fitted with a cooling device
84158300	Not equipped with a cooling device
84159000	Parts
84181010	frost-free, electrical
84181020	Other, electrical
84182110	frost-free, electrical
84182120	Other, electrical
84182910	Electrical
84183000	freezers with a capacity of not more than 800 l
84184000	freezers with a capacity of not more than 900 l
84185000	Other chests, cupboards, display cases, counters and similar refrigerated or freezer cabinets
84186100	Compression machines whose condenser consists of a heat exchanger
84186900	Other
84189100	Furniture designed to be provided with a refrigeration equipment
84189900	Other
SMALL HOUSEHOLD APPLIANCES	
85161010	Electric geysers and others
85162900	Other
85163100	Hairdryer devices
85163200	Other devices for hair care
85163300	Hand drying equipment
85164000	Electric irons
85165000	Microwave ovens
85166010	Kitchen stoves
85166090	Other
85167100	Coffee and tea makers
85167200	Toasters
85167900	Other
IT AND TELECOMMUNICATION EQUIPMENT	
85168000	Heating elements (heating resistors)
85169000	Parts
85171100	Line telephones with portable wireless

85171210	Portable telephones
85171290	Other
85171800	Other
85176200	Other devices to send and receive
85176900	Other
85177000	Other
CONSUMER EQUIPMENT	
85181000	Microphones and stands therefor
85182100	Cabinets with one speaker
85182200	Cabinets with more than one speaker
85182900	Other
85183000	Headphones and earphones, whether or not
85184000	Electrical audio frequency booster
85185000	Electrical sound boosters
85189000	Parts
85193000	Record players
85198140	Magnet bands
85198190	-
85198900	Other
85211000	Working with magnet bands
85219000	Other
85229000	Other
85232110	On which is not recorded
85232190	Recorded on
85232990	Other
85234010	Discs (plates) and other carriers
85234030	Other discs (plates)
85234040	compact disks voor geluid
85234050	Other compact disks
85234060	Digital Versatile Discs (dvd's)
85234070	Digital Versatile Discs (dvd's)
85234090	Other
85235110	USB Flash drive
85235120	Flash memory cards
85235130	Other, on which is not
85235170	Other, on which is recorded
85235200	Intelligent cards
85235900	Other
85238010	Other, on which is not
85238090	Other, on which is recorded
85255000	Transmitting devices
85256000	Transmitters with built-in receiver
85258000	Television cameras, digital cameras and video camera recorders
ELECTRONIC AND ELECTRICAL TOOLS	
84152000	Of a kind used for the comfort of persons in motor vehicles

85271300	Other devices combined with a sound recording or reproducing device
85271900	Other
85272100	Combined with a sound recording or reproducing device
85272900	Other
85279900	Other
85284100	Of a kind used solely or principally in an automatic data-processing system
85284900	Other
85285100	Of a kind used exclusively or mainly
MONITORING AND CONTROL INSTRUMENTS	
85285910	Monitors with a built-in receiver
85285990	Other
85286100	Of a kind used exclusively or mainly
85286900	Other
85287100	Not designed to operate a display
85287200	Other, for colour rendering
85287300	Other, for monochrome display (black and white)
85291000	Antennas and antenna reflectors of all kinds; parts suitable for use with these articles
85299000	Other

9.9. Appendix 9: Landfill Sites in Suriname

Appendix Figure 9.9-1: Entrance Road (Landfill Site North of Paramaribo)

Appendix Figure 9.9-2: Entrance Road (Landfill Site North of Paramaribo)

Appendix Figure 9.9-3: E-Waste at the Landfill Site Near Charles Burg

Appendix Figure 9.9-4: Entrance Road (Landfill Site North of Paramaribo)

Appendix Figure 9.9-5: E-Waste at the Landfill Site Near Charles Burg

Appendix Figure 9.9-6: Entrance Road (Landfill Site Ornamibo)

Appendix Figure 9.9-7: E-Waste at the Landfill Site Ornamibo

Appendix Figure 9.9-8: Waste at the Landfill Site Ornamibo

Appendix Figure 9.9-9: Entrance Road (Landfill Site for Sipaliwini)

Appendix Figure 9.9-10: Waste at The Landfill Site Sipaliwini (Located in Brokopondo)

Appendix Figure 9.9-11: E-Waste Near the Road to the Landfill Site Sipaliwini (Located in Brokopondo)

Appendix Figure 9.9-12: E-Waste Put on the Curb to Transport to the Landfill Site Sipaliwini (Located in Brokopondo)

Appendix Figure 9.9-13:Entrance Road (Landfill Site Brokopondo)

Appendix Figure 9.9-14: Waste at the Landfill Site Brokopondo

Appendix Figure 9.9-15: E-Waste at the Landfill Site in Brokopondo

Appendix Figure 9.9-16: Entrance Road (Landfill Site Marowijne)

Appendix Figure 9.9-17: E-Waste at the Landfill Site in Marowijne

Appendix Figure 9.9-18: Entrance Road (Landfill Site Albina)

Appendix Figure 9.9-19: E-Waste at Landfill Site Albina

Appendix Figure 9.9-20: E-Waste at Landfill Site Albina

Appendix Figure 9.9-21: Entrance Road (Landfill Site Coronie)

Appendix Figure 9.9-22: Potential E-Waste at Landfill Site Coronie

Appendix Figure 9.9-23: Waste at landfill Site Coronie

Appendix Figure 9.9-24: Waste Burned at Landfill Site Coronie

Appendix Figure 9.9-25: Entrance Road (First Landfill Site Nickerie)

Appendix Figure 9.9-26: Waste at First Landfill Site Nickerie

Appendix Figure 9.9-27: E-Waste at First Landfill Site Nickerie

Appendix Figure 9.9-28: Entrance Road (Second Landfill Site Nickerie)

Appendix Figure 9.9-29: Waste at Second Landfill Site Nickerie

Appendix Figure 9.9-30: Potential E-Waste at Second Landfill Site Nickerie

Appendix Figure 9.9-31: Waste Road at Second Landfill Site Nickerie

Appendix Figure 9.9-32: Waste being Crushed at Second Landfill Site

9.10. Appendix 10: UN Comtrade and ABS Import, Export Data and Calculations for POM and EWG

Attached as a separate document to the assessment report.

9.11. Appendix 11: Suriname Economic Model

Attached as a separate document to the assessment report.

10. Annexes

The following are attached as annexes to this report:

10.1. Annex 1: E-Waste Legal and Institutional Capacity Assessment Report for E-Waste Management in Suriname

10.2. Annex 2: Legal Recommendations and Considerations Associated with the Establishment of a Sub-Regional E-waste Management Solution