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REGIONAL E-WASTE MONITOR

for Latin-America, results for the 13 countries
participating in project UNIDO-GEF 5554

— 2022



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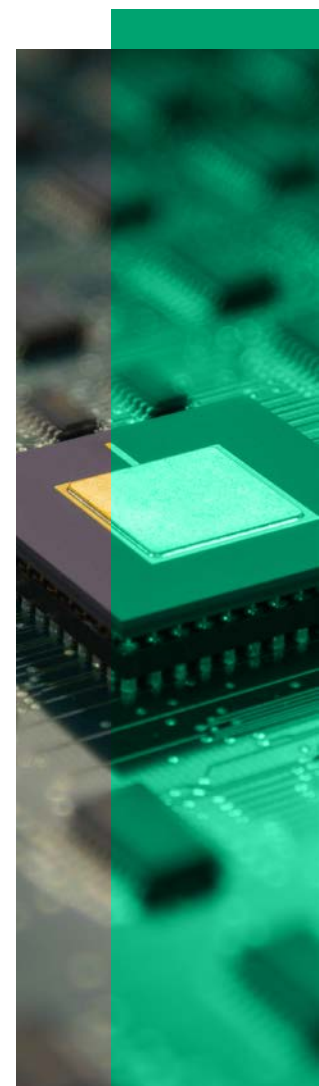


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The SCYCLE Programme, now in transition from UNU to UNITAR, envisions enabling societies to reduce the environmental load from production, use, and disposal of ubiquitous goods, especially EEE, to sustainable levels by means of independent, comprehensive, and practical research and training, providing more thorough fact bases for policy development and decision-making. SCYCLE leads the global e-waste research and related trainings, and advances sustainable e-waste management strategies based on life-cycle thinking. For detailed information on SCYCLE and its projects, including its research and training activities, visit www.scycle.info.

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TABLE OF CONTENTS

LIST OF FIGURES & TABLES	8
EXECUTIVE SUMMARY	10
ABBREVIATIONS	14
1. INTRODUCTION	16
A. What is E-waste?	16
B. E-waste: An International Issue	18
C. POP Management: An International Issue	20
D. Framework Condition for the LATAM Countries	22
E. Background to the Report	25
2. METHODOLOGY	26
A. E-waste Statistics	26
B. E-waste Plastics and BFR Statistics	30
C. E-waste and POP Policy and Management Assessment	30
D. Data Sources	36
3. OVERVIEW OF THE E-WASTE AND POP LEGISLATION AND MANAGEMENT SYSTEMS	38
A. Status of E-waste and POP Legislation	38
B. International Agreements	40
C. Mapping of Key Stakeholders	42
D. Projects and Campaigns for E-waste Collection and Recycling	46
4. STATISTICAL OVERVIEW ON E-WASTE AND POPS CONTAINED IN E-WASTE PLASTICS FOR THE LATAM COUNTRIES	48
A. EEE POM and E-waste Generated	48
B. E-waste Categories	51
C. Plastic and BFR Content in EEE POM and in E-waste Generated	52
D. Environmentally Sound Management of E-waste and POPS from E-waste Plastic	54
5. TRANSBOUNDARY MOVEMENTS (TBM) OF E-WASTE IN THE REGION	56
A. Overview of Transboundary Movement (TBM)	56
B. Overview of E-waste and Plastic POPS' Impact on Import and Export Legislation/Policies	57

C. Overview of E-waste Importing and Exporting Quantities	58
D. Issues and Impact of Import/Exports of E-waste	60
6. E-WASTE AND POP MANAGEMENT ASSESSMENT	62
A. E-waste Management Assessment	62
B. POPs Contained in E-waste Plastic Management Assessment	64
7. COMMON ISSUES AND CHALLENGES	66
8. RECOMMENDATIONS	72
9. COUNTRY PROFILES	80
Argentina	82
Bolivia (Plurinational State of)	94
Chile	104
Costa Rica	120
Ecuador	134
El Salvador	144
Guatemala	156
Honduras	164
Nicaragua	180
Panama	190
Peru	204
Uruguay	222
Venezuela (Bolivarian Republic of)	234
10. REFERENCES	244
11. ANNEXES	260
A. UNU-KEYs and Six E-waste Categories	260
B. Mathematical equations	262
C. List of Waste and Substances under the Basel Convention That are Relevant for E-waste	263
D. E-waste Statistics and Management Assessment Scores Per Countries	265
E. EEE and E-waste Plastic BFR Statistics and Management Assessment Scores per Countries	267
12. ABOUT THE AUTHORS	270














LIST OF FIGURES & TABLES

FIGURE	PAGE	FIGURE	PAGE
1. Demographic overview of the region	23	20. EEE POM and e-waste generated in Costa Rica	125
2. Economic overview of the region	24	21. Share of the EU-6 categories in the EEE (2019)	126
3. E-waste statistics framework	26	22. Share of the EU-6 categories in the e-waste generated (2019)	127
4. Examples of product lifespans of EEE	27	23. EEE POM and e-waste generated in Ecuador	138
5. EEE POM and e-waste generated in the region (kt) for 2010- 2019	49	24. Share of the EU-6 categories in the EEE (2019)	139
6. EEE POM and e-waste generated in the region (USD/inh) for 2019	50	25. Share of the EU-6 categories in the e-waste generated (2019)	140
7. E-waste generated disaggregated to category and year-to-year e-waste growth rate in the region	51	26. EEE POM and e-waste generated in El Salvador	147
8. EEE POM plastics and e-waste plastics generated and yearly growth rate of e-waste plastics generated in the region	52	27. Share of the categories in the EEE (2019)	148
9. BFR in plastics EEE POM and e-waste generated for 2010-2019, and e-waste generated of BFR from plastic disaggregated to category in the region for 2019	53	28. Share of the categories in the e-waste generated (2019)	149
10. E-waste formally collected for ESM (kg/inh) and e-waste collection rate for 2019	55	29. EEE POM and e-waste generated in Guatemala	159
11. EEE POM and e-waste generated in Argentina	87	30. Share of categories in EEE POM (2019)	160
12. Share of EEE categories (2019)	88	31. Share of categories in e-waste generated (2019)	161
13. Share of the categories of e-waste generated (2019)	89	32. EEE POM and e-waste generated in Honduras	168
14. EEE POM and e-waste generated in Bolivia (Plurinational State of)	99	33. Share of the EU-6 categories in the EEE (2019)	169
15. Share of the EU-6 categories in the EEE (2019)	100	34. Share of the EU-6 categories in e-waste generated (2019)	170
16. Share of the EU-6 categories in the e-waste generated (2019)	101	35. EEE POM and e-waste generated in Nicaragua	183
17. EEE POM and e-waste generated in Chile	109	36. Share of categories in EEE POM (2019)	184
18. Share of the EEE categories (2019)	111	37. Share of categories in e-waste generated (2019)	185
19. Share of the categories in e-waste generated (2019)	112	38. EEE POM and e-waste generated in Panama	194
		39. Share of the EU-6 categories in the EEE (2019)	195
		40. Share of the EU-6 categories in the e-waste generated (2019)	196
		41. EEE POM and e-waste generated in Peru	213

FIGURE	PAGE
42. Share of the EU-6 categories in the EEE (2019)	214
43. Share of the EU-6 categories in the e-waste generated (2019)	215
44. EEE POM and e-waste generated in Uruguay	227
45. Share of the EU-6 categories in the EEE (2019)	228
46. Share of the EU-6 categories in the e-waste generated (2019)	229
47. EEE POM and e-waste generated in Venezuela (Bolivarian Republic of)	238
48. Share of the EU-6 categories in the EEE (2019)	239
49. Share of the EU-6 categories in the e-waste generated (2019)	239

TABLE	PAGE
8. Dashboard of POPs in e-waste management systems and performance. The reference year is 2019 for all countries	64
9. The parameter of Alpha and Beta developed by CEGIRE that the Ministry of Health and UNU/UNITAR used to calculate e-waste generation in Costa Rica	128
10. Collection target per year	211
11. Authorised e-waste operators (18.05.2021), sources MINAM 2021	217

TABLE	PAGE
1. Features of the e-waste system matrix in various stages of development, adapted from	31
2. Overview of indicators in the e-waste management system and minimum level for each stage	33
3. Overview of indicators of the POPs contained in e-waste plastics management system and minimum level for each stage	35
4. Presence of e-waste-specific legislation, EPR, & EHS standards on e-waste management and POP regulation	39
5. Overview of the status of party and signatory countries of international agreements	41
6. E-waste export/import by the LATAM countries	59
7. Dashboard of e-waste management system and performance. All reference years for the countries analysed are 2019, with the exception of Ecuador. Data for EU-27 is for 2019 as well	63

	Argentina		Honduras
	Bolivia (Plurinational State of)		Nicaragua
	Chile		Panama
	Costa Rica		Peru
	Ecuador		Uruguay
	El Salvador		Venezuela (Bolivarian Republic of)
	Guatemala		

EXECUTIVE SUMMARY

E-waste constitutes one of the fastest-growing streams of physical waste in today's global environment and is a threat to sustainable development. Data on e-waste is required in order to evaluate developments over time, delineate national and international policies, limit e-waste generation, prevent illegal dumping, promote recycling, and create jobs in the recycling sectors. However, few countries collect internationally comparable e-waste statistics, and many countries lack the capacity to collect e-waste data at both the regional and national level.

Within the framework of the project, 'Strengthening of National Initiatives and Enhancement of Regional Cooperation for the Environmentally Sound Management of POPs in Waste of Electronic or Electrical Equipment (WEEE)', known primarily as PREAL (Proyecto Residuos Electrónicos America Latina project) - which is funded by Global Environment Facility (GEF) and coordinated by the United Nations Industrial Development Organization (UNIDO) - this *Regional E-waste Monitor for Latin-America: Results for the 13 countries participating in project*⁽¹⁾ UNIDO-GEF 5554 is the first regional monitoring effort on e-waste statistics, legislation, and e-waste management infrastructure to enhance the understanding and interpretation of regional e-waste data, with the goal of facilitating environmentally sound management of e-waste.

The key statistical findings of the region are that the total amount of electrical and electronic equipment (EEE) placed on the market (POM) has fluctuated between 2010 and 2019. The total EEE POM was 1.7 Mt (8.9 kg/inh) in 2010, increased to a height of 1.9 Mt in 2017, and decreased to 1.7 Mt (8.1 kg/inh) in 2019. Only Argentina, Costa Rica, and Chile have internal domestic production of EEE; all 10 other countries rely entirely on imports. Over the same period, e-waste generation in the region increased by 49 percent, from 0.9 Mt (4.7 kg/inh) in 2010 to 1.3 Mt (6.7 kg/inh) in 2019. The amount of e-waste generated per inhabitant was highest in Costa





Rica (13.2 kg/inh) and lowest in Nicaragua (2.5 kg/inh). Small equipment (Cat. V), temperature exchange (Cat. I), and large equipment (Cat. IV) have the highest share of e-waste generation, representing 75 percent of the total share in the region. The annual growth rate decreased for nearly all categories, remaining positive except for screens, which show negative growth rates as the cultures have moved from CRT screens to lighter flat screens. The 13 analysed countries officially collect and managed a total of 36.0 kt (0.21 kg/inh) of e-waste in 2019. At the time of this report's publication, Guatemala was in the process of surveying data on the collection of e-waste, but no official data was provided. Costa Rica has the highest e-waste collection of 8.0 percent (1.0 kg/inh) of its total e-waste generated, followed by Chile with 5.0 percent (0.4 kg/inh). The EEE plastic POM has decreased slightly over the years, from 0.47 Mt (2.49 kg/inh) in 2010 to 0.46 Mt (2.22 kg/inh) in 2019. E-waste plastic generated increased steadily from 0.24 Mt (1.29 kg/inh) in 2010 to 0.38 Mt (1.85 kg/inh) in 2019. Since 2010, e-waste plastic generation has increased 63 percent – to 0.38 Mt in 2019. There is no specific data on the volume of Environmentally Sound Management, or ESM of Persistent Organic Pollutants, or POPs, resulting from e-waste plastic.

All 13 participating countries in the region have some legal and regulatory frameworks for waste management, but only five – Bolivia (Plurinational State of), Chile, Costa Rica, Ecuador, and Peru – have specific legislations for e-waste and Extended Producer Responsibility (EPR) systems in place, focusing on the regulation of e-waste. Argentina, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Uruguay, and Venezuela (Bolivarian Republic of) have neither EPR nor defined collection targets for e-waste in place. E-waste management in these countries is primarily defined in general waste or hazardous legislations and/or regulations. All countries have hazardous waste regulation that includes POPs, but none has legislation specifically for POPs from e-waste.

Since 2010, e-waste generation has increased in the 13 countries analyzed 49 percent – to 1.3 Mt in 2019. The e-waste formally collection rate is 2.7 percent.

The Basel Convention⁽²⁾ on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (commonly referred to as the Basel Convention) controls the transboundary movement (TBM) of e-waste, and all 13 of the participating LATAM countries have ratified it and enacted national bans on e-waste imports, but the enforcement of these measures remains a significant challenge. Many countries in the region do not submit transboundary movement (TBM) reports to the Basel Convention. This makes monitoring and mapping of the TBM of e-waste and POPs within and outside of the region difficult. There is no official data on e-waste importation/exportation from 2016-2019 for Bolivia (Plurinational State of), Chile, Ecuador, and Panama. There is TBM of materials into and out of the region that are not reflected in the reporting to the Basel Convention. All countries studied do not restrict the export of hazardous waste and other wastes for final disposal or recovery. Low quality of data and control of TBM of e-waste through the Basel Convention poses a threat to the environmentally sound management of e-waste and illegal movements. Furthermore, used-EEE imports result in more e-waste in the receiving countries and place burdens on existing e-waste management. Meanwhile, the functionality of imported used-EEE and (if mixed with e-waste) their quantities remain unknown.

Managing e-waste could be an economic opportunity, as the e-waste generated in 2019 contained 7 t of gold, 0.31 t of rare earth metals, 591 kt iron, 54 kt copper, and 91 kt aluminium, representing a total value of approx. \$1.7 billion USD of secondary raw materials. Over 97 percent of e-waste in the region is not formally collected or sent to ESM facilities for proper management. Most e-waste ends up in landfills, with the informal sector cherry picking some valuable parts. The hazardous substances in e-waste – comprising at least 2.2 t of mercury, 0.6 t cadmium, 4.4 kt lead, 4 kt brominated flame retardants, and 5.6 Mt of Greenhouse Gases-equivalents (due to

refrigerants) – are poorly managed within the region and are likely to be untreated, generating various risks to the stability of a healthy environment.

The assessments of e-waste management and of POPs contained in them, statistics, legislation, and the existing challenges evidently show that changes for the improvement of e-waste and POP management systems applied thus far would also vary from country to country. The countries in the region will need to introduce and enforce either: a) a robust legal and policy framework focused on ESM of e-waste, or b) monitor and reinforce existing systems to make them more efficient and effective. Adequate financing and monitoring of the systems and cooperation of all stakeholders are essential for ensuring that the policies setup for e-waste management is sustained. Seven general recommendations can be drawn from the analysis presented herein, and an all-encompassing approach, involving all actors and stakeholders in each country, would be needed in order to implement them. A somewhat strengthened transnational cooperation is necessary in order to reduce the burden of large investments and secure the necessary turn-around. The seven recommendations are: (i) Prevent More, (ii) Be More Aware, (iii) Collect More, (iv) Pollute Less, (v) Pay Adequately, (vi) Work More Safely, and (vii) Train More.

E-waste generation for the 13 countries analyzed represent a total value of \$1.7 billion USD.



ABBREVIATIONS

BFRs	Brominated Flame Retardants	POP	Persistent Organic Pollutant
Cat.	Category	PPP	Purchasing Power Parity
CRT	Cathode Ray Tube	PREAL project	Strengthening of National Initiatives and Enhancement of Regional Cooperation for the Environmentally Sound Management of POPs in Waste of Electronic or Electrical Equipment (WEEE) in Latin American Countries project
EEE	Electrical and Electronic Equipment		
EEE POM	Electrical and Electronic Equipment Placed On the Market	REM	Regional E-waste Monitor
EHS	Environmental Health and Safety	SAICM	Strategic Approach to Chemicals
EPR	Extended Producer Responsibility	Management	
ESM	Environmentally Sound Management	SDG	Sustainable Development Goals
EU	European Union	t	(metric) Ton, or 1,000 kg
E-waste	Electronic waste, synonym of Waste Electrical and Electronic Equipment (WEEE)	TBM	Transboundary movement
		UN Comtrade	United Nations Commodity Trade Statistics Database
GDP	Gross Domestic Product	UNDESA	United Nations Department of Economic and Social Affairs
GEF	Global Environment Facility	UNDP	United Nations Development Programme
ICT	Information and Communication Technology	UNIDO	United Nations Industrial Development Organization
inh	Inhabitant	UNITAR	United Nations Institute for Training and Research
IT	Information Technology	UNU	United Nations University
ITU	International Telecommunication Union	UNU-KEY	Product-based classification distinguishing 54 products, used to measure e-waste statistics
km	Kilometers	UNEP	United Nations Environment Program
kt	(metric) kiloton, or 1,000,000 kg	UNU-VIE-SCYCLE	United Nations University Vice-Rectorate in Europe SCYCLE – Sustainable Cycles Programme
LATAM	Latin America	USD	United States Dollar
LATAM REM	Regional E-waste Monitor for Latin America: Results for the 13 countries participating in project UNIDO-GEF 5554	WEEE	Waste Electrical and Electronic Equipment
LCD	Liquid Crystal Display		
LED	Light-emitting Diode		
MEAs	Multilateral Environmental Agreements		
NGO	Non-Governmental Organisations		
NIP	National Implementation Plan		
PCBs	Polychlorinated biphenyls		
PIC	Prior Informed Consent		
POM	Placed On the Market		

	OFFICIAL COUNTRY NAME	NAME USED IN THE REPORT⁽³⁾
ARG	Argentine Republic	Argentina
BOL	Plurinational State of Bolivia	Bolivia (Plurinational State of)
CHL	Republic of Chile	Chile
CRI	Republic Costa Rica	Costa Rica
ECU	Republic of Ecuador	Ecuador
GTM	Republic of Guatemala	Guatemala
HND	Republic of Honduras	Honduras
NIC	Republic of Nicaragua	Nicaragua
PAN	Republic of Panama	Panama
PER	Republic of Peru	Peru
SLV	Republic of El Salvador	El Salvador
URY	Eastern Republic of Uruguay	Uruguay
VEN	Bolivarian Republic of Venezuela	Venezuela (Bolivarian Republic of)

⁽³⁾ Country names are based on the United Nations Terminology Database (UNTERM): <http://unterm.un.org>, and were previously available in the Terminology Bulletin No. 347/Rev.1, prepared by the Department of General Assembly Affairs and Conference Services of the United Nations Secretariat.

1. INTRODUCTION

A. What is E-waste?

Electrical and Electronic Equipment (EEE) contains all products and parts that run on a power or battery supply. Upon being discarded by its owner, EEE becomes e-waste, which contains both valuable and hazardous materials [1].

EEE is a term used to define the wide variety of products having circuitry or electrical and electronic components that need a power or battery supply in order to perform their functions. EEE includes almost any such products available in households and businesses – including laptops, mobile phones, fridges, washing machines, dishwashers, cooking and kitchen appliances, many toys, servers, and musical instruments. The use of EEE is increasing rapidly alongside societies' general development and the rapid development of information and communications technology (ICT), and EEE is spreading quickly in emerging sectors such as electric transport, clean energy production, and smart cities, which base their services on EEE and sensors.

When an EEE item is discarded, it becomes Waste Electrical and Electronic Equipment (WEEE), also known as electronic waste, or e-waste. According to the StEP (Solving the E-waste Problem) Initiative, e-waste is: 'a term used to cover items of all types of EEE and its parts that have been discarded by the owner as waste without the intention of reuse' [1]. The International Telecommunication Union (ITU) and the legally binding definition of the Basel Convention also define e-waste or WEEE as 'electrical or electronic equipment that is waste, including all components, sub-assemblies, and consumables that are part of the equipment at the time the equipment becomes waste'⁽⁴⁾.

Each type of e-waste has a specific size, hazardous components, and valuable materials that affect the way it must be formally collected, treated, recycled, or disposed of in an environmentally sound manner (ESM).

E-waste are discarded products or components that need a power or battery supply in order to perform their functions.

E-waste encompasses a wide variety of discarded products and is categorised into six main categories.

E-waste can be categorised in different ways, including by product type or size. The European Union's WEEE Directive and the 'E-waste Statistics Standards Guidelines' [2] use a treatment-oriented categorisation, with six main categories, as follows:



1. Temperature exchange equipment, including fridges, freezers, air conditioners, and heat pumps.



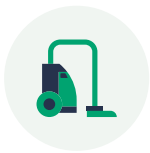
2. Screens and monitors, comprising liquid crystal display (LCD) and light-emitting diode (LED) televisions and monitors, laptops, and tablets.



3. Lamps, including LED lamps, high-intensity discharge lamps, and compact and straight tube fluorescent lamps.



4. Large equipment, including products such as dishwashers, washing machines, ovens and central heating systems, large printing systems, and photovoltaic panels.



5. Small equipment, comprising microwaves, grills and toasters, personal care products, speakers, cameras, audio sets and headphones, toys, household tools, and medical and monitoring systems.



6. Small IT and Telecommunication equipment, including desktop personal computers, printers, mobile phones, cordless phones, keyboards, routers, and consoles.

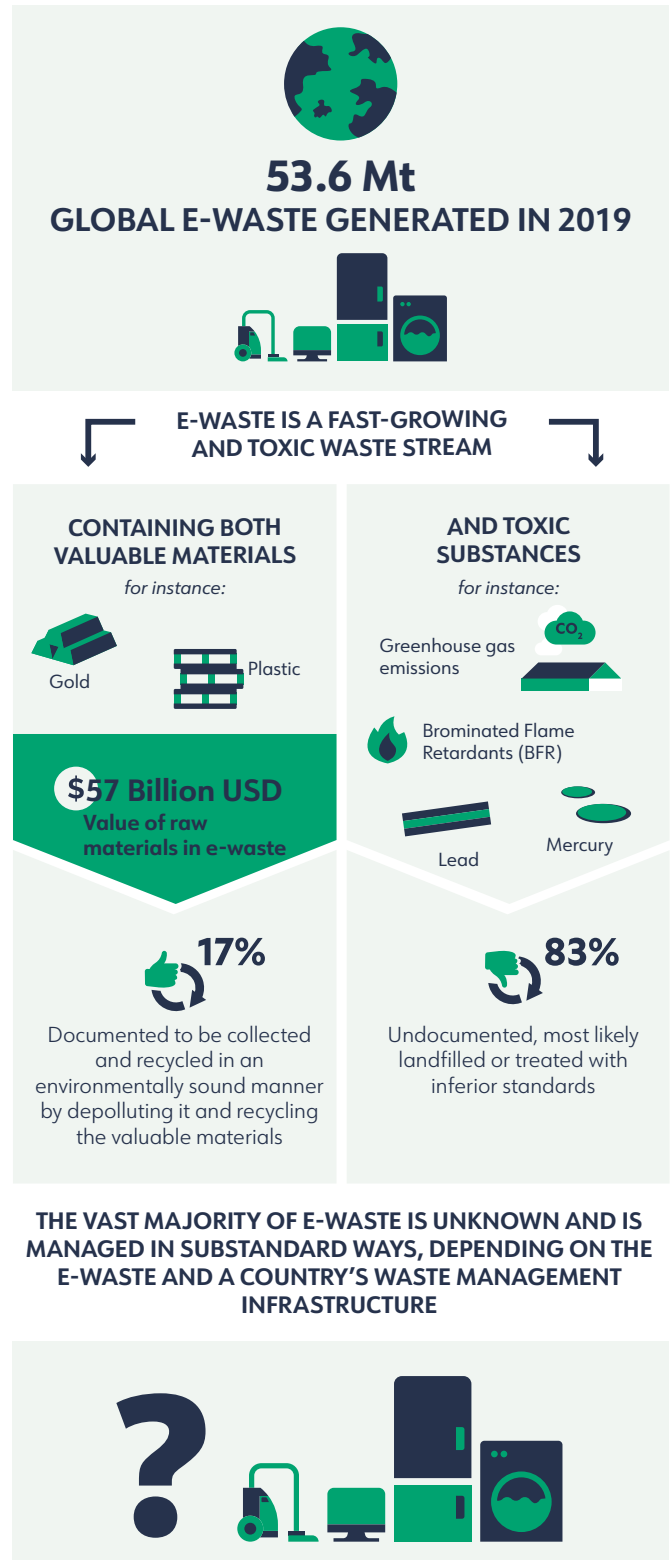
B. E -waste: An International Issue

E-waste is one of the fastest-growing waste streams. Globally, only 17 percent is officially collected and recycled, wasting valuable materials and causing damage to the environment [3].

EEE, including equipment used for information and communication technology services, offers good opportunities for the world's development, guaranteeing higher living standards and satisfying numerous needs. However, discarded equipment – such as phones, laptops, sensors, TVs, washings machines, air conditioners, refrigerators, and many other items that contain harmful substances – poses considerable risks to human health and the environment, especially when managed improperly.

The *Global E-waste Monitor* (2020) highlighted that a record 53.6 million metric tonnes (Mt) of e-waste were generated in 2019 – an increase of 21 percent since 2014 [3]. This increase is linked to the growing number of people using EEE worldwide as well as to a constant technological development and the phasing out of old technologies – i.e. shorter product lifecycle and designs that do not support repair or reuse. Only 17 percent is reportedly formally collected and recycled in an environmentally sound manner. The majority of e-waste that is not recycled or disposed of in an environmentally sound manner usually ends up in landfills, mixed with other waste streams. Consequently, valuable resources, such as precious metals and rare earth elements, are wasted, and hazardous substances are released into the environment in ways that pose risks to human health and the environment.

Managing e-waste requires specific legislation and collection infrastructure and generally is poorly regulated and enforced globally.



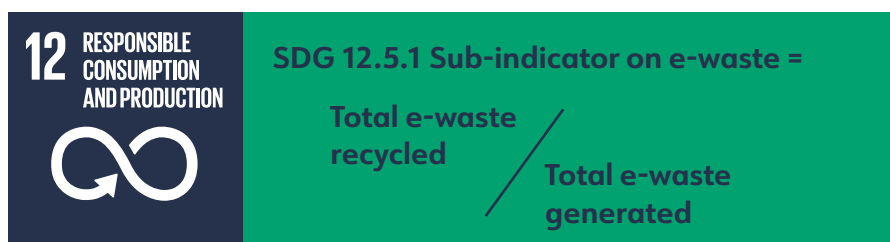
Source: The Global E-waste Monitor [3]

As a complex and relatively recent waste stream, countries need to introduce specific legislation to enforce sound environmental treatment and management of e-waste. In 2019, 78 countries (comprising 71 percent of the global population) were covered by a legislation, policy, or regulation on e-waste, which is a significant development from the 67 countries (66 percent of the population) identified in 2017. Nevertheless, in most cases, policies are neither legally binding nor appropriately supported financially, which has been found to be less compelling for ensuring their implementation and compliance. Also, most legislative instruments concentrate on improving e-waste management, but neither the reduction of the volumes of e-waste generated nor management practices, such as repair and reuse of EEE, have yet been properly examined.

E-waste management is monitored in the United Nations’ Sustainable Development Goals under SDG 12 on Sustainable Consumption and Production.

In 2015, the United Nations Member States adopted the 2030 Agenda for Sustainable Development. This agenda included the 17 Sustainable Development Goals (SDGs) and 169 targets for ending poverty, protecting the planet, and ensuring prosperity for all people over a 15-year span. Increasing e-waste

generation and adopting improper and unsafe treatment and disposal approaches pose significant challenges to human health and the environment, as well as to the achievement of the SDGs. E-waste management is closely related to many SDGs, such as SDG 8 on decent work and economic growth, SDG 3 on good health and well-being, SDG 6 on clean water and sanitation, and SDG 14 on life below water. Considering the high raw material demand for EEE production, e-waste also relates to the SDG indicators on the material footprint (SDGs 8.4.1 and 12.1.1) and the SDGs on the domestic material consumption (SDGs 8.4.2 and 12.2.2). Consequently, e-waste remains a global challenge because of its increasing generation worldwide and because the proper treatment and prevention of its overall generation requires active engagement of a diverse set of actors, sometimes going beyond national borders. As such, the management of e-waste is monitored in SDG 12 on responsible consumption and production, under indicator 12.5.1 (national recycling rate) and indicator 12.4.2 on hazardous waste generation, which has a specifically defined sub-indicator [3], [4]⁽⁵⁾.



ITU’s Connect 2030 Agenda set targets of increasing the global e-waste recycling rate to 30 percent (Target 3.2) and raising the number of countries with e-waste legislation to 50 percent by 2023 (Target 3.3)⁽⁵⁾.

⁽⁵⁾ ITU’s Connect 2030 Agenda (PP-18 Resolution 200, Rev. Dubai, 2018) <https://www.itu.int/en/mediacentre/backgrounders/Pages/connect-2030-agenda.aspx>.

C. POP Management: An International Issue

Persistent Organic Pollutants (POPs) are organic compounds that are resistant to environmental degradation through chemical, biological, and photolytic processes [5]. They are primarily products and by-products resulting from industrial processes, chemical manufacturing, and the wastes resulting from such processes and manufacturing. POPs are intentionally produced (e.g. pesticides) or unintentionally released from incomplete combustion or reaction processes.

POPs pose a particular hazard, due to four of their characteristics: (1) they are toxic, (2) they are persistent, resisting normal processes that break down contaminants, (3) they accumulate in the body fat of people, marine mammals, and other animals and are passed from mother to foetus, and (4) they can travel great distances on wind and water currents. Most POPs generated in one country easily cross national boundaries, affecting people and wildlife far from where they are used and released, including those where POPs have never been used – thus presenting a transboundary problem. Today, POPs are found almost everywhere: in our food, soil, air, and water. Wildlife and humans around the world carry amounts or traces of POPs in their bodies at or near levels that can cause injury. Specific effects of POPs can include cancer, allergies and hypersensitivity, damage to the central and peripheral nervous systems, reproductive disorders, and disruption of the immune system. Some POPs are also considered to be endocrine disruptors, which can damage the reproductive and immune systems of exposed individuals as well as their offspring by altering the hormonal system; they can also have developmental and carcinogenic effects⁽⁶⁾. Though POPs have been in use for decades, the world has only recently learned of their deadly qualities. Armed with knowledge regarding the dangers of POPs, many countries have since begun limiting or banning their production, use, and release.

The effort by many countries of limiting or banning POP production and use culminated in the Stockholm Convention on Persistent Organic Pollutants. More than 180 countries are signatories to the Convention and have agreed to eliminate or reduce the release of POPs into the environment⁽⁷⁾. The Stockholm Convention is an international treaty for protecting human health and the environment from POPs. The Convention was adopted in 2001 and entered into force in 2004, initially covering 12 chemicals [5]. The 12 POPs include eight pesticides (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, and toxaphene), two types of industrial chemicals (polychlorinated biphenyls or PCBs and hexachlorobenzene), and two chemical families of unintended by-products of the manufacture, use, and/or combustion of chlorine and chlorine-containing materials (dioxins and furans). Currently, 16 additional POPs have been added by 181 Parties (as of 2017) to the Stockholm Convention [6].

The Basel, Rotterdam, and Stockholm Conventions (which entered into force in May 1992, February 2004, and May 2004, respectively) focus on protecting human health and the environment from hazardous chemicals and waste, including POPs. Specifically, the Stockholm Convention commits all Parties to eliminate or restrict the production, trade, use, and waste of specific POPs. The Stockholm Convention on Persistent Organic Pollutants aims to phase out and eliminate the production and use of these chemicals, as well as new ones that could be added over time.

All 13 countries included in this Regional E-waste Monitor have completed ratification, acceptance, approval, or accession to the convention. The National Implementation Plan requires each Party to develop a policy framework for effective management of POPs [7].

⁽⁶⁾ <http://www.pops.int/TheConvention/ThePOPs/tabid/673/Default.aspx>.

⁽⁷⁾ <https://www.thegef.org/topics/persistent-organic-pollutants>.

E-waste may contain POPs such as PCBs, polybrominated diphenyl ethers (PBDEs), and other halogenated flame retardants. Brominated flame retardants (BFRs), like all flame retardants (FRs), act to decrease the risk of fire by increasing the fire resistance of the materials to which they are applied (e.g. e-waste plastics). Approximately 25% of e-waste (by weight) consists of plastics in the form of various polymers (mainly acrylonitrile butadiene styrene [ABS], polypropylene [PP], and polystyrene) [21]. However, such plastics contain a wide range of additives, such as flame retardants, fillers, pigments, and stabilisers, which collectively impact the recycling of e-waste plastics. Restricted BFRs (e.g. Octa-BDE and Deca-BDE) represent only a small and rapidly declining fraction of all BFRs found in e-waste plastic streams, reflecting the restrictions on use of these substances that have now been in place for more than a decade (2003 for Octa-BDE, 2008 for Deca-BDE). One of the challenges encountered by e-waste plastic recyclers is the presence in their input of legacy additives – substances added into EEE plastics in the past but whose use has been discontinued (voluntarily or by law), due to concerns regarding human and environmental health. Such additives include low molecular weight phthalates (such as DEHP, BBP, DBP, and DIBP, used as plasticisers), heavy metals (such as lead and cadmium compounds, used as stabilisers), and some brominated flame retardants (BFRs, such as octaBDE and decaBDE, used in external housings, and HBCD, used in foams). Plastics containing BFRs have to be removed during the treatment process of e-waste so that they do not end up in recyclables [21].

However, due to their potential to form POPs (e.g. polybrominated dioxins and furans, PBDD/F) during processing, the use of certain BFRs (POPs-BFRs) is being restricted.

These 28 compounds, or group of compounds, are listed as POPs under the Stockholm Convention, either in Annex A (Elimination), Annex B (Restriction), or Annex C (Unintentional production). Annex A includes 5 BFR compounds, referred to as POP-BFRs:

- Hexabromobiphenyl (hexaBB), listed in 2009.
- Commercial pentabromodiphenyl ether (c-pentaBDE, consisting mainly of tetraBDE and pentaBDE), listed in 2009.
- Commercial octabromodiphenyl ether (c-octaBDE, consisting mainly of hexaBDE and heptaBDE), listed in 2009.
- Hexabromocyclododecane (HBCD), listed in 2013
- Commercial decabromodiphenyl ether (c-decaBDE consisting mainly of decaBDE), listed in 2017.

POPs pose a particular hazard, due to four of their characteristics:

1) They are toxic.

2) They are persistent, resisting normal processes that break down contaminants.

3) They accumulate in the body fat of people, marine mammals, and other animals and are passed from mother to foetus.

4) They can travel great distances on wind and water currents.

D. Framework Condition for the LATAM Countries

This report covers 13 Latin American (LATAM) countries located in Central and South America.

The countries in the scope of the Regional E-waste Monitor for Latin- America are: Argentina (ARG) Bolivia (Plurinational State of, BOL), Chile (CHL), Costa Rica (CRI), Ecuador (ECU), Guatemala (GTM), Honduras (HND), Nicaragua (NIC), Panama (PAN), Peru (PER), El Salvador (SLV), Uruguay (UGY), and Venezuela (Bolivarian Republic of, VEN).

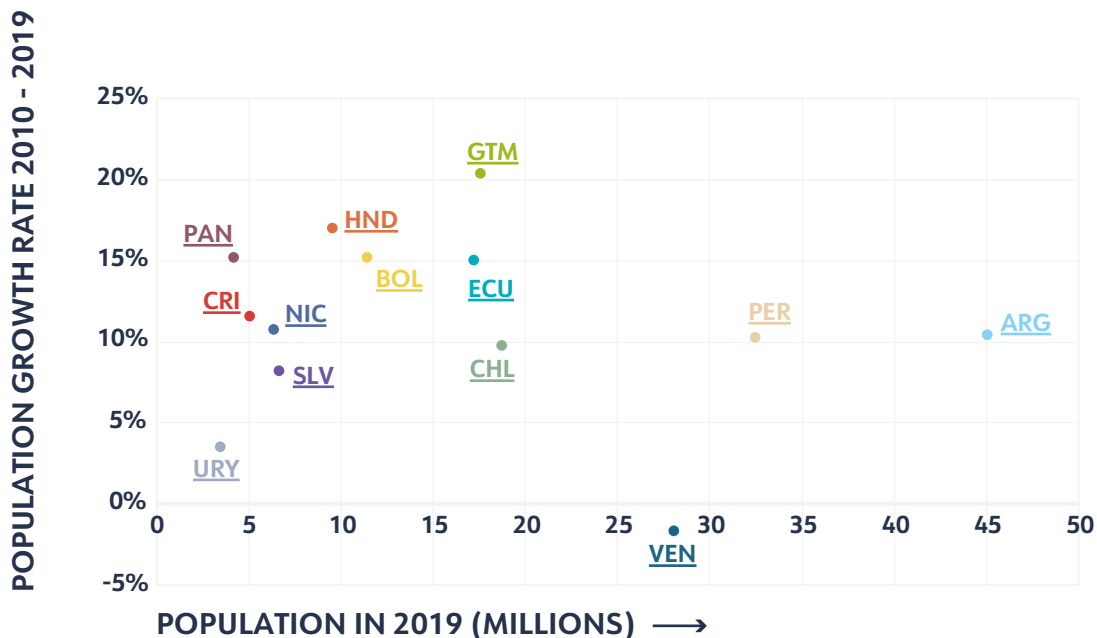


The 13 countries have 206.1 million inhabitants (inh), collectively, the most populous country being Argentina (45.1 million inh) and the least populous being Uruguay (3.5 million inh). The average population growth of the 13 countries from 2010 to 2019 was 10 percent.

In terms of demographics, the 13 countries have, collectively, 206.1 million inh (2019). As of 2019, the most populous country is Argentina with 45.1 million inh, followed by Peru (32.5 million inh) and Venezuela (Bolivarian Republic of) (28.1 million inh) (Figure 1). The population growth rate for the 13 countries between 2010 and 2019 averaged 10 percent. Between 2010 and 2019, Guatemala's population growth rate was 20 percent, followed by Honduras (17 percent), then Bolivia (Plurinational State of), Panama, and Ecuador (15 percent each), while Uruguay had the smallest growth (4 percent). All countries' populations grew, except for Venezuela's (Bolivarian Republic of); the Venezuelan population decreased, as more than 5 million people emigrated due to economic and political crises domestically, with about 80 percent of them residing in other Latin American countries⁽⁸⁾.

The LATAM countries have 206.1 million inhabitants (2019).

Figure 1. Demographic overview of the region [8]



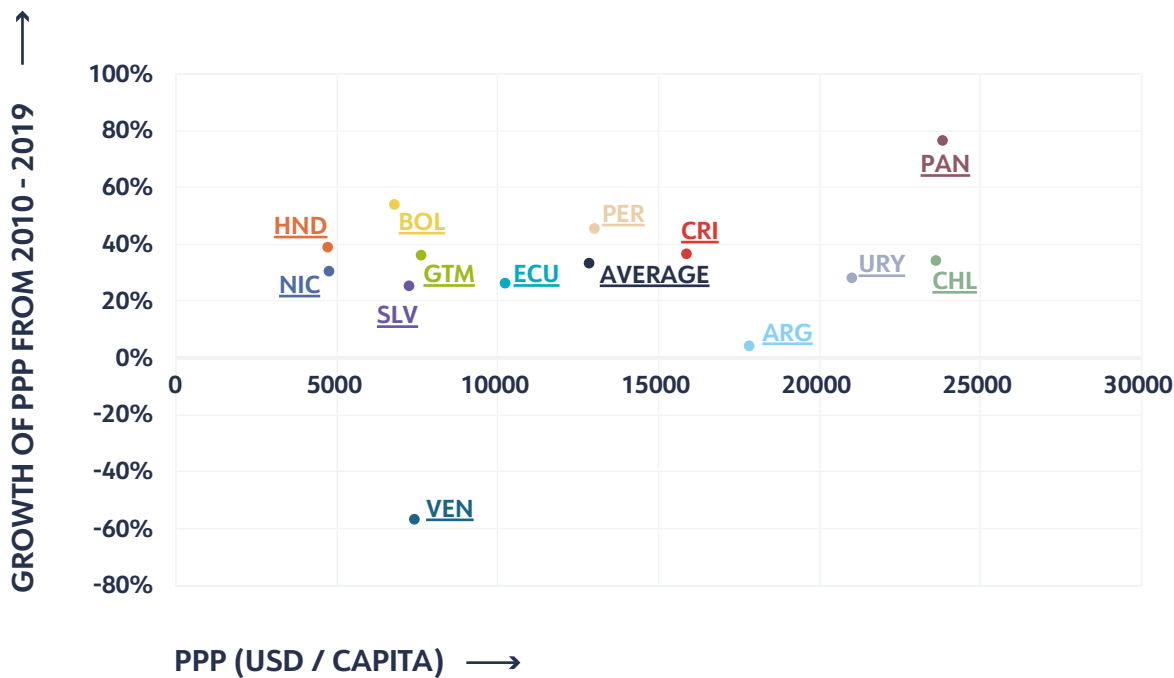
⁽⁸⁾ <https://www.worldbank.org/en/programs/world-bank-support-to-the-venezuelan-migration#:~:text=World%20Bank%20Support%20to%20Venezuelan,host%20countries%20to%20integrate%20migrants.>

The difference in economic power per inhabitant is large across the countries studied, but nearly the entire population has access to electricity and internet. Between 1-4 percent of the populations of Venezuela (Bolivarian Republic of), Costa Rica, Ecuador, Nicaragua, El Salvador, Panama, and Peru are below the poverty line (\$1.90 a day), while 9 percent of Guatemala and 16 percent of Honduras live below the poverty line.

In terms of socioeconomic development, the countries have a very wide range of product purchasing power parity (PPP)⁽⁹⁾, ranging from \$5,000 USD/year in Honduras and Nicaragua to \$24,000 USD/year in Panama and Chile (Figure 2). All countries except Venezuela (Bolivarian Republic of) show a growth of PPP. According to the World Bank classification, three countries are high-income countries (Chile, Panama, Uruguay)⁽¹⁰⁾, six are upper middle-income countries

(Argentina, Costa Rica, Ecuador, Guatemala, Peru, and Venezuela - Bolivarian Republic of), and four are lower middle-income countries (Bolivia - Plurinational State of, El Salvador, Honduras, and Nicaragua). As for poverty, available data for 2014 shows that only seven of the countries (Venezuela - Bolivarian Republic of, Costa Rica, Ecuador, Nicaragua, El Salvador, Panama, and Peru) have between 1 and 4 percent of the population living below poverty line (\$1.90 a day), while 9 percent of Guatemala and 16 percent of Honduras live below the poverty line. In 2017, not all of the population in some countries studied have access to electricity. For example, in Costa Rica, 99 percent of the population have access to electricity; in Bolivia (Plurinational State of), 96.3 percent⁽¹¹⁾; Guatemala, 93 percent; Honduras, 87 percent; Peru, 84 percent; and Nicaragua, 68 percent. By contrast, 100 percent of the population in Argentina, Chile, Ecuador, El Salvador, Panama, Uruguay, and Venezuela (Bolivarian Republic of) have access to electricity (not shown).

Figure 2. Economic overview of the region showing the purchasing power parity in USD/capita in 2019 (x-axis), the total PPP growth rate from 2010 to 2019 (y-axis, bottom), and the share of the population with access to electricity (top) [8]



⁽⁹⁾ The purchasing power parity (PPP) is an economic indicator that allows for comparing economic productivity and standards of living between different countries and locations. PPP can be used to adjust the gross domestic product (GDP). ⁽¹⁰⁾ High income | Data (worldbank.org). ⁽¹¹⁾ Access to electricity (% of population) - Latin America & Caribbean | Data (worldbank.org).

E. Background to the Report

Though some assessments, projects, and initiatives on e-waste have been undertaken in recent years, a comprehensive overview and analysis of the e-waste and POPs contained in the e-waste plastic situation in the Latin-American region is still lacking. This report strives to fill the gap by presenting the past and current e-waste situation and POPs contained in e-waste plastics managed in the 13 countries under the scope of the PREAL project. This LATAM Regional E-waste Monitor presents an overview of the regional e-waste status and has been prepared through a collaboration with governments, national statistical offices, and countries' independent experts. This overview allows for international comparisons and contributes to the development of more effective e-waste as well as appropriate POP management systems in the region.

Within the regional effort toward strengthening the National Initiatives and Enhancement of Regional Cooperation for the ESM of POPs in Waste Electronic or Electrical Equipment (E-waste) in Latin-American countries, the United Nations Industrial Development Organization (UNIDO) partnered with the United Nations University (UNU), Vice-Rectorate in Europe (ViE), and Sustainable Cycles (SCYCLE) Programme (UNU-ViE SCYCLE) to implement the *Regional E-waste Monitor for Latin America: Results for the 13 countries participating in project UNIDO-GEF 5554* (known primarily as the PREAL project), which is focused on building regional capacity on e-waste statistics for government officials and statisticians and improving e-waste data and statistics in the region. Within the LATAM Regional E-waste Monitor, special focus will be given to plastics, especially those containing POPs, to provide data and information required for establishing 'custom-made' e-waste management systems.

Specifically, this study reviews the current situation of e-waste and POP legislation and management in the 13 countries analysed in this report. It also analyses the trend in transboundary movement (TBM) of e-waste within and out of these countries and provides a periodic monitoring on formally collected e-waste and POP statistics information for these materials and understudies efforts at ESM of these materials.

2. METHODOLOGY

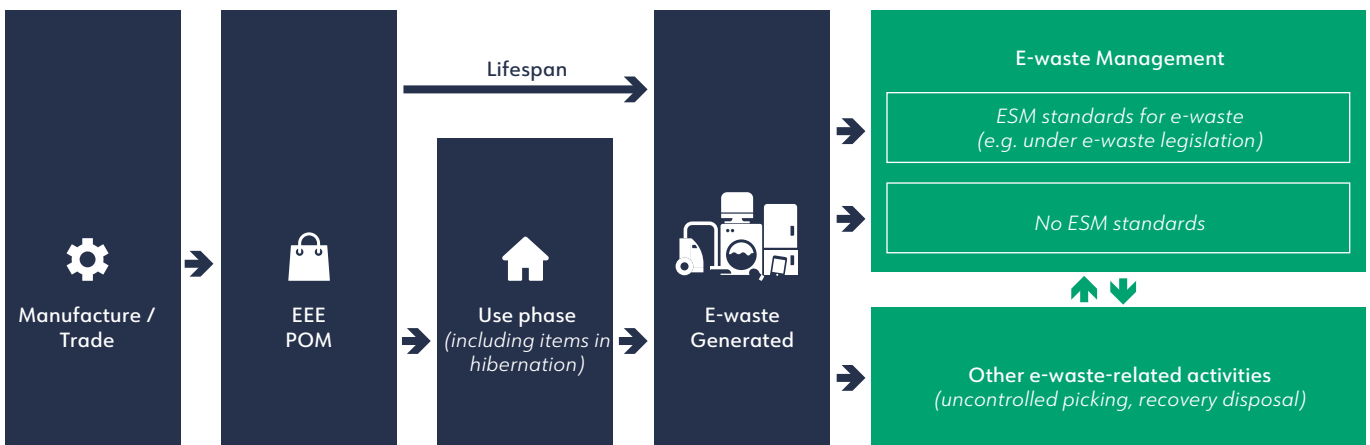
This report compares the e-waste statistics, legislation, and infrastructure in thirteen countries in the Latin American region. The statistical methodology used follows the same principles as the internationally harmonised framework, which has been developed by the Partnership for Measuring ICT for Development as a joint effort by the United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR), International Telecommunication Union (ITU), United Nations Environment Programme (UNEP), the Statistical Office of the European Union (Eurostat), and other United Nations (UN) agencies that have been described in *E-waste Statistics Guidelines on Classification Reporting and Indicators* [2], [9]. For the assessment of POPs and e-waste legislation and management, a novel methodology has been developed. The key concepts, statistical framework, e-waste, and POPs contained in e-waste management assessment are explained in more detail below.

A. E-waste Statistics

E-waste statistics follows a mass balance of the entire lifecycle of EEE and are calculated using a product-based classification, referred to as the UNU-KEYs.

The measurement framework of e-waste statistics follows a mass balance approach over the entire life cycle of EEE. This approach covers production, imports, placing on the market, e-waste generation, e-waste management, and other e-waste-related activities (Figure 3). In doing so, and as a first step, the approach quantifies the amount of EEE placed on market (EEE POM). The term EEE refers to any household or business item (excluding vehicles) with circuitry or electrical components and a power or battery supply [1]. EEE POM covers any product supplied to the national market for consumption and use by households, businesses, and public authorities. EEE POM has been calculated for 54 products – the so-called UNU-KEYs. The UNU-KEYs are a product-based classification in which each UNU-KEY has a homogeneous lifespan, average weight, material composition, and hazardousness profile. The UNU-KEYs can be linked to the six e-waste categories and are used to measure e-waste statistics (See ANNEX A).

Figure 3. E-waste statistics framework



E-waste generation is calculated using the EEE POM and lifespans for each UNU-KEY. E-waste generated is the total mass of e-waste, prior to any e-waste management activity.

The EEE POM can be calculated from a variety of data sources. The most straightforward methodology is using the apparent consumption methodology, according to which EEE POM can be obtained with Equation 1:

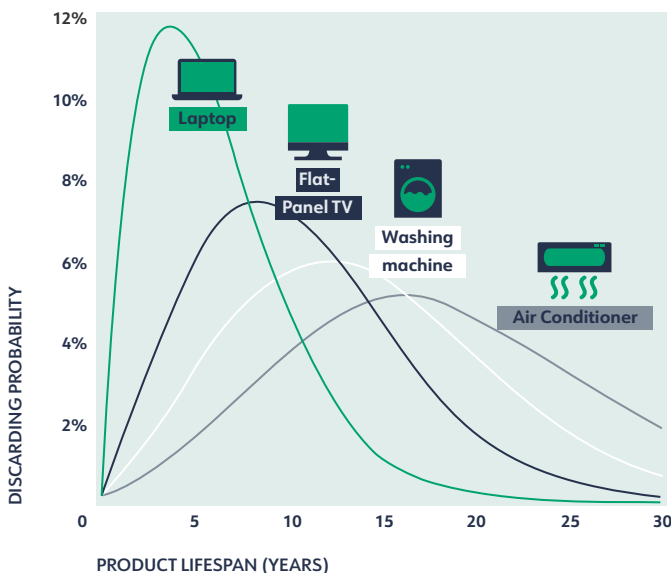
Equation 1:

$$POM = Import - Export + Domestic Production$$

The EEE POM is calculated for each UNU-KEY, preferably from 1980 to the present day, and includes imports of both new and used-EEE, as well as domestically produced EEE. Since trade statistics and domestic production data are usually expressed in units, a unit-to-weight conversion factor per each UNU-KEY is calculated and applied in order to obtain the amount of EEE POM in mass.

After a product has been POM, it stays in use – or at the household, business, or governmental institute – until it is discarded. The lifespan of a product is the period of time from when the product has been POM until it becomes e-waste. This includes the hibernation phase – such as the storing/stockpiling of the equipment until POM or the hoarding time of the equipment prior to actually being discarded at the end of its life – as well as the passing on of the equipment from one owner to another (reuse). The lifespan of EEE is expressed as a Weibull function and varies per UNU-KEY, with the shape and scale parameters associated to the average lifespan for each UNU-KEY individually Figure 4.

Figure 4. Examples of product lifespans of EEE



The time series of EEE POM and lifespans are then used to calculate e-waste generated for each UNU-KEY. The mathematical description of 'E-waste Generated' is explained in ANNEX B. E-waste generated in a country refers to the total weight of e-waste resulting from EEE that had been POM in that country, prior to any other activity, such as collection, preparation for reuse, treatment, or recovery (including recycling and export) [10].

E-waste generation is the basis for conducting statistics on e-waste flows. Assessment of the amount of e-waste that is treated using ESM approaches is crucial. Other e-waste flows are also considered, covering other e-waste management practices. To assess e-waste statistics, e-waste import and export data must be measured as well.

In general, waste management involves the collection, transportation, storage, and disposal of waste, including after-care of disposal sites. Waste management can be undertaken by an economic unit within a legal framework, but waste handling carried out by informal economic units (e.g. informal waste-picking) and illegal waste-handling also exists. In this context, 'waste management' and 'other waste-related activities', as proposed by the UNECE's Waste Statistics Framework, are distinguished. In that framework, waste management is defined as the set of lawful activities carried out by economic units of the formal sector, both public and private, for the purpose of the collection, transportation, and treatment of waste, including final disposal and after-care of disposal sites [11]. The 'other waste-related activities' includes waste dumping, waste-picking, disposal, etc. and may include the informal sector⁽¹²⁾.

It is of vital importance that e-waste undergoes depollution, that hazardous fractions are disposed of in an environmentally sound manner, and that recyclable components are properly recycled. These steps are typically, but not exclusively, performed under the requirements of national e-waste legislation. Therefore, this flow is referred to as 'e-waste formally collected' in this report and in the e waste statistics guidelines. 'E-waste formally collected' implies that the e-waste is collected under the specific legislation for e-waste (or in a similar manner). In this report, such waste is also referred to as 'e-waste managed environmentally soundly'.

E-waste can also be managed by waste managers involved in various processes such as collection, dismantling, and metals recovery, using operations that

do not guarantee environmentally sound management, and which, due to inferior quality, may then cause damage to the environment as result of the e-waste's hazardous substances not being treated. An example is e-waste being mixed in with residual waste that is not source-separated and which ends up in landfills. The e-waste can also be mixed in with other waste, such as metal scrap, and recycled together with it. Not all recyclable parts are recycled, and hazardous components of e-waste are left untreated. Thus, this waste management is not accounted for in the flow of e-waste environmentally soundly managed.

For e-waste, 'other waste-related activities' may involve the selective dismantling of the valuable parts, recovery of some metals, or dumping at uncontrolled landfills. The hazardous components of e-waste are untreated, and such treatment is typically performed by informal waste operators.

The activities performed by the informal sector usually do not imply minimum safety requirements, environmental standards, and depollution techniques. However, the informal sector can sometimes hand complete products of e-waste over to the formal sector.

Some countries have adopted the Extended Producer Responsibility (EPR) – a policy approach under which producers are given the responsibility (financial and/or physical) for the collection and treatment or disposal of their post-consumer products. EPR is based on the "polluter pays" principle, making waste producers responsible for the recycling and disposal of their waste while moving the cost of managing post-use products partially or fully from local governments to the production industry. For instance, in an EPR-regulated system, quantities formally collected and recycled in an environmentally sound manner should be counted as e-waste for ESM. E-waste can also be disposed of in residual waste or bulk waste, going straight to landfills or to waste incineration facilities.

Importation and exportation can occur for used-EEE and e-waste. This is called transboundary movement (TBM). TBM of e-waste occurs both with whole products and with parts/components. It is important that it be made clear whether the exported e-waste is designated according to the ESM criteria in the national legislation (and thus managed by e-waste-certified recyclers in the receiving countries) or not. The amounts of exported e-waste must then be added to the e-waste managed using ESM; otherwise, it should be added to other e-waste management. However, imports of e-waste do not have to be added to the national totals of e-waste managed using ESM; these should be recorded separately. TBM is slightly different for used-EEE. Products are not waste yet, but this data is needed to complete the mass balance of EEE and e-waste. Imported used-EEE must be added to the EEE POM, whereas the exported used-EEE can be defined as a specific flow to be measured.

International indicators for e-waste and the SDG 12 e-waste indicators are defined for EEE POM, e waste generated, e-waste formally collected (also referred to as e-waste managed in an environmentally sound manner), and the e-waste collection rate.

In order to capture the most important dynamics of e-waste, four indicators are defined for SDGs and for international guidelines [2], [4], [9]:

- 1** **Indicator 1:** EEE POM.
- 2** **Indicator 2:** E-waste generated.
- 3** **Indicator 3:** E-waste managed in an environmentally sound manner (also referred to as e-waste formally collected in the statistics guidelines) ESM standards for e-waste (e.g. under e-waste legislation).
- 4** **Indicator 4:** E-waste collection rate (indicator 3 divided by indicator 2).

The indicator 1 on EEE POM includes used-EEE imports. Indicator 2 includes the exports for ESM of e waste, but excludes imports. The unit of indicators 1 to 3 are kiloton

(kt), and for international comparison, a normalisation into population is made, as expressed by kg/inh. The performance of the entire e-waste management is expressed using the e-waste collection rate, defined as Indicator 4, which is expressed as a percentage. The collection rate can be an indication of the progress made by the country toward achieving a proper management of the e-waste sector.

The e-waste data are harmonised according to international standards, as per SDG 12 on sustainable consumption and production.

B. E-waste Plastics and BFR Statistics

In Latin America, there are currently no official statistics on plastics and Brominated Flame Retardants (BFRs) contained in EEE POM and e-waste generated. In order to quantify the plastic and BFR contained in e-waste, the UNU/UNITAR internal composition database was used in combination with the outcomes of the UNDP project *Reducing the release of unintentional POPs and mercury from hospital waste management, e-waste, scrap metal processing and biomass burning* and literature review.

Having estimated the EEE POM and e-waste generated using the measurement framework of e-waste statistics methodology for all 13 countries, plastic and BFR estimation were calculated by multiplying the concentration percentage per UNU-KEY with the corresponding Collection Category EEE POM and e-waste generated using the following equations 2 and 3:

Equation 2:

$$\text{Plastic Cat.}_n \text{ POM}_{\text{for year } z} = \% \text{ Plastic} * \text{POM}_{\text{tons Cat for year } z}$$

The plastic concentration per UNU-KEY was grouped per EU6 collection category (see Annex A) for analytical purposes. When calculating BFR content, the following equation was used:

Equation 3:

$$\text{BFR in Plastic Cat.}_n \text{ POM}_{\text{for year } z} = \% \text{ BFR} * \text{Plastic}_{\text{tons Cat for year } z}$$

The above calculation routine was repeated for all six EU6 collection categories for EEE POM and e-waste for each country, taking into account the UNU-KEYs' lifespans. (see Annex B).

C. E-waste and POP Policy and Management Assessment

Assessment of national e-waste policy coverage and e-waste infrastructure is done by distinguishing three development stages: A (advanced), B (in transition), and C (basic).

Countries or regions may define their own standards for sound treatment of hazardous waste, based on their national context [4], which gives rise to differences in interpretation and the standard of ESM of waste, including e-waste. Therefore, this report provides a novel methodology for further interpretation regarding the progress of e-waste toward ESM, in terms of developing legislation and development of e-waste management infrastructure, which allows a cross-country comparison.

In practice, the implementation of ESM of e-waste requires a comprehensive approach and can only be successful when taking into account many factors such as socioeconomic development, governance structures, geography, trade links, infrastructure, and consumer behaviors. The description of the stages are shown in Table 1, where A, B, and C can be roughly interpreted in A as advanced, in B as transition, and in C as basic.

Table 1. Features of the e-waste system matrix in various stages of development, adapted from [8-11]

Stages	Legal Framework	Infrastructure
A	E-waste legislation, including financing mechanisms, enforcement with efficient controls, and monitoring; alternatively, strong voluntary system with governmental support and collaboration, legally mandated compulsory nationwide environmental health and safety (EHS) standards with internationally accepted for all facilities.	Widespread network of formal collection channels; e-waste and plastic containing POPs collection is entirely formalised, with only legally authorised e-waste collection taking place, either through legally obligated take-back systems or voluntary initiatives or informal sector handing over e-waste and components and materials containing POPs to a formal collector. Depending on the country, high-efficiency and advanced industrial facilities (large and small scale) for recycling and recovery of functions and materials from e-waste, including precious metals, rare earths, etc.
B	E-waste and POPs contained in e-waste plastics-specific draft legislation under discussion or recently enacted; in the early stages of enforcement regime development; potentially limited scope of legislation; voluntary EHS standards with basic minimum thresholds; greater individual awareness about environmental and health risks.	Informal and formal collection channels co-exist; formal collection channels operate within a legal framework, such as a licensing system; informal collectors still exist outside of the legal system; voluntary take-back schemes/collection by private sector in operation. Semi-mechanised formal small and medium enterprise recycling facilities for e-waste and POP treatment and recycling; dismantling and partial recovery facilities to segregate recyclable fractions; informal sector recyclers recover copper, gold, and other materials using rudimentary methods.
C	No e-waste specific legislation or specific legislation of POPs contained in e-waste plastics: e-waste management depends on ad hoc local actors; limited or no awareness of EHS among e-waste processors, and thus, little protection from toxins and hazardous substances released during e-waste treatment and recycling.	Only informal collection and/or disposal with municipal waste. E-waste treatment/recycling on micro- and small-scale often run individually by facilities in the informal sector using rudimentary and manual techniques for dismantling and repair, reuse, and recycling. POPs contained in e-waste plastics are not appropriately separated, treated, and disposed of in landfills.

In the indicator framework developed, each indicator available for the legal framework and collection infrastructure is scored as A, B, or C.

The approach taken is to develop a framework of indicators relevant for e-waste and POP legislation, e-waste, and POP management. Each indicator would have to be measurable and meaningful for e-waste and POP management. The adopted choice of indicators comes from a pragmatic compromise between the data available and the ideal situation, and it sometimes resulted in proxies. Each indicator is scored toward the three stages: A, B, or C (see Table 2). If a score is not known, it is set to unknown.

In the legal framework, five indicators are distinguished that deal with national and international legislation (see Table 2). They cover the national e-waste legislation aspects, such as the treatment or proper management of products. This includes whether or not the legislation defines collection targets and whether or not the law defines minimum standards for ESM of e-waste. Furthermore, the indicators take into account the obligations under international treaties, such as the:

- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.
- Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.
- Stockholm Convention on Persistent Organic Pollutants.
- Minamata Convention on Mercury.

In the collection mechanism, two indicators are defined. One indicator addresses the e-waste collection points, whether all municipalities have e-waste collection points, whether only the main cities do, or whether collection points are absent in the country. The nature of the collection points varies largely worldwide due to e-waste collection schemes, which, in some countries, may be administered through municipalities, informal collectors, retailers, etc. In practice, e-waste collection depends on how the collectors are handing over e-waste to treatment and recycling infrastructure for ESM of e-waste. Collection points can be organised either through municipalities or through producer take-back schemes, both of which include pick-up and drop-off services. The second indicator is whether or not an e-waste management infrastructure exists in the country.

Table 2. Overview of indicators in the e-waste management system and minimum level for each stage

	Number	Description of Indicator	Minimum Level for Stage C	Minimum Level for Stage B	Minimum Level for Stage A
Legislation	1.1	Existence of e-waste specific legislation	No	In development	Yes
	1.2	Enforced products in national e-waste legislation (percentage of mass of all UNU-KEYs in the e-waste generated)	At least 0%	At least 20%	At least 75%
	1.3	Is there a national e-waste collection target? (mandatory/voluntary/no)	No	Voluntary/in development	Yes
	1.4	Are there standards of e-waste management?	No	Voluntary/in development	Yes
	1.5	Number of MEAs ratified or signed (Basel, Minamata, Stockholm, Rotterdam)	1 Ratified or Signed	2 Ratified + 1 Signed	3 Ratified + 1 Signed
Infrastructure	2.1	Are there e-waste collection points in each municipality? (yes/in the main cities/no)	No	In the main cities	Yes
	2.2	Are there management facilities in the country for ESM of e-waste? (yes/no)	No	In process of being developed	Yes
Performance	3	E-waste collection rate (%)			
E-waste quantity	4	E-waste generated (in kg/inh and kt)			

The e-waste management in the countries is assessed by comparing the outcomes of the indicators on legislation and infrastructure with e-waste statistics indicators to determine the overall performance.

In practice, both the outcomes of the e-waste management matrix (i.e. legal development and the development of the e-waste management infrastructure) and the e-waste

statistics indicators provide an overview of whether the countries are legislating and building an effective e waste management infrastructure that can collect e-waste – the indicator ‘e-waste generation’ (indicator 2). The ‘e-waste collection rate’ (indicator 4) indicates the effectiveness of the legislation and infrastructure. Together, they provide a dashboard at the country level.

In the assessment of POPs contained in e-waste plastics, four indicators focused on national legislation are identified (see Table 3). They cover national legislation aspects concerning POPs in general and specifically those contained in e-waste (e.g. treatment or proper management of POPs). This includes whether the legislation defines collection targets for POPs and whether the regulations define minimum standards for ESM of POPs contained in e-waste plastics. The commitment and ratification of international treaties are not taken into account in this assessment, as they are covered in the e waste management matrix.

When analysing the collection and processing infrastructure of POPs contained in e-waste plastics, three main indicators are defined – one being actors who perform the collection of e-waste plastics and components expected to contain POPs. The entity performing the collection can provide a significant overview of how the materials are handled (e.g. using ESM) and can indicate the materials' final disposal. The management of this material can be undertaken solely by the formal sector (organisations/companies/actors authorized by the national authority), a combination of both the informal and formal sectors (e.g. through alliances or independently), and by the informal sector. The second indicator focuses on the how the separation of plastics containing POPs is carried out in a country. This process is relevant, as the separation of plastics containing POPs from e-waste is the first step in guaranteeing their ESM, treatment, and disposal and in avoiding the generation of hazardous contaminants as a by-product of their inadequate treatment (i.e. furans and dioxins). To evaluate the separation of plastics containing POPs from e-waste, common formal and informal practices used worldwide were taken into account in order to be able to compare results. Among them were using Industrial/Mechanical separation, flotation/immersion methods, and product/material labels, colour, knowledge acquired through experience, combination of colour, and knowledge acquired through

experience. As a third indicator, the treatment provided to POPs contained in e-waste plastics was evaluated. Given that not all countries have treatment plants that specialise in materials containing POPs, exportation for their ESM was taken into account as well as treatment and final disposal of this type of waste using co-processing methods by cement companies. The use of co-processing can: 1) support waste management in some countries where infrastructure may be lacking, 2) substitute fossil fuels and primary raw materials in cement production, and 3) eliminate harmful substances when monitored appropriately and in line with international agreements, country-specific requirements, and legal framework. The labelling of material in e-waste products and components to identify the plastic were taken into account as well when assessing the separation of e-waste plastics. Furthermore, artisanal separation methods, such as colour, knowledge through experience, and a combination thereof were taken into account.

Table 3. Overview of indicators of the POPs contained in e-waste plastics management system and minimum level for each stage

	Number	Description of Indicator	Minimum Level for Stage C	Minimum Level for Stage B	Minimum Level for Stage A
Legislation	1.1	Existence of a general POP legislation	No	In development	Yes
	1.2	Existence of a specific legislation of POPs contained in e-waste plastics	No	In development	Yes
	1.3	Is there a national POP collection target? (mandatory/voluntary/no)	No	Voluntary/in development	Yes
	1.4	Are there standards for the management of POPs contained in e-waste plastics?	No	Voluntary/in development	Yes
Infrastructure	2.1	Actors performing the collection of POPs contained in e-waste plastics (formal sector, informal sector, combination of formal and informal sectors, and unknown)	Informal sector	Combination of formal and informal sector	Formal sector
	2.2	How is the plastic contained in e-waste separated? (Industrial/Mechanical separation, flotation/immersion methods, product labels, by colour, through experience, combination of colour and through experience and unknown)	Colour, separation done through experience, combination of colour, and through experience	Using submersion methods, products labels	Industrial/Mechanical separation
	2.3	Management of POPs contained in e-waste plastics (sent to treatment plant, exported for treatment, co-processing, landfilled)	Landfilled	Co-processing	Sent to treatment plant, exported for treatment
Performance	3	POPs contained in e-waste plastics collection rate (%)			
E-waste quantity	4	POPs contained in e-waste plastics generated (in kg/inh and kt)			

Assessment of the management of POPs contained in e-waste plastics is completed by comparing the policy and infrastructure with statistics on performance, as well as the amount of POPs contained in e-waste plastics. Similar to the e-waste management matrix assessment, the POPs contained in e-waste plastics management are assessed in a matrix using a comparable and compatible methodology. Its outcome on key indicators (legal development, management, and infrastructure), together with available statistics, provides an overview of whether the countries are legislating and building an effective management and treatment infrastructure (indicator 4).

The 'POPs contained in e-waste plastics collection rate' (indicator 3) illustrates the effectiveness of the legislation, infrastructure, and overall management. Together, they provide a dashboard at the country level as illustrated in the Country profiles (Chapter 10).

D. Data Sources

Several sources have been used and complemented to quantify the main statistics indicators and to overcome challenges of data availability and comparability.

Statistical data on EEE POM and e-waste generated were obtained from the governments or national statistical offices of 11 countries (Argentina, Bolivia - Plurinational State of, Costa Rica, Chile, El Salvador, Ecuador, Guatemala, Panama, Peru, Uruguay, and Venezuela - Bolivarian Republic of), and for countries with no available information (Honduras and Nicaragua), datasets from UNU/UNITAR in *The Global E-waste Monitor 2020* [3] were used. Data on e-waste formally collected have been obtained from national official databases and countries' authorities that were part of the study.

To determine the amount of e-waste imported and exported per country, data have been extracted from the national reports of the Basel Convention 2016-2019. The analysis of whether TBM corresponded to e-waste or not has been performed using a combination of the codes in List A (hazardous waste) and List B (non-hazardous waste), as well as the Y codes of the Basel Convention (ANNEX C). Additionally, all descriptions in the reporting were checked to ensure that wrong declarations were left out and not erroneously included.

The socioeconomic condition has been analysed from factors such as population and PPP, obtained from the United Nations Department of





Economic and Social Affairs (UNDESA) – as well as from the size of the informal sector, access to electricity and internet, and share of the population below the poverty line, which were obtained from the United Nations Statistics Division (UNSD) SDGs⁽¹³⁾ database.

Information regarding the current status of the legislative framework and the overall e-waste and POP management was acquired via questionnaires and direct interviews addressed to ministries of each country and stakeholders of relevance for the e-waste sector. For countries with a national legislation defining e-waste or Extended Producer Responsibility (EPR) system in place, relevant legal acts were examined to determine the products in the scope, which were then converted to the UNU-KEYs classification in order to quantify the percentage of the total amount of e-waste generated in the countries covered by the legislation (expressed as ‘Legislation product coverage in UNU-KEYs’ and ‘Legislation product coverage in weight [%] on total and per category’ in each country profile).

Composition information of EEE plastic was extracted from UNU/UNITAR’s internal database. In the case of BFR content in EEE plastic a combination of UNU/UNITAR’s internal composition database, outcomes of the UNDP project ‘Reducing the release of unintentional POPs and mercury from hospital waste management, e-waste, scrap metal processing and biomass burning’, and a literature review were used.

Data on the Parties and status of the signatories of the Basel, Rotterdam, Stockholm, and Minamata Conventions were obtained from their individual websites: Parties to the Basel Convention (basel.org), Parties to the Rotterdam Convention (pic.int), Parties to the Stockholm Convention (pops.int), and Parties to Minamata Convention (mercuryconvention.org).

Where first-hand information could not be retrieved, literature research, reviews of existing papers, and national studies for the countries of interest were conducted.

⁽¹³⁾ UN SDGs <https://unstats.un.org/sdgs/indicators/database/>.

3. OVERVIEW OF THE E-WASTE AND POP LEGISLATION AND MANAGEMENT SYSTEMS

A. Status of E-waste and POP Legislation

All 13 countries in the region have well-developed legal and regulatory frameworks for waste management, but most do not have specific legislations for e-waste and EPR systems focused on the regulation of e-waste (Table 4).

Five countries have established e-waste-specific legislation and EPR on e-waste for some products.

Of the 13 Latin American countries analysed, five have e-waste legislation in place. Bolivia (Plurinational State of), Chile, Costa Rica, Ecuador, and Peru have e-waste-specific legislation or regulation implemented. In the case of Ecuador, the legislation and regulatory framework for hazardous wastes and chemicals includes specific secondary laws related particularly to mobile phones. For other countries, the legislation covers all categories of EEE. Drafts of e-waste legislations are in development in El Salvador, Panama, and Uruguay.

Following the Regulation for the Declaration for Waste requiring Special Management, enacted in 2014, collection targets in Costa Rica were established from 2014 to 2019 on a voluntary basis. Chile's EPR was established in 2015, but implementing regulations are still in the process of being adopted. In 2012, Ecuador introduced an EPR scheme for producers and importers of EEE that establishes a percentage of annual recycling of 3 percent of the total number of mobile phones POM during the regulatory year. In the case of Peru, complementary provisions with annual e-waste management targets ranging from 4 to 16 percent were established in 2015 for some categories of EEE (i.e. IT, telecommunications, and consumer equipment). In 2019, collection targets were further defined for large and small household equipment. Other EEE (e.g. lamps, electrical and electronic tools, toys, etc.) are formally collected in a voluntary basis. Costa Rica, Chile and Ecuador's collection targets and treatment fees are currently being discussed.

In Bolivia (Plurinational State of), the EPR regulation was not followed by necessary secondary implementing bylaws, so it does not establish applicable collection targets. Moreover, discussions of implementing an EPR system for e-waste are currently underway in Panama.

Argentina, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Uruguay, and Venezuela (Bolivarian Republic of) have neither EPR for e-waste nor defined collection targets in place. E-waste management in these countries is mainly defined in general waste or hazardous legislations and/or regulations. In the case of Argentina, even though there is no specific e-waste regulation in place at the national level, eight provinces have e-waste-specific regulation.

Table 4. Presence of e-waste-specific legislation, EPR, & EHS standards on e-waste management and POP regulation*

Country	Specific Legislation/ Regulation on E-waste	Status of E-waste EHS	Status of E-waste EPR	Hazardous Waste Regulation (incl. POPs)*	Specific Legislation of POPs Contained in E-waste Plastics	Standards for Management of POPs in E-waste Plastics
Argentina	✘	⚙️	✘	✔️	✘	⚙️
Bolivia (Plurinational State of)	✔️	✔️	✔️	✔️	✘	⚙️
Chile	✔️	✔️	✔️	✔️	✘	⚙️
Costa Rica	✔️	✔️	✔️	✔️	✘	⚙️
Ecuador	✔️	✔️	✔️	✔️	✘	⚙️
El Salvador	⚙️	✔️	✘	✔️	✘	⚙️
Guatemala	✘	⚙️	✘	✔️	✘	✘
Honduras	✘	⚙️	✘	✔️	✘	⚙️
Nicaragua	✘	⚙️	✘	✔️	✘	⚙️
Panama	⚙️	⚙️	⚙️	✔️	✘	⚙️
Peru	✔️	✔️	✔️	✔️	✘	⚙️
Uruguay	⚙️	⚙️	⚙️	✔️	✘	⚙️
Venezuela (Bolivarian Republic of)	✘	⚙️	⚙️	✔️	✘	⚙️

Key: ⚙️ draft stage ✔️ present ✘ absent

*Detailed information about specific laws can be found in the respective country profiles (see also Chapter 10); e-waste-specific POP legislation is non-existent in all 13 countries.

All countries have hazardous waste regulation that includes POPs, but none has legislation specifically for POPs from e-waste plastics.

All 13 countries have hazardous waste regulation that includes POPs. However, none of the countries have specific regulation for POPs contained in e-waste plastics. POPs from e-waste are regulated as hazardous waste within the relevant general legal frameworks. However, under the framework of the PREAL project⁽¹⁴⁾, the project is currently being evaluated with the aim of identifying recycling options and promoting the separation of plastic POPs contained in e-waste plastics for ESM.

⁽¹⁴⁾ <https://residuoselectronicosal.org/>.

Overall, all countries within the scope of the PREAL project have made progress with respect to e-waste and POPs contained in e-waste plastic management. For example, Honduras has started registering EEE producers and quantifying EEE products as an initial step in the process of implementing an EPR system. Guatemala and Nicaragua have begun developing a regional e-waste classification in coordination with other countries in the region. As well, Uruguay is evaluating alternatives for the treatment of POPs from e-waste plastic and have started to compile statistical information. Panama has started coordinating and promoting the separation of e-waste from residual waste, while strengthening the national capacities in facilities/ infrastructure for proper and sound e-waste management. Furthermore, Venezuela (Bolivarian Republic of) has defined an e-waste collection plan that includes creation of collection points in recreational parks and dissemination of information on proper e-waste management (e.g. with formal training), while being in discussions with producers and distributors of e-waste regarding their proper management, regulations, and technical standards for EPR. Nicaragua is currently mapping key stakeholders and developing plans to improve the collection, sorting, and disposal of e-waste, while a preliminary study developed under the PREAL project in Ecuador showed that the collection rate has remained the same through the years.

Six countries have EHS standards for e-waste management, and such standards are under development in the other seven countries.

To ensure proper environmental management and employee safety in the e-waste management sector, EHS is required. EHS (environmental health and safety) refers to standards, laws/ regulations, and workplace efforts to protect the health and safety of employees, the public, and the environment from hazards (emissions, etc.) associated with the workplace. Costa Rica, El Salvador, and Peru currently have EHS standards for the management of e-waste. E-waste operators in Argentina, Bolivia (Plurinational State of), Chile, Honduras, Panama, and Venezuela (Bolivarian Republic of) implement EHS standards for ESM of e-waste on a voluntarily basis. Nicaragua and Uruguay are in the process of introducing EHS for e-waste.

B. International Agreements

There are several international agreements that countries in the region have put in place or agreed to be bound by that relate to e-waste. These range from multilateral environmental agreements (MEAs) to agreements on restricting the use of hazardous substances in manufacturing to agreements promoting the circular economy. Table 5 provides a summary of all international agreements in the region and is described below.

All 13 countries are Parties to the Basel, Rotterdam, and Stockholm Conventions; 12 countries are Party to the Minamata Convention, and Guatemala is currently a signatory.

The 13 Latin American countries analysed have all adhered to the Rotterdam Convention and the other two major MEAs relevant for e-waste issues (Basel and Stockholm). All 13 countries are Parties to the Basel Convention on the Control of TBM of hazardous waste and their disposal and

are also bound to the Rotterdam Convention on the Prior Informed Consent Procedure (PIC) for Certain Hazardous Chemicals and Pesticides in International Trade.

Guatemala has signed the Minamata Convention on Mercury, but the ratification process has not yet been completed. Though the Minamata Convention on Mercury is more recent, it is also relevant for e-waste issues. In fact, Part 1 of Annex A of the Minamata Convention prohibits production, importation, or exportation of a whole list of mercury-containing goods, including EEE.

Table 5. Overview of the status of party and signatory countries of international agreements

Countries	International Agreements			
	Basel Convention ⁽¹⁵⁾	Rotterdam Convention ⁽¹⁶⁾	Stockholm Convention ⁽¹⁷⁾	Minamata Convention ⁽¹⁸⁾
Argentina	✓	✓	✓	✓
Bolivia (Plurinational State of)	✓	✓	✓	✓
Chile	✓	✓	✓	✓
Costa Rica	✓	✓	✓	✓
Ecuador	✓	✓	✓	✓
El Salvador	✓	✓	✓	✓
Guatemala	✓	✓	✓	⚙️
Honduras	✓	✓	✓	✓
Nicaragua	✓	✓	✓	✓
Panama	✓	✓	✓	✓
Peru	✓	✓	✓	✓
Uruguay	✓	✓	✓	✓
Venezuela (Bolivarian Republic of)	✓	✓	✓	⚙️

✓ Party ⚙️ Signatory ✗ Not Party or Signatory

The 13 Latin American countries analysed have all adhered to the Rotterdam Convention and the other two major MEAs relevant for e-waste issues (Basel and Stockholm).

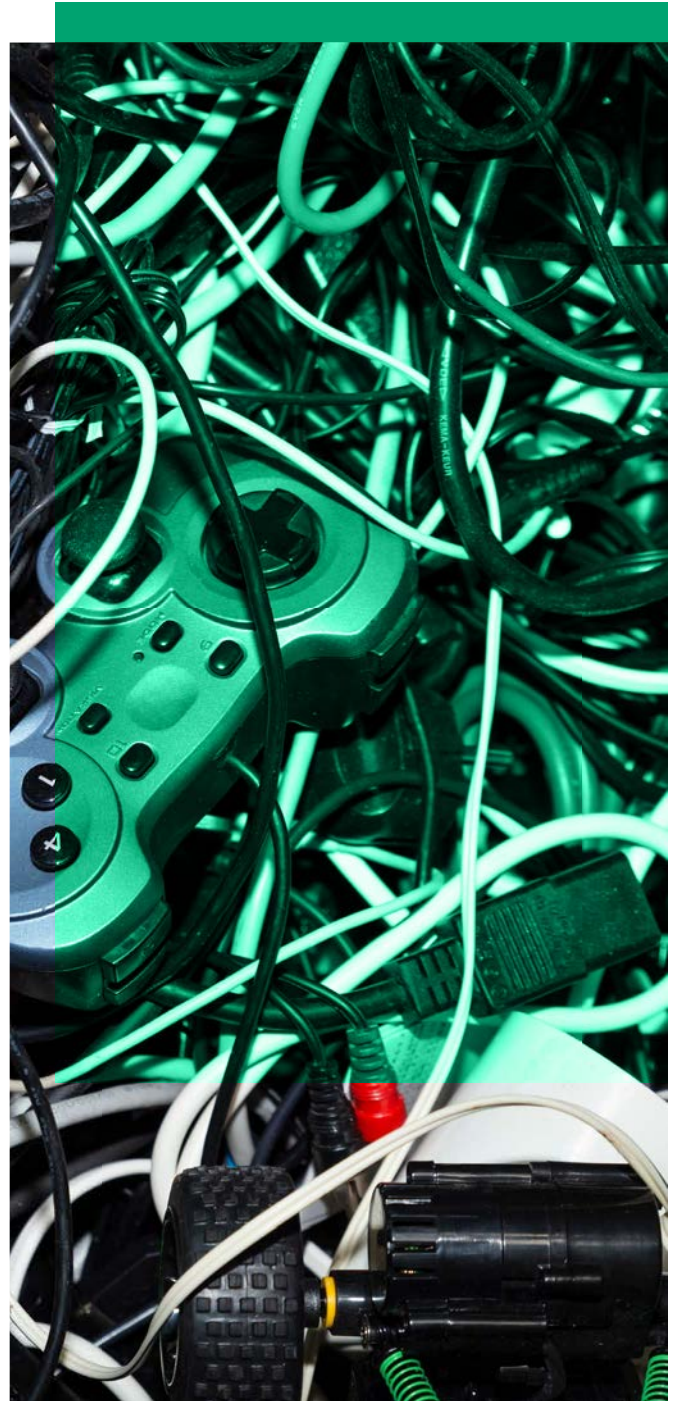
C. Mapping of Key Stakeholders

The authorities in charge of e-waste and waste management in Latin America are the government ministries/agencies at both the central and local levels. Other relevant stakeholders include the EPR organisations and implementing bodies, importers and exporters, producers and distributors, consumers, and treatment/recycling companies. Among such stakeholders are several private/civil society organisations and non-governmental organisations (NGOs), most of which are active in awareness creation. The stakeholders are described in more detail below.

In most countries, the Ministry of Environment or Health is the leading governmental agency in charge of legislating and monitoring e-waste and POPs.

In Argentina⁽¹⁹⁾, Chile, Guatemala, Nicaragua, Peru, and Uruguay, the Ministry of Environment coordinates e-waste management, while in Ecuador, the Ecuadorian Ministry of Environment, Water and Ecological Transition (MAATE) is in charge. In Bolivia (Plurinational State of), the Ministry of Environment and Water is the entity in charge of developing waste management policies and legislation. In Honduras and El Salvador, the Secretariat/Ministry of the Environment and Natural Resources oversees the management of and enforcement of regulations relating to e-waste and POPs. The Ministry of Health is the responsible agency in Costa Rica and Panama, and the Ministry of People Power for eco-Socialism is the focal ministry/agency in Venezuela (Bolivarian Republic of).

In Costa Rica, the Ministry of the Environment enacted the Plan of Action on POP management, and the Ministry of Health introduced the Specific EHS Standards for e-waste management.



Municipalities are responsible for the management of waste in their jurisdiction (incl. e-waste). The final disposal of waste is typically landfilling in countries in which waste separation has not been implemented at the national level.

Municipal authorities at the national, state/provincial, and local levels are a major stakeholder in waste (including e-waste) management. In most of the countries (e.g. Argentina, Bolivia - Plurinational State of, Chile, Costa Rica, Ecuador, El Salvador, Honduras, Nicaragua, etc.), the municipalities are responsible for waste management. Municipalities in Uruguay are responsible for waste management in their respective jurisdictions, including the enactment of waste management plans supported and aligned with the strategies defined by the National Directorate of the Environment and with EPR principles. In Bolivia (Plurinational State of), the national legislation places primary responsibility for waste management on producers, who must be responsible for the products they sell, and additional responsibility on consumers and government and municipal authorities. As well, municipalities are also responsible for issuing land use permits for the establishment of e-waste disassembly and recovery facilities. In Ecuador, voluntary initiatives to recycle e-waste are carried out through municipalities that perform consumer campaigns. Municipalities in Nicaragua only focus on non-hazardous and construction waste.

For countries such as Nicaragua, Guatemala, Honduras, and El Salvador that are just beginning to embark on developing their e-waste management strategies, it is likely that reasonable quantities of e-waste generated are partly mixed in with residual waste and destined for landfills.

Producers/importers are also collectors of e-waste under the EPR in only a few countries.

With their respective EPR compliance schemes, EEE producers/importers contribute to proper e-waste management through the EPR system. The general

responsibilities of the producers placing EEE on the market (and importers, which are often defined as producers in the legislation) are to create an infrastructure for the collection and treatment/recycling of waste, and the producers usually have legally imposed financing mechanisms in place to ensure that they are ultimately covering the costs necessary for depollution and recycling.

Only five countries (Bolivia - Plurinational State of, Costa Rica, Chile, Ecuador, and Peru) currently have an EPR system. Of these five countries, only two countries' legislation defines collection targets and provides alternative measures in the form of an environmental fee for non-compliance for producers and importers who do not have their own collection and processing system (i.e. Ecuador defined collection targets for mobile phones, and Peru established collection targets for cat. 3 and 4 of EU10), and other collection categories are voluntary. Nonetheless, available information indicates that collection points are insufficient to cover the entire population, and enforcement and monitoring to apply these measures are lacking.

Of the countries analysed in this report, only Chile, Argentina, and Costa Rica manufacture EEE and related components. Generally, importers and exporters of EEE facilitate e-waste collection from consumers and businesses when the products they place on the market reach the end of their useful life cycle. This e-waste collection is done voluntarily in countries without an EPR system. Consequently, the e-waste recycling capacity for the countries analysed is insufficient for managing all e-waste generated in an environmentally sound manner; as such, exporting of this equipment and landfilling are common practices for most countries.

Consumers (household, public, and private sector) generate most e-waste and make the choice on where to discard it.

Consumers – both bulk (public and private sector) and individuals (households) – are major stakeholders, as they generate e-waste and also determine where the discarded e-waste is handed over to or repaired. In some countries (e.g. Honduras, Nicaragua, etc.), there is no e-waste collection infrastructure, so consumers have the option to deal with informal collectors (e.g. collectors that collect door-to-door, kerbside etc.), dispose of e-waste in residual waste, repair the items, or donate them. In Argentina, e-waste from businesses or industries is normally collected and handled by registered companies who manage such waste. In many countries (e.g. Peru), the consumers can hand over e-waste at municipal or private collection points and at retail shops that have take-back obligations.

Voluntary initiatives for collecting e-waste (e.g. collection and awareness campaigns) occur in most of the countries. These are normally carried out in cooperation with municipalities and key e-waste stakeholders, such as universities, the private sector (e.g. mobile phone companies, retailers, etc.), and, in some cases, NGOs. In Ecuador, the voluntary initiative is achieved in municipalities that perform consumer campaigns. In the past, such campaigns have been used to promote replacing old refrigerators and lamps with more efficient technologies.

In some countries, the lack of infrastructure, public awareness of the consumer, enforcement, the monitoring of collection targets, and financial incentives drive the flows of e-waste into the informal sector. As a result, informal recycling of e-waste is prominent in such countries. Informal recycling is mostly laborious and hazardous, resulting in adverse effects for the environment and human exposure to hazardous chemicals.

E-waste operators exist in all countries, but only Argentina, Chile, Costa Rica, Ecuador, Panama, Peru, and Venezuela (Bolivarian Republic of) have e-waste treatment facilities for some EEE. Most e-waste operators export e-waste for treatment.

Of the 13 countries analysed, 7 – Argentina, Chile, Costa Rica, Ecuador, Panama, Peru, and Venezuela (Bolivarian Republic of) – have medium- and small-scale recycling and treatment facilities where e-waste is treated or recovered. Some of the facilities accept and recycle any categories of e-waste, while others are more specific. Most e-waste operators (e-waste managers) licenced to perform e-waste management have additional roles, including collection, transportation, refurbishment, dismantling/recovery, storage, partly recovering, recycling, and exporting all types of electronic equipment.

Authorised e-waste operators and/or recovery centres can receive e-waste in multiple ways, such as through collection campaigns, directly from consumers, through other authorized dealers/collectors, and from municipalities (collected as a result of previous selective collection in households). E-waste operators in the region normally focus on collection and conditioning of e-waste for subsequent export and the dismantling of equipment to obtain valuable fractions such as ferrous and non-ferrous metals, circuit boards, and plastic. For instance, in Honduras, e-waste operators typically disassemble/dismantle e-waste and separate the valuable parts (e.g. printed circuit boards) from the non-valuable parts. The valuable parts are either sold in the internal market (e.g. aluminum, iron, etc. to smelters) or stored in containers, and once enough material is accumulated (such as printed circuit boards, batteries, etc.), it is exported to the United States or other countries for treatment. The non-valuable parts are likely to be disposed of mixed in residual waste.

Costa Rica currently has 60 companies registered for the management of e-waste, Argentina has 27, Chile and Nicaragua each have 11, Uruguay has 9, Honduras and

Panama each have 7, Bolivia (Plurinational State of) and Peru each have 6 (of which 3 provides services), Ecuador has 5, Venezuela (Bolivarian Republic of) has 4, El Salvador has 3, and Guatemala has 2. One of Uruguay's e-waste operators has authorisation to incinerate ink and toner cartridges.

Most countries separate plastics (incl. plastics containing POPs) derived from e-waste by type (using colour and *experience*) as valuable and non-valuable. There are no treatment facilities specialising in the treatment of POPs or POPs contained in e-waste plastic.

All 13 countries analysed have a general regulation or legislation on POPs (aligned with the Stockholm Convention), but none has POP legislation specifically on e-waste. Some countries (such as Ecuador and Honduras) separate and sort plastics resulting from e-waste. Most countries analysed are working toward preparing EHS standards for handling and treatment of POPs resulting from e-waste management. To achieve this, countries foresee sorting plastics according to their type (polypropylene [PP], acrylonitrile-butadiene-styrene [ABS], polycarbonate [PC], etc.) and separating the plastics containing Polychlorinated biphenyl (PCB) for their subsequent treatment.

All 13 countries lack facilities for treating POPs contained in e-waste plastic (e.g. PCB and Brominated Flame Retardant-BFR). However, under the framework of the PREAL project, alternative solutions are currently being evaluated for the management of POPs contained in plastic e-waste. One alternative being contemplated is the use of co-processing of e-waste plastics containing POPs by cement companies. The plastics' high calorific value is used as an energy source, and since the furnace operates at very high temperatures, no contaminants are produced (e.g. furans, dioxins) or released as by-products. Co-processing of plastics containing POPs is currently occurring in El Salvador.

E-waste plastic is normally shredded and either disposed of in landfills or exported for treatment (as in Argentina and Chile). One company in Ecuador separates brominated and non-brominated plastics from e-waste, discarding its PCB in safety cells in landfills. In Peru, plastics that do not contain brominated retardants are sold for recycling, the other plastics are sent to landfill. Within the framework of the PREAL project, studies are currently being conducted to evaluate the management of POPs overall, including the assessment of the capability and feasibility of treatment facilities to manage plastics containing POPs.

Overall, regulatory standards for the management of POPs in the 13 countries follow the provisions defined in the hazardous waste legislation, and all countries have national implementation plans, due to the Stockholm convention. However, there are no specific standards or regulations on the management and treatment of POPs contained in e-waste plastic.

Informal operators of e-waste exist in the region and focus on valuable parts.

In most of the countries, the informal sector⁽²⁰⁾ is also active, but there is little or no quantitative information about its role or involvement. The informal operators often work behind the scenes and participate in the collection and pre-processing of e-waste. When not regulated, the activities of the informal operators contribute to the observable adverse effects of unsafe e-waste management on the environment and human health. The informal sector mostly focuses on the scavenging of valuable parts and their sale to other recyclers. In some countries, this can also involve open burning and acid baths at landfill sites. Only some of the e-waste (valuable fraction) is collected by the informal sector, and it is often subjected to substandard treatments, as well as to the subsequent improper dumping of non-valuable and hazardous components.

⁽²⁰⁾ ILO definition of informal sector: A group of production units comprised of unincorporated enterprises owned by households, including informal own-account enterprises and enterprises of informal employers (typically small and non-registered enterprises). See ILO (2017) section 4.5 on informal economy workers.

The informal sector dominates countries in the region (e.g. Panama, Chile, El Salvador, and Guatemala). Some countries, such as El Salvador, have published provisions in their management guidelines which specify that if an appliance can no longer be repaired, it should not be thrown in the street or sold to “scrap dealers” or informal actors’, promoting formal collection. Other countries, (e.g. Chile, Honduras, Nicaragua, etc.) have e-waste operators who have developed alliances with the informal sector or co-operatives (formed from members that used to belong to the informal sector) who sell them e-waste collected informally. In the case of Chile, this is in line with the inclusion policy, established by the Ministry of Environment, which promotes the formalisation process of the informal sector at fair market prices. In countries where it is not regulated, the e-waste provided to formal e-waste operators usually consists of valuable parts, and the non-valuable parts are most likely disposed of either in landfills or as mixed in with residual waste.

Given that e-waste plastic containing POPs is not profitable, it is safe to assume that when collected informally, it is disposed of in landfills or burned.

Repair and refurbishment of end-of-life EEE.

All 13 countries have a strong repair culture and have companies (including repair shops) dedicated exclusively to the reconditioning, refurbishment, and repair of equipment for reuse or for sale as second-hand devices. In Ecuador, used electric and electronic equipment that is disposed of and still suitable for reuse is sold as second-hand equipment. In Chile, some organisations collect used electric and electronic equipment directly from households, free of charge. If the equipment is in good condition or can be repaired, it is fixed and sold for reuse. If the equipment cannot be repaired, it is dismantled and the valuable fractions are extracted and sold in the internal market. In Chile, one non-profit association (Chilenter) is dedicated to the reconditioning of discarded electronic equipment (e.g. computer equipment such as notebooks, screens, and projectors)

for reuse, especially through donations from educational establishments (through existing agreements with the Ministry of Education). Similarly, in Peru, e-waste collected as donations from non-profit associations are taken to facilities (their own or third parties’) for repair and reconditioning before they are donated to low-income individuals or sold at low prices. Besides providing customers with reverse logistic solutions, most e-waste operators in Guatemala also render refurbishing services for customers and place second-hand equipment for sale locally and internationally. All countries allow imports of used EEE, whose statistics are not differentiated from new EEE.

The civil society (i.e. non-governmental organisations, academia, associations, etc.) operate in all countries.

In the 13 countries analysed, public organisations and NGOs exist and are involved in educational and public awareness activities. Periodically, they conduct research and events to raise public awareness in the field of waste management, including e-waste. In some cases, they assist local governments on the organisation of awareness campaigns. For instance, in Peru, the NGO Sustainable Development Production (abbreviated as IPES in Spanish) developed a Diagnosis of Electronic Waste Management in 2008 (updated in 2010) that provides information on key e-waste indicators (e.g. POM, e-waste generated, etc.) and an overview of the e-waste management. Since then, IPES has published diagnoses of e-waste management for various cities in Peru, which are intended to provide an overview of e-waste management and an estimation of e-waste statistics.

D. Projects and Campaigns for E-waste Collection and Recycling

Countries in the region have adopted several initiatives and campaign strategies to create awareness on e-waste collection and recycling with active participation from both the public and private sectors. To achieve wide dissemination on information of e-waste, countries

have adopted different strategies, including the use of brochures, articles in newspapers and on social media, and awareness campaigns.

Some projects on e-waste are regional in nature – e.g. UNIDO and the Global Environment Facility (GEF) initiative for addressing the proper disposal and recycling of electrical and electronic waste by adopting a circular economy approach, which began in June 2018⁽²¹⁾⁽²²⁾. The project works to harmonise key aspects of e-waste policies, strengthening regional cooperation, knowledge management, and information exchange systems⁽²³⁾. In some countries (e.g. Argentina), awareness activities through social networks and local media are used by the producer responsibility organisations (PROs, which are professional organisations authorised or financed collectively or individually by EEE producers to take responsibility for collection and ESM of e-waste) as a campaign for collecting e-waste from companies, local government, educational institutions, and households as part of the annual (2020 edition) of the International Electronic Waste Day⁽²⁴⁾.

These mapped projects do not comprise a complete overview of the region, but nonetheless focus on:

- the establishment of policy and legal measures⁽²⁵⁾;
- improving e-waste management⁽²⁶⁾;
- national studies to map the e-waste situation;
- initiatives to increase the number of e-waste collection points;
- initiatives to export e-waste for ESM⁽²⁷⁾;
- improving local capacity for sustainable recycling⁽²⁸⁾;
- awareness-raising campaigns⁽²⁹⁾.

Projects and initiatives for creating awareness of the danger of POPs and the need to ensure their reduction, ban, and ESM have also increased [16], as have support via training and capacity-building activities for assisting countries in implementing a global monitoring plan for subsequent evaluations [17]. In 2018, the Government of Honduras launched the **COPs4 Project** through the Secretariat of Natural Resources and Environment (Mi

Ambient+) and using the United Nations Development Program (UNDP) funding from GEF. The project has a duration of 5 years and enables the implementation of the National Chemicals Policy, approved in Honduras in 2013, specifically to comply with the National Plan of the Strategic Approach to Chemicals Management (SAICM), the Stockholm Convention on POPs, and the Basel Convention on Transboundary Movements of Hazardous Wastes⁽³⁰⁾. Honduras also has an ongoing project on the ESM of POPs [18].

Chile and Ecuador are among the 12 pilot countries that participated in the pilot project, Development of National Implementation Plans for the Management of Persistent Organic Pollutants (POPs) [19]. The project was part of the work program approved by the May 2001 Council meeting. This proposal is an add-on that would allow Chile to complete the work needed to finalise their National Implementation Plan (NIP). The mapping of different stakeholders (both public and private sectors) involved in e-waste management that could be identified are listed by country in Chapter 10.

⁽²¹⁾ <https://www.unido.org/ewastelac>.

⁽²²⁾ <https://www.unido.org/news/solving-e-waste-problem-latin-america>.

⁽²³⁾ <https://global-recycling.info/archives/650>.

⁽²⁴⁾ <https://weee-forum.org/international-waste-country/ar/?year=%222020%2>.

⁽²⁵⁾ <https://www.wrforum.org/projects/sri/colombia-e-waste-management-policy/>.

⁽²⁶⁾ <https://www.giswatch.org/country-report/2010-icts-and-environmental-sustainability/argentina>.

⁽²⁷⁾ <https://www.azernews.az/business/57038.html>.

⁽²⁸⁾ <https://chemicalwatch.com/84626/latin-america-project-to-tackle-pops-in-e-waste>.

⁽²⁹⁾ <https://www.giswatch.org/country-report/2010-icts-and-environmental-sustainability/costa-rica>.

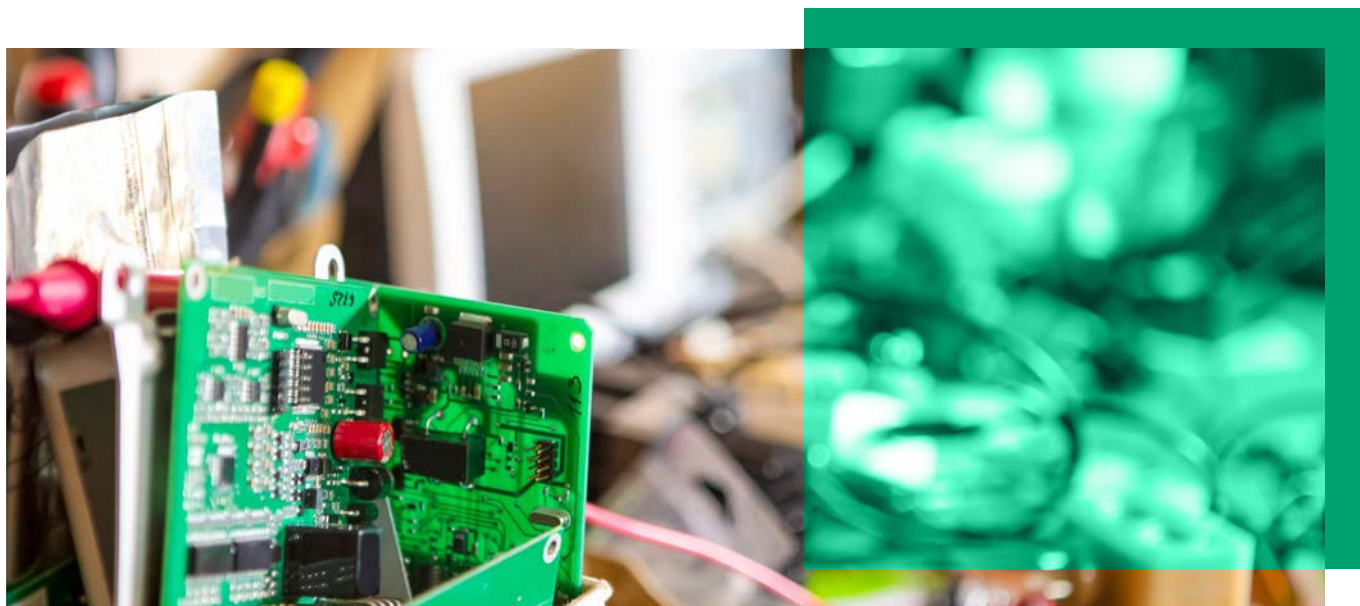
⁽³⁰⁾ https://procurement-notice.undp.org/view_notice.cfm?notice_id=30256.

4. STATISTICAL OVERVIEW ON E-WASTE AND POPS CONTAINED IN E-WASTE PLASTICS FOR THE LATAM COUNTRIES

A. EEE POM and E-waste Generated

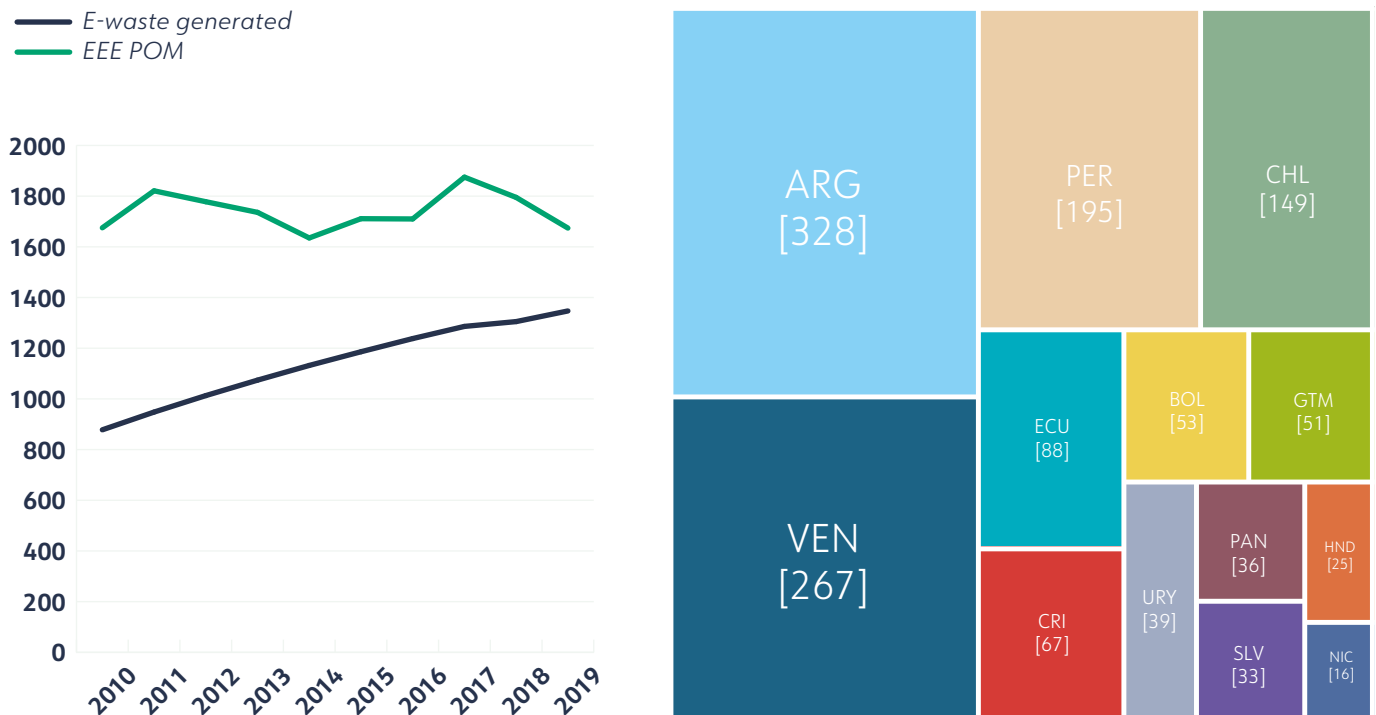
The EEE POM for the 13 countries analysed has fluctuated from 2010 to 2019. The total EEE POM in 2010 of 1.7 Mt (8.9 kg/inh) increased to 1.8 Mt in 2011, then again to a height of 1.9 Mt in 2017, before decreasing to 1.7 Mt (8.1 kg/inh) in 2019. Countries in the region mostly import EEE. E-waste generation in the region increased by 49 percent from 0.9 Mt (4.7 kg/inh) in 2010 to 1.3 Mt (6.5 kg/inh) in 2019.

The total EEE POM has fluctuated over the years, from 1.7 Mt (8.9 kg/inh) in 2010 to 1.8 Mt (9.2 kg/inh) in 2012, down to 1.6 Mt (8.3 kg/inh) in 2014, up to 1.9 Mt (9.2 kg/inh) in 2017, and back down to 1.7 Mt (8.1 kg/inh) in 2019 (Figure 5). The EEE POM fluctuations observed over the last decade for the countries analysed could be attributed to the impact of national and international economic crises experienced over the years in some countries (e.g. Argentina, Honduras, and Venezuela - Bolivarian Republic of). This fluctuation has had a strong correlation between the countries' purchasing power and the quantity of EEE POM.



All countries analysed rely mainly on imports of EEE, with only Argentina, Costa Rica, and Chile having an internal domestic production of such equipment. In 2017, it was estimated that Chile's domestic production (i.e. refrigerators, kitchen, stoves, and washing machines) represented only 7 percent (21 kt) of the total EEE POM in the country. In 2019, Argentina had a domestic production of 4 percent (157 kt) of the total EEE POM, consisting of mainly washing machines and dryers, refrigerators, freezers, microwaves, and televisions. The amount of e-waste generation shows a steady increase, from 0.9 Mt (4.7 kg/inh) in 2010 to 1.3 Mt (6.5 kg/inh) in 2019, for an average per annum increase of 50 kt. All data per country is shown in ANNEX D.

Figure 5. EEE POM and e-waste generated in the region (kt) for 2010-2019

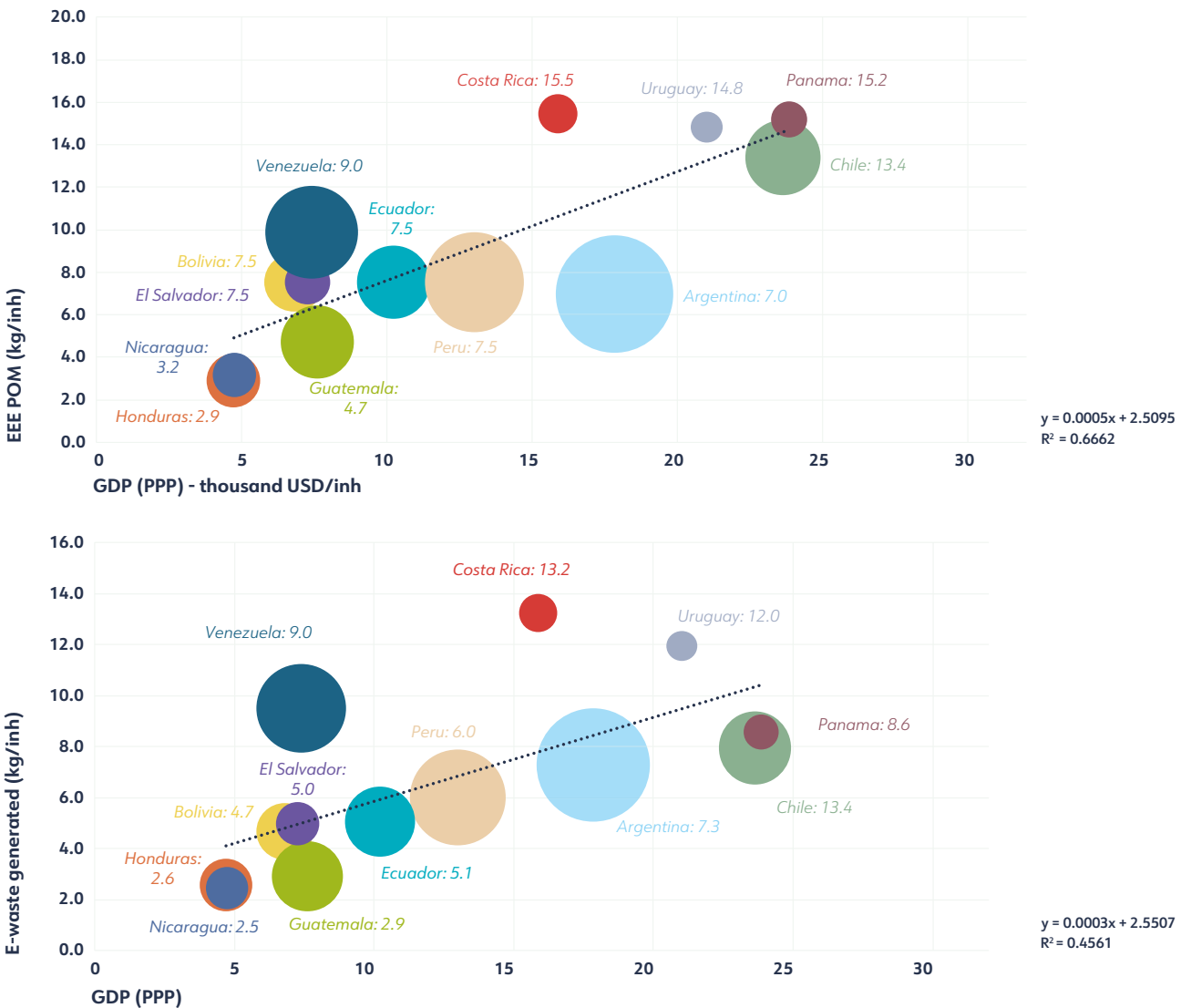


E-waste generation and EEE POM show a positive correlation with the PPP.

The EEE POM in for the countries analysed varies from 2.9 kg/inh for Honduras to 15.5 kg/inh for Costa Rica (Figure 6). There is a positive correlation ($R^2 = 0.67$) between EEE POM in kg/inh and the purchasing power parity (PPP) per inhabitant of the countries, indicating that the EEE POM increases when the PPP increases. Similar variations and trends were observed for e-waste generation. The amount of e-waste generated per inhabitant (Figure 6) was highest

in Costa Rica (13.2 kg/inh) and lowest in Nicaragua (2.5 kg/inh), and showed a positive correlation ($R^2 = 0.46$) with the PPP. The largest EEE POM in the region is Argentina, with 313 kt in 2019, followed by Venezuela (Bolivarian Republic of) (277 kt), Chile (251 kt), and Peru (244 kt). The country generating the most e-waste in 2019 was Argentina (328 kt), with 24.3 percent of the total e-waste generated in the region, followed by Venezuela (Bolivarian Republic of) (267 kt; 19.8 percent), Peru (195 kt; 14.4 percent), and Chile (149 kt; 11.0 percent).

Figure 6. EEE POM (top) and e-waste generated (bottom) in the region (USD/inh) for 2019



B. E-waste Categories

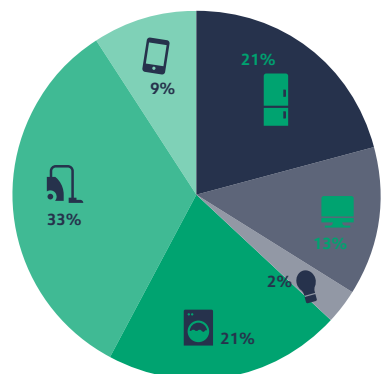
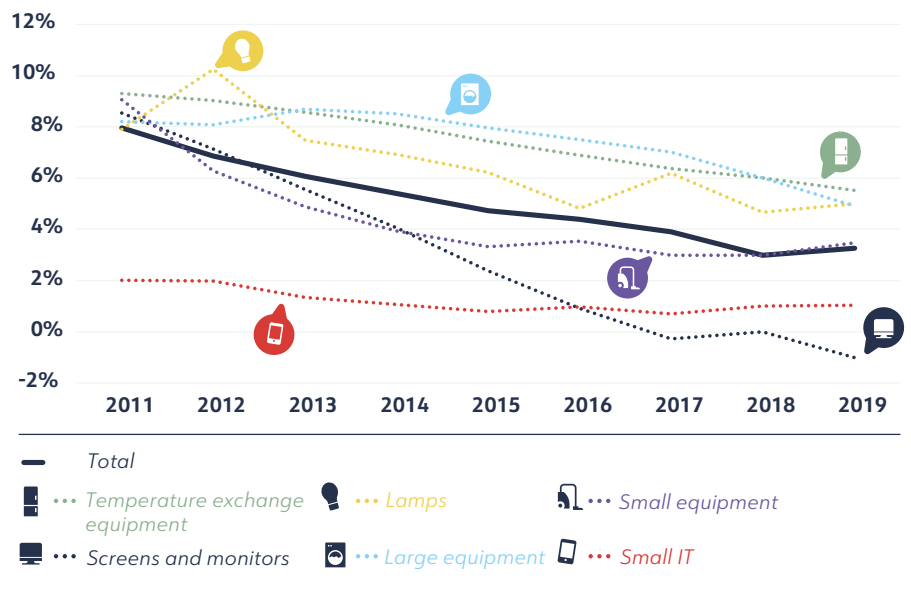
Small equipment (Cat. V), temperature exchange (Cat. I), and large equipment (Cat. IV) have the highest share of e-waste generation, with 75 percent of the total share. The annual growth rate decreases for nearly all categories but remaining positive, except for screens, which have negative growth rates.

When disaggregating the e-waste generated quantities into the six e-waste categories, the largest category (Cat.) is small equipment (e.g. microwaves, grills and toasters, speakers, cameras, etc.) with 33 percent, followed by both large equipment (dishwashers, washing machines, ovens, central heating systems, etc.) and temperature exchange equipment (fridges, freezers, air conditioners, heat pumps, etc.), each with 21 percent (Figure 7 left). The large equipment and temperature exchange equipment categories are comprised of large and bulky appliances having a relatively high unit weight and long lifespans that are commonly used and characterised by a possession rate of no more than one or two appliances per household for both categories. By contrast, small equipment has a relatively smaller unit weight. Such items are sold in higher numbers and have shorter lifespans, so they are more frequently discarded. The smallest category in terms of e-waste generation is lamps

(3 percent of the weight), which are used in every household but which have a very small unit weight.

All annual growth rates (for EEE) are positive, except for the categories for screens and monitors. These categories are decreasing in EEE POM in mass because the past decade has witnessed a technological change in computer and television screens, with nearly all applications of heavy cathode ray tube (CRT) screens having been replaced by substantially lighter flat-panel displays. The decrease of small IT equipment can be explained by miniaturisation, which is the trend of manufacturing smaller electrical and electronic products and devices. Though most growth rates are positive, a declining trend for all categories has been observed; the increasing pace slows down over time (Figure 7 top) for most products.

Figure 7. E-waste generated disaggregated to category (bottom) and year-to-year e-waste growth rate (top) in the region



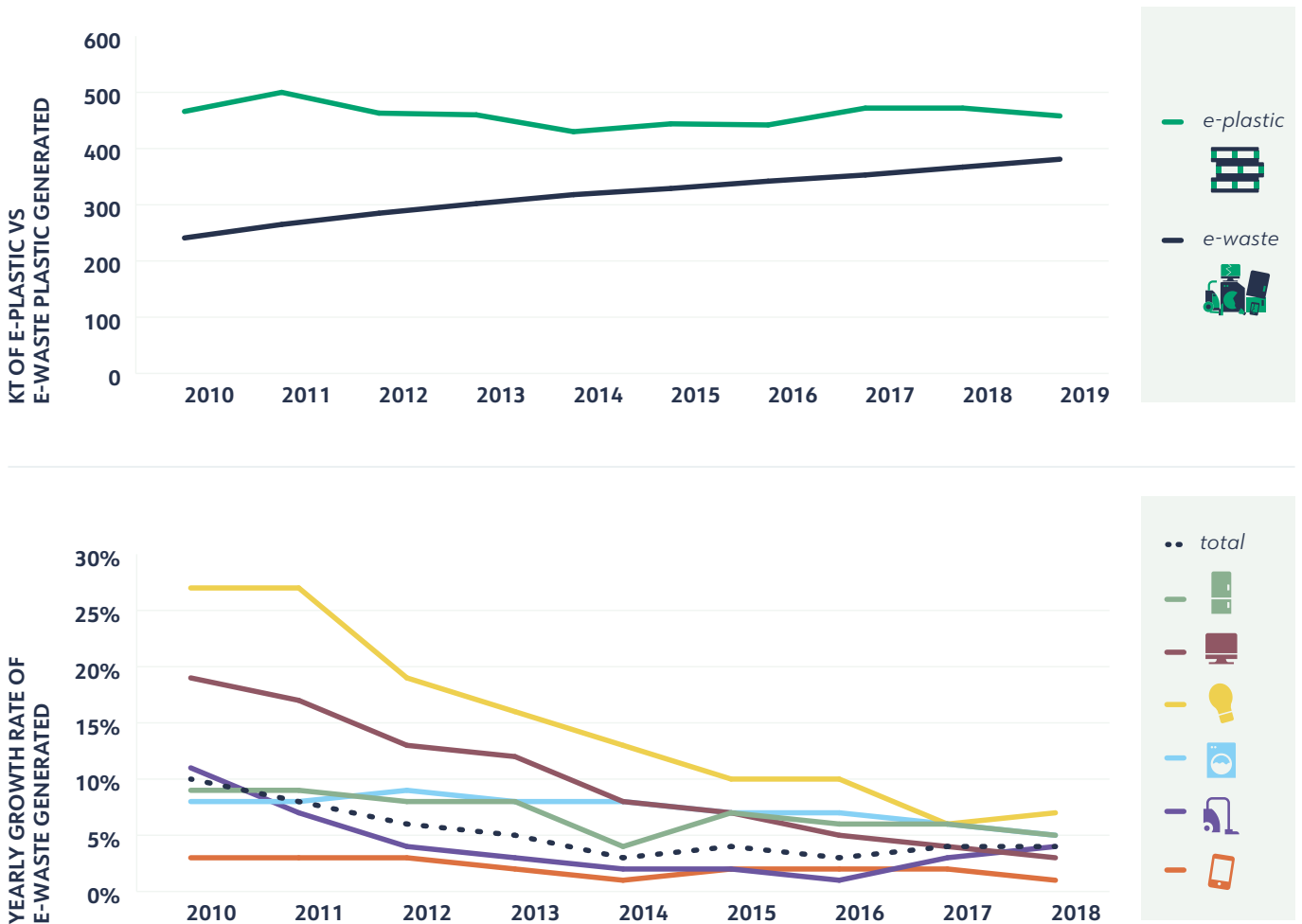
SIX CATEGORIES OF E-WASTE GENERATED IN 2019 (%)

C. Plastic and BFR Content in EEE POM and in E-waste Generated

The EEE plastic POM has decreased over the years, from 0.47 Mt (2.49 kg/inh) in 2010 to 0.46 Mt (2.22 kg/inh) in 2019. The e-waste plastic generated increased steadily from 0.24 Mt (1.29 kg/inh) in 2010 to 0.38 Mt (1.85 kg/inh) in 2019.

The EEE plastic POM increased from 0.47 Mt in 2010 (2.49 kg/inh) to 0.50 Mt (2.64 kg/inh) in 2011, decreased to 0.43 Mt (2.18 kg/inh) in 2014, then increased to 0.46 Mt (2.22 kg/inh) in 2019 (Figure 8 left). The e-waste plastic generated increased steadily from 0.24 Mt (1.29 kg/inh) in 2010 to 0.38 Mt (1.85 kg/inh) in 2019. The slight fluctuation of EEE plastic POM can be attributed to the change of technology of screens (from CRT to FDP), material replacement, and demand of some EEE categories. Plastic waste generation from all e-waste categories increased over the years for all categories, as shown in (Figure 8 right).

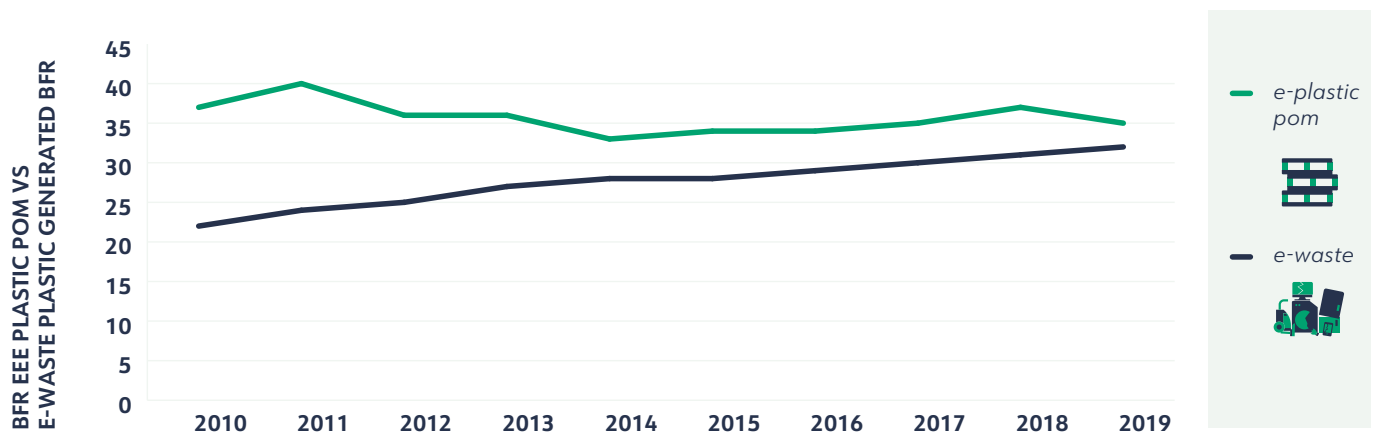
Figure 8. EEE POM plastics and e-waste plastics generated (top) and yearly growth rate of e-waste plastics generated (bottom) in the region [3]



The BFR from EEE plastic-POM fluctuated from 0.04 Mt (0.20 kg/inh) in 2010 to 0.03 Mt (0.17 kg/inh) in 2019. The e-waste generated plastic BFR also increased steadily from 0.02 Mt (0.12 kg/inh) in 2010 to 0.03 Mt (0.15 kg/inh) in 2019.

The BFR-plastic POM fluctuated over time, increasing from 0.04 Mt (0.20 kg/inh) in 2010 to 0.04 Mt (0.21 kg/inh) in 2011, then decreasing to 0.03 Mt (0.17 kg/inh) in 2019. The generation of BFR containing waste plastics increased from 0.02 Mt (0.12 kg/inh) in 2010 to 0.03 Mt (0.15 kg/inh) in 2019 (Figure 9 left). When analysing the e-waste generated of BFR-plastic per EU6 collection category for 2019, it can be seen that small equipment has the largest share of BFR content with 0.016 MT (0.08 kg/inh), followed by small IT with 0.01 MT (0.05 kg/inh) and screens with 0.005 MT (0.02 kg/inh). This represents a share of 94% of total BFR plastic in e-waste generated (Figure 9 right). Given that lamps do not have BFR content, this was equivalent to '0'.

Figure 9. BFR in plastics EEE POM and e-waste generated for 2010-2019 (top), and e-waste generated of BFR from plastic disaggregated to category (bottom) in the region for 2019 [3, 20 - 21]



D. Environmentally Sound Management of E-waste and POPs from E-waste Plastic

The 13 countries analysed formally collected and managed a total of 0.04 Mt (0.21 kg/inh) of e-waste between 2018 and 2019. This is a collection rate of 2.7 percent when compared to the e-waste generated for the same year. Costa Rica has the highest e-waste collection of 8.0 percent (1.0 kg/inh) of its total e-waste generated, followed by Chile with 5.0 percent (0.4 kg/inh).

The total e-waste managed in an environmentally sound manner in the 13 countries is 35.97 kt (0.21 kg/inh). The countries with the highest collection rate by weight are Chile (6.84 kt), Costa Rica (5.10 kt), Peru (3.02 kt), and Ecuador (3.0 kt). When analysing the collection rate per inhabitant, Costa Rica has the highest, equivalent to 1.0 kg/inh, or 8.0 percent of the e-waste formally collected for ESM (Figure 10). In relation to the amount of e-waste generated in the country, i.e. the e-waste collection rate, Costa Rica collects 8.0 percent of the e-waste for environmentally sound treatment. Chile is collecting 5.0 percent of the total e-waste generated, followed by Argentina, Bolivia - Plurinational State of, and Ecuador, each with a collection rate of 4.0 percent (Figure 10). This is followed by Uruguay, with a collection rate of 3 percent at 1.21 kt (0.3 kg/inh), Peru with 2.0 percent at 3.02 kt (0.1 kg/inh), and Honduras with 1.0 percent at 0.12 kt (0.01 kg/inh). These low rates could be the result of a lack of e-waste collection infrastructure (e.g. collection points) in all cities that can cover the entire population, the lack of monitoring, and the lack of enforcement, among other reasons. As of the finalisation of this report, Guatemala was still estimating its collection rate as part of the PREAL project activities. Consequently, in this assessment, a collection rate (per cent) of zero was assigned to Guatemala, as no official statistics exist. There was no statistically relevant correlation observed between PPP of countries and their e waste collection, so it is not shown.

Of the 13 countries analysed, only Argentina, Chile, Costa Rica, Ecuador, Panama, Peru, and Venezuela (Bolivarian Republic of) have e-waste treatment facilities specialised for some categories and/or certain products. Most countries have e-waste operators that export e-waste for treatment and recovery of valuable parts and profitable products.

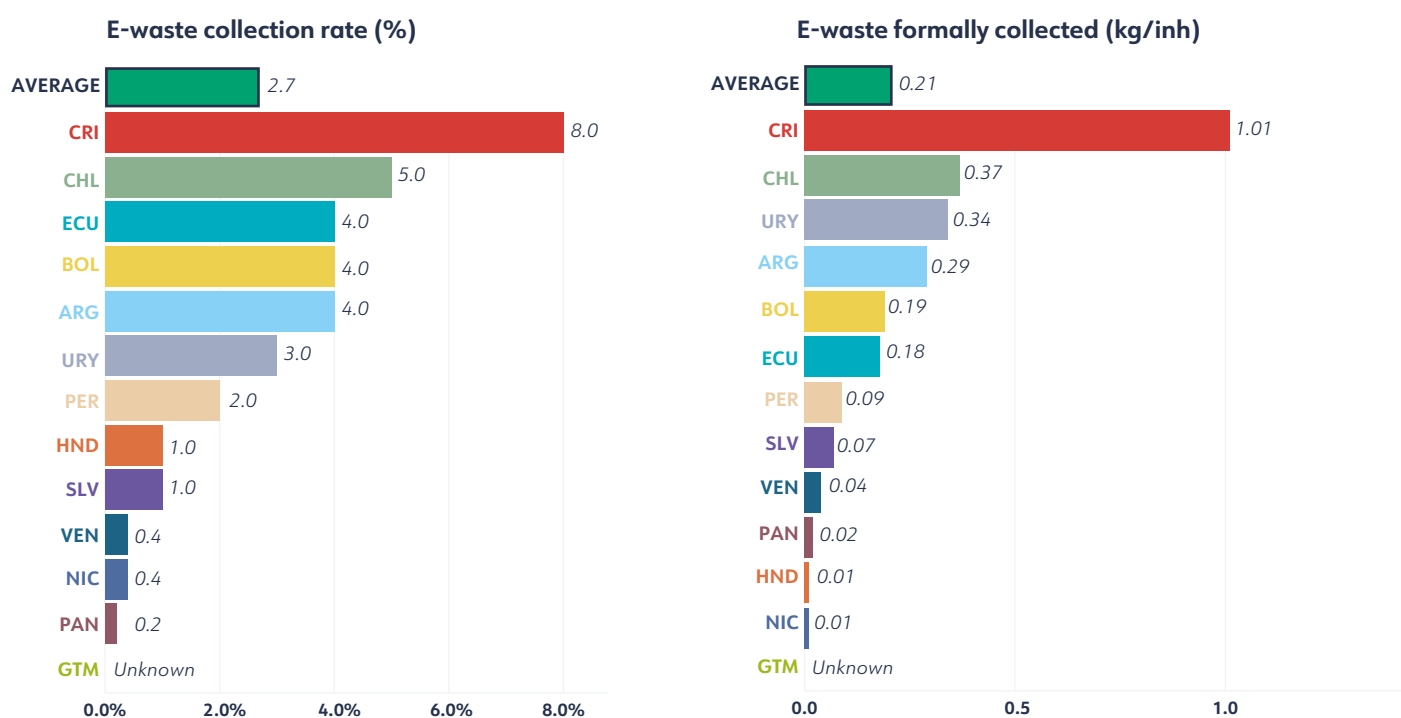
In the case of Chile, 9 of the 11 e-waste operators treat Cooling and Freezing equipment; 2 of these 9 treat the equipment without any refrigerant, and 3 of the 9 extract them and send them for final disposal to a certified safety landfill. Lamps are managed by three e-waste operators, of which 2 separate the mercury from the lamps and fluorescent tubes and further dispose them in landfills' safety cells. Moreover, screens and monitors are processed by 9 of the 11 e-waste operators. In the case of large and small equipment, 9 of the 11 e-waste operators collect them and dismantle them.

The region managed 2.7 per cent of the e-waste generated in an environmentally sound manner.

As of 14 May 2021, Costa Rica had 60 authorised e-waste operators, of which 47 are authorised to prepare recovery, export, import, treatment and disposal. In Ecuador, 5 e-waste operators have environmental permits for different phases of e-waste management (storage, transport, dismantling, and treatment). Moreover, as of July 2021, Panama had 7 official e-waste operators that provide transportation and collection services. E-waste operators in Panama collect (5/7), provide transportation (5/7), store (4/7), dismantle (3/7), export (2/7), and perform wholesale of components and materials (2),

and two offer treatment of fluorescent lamps. In the case of Peru, 6 e-waste operators are in charge of providing collection, transportation, and recovery of materials. E-waste operators in Peru normally separate valuable parts (e.g. printed circuit boards, metals) and non-valuable parts. The valuable parts are either exported for treatment or recovered within the country. E-waste that cannot be recovered and is not hazardous is taken to sanitary landfills by waste operators. Hazardous waste is transferred by e-waste operators with recovery plants to safety landfills.

Figure 10. E-waste formally collected for ESM (kg/inh) (left) and e-waste collection rate (right) for 2019*



*As of this report's publication, Guatemala was in the process of estimating the amount of e-waste ESM.

There are no official statistics on how much POP from e-waste plastic is ESM.

There is no specific data on the volume of ESM of POPs from e-waste plastic. Under the PREAL project, Argentina identified that one operator exports products generally containing PCB (e.g. contained in pesticides, e-waste,

etc.) for treatment. Costa Rica and El Salvador have cement plants authorised for co-processing of e-waste plastic, including parts with BFR. Within the framework of the PREAL project, countries are identifying means to provide POPs with an ESM – one being co-processing in cement kiln plants.

5. TRANSBOUNDARY MOVEMENTS (TBM) OF E-WASTE IN THE REGION

A. Overview of Transboundary Movement (TBM)

Several regulations at the national, regional, and international levels have been developed for monitoring and controlling TBM of e-waste. At the international level, the Basel Convention⁽³¹⁾ on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (commonly referred to as the Basel Convention) is the only global treaty on hazardous and other wastes that encompasses e waste [22]. The Convention was adopted on 22 March 1989 and entered into force on 5 May 1992. In 2006, Parties adopted the Nairobi Declaration on the Environmentally Sound Management of Electrical and Electronic waste [23], and in 2011 Parties adopted the Cartagena Declaration on the Prevention, Minimisation and Recovery of Hazardous Wastes and Other Wastes [24]; these declarations promoted the ESM of hazardous waste, including e-waste, its prevention, minimisation, and environmentally sound recycling, recovery, and final disposal.

The Basel Convention defines the 'hazardousness' of waste on the basis of the substances present in waste materials and classifies the waste as either hazardous or non-hazardous, depending on the chemical properties. The Basel Convention sets out a detailed Prior Informed Consent procedure with strict requirements for TBM of hazardous wastes. TBM of hazardous waste and e-waste is subject to such procedure when an importing and/or exporting Party identifies hazardousness in e-waste, as determined under the provisions of the national law. The Basel Convention identifies hazardous wastes subject to TBM under the Convention as follows:

- Wastes that belong to any category contained in Annex I, unless they do not possess any of the characteristics contained in Annex III.
- Wastes not covered under the previous group but which are considered to be hazardous waste by the domestic legislation of the Party of export, import, or transit.

It is important to note that national guidelines concerning the definition of waste may differ, and the same material regarded as waste in one country may be non-waste in another. Furthermore, besides the provisions set by the Basel Convention, some Parties set national threshold values to distinguish between hazardous and non-hazardous waste, including e-waste.

El Salvador, Costa Rica, Guatemala, Honduras, Nicaragua, and Panama are parties to a regional agreement, the Regional Agreement of Transboundary Movement of Hazardous Wastes⁽³²⁾, signed on December 11, 1992, whose objective is to control the TBM of hazardous wastes and prevent the illegal traffic and disposal of such waste in Central America. The Agreement lays down a ban on imports of any type of hazardous wastes from outside of the Central American region.

⁽³¹⁾ <http://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx>.

⁽³²⁾ <https://www.ecolex.org/es/details/treaty/regional-agreement-on-the-transboundary-movement-of-hazardous-wastes-tre-001167/?q=regional+agreement+on+the+transboundary>.

B. Overview of E-waste and Plastic POPs' Impact on Import and Export Legislation/Policies

All countries have ratified The Basel Convention (which controls TBM of e-waste) and the Stockholm Convention for POPs.

All countries in the region have ratified the Basel Convention and the Stockholm Convention. The Latin American countries prohibit the import of hazardous waste in their territories. The countries in the region do not have specific export bans of e-waste unless they are for recycling purposes and under compliance with the Basel Convention. As for POPs, Ecuador specifically prohibits their importation, as well as other internationally prohibited agrochemicals, while Guatemala specifically mentions the prohibition of chemical mixtures and asbestos in their legislation.

All countries have ratified The Basel Convention (which controls TBM of e-waste) and the Stockholm Convention for POPs.

Though the 13 countries have ratified the Basel Convention and enacted the framework and bans in their national legal framework, the enforcement of these measures remains a significant challenge. Many countries in the region do not submit TBM reports to the Basel Convention. This makes monitoring and mapping of the TBM of e-waste, POPs, and mercury within and outside the region difficult. There is no official data on e-waste importing/exporting from 2016-2019 for Bolivia (Plurinational State of), Chile, Ecuador, and Panama.

From the information acquired, it is clear that there is TBM of materials within and outside the region that is not reflected in the reporting to the Basel Convention. For instance, e-waste operators in Honduras export valuable parts, such as printed circuit boards, to Panama, Mexico, Canada, and the United States, but these exports are not reported to the Basel Convention. The implication of the non-reporting is that hazardous materials (e.g. POPs, mercury, and e-waste) can be exported to countries where ESM cannot be assured.

All countries studied do not restrict the export of hazardous wastes and other wastes for final disposal or recovery⁽³³⁾. Some countries (e.g. Honduras) do not restrict the transit of hazardous wastes and other wastes, based on Basel PIC procedure. Though there is evidence of importing and exporting of used EEE in the region, there are no official statistics from any of the countries studied.

⁽³³⁾ <http://www.basel.int/Countries/ImportExportRestrictions/tabid/4835/Default.aspx>.

C. Overview of E-waste Importing and Exporting Quantities

The outcomes from the analysis of the TBM of e-waste in the Latin American countries are presented in Table 6.

None of the 13 countries reported cases of e-waste and POP imports to the Basel Convention.

None of the 13 countries officially reported importing of e-waste and POPs or any other hazardous materials from other countries to the Basel Convention. It is worth noting that the reporting to the Basel convention only comprises the regulated and documented TBM of e-waste and POPs and does not include illegal e-waste or used-EEE flows.

Nine countries reported TBM statistics to the Basel Convention, but only six exported materials for recycling and final disposal.

Nine countries (Argentina, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Peru, Uruguay, and Venezuela - Bolivarian Republic of) provided annual National Reports to the Basel Convention. It was reported that six of those nine countries (Argentina, Costa Rica, El Salvador, Nicaragua, Peru, and Venezuela - Bolivarian Republic of) export e-waste to several destinations for treatment and material recovery (Table 6). Argentina made three exports in 2019 to three different EU countries for treatment purposes and final disposal. El Salvador exports mostly materials/components extracted from e-waste to countries such as the United States, Mexico, and Asia (e.g. North Korea) for further processing, but data on quantities are not provided. Unreported exports to the Basel Convention also occurs in the assessed countries.

In Chile, CRT screens, connectors, and capacitors are stored until enough volume is reached for exporting them to recyclers in Belgium, but a National Report has been provided to the Basel Convention. In 2019, Nicaragua exported approximately 60 tons of e-waste from households and businesses for ESM.

According to reports submitted to the Basel Convention by countries, an estimated 7.4 tons of electronic waste are exported.

Imports of hazardous waste for recovery and final disposal are not allowed by the LATAM countries.

No e-waste has been declared by the LATAM countries to the Basel Convention, based on the annual reports to the Convention in 2018 and 2019. Four countries (Bolivia -Plurinational State of, Chile, Ecuador, and Panama) have not provided annual reports on these items to the Convention for either year. Imports of hazardous waste for recovery, final disposal, or any other purpose are not allowed by legislation in all 13 countries. In fact, Ecuador specifically prohibits the importation of POPs and other internationally prohibited agrochemicals, while Guatemala specifically mentions chemical mixtures and asbestos.

Table 6. E-waste export/import by the LATAM countries

Country	National Report Available 2016-2019	Statistics Available	Estimate on E-waste Reported Under Basel Convention (2018 and 2019) ⁽³⁴⁾	
			Import (t)	Export (t)
Argentina	Yes	Yes	-	118
Bolivia (Plurinational State of)	No	No	-	-
Chile	No	No	-	-
Costa Rica	Yes	Yes	-	1,287
Ecuador	No	No	-	-
Guatemala	Yes	Yes	-	-
Honduras	Yes	Yes	-	-
Nicaragua	Yes	Yes	-	100
Panama	No	No	-	-
Peru	Yes	Yes	-	352
El Salvador	Yes	Yes	-	3,978
Uruguay	Yes	Yes	-	-
Venezuela (Bolivarian Republic of)	Yes	Yes	-	1,551
Total	9 of 13	9 of 13	-	7,386

⁽³⁴⁾ Please note that these values represent only ones declared to the Basel Convention and not the full picture of e-waste imports and exports.

D. Issues and Impact of Import/Exports of E-waste

Non-reporting, low quality data and control of TBM of e-waste through the Basel Convention poses a threat to the ESM of e-waste and illegal movements.

Four countries have not reported TBM statistics to the Basel Convention. Therefore, a comprehensive overview of TBM of e-waste, POPs, and mercury in the 13 countries is not available.

Despite the formal steps undertaken through the ratification of the Basel Convention and through the national legal framework and bans, enforcement of these measures remains a significant challenge in all countries in the region, and reporting is still limited. Consequently, TBM of e-waste cannot easily be mapped and monitored.

Four countries (Bolivia -Plurinational State of, Chile, Ecuador, and Panama) made no report on TBM statistics to the Basel Convention for the period 2018-2019, so a complete picture of TBM of e-waste, POPs, and mercury in the 13 countries is not available. From our interviews and questionnaires, it was concluded that there is TBM of specific fractions of e-waste, such as printed circuit boards, from some countries to the United States, Mexico, and Asia. However, this TBM is not reflected in the reporting to the Basel Convention. The implication of non-reporting is that e-waste can be moved from points where ESM cannot be assured to states where value recovery using best-available technology is guaranteed. Thus, the TBM can give rise to illegal shipments of e-waste.

El Salvador is implementing an electronic tracking system of imports and exports of hazardous waste.

Some countries have companies officially licenced to collect, pre-process, and export e-waste, even though they are not reporting exports under the Basel Convention. For some countries (e.g. Nicaragua, Honduras, etc.), collected e-waste is dismantled and some valuable parts (e.g. aluminum, iron, gold, etc.) are readily sold in the internal market, while other parts (e.g. printed circuit boards, batteries, etc.) are stored in containers and exported to other countries for treatment once enough material has been accumulated.

To avoid this, El Salvador is developing an electronic platform that tracks the import and export of hazardous waste, which will assist authorities in identifying companies subject to surveillance and in maintaining the exchange of information between different national authorities involved in





the authorisation, control, and monitoring of the importation/exportation of the waste. This platform could be linked to other countries in Central America to improve regional cooperation.

Used-EEE imports result in more e-waste in the receiving countries and place burdens on existing e waste management. Meanwhile, the functionality of imported used-EEE or EEE mixed with e waste and their quantities remain unknown.

All countries' statistics do not differentiate between new or used appliances being imported and exported. As a result, no information on used-EEE imports is available. Imports of used-EEE that are actually functional and for which there is a market are not problematic, as the local population will reuse the items. Conversely, imports of used-EEE that are functional but for which there is no market (e.g. Pentium III computers) will result in the items most likely being disposed of through informal or formal channels.

However, after some time, the marketable and functional used-EEE is discarded, and depending on how the system is set up, the importer should pay under the EPR, though, they are most often not charged because they are not defined as producers in the EPR norms of some countries. As well, problems in the system may also occur; for example, no fees for collection and recycling are paid upon importation, which places an additional burden on the EPRs in countries that have such a system in place.

Furthermore, it is unknown whether the used-EEE imports are entirely (as opposed to partially) functional. If the items are partly functional, they should be considered e-waste upon arrival, as is the case for 30 percent in Western Africa [25]. In this case, used-EEE items are linked with illegal e-waste imports.

6. E-WASTE AND POP MANAGEMENT ASSESSMENT

A. E-waste Management Assessment

In general, the combination of a developed e-waste policy framework and infrastructure leads to more collection of e-waste.

The e-waste management systems of the countries have been assessed and categorised as either advanced (A), in transition (B), or basic (C). All scores for each country can be found in ANNEX D. The outcomes are summarised in Table 7, showing a dashboard of the number of indicators scoring an A in legislation, the number of indicators scoring an A in collection and infrastructure, the collection rate, and e-waste generation.

Of the 13 countries analysed, Costa Rica (8 percent) and Chile (5 percent) have the highest collection rates, followed by Argentina, Bolivia (Plurinational State of), and Ecuador (each with 4 percent) and Uruguay (3 percent). Their higher collection rate (when compared with the other countries analysed in the region) can be attributed to the relatively well-developed e-waste management infrastructure (e.g. collection points and treatment facilities) and legislation in comparison to the rest of the region. Costa Rica, Chile, Bolivia (Plurinational State of), and Ecuador are currently developing collection targets for e-waste. Uruguay's and Peru's collection rates are both higher than one per cent, but lower than four per cent (3 and 2 percent, respectively). Moreover, El Salvador and Honduras have a collection rate of 1 percent, while Venezuela (Bolivarian Republic of) (0.4%), Nicaragua (0.4%), and Panama (0.4%) have collection rates of less than 1 percent. As of this report's publication, Guatemala was in the process of estimating the collection rate as part of the PREAL project activities, so a collection rate of 0% was allocated.

Of the 13 countries that are part of the PREAL project, only Costa Rica, Chile, Bolivia (Plurinational State of), Peru, and Ecuador have a well-established a legislation framework.

These countries have recently begun to legislate e-waste, but most not yet have the necessary e-waste management infrastructure in place (e.g. collection points in all cities) or defined enforcement strategies resulting in an e-waste collection rate below 10 percent. Countries in which legally binding policies have been enacted but where enforcement strategies are not yet well implemented comprise a key issue. Countries' legislations do not necessarily align with enforcement, which contributes to low collection rates. Moreover, the type of e-waste covered by legislation differs considerably throughout countries as well. Countries such as Chile, Costa Rica, and Bolivia (Plurinational State of) have (or in the process of defining) collection targets. Ecuador has a 3 percent collection target only on mobile phones, but is in the process of defining collection targets for other products. In the case of Peru, 2020 collection targets have been defined for large household equipment (4 percent), small household equipment (4 percent), IT and telecom equipment (16 percent), and consumer equipment (16 percent). Other collection categories have a voluntary collection target. For these countries, the amount of e-waste generated per inhabitant is close to the regional average (e.g. Ecuador, Costa Rica, and Bolivia -Plurinational State of) or above the regional average (e.g. Peru and Chile).

Three countries (Panama, Uruguay, and El Salvador) are in the process of establishing an e-waste legislation framework. Guatemala, Honduras, Nicaragua, and Venezuela (Bolivarian Republic of) address e-waste in their waste management or hazardous waste legislation, but no conditions on the waste's management exist. The absence of legislation, enforcement, collection, and treatment infrastructure contributes to the e-waste collection rate being equal to or lower than 1 percent. Except for Venezuela (Bolivarian Republic of), these countries generate considerably less e-waste than the regional average.

Compared to the European Union (EU), the 13 countries analysed generate less e-waste per inhabitant, but also have a less developed e-waste legislation framework and e-waste management infrastructure. As a result, the majority of these countries have collection rates lower than 10 percent.

A strong correlation exists for countries (e.g. European countries) with a legislation, enforcement, e-waste management infrastructure, and collection rate; in the case of Europe, the correlation is 50 percent. Table 7 shows a dashboard of e-waste management system and performance.

Table 7. Dashboard of e-waste management system and performance. All reference years for the countries analysed are 2019, with the exception of Ecuador. Data for EU-27 is for 2019⁽³⁵⁾ as well

Country / Region	Legislation (5 indicators)	Infrastructure (2 indicators)	Collection Rate	E-waste Generated
EU-27	●●●●●	●●	●●●●●	●●●●●●●●●●
13 countries in Latin-America	●●●●●	●●	○	●●●●●
Peru	●●●●●	●●	○	●●●
Costa Rica	●●●●●	●●	●	●●●●●●●●●●
Ecuador	●●●●●	●●	●	●●●
Chile	●●●●●	●●	●	●●●●●
Bolivia (Plurinational State of)	●●●●●	●●	●	●●●
Argentina	●●●●●	●●	●	●●●●●
Uruguay	●●●●●	●●	○	●●●●●●●●●●
El Salvador	●●●●●	●●	○	●●●
Honduras	●●●●●	●●	○	●●
Panama	●●●●●	●●	○	●●●●●
Nicaragua	●●●●●	●●	○	●●
Venezuela (Bolivarian Republic of)	●●●●●	●●	○	●●●●●
Guatemala	●●●●●	●●	○	●●

Legislation and Infrastructure:

● indicates advanced, ● transitional, ● basic.

Collection Rates:

● indicates 10%, ● 7.5%, ● 5%, ○ 2.5%, ○ 1%, ○ less than 1%, and ○ means no information was available at the time of writing the report.

E-waste Generated:

● indicates 2 kg/inh, ● 1.5 kg/inh, ● 1 kg/inh, ○ 0.5 kg/inh.

⁽³⁵⁾ For the purpose of visualisation, some values have been rounded up (<0.5 = 0, >0.5 = 1). At the time of writing the REM, information on collection rates for Guatemala was not available.

B. POPs Contained in E-waste Plastic Management Assessment

The combination of a developed legislation framework, enforcement, monitoring, and infrastructure leads to more collection and treatment of materials and products.

In evaluating the countries' POP legislation, all countries expressed that they have a norm or regulation under the framework of the management of hazardous substances. However, no country has a specific legal instrument for the management of POPs contained in e-waste plastic. Chile and Costa Rica are currently in the process of developing and/or defining legal frameworks for e-waste plastic's POPs in their countries. Under the project's framework, specifically under component 2 (Strengthening of National Capacities on Waste Dismantling and Recycling Facilities/Infrastructure), most countries are currently developing minimum e-waste standards for the management and final disposal of POPs contained in e-waste plastic. Table 8 shows a dashboard of POPs in e-waste management systems and performance.

Table 8. Dashboard of POPs in e-waste management systems and performance. The reference year is 2019 for all countries

Country / Region	Legislation	Infrastructure
13 countries in Latin-America	● ● ● ●	● ● ● ●
Costa Rica	● ● ● ●	● ● ● ●
El Salvador	● ● ● ●	● ● ● ●
Argentina	● ● ● ●	● ● ● ●
Bolivia (Plurinational State of)	● ● ● ●	● ● ● ●
Chile	● ● ● ●	● ● ● ●
Ecuador	● ● ● ●	● ● ● ●
Honduras	● ● ● ●	● ● ● ●
Panama	● ● ● ●	● ● ● ●
Peru	● ● ● ●	● ● ● ●
Uruguay	● ● ● ●	● ● ● ●
Venezuela (Bolivarian Republic of)	● ● ● ●	● ● ● ●
Nicaragua	● ● ● ●	● ● ● ●
Guatemala	● ● ● ●	● ● ● ●

Legislation and infrastructure indicators scoring advanced ●, transitional ●, or basic ●.

In 2017, Costa Rica approved the Regulation on the Identification and Environmentally Sound Elimination of PCBs, requiring registration in the Information System of POPs⁽³⁶⁾. Currently, this is being evaluated to emphasise the management of POPs contained in e-waste. Ecuador has EHS standards related to chemicals and hazardous waste in general, but none specific to POPs in e-waste. In January 2021, El Salvador adopted a new regulation related to hazardous waste management as a result of establishing the Special Regulation on Hazardous Substances, Residues and Waste, enacted by Decree 41 of 2021. In 2013, the Ministerial Agreement for 'Environmentally Sound Management of Equipment and Waste that Contain or are Contaminated with Polychlorinated Biphenyls' in Honduras established the procedures, measures, terms, and responsibilities of the ESM of equipment and waste that consist of, contain, or are contaminated with PCBs to prevent contamination and protect the environment. However, EHS standards specifically for e-waste management and POPs are missing.

All 13 countries have signed the Stockholm Convention on Persistent Organic Pollutants, an international treaty.

All 13 countries have signed the international treaty, Stockholm Convention on Persistent Organic Pollutants, and 12 (all but Panama) presented their National Implementation Plans (NIPs)⁽³⁷⁾.

POPs are managed both by the formal and informal sector.

The collection of components and materials contained in e-waste plastics that contain POPs is done both by the formal and informal sectors. When managed by the formal sector, the plastic is normally separated by colour and/or through knowledge of which type of plastic is valuable in the market or not. Some countries, such as Chile, have some recyclers that may classify the plastic by the products' or parts' labels. Plastics that have value are normally sold locally or exported to other countries. Similarly, the informal sector sorts e-waste plastics by their value (i.e. valuable and non-valuable parts). The final destination of the remaining e-waste plastics (not used locally or exported), especially those containing hazardous components (e.g. capacitors) for both the formal and informal sector, is typically general waste or, at best, landfills (i.e. for the formal sector), depending on the country. In the cases of El Salvador and Costa Rica, though they don't have facilities that process/treats e-waste plastic that contains POPs, they have authorised cement plants who co-process these parts.

Under the framework of the PREAL project, both legislation and infrastructure are currently being evaluated (as of 2021) to tackle this gap and improve on POP management in these countries.

The collection e-waste plastics that contain POPs is done both by the formal and informal sectors. There are no statistics of how much e-waste plastics are disposed of in an environmentally sound manner.

⁽³⁶⁾ <http://cops.digeca.go.cr/documentos/DE%2040697%20Reglamento%20PCBs%20.pdf>.

⁽³⁷⁾ <http://www.pops.int/Countries/CountryProfiles/tabid/4501/Default.aspx>.

7. COMMON ISSUES AND CHALLENGES

More than 97 percent of e-waste generated in the 13 countries analysed is not collected or sent to ESM facilities for proper management. Most e-waste ends up in landfills or is managed by the informal sector, which separates the valuable parts contained in e-waste while the plastics and hazardous parts (e.g. BFR) are disposed of in landfills. Costa Rica has the highest collection rate, with 8.0 percent of the total e-waste generated. None of the countries collects and treats POPs (e.g. BFR) contained in e-waste plastics.

The results of the study are that the countries in the region collect and process 2.7 percent (36.0 kt) of the region's e-waste under ESM conditions. The remaining 97.3 percent is neither collected nor sent to environmentally sound e-waste management facilities. Among the main reasons are the low level of e-waste collection by municipalities and the lack of take-back schemes set up by producers under an EPR or other e-waste collectors that hand over the e-waste for ESM. Most countries don't have separate collection of e-waste, and the use of designated collection centres is almost non-existent in the region. None of the countries have a mandatory disposal/handover of e-waste to licenced collectors and operators. For many countries, the collection and separation of e-waste involves many actors from the formal sector (i.e. licensed e-waste operators where available), who collect e-waste at 'green collection points', and from the informal sector (e.g. scavengers, metal scrapers), who carry out collection on public roads and kerbsides, door-to-door, and at waste dumps and/or landfills. As for businesses' or industries' e-waste, they typically resort to e-waste operators, who, depending on the country's infrastructure, may export the waste or send it to treatment facilities.

The highest e-waste collection rate in the region is 8.0 percent for Costa Rica, followed by 5.0 percent for Chile (ANNEX D). These collections rates are not comparable to the collection rates of the European Union (50 percent) or to the global average collection rate of 17 percent [3, 26].

No POP legislation specifically on e-waste exists in the 13 countries analysed, and none of the countries has a national POP collection and processing target. However, most of the countries are in the process of developing minimum standards for management of POPs from e-waste. Collection of POP-containing e-waste plastics are currently handled by both the formal and informal sectors (ANNEX E). These are sorted according to colour and thorough previous experience. Since there are no POPs treatment facilities in these countries, the POP-containing plastics are either exported for treatment or landfilled (ANNEX D).

FIVE DRIVING REASONS HAVE BEEN IDENTIFIED AS TO WHY E-WASTE COLLECTION RATES ARE LOW IN THE LATIN AMERICAN REGION:

Reason 1: Increasing volumes of e-waste and POPs BFR-plastics

E-waste generation in the 13 countries grew by 49 percent from 2010 to 2019 – a growth rate faster than the global average. Conversely, BFR generation increased from 0.02 Mt in 2010 to 0.03 Mt in 2019, representing a growth of 47 percent.

The amount of e-waste in the region increased from 0.9 Mt (4.7 kg/inh) in 2010 to 1.3 Mt (6.5 kg/inh) in 2019, equating to an e-waste growth rate of 49 percent. The global e-waste growth rate is 52 percent. The e-waste collection rate of the 13 countries was 2.7 percent in 2019. The e-waste generated is expected to further increase in the coming decades, concurrently with expected further development of the region. If collection rates do not substantially improve, the absolute quantity of unmanaged e-waste and e-waste plastic-BFR will further increase. The design and use of materials in products and the increasing volumes of e-waste generated in the countries are interlinked with the increases in POPs from e-waste plastics.

Reason 2: Absence of specific legislation

Seven countries do not have e-waste-specific legislation for implementing and enforcing collection of e-waste for ESM.

E-waste-specific regulations are lacking in seven countries, though regulatory norms defining the procedures for the management of hazardous or special waste (often listing/including e-waste) allow for monitoring and enforcement in some countries. Only five countries (Bolivia -Plurinational State of, Chile, Costa Rica, Ecuador, and Peru) have the basic prerequisites for ESM of e-waste – including e-waste-specific legislation/EPR, collection mechanism for some products and recycling infrastructure – but insufficient collection of e-waste remains a challenge. Even when these prerequisites exist, their applications and enforcement are weak in some countries, such as in Peru. Furthermore, EPR regulation for some countries (e.g. Bolivia -Plurinational State of, Chile, and Costa Rica) was not followed by necessary secondary implementing bylaws, so it does not establish applicable collection targets, while in other countries (e.g. Ecuador and Peru), such bylaws are implemented only for some products. In other countries (e.g. Guatemala, Honduras, Nicaragua, etc.), adequate policy and legislation are lacking, making it difficult to drive ESM of e-waste. If there are no appropriate legal instruments in place, or if they are not properly enforced, e-waste collection and its financing will be limited. The legal definition of e-waste in the region has posed challenges with regard to TBM and regional cooperation, as some countries define e-waste as a hazardous waste and others define it as a special waste.

The absence of e-waste-specific legislation for ESM of waste invariably implies that most BFR plastics would be managed by the informal sector, with most e-waste ending up in landfills or burned. Though all LATAM countries have legislation for POP management, implementation is lax, and facilities are non-existent.

Reason 3: Limitations of the infrastructure

Countries have insufficient e-waste collection and drop-off points for separately collecting all e-waste generated; consequently, the informal sector is very strong.

Most countries have either insufficient e-waste collection points in the main cities and municipalities or no collection points at all. Only Argentina, Chile, Costa Rica, Ecuador, and Peru have e-waste-specific collection points – often located within the main cities. The absence of formal collections systems and treatment facilities helps the informal sector thrive.

Of the 13 countries analysed, only Argentina, Chile, Costa Rica, Ecuador, Panama, Peru, and Venezuela (Bolivarian Republic of) have e-waste treatment facilities specialised for some categories and/or certain products. E-waste plastic POPs are mainly disposed of in landfills, since no country has treatment facilities for POP management – except Argentina, which has one operator who exports products generally containing PCB (e.g. contained in pesticides, e-waste etc.) for treatment⁽³⁸⁾. Costa Rica and El Salvador have cement plants authorised for co-processing e-waste plastics, including parts with BFR.

Most countries have e-waste operators that export e-waste for treatment and recovery of valuable parts and profitable products. E-waste is mostly handled by the informal sector. Similarly to e-waste, POPs are either mixed with residual waste or, in Argentina's case, exported for proper ESM abroad. No country has treatment for POPs.

⁽³⁸⁾ A POP facility can be found in Argentina, but there are no specific treatment facilities that treat POPs contained in e-waste.

Reason 4: Competition between formal and informal sectors for valuable components of e-waste

The informal sector focuses on valuable components of e-waste.

Illegal treatment/recycling of e-waste is common in nearly all countries studied, due to the fact that it is a financially beneficial activity associated with generally low operational costs as compared to the official processors. Formal operators are more economically disadvantaged than the informal sector because of the need to abide by a number of bureaucratic procedures relating to legal operations and because of the financial investments required. Additionally, in many of the region's countries, there is no legal or regulatory framework stipulating the development and enhancement of formal operators. Consequently, the informal sector appears to thrive more, receiving more materials than formal recyclers. As well, informal collectors are more efficient in collecting e-waste door-to-door, which are then routed toward the informal sector for treatment/recycling.

Reason 5: Collection of E-waste and POPs-plastic data has only recently been initiated

For most countries, e-waste and POPs-plastics statistics just begun being collected. Statistics on the other e-waste management routes (e.g. e-waste and POPs mixed in with residual waste) are absent.

Within the framework of the PREAL project, most countries analysed (except Honduras and Nicaragua, due to time constraints and availability of information) have been successful in the compilation of key e-waste indicators (i.e. EEE POM, e-waste generated, and formal collection of e-waste). One of the main challenges observed is the lack of knowledge on the collection rate in countries. As of this report's publication, El Salvador, Panama, Nicaragua, and Guatemala were beginning the process of quantifying the e-waste and POPs-plastic from e-waste collection and processing in their countries. Statistics remain unquantified on other flows, e-waste

entering landfills, activities of the informal sector, the mixing of e-waste with other recyclable wastes (such as metal scrap), imports/exports of e-waste, and other types of e-waste disposal.

There is no data on POPs' BFR-plastics generation and management in the 13 countries. None of the countries studied has PCB or POP treatment facilities. Except for Argentina, plastic resulting from e-waste not considered valuable is landfilled.

The lack of e-waste and POPs BFR-plastics data makes it hard to design fact-based interventions for increasing e-waste collection as well as to assess environmental impact and losses of secondary resources due to mismanagement.

Data is mostly lacking on the majority of e-waste and POPs' BFR-plastics and thereby constitutes a missed opportunity for understanding both the whereabouts of the majority of e-waste and the markets, financial incentives, and behavioural aspects of consumers and e-waste stakeholders. This lack of information limits the ability to design fact-based interventions for increasing e-waste collection and recycling, the ability to get more secondary raw materials back into economies, and the potential for associated environmental and societal gains.

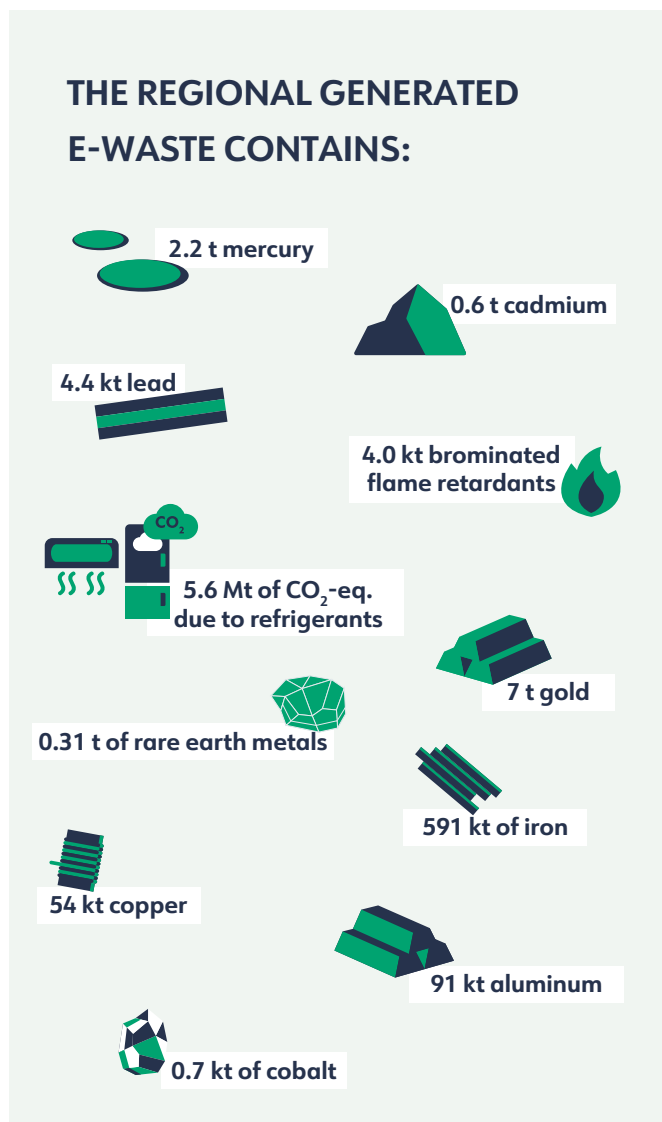
FURTHERMORE, IMPACTS ON THE ENVIRONMENT AND ON OCCUPATIONAL HEALTH AND RESOURCES MANAGEMENT ARE ALSO DISCUSSED AS FOLLOWS:

Impact 1: on the environment and resources management

The majority of e-waste ends up in landfills, causing damage to the environment due to leakages from the waste's hazardous substances. Waste recycling by the informal sector could mean that the hazardous parts re-enter production.

As a consequence of the lapses observed in the 13 countries, there is a strong likelihood of some e-waste parts being transported to landfills and/or managed through some other informal routes that could present immediate and long-term harm to the population and environment. The informal recycling activities of e-waste that can take place before or at landfills could mean that hazardous waste fractions are again entering recycling loops, instead of being disposed of in an environmentally sound way.

As e-waste contains hazardous substances such as cadmium, lead, mercury, and brominated flame retardants, these can leak into the environment. Also, refrigerants in temperature exchange equipment are directly emitted to the environment, contributing to the emissions of greenhouse gasses.



The generated e-waste in the countries analysed contains USD \$1.7 billion of valuable materials. The unmanaged e-waste also could result in a loss of potential resources.

The e-waste generated in the 13 countries also contains valuable materials, such as platinum metal group metals, gold, etc. The e-waste also contains rare earth metals and base metals, which are important to recover for the production of new products (e.g. electronic equipment). If landfilled, these materials will not be recycled and used as a secondary resource, which would amount to losses. At prevailing prices from refined metals, these recoverable valuable materials from the generated e-waste are valued at USD \$1.7 billion.

The generation of BFR in e-waste plastics in the 13 countries analysed increased from 22 kt (0.12 kg/inh) in 2010 to 32 kt (0.15 kg/inh) in 2019. The adoption of unsound treatment approaches of these waste plastics and the POPs contents could expose humans and the environment to a cocktail of toxic materials. For example, the burning of e-waste has become one of the main emission sources of dioxin-like compounds, exposing workers and nearby residents and resulting in estimated total daily intakes that far exceed the WHO-recommended total daily intake limit [27].

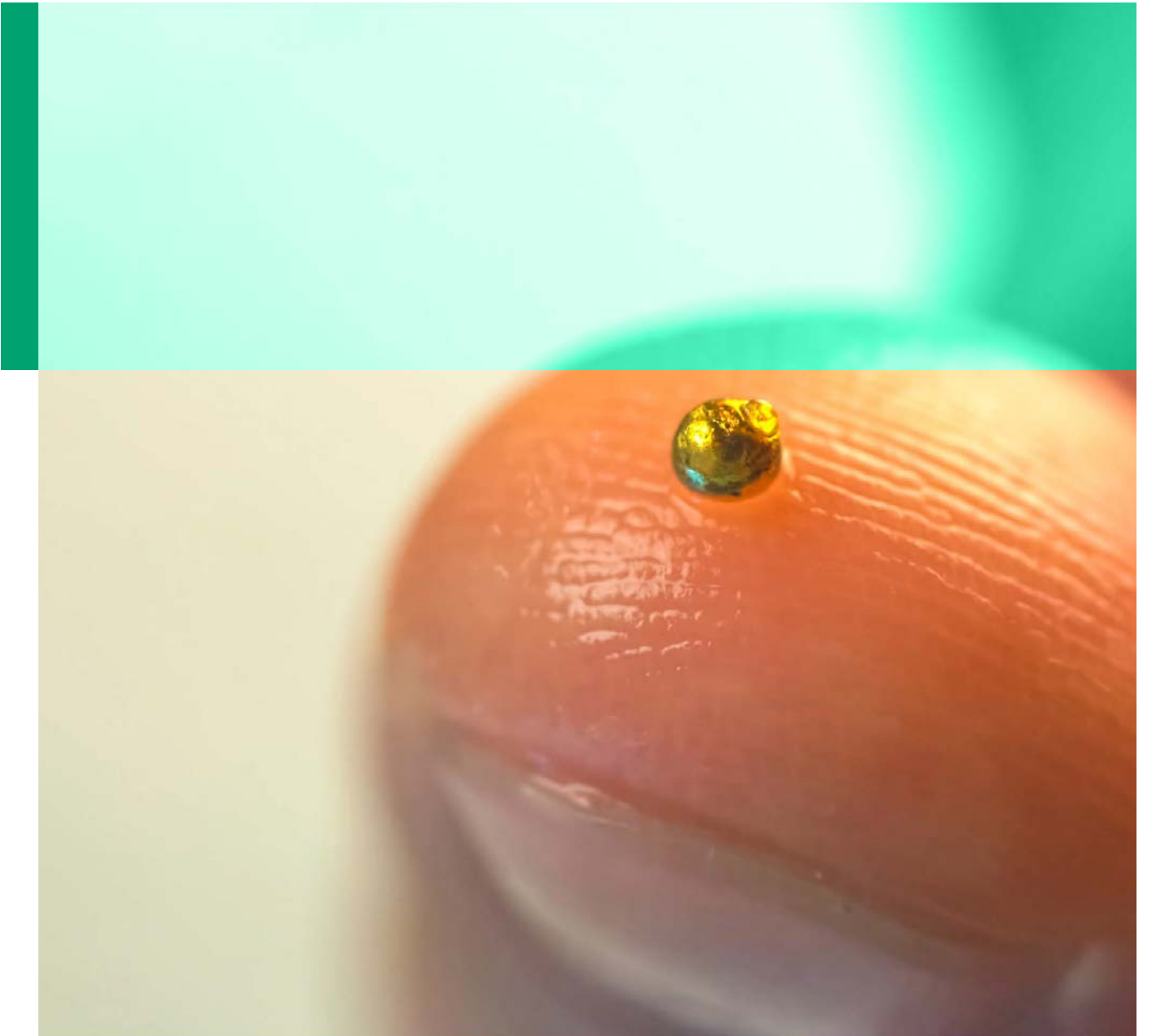
Impact 2: on occupational and community health

Informal management of e-waste negatively impacts occupational and community health.

The informal sector dominates the collection and treatment of e-waste in the countries analysed. The main activities of the informal sector include the labor-intensive and frequently insecure manual dismantling of equipment, using simple tools for quick extraction of materials. It is mainly limited to extraction of the most valuable and accessible components, which are sorted and sold to merchants/recyclers. The remaining less-valuable components are transported to domestic waste landfills. POPs' BFR-plastics are not separately treated,

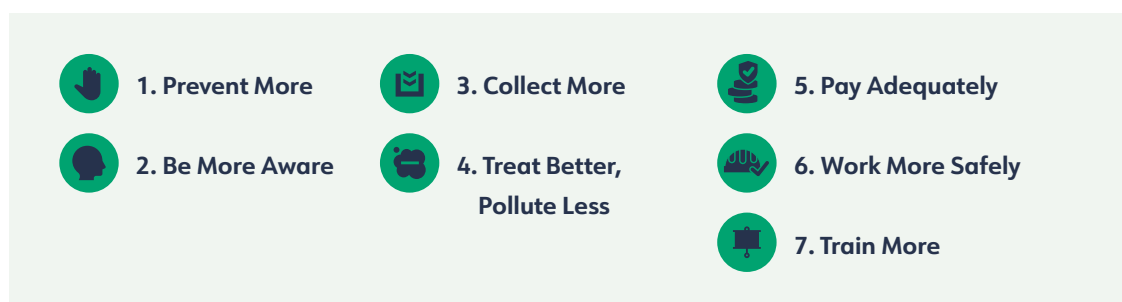
since countries do not have facilities that process/treat POPs arising from e-waste, which presents risks for operators and the environment.

The dangerous practice of e-waste and POPs' BFR-plastics-handling performed by the illegal processors includes open burning, toner extraction, and the burial/dumping of less valuable parts – especially those containing hazardous components such as lead, polychlorinated biphenyls, and chlorofluorocarbons (which contribute to ozone depletion and climate change). Such practices represent direct threat to the health of workers, nearby communities, and the environment. Notably, workers in the field of such production are frequently poor and the most vulnerable groups of the population, yet they hardly use personal protective equipment.



8. RECOMMENDATIONS

The above assessment of e-waste management, statistics, and legislation – and on related challenges, such as e-waste plastics POP treatment – illustrates that the clear need for the improvement of existing e-waste management systems and e-waste plastics POP treatment would vary from country to country in the region. Countries will need to introduce and enforce either a) a robust legal and policy framework focused on an ESM of e-waste and appropriate e-waste plastics POP treatment, or b) monitor and reinforce existing systems to make them more efficient and effective. Adequate financing of the systems as well as monitoring and cooperation of all stakeholders are essential for ensuring that the policies set up for e-waste management are sustained. Seven general recommendations can be drawn from the analysis presented above, and an all-encompassing approach, involving all actors and stakeholders in each country, would be needed in order to implement them. A strengthened transnational cooperation is necessary in order to reduce the burden of large investments and secure the necessary turn-around.



1. Prevent More

The ‘waste hierarchy’, in which prevention is given primacy over other treatment options, is well-known. For example, the European Waste Framework Directive 2008/98/EC on waste management clearly states that ‘waste prevention should be the first priority of waste management’. This is accomplished ‘with a view to breaking the link between growth and waste generation’. But currently, most industrial groups and public policies are primarily more focused on recycling and the safe disposal of e-waste than on reuse of EEE⁽³⁹⁾. Still, prevention and reuse are at the top of the waste hierarchy as they are ‘environmentally preferable to recycling due to energy savings in the production phase and raw material usage, except where inefficient products remain in service’.

The principle, ‘the best e-waste is the one that does not exist’, applies to all countries globally, not just to LATAM countries. Therefore, more attempts are required to successfully minimize e-waste and POP generation. But the decreasing longevity of products is driven by production and consumption patterns, as consumers are fascinated by the modernity of EEE, low prices for new technology, and new models and innovations that are frequently launched on the market⁽⁴⁰⁾. This is understandable but is also fuelling the ever-growing e-waste mountain.

⁽³⁹⁾ https://step-initiative.org/files/_documents/green_papers/Step%20Green%20Paper_Prevention%26Take-backy%20System.pdf.

⁽⁴⁰⁾ *ibid.*

So, more attempts should be made in the LATAM region for making consumers aware of the implications of EEE production and that usage and final disposal have steering for behavioral changes – where, e.g., 1) reuse and refurbishment are favored over recycling, 2) services to repair become an important indicator in procurement and purchasing decisions, and 3) instead of purchasing product, more and more people purchase only the service that products provide. As such, ownership would stay with the producer and service provider and in having an interest in easy collection, maximum reuse of materials and components, and supporting technological innovations.

Reusing a product to extend its lifetime is a much more effective, environmentally sound option than discarding it.



2. Be More Aware

The e-waste problem is perceived very differently across the world, but it is mainly regarded as an issue for the global South due to informal, partly undeveloped or outdated recycling practices with environmental and health consequences. This perception also broadly applies to the LATAM region. And despite the fact that low collection rates and the insufficient financing for e-waste management systems, lack of enforcement, and missing infrastructure for appropriate recycling procedures are well-known among the countries' experts, awareness of the wider public is limited in that the origin and source of the problem and its resulting consequences lie directly with the manufacturers and consumers, as opposed to being at a distance. There is a common desire for the latest gadgets, whose productions have enormous environmental footprints such that their lifespans should be increased and not decreased. There remains a lack of awareness of how to appropriately dispose of EEE at its end-of-life, thus returning it as soon as possible to state-of-the-art treatment facilities. There is also a lack of awareness that low levels of collection and recycling result in a loss of resources vital for the manufacturing of EEE. Therefore, in the absence of appropriate substitutes, we are even running a risk for certain production chains.

A substantially increased awareness of the e-waste challenge might also lead to changed consumer behaviour, especially considering the environmental aspects during purchasing and in comparing aspects between different brands and products. Consequently, increased awareness could also result in enhanced competition among manufacturers in terms of their environmental performance, as we can see these days with respect to climate change.

The necessary increase of awareness must come through consumer campaigns in social media, TV, cinemas, radios, and newspapers, as well as in informational brochures coupled with initiatives such as door-to-door collections, placement of collection containers, and green-procuring of municipalities and governments. The potential of children as ambassadors for change should also be seriously considered.



3. Collect More

The establishment of an adequate number of easily accessible e-waste collection points, accompanied by an increased awareness among end users, would prevent landfilling and leakages.

The number of collection points for separate collection of e-waste should be increased, including their territorial density, and made easily accessible and more visible. Such a system should encompass collection through municipal collection points, on-demand pickup services, collection of smaller e-waste at supermarkets, etc. The engagement of informal sector actors in e-waste collection should also be supported. Security at collection points should be improved as a way of preventing theft of valuable parts. There is an information deficit for consumers, many of whom may not be aware of the policy and legal framework. Consumers should be made better-informed as a means of preventing bad practices in discarding e-waste and ensuring collection through registered collectors.

E-waste collection rates need to increase across countries in the region, just as they need to increase elsewhere worldwide. This improvement can be realised through mandatory handover of e-waste to licenced facilities.

In the LATAM region, more than 97 percent of e-waste is not formally collected and handed over to licenced facilities. Legislation is needed, with incentives, for mandating that consumers and financial instruments ensure handover of e-waste collected by informal actors to licenced collectors; the legislation should require that, in turn, collectors transfer collected e-waste to licenced processors as a means of redirecting e-waste from dumpsites and ensuring ESM. This increased collection infrastructure should be supplemented by progressive target rates for collection of e-waste as defined in all countries in the region.

Establish mandatory reporting obligations for all actors collecting e-waste.

Effective e-waste legislation should include a clear definition of 'electric and electronic wastes' and a classification for ease of identification and monitoring. To monitor collection, LATAM countries should introduce a legal obligation for collectors and pre-processors to report and record the amounts and destinations of all types of input and output parts (including e-waste plastic POPs). Several targets and indicators are defined or are currently in the process of being developed as part of monitoring the progress in the region. The enforcement should accompany the monitoring through targeted inspections, intelligence-led risk assessments, and annual enforcement plans involving different actors in the compliance and enforcement chain. Sufficient and trained personnel should be provided to the respective authorities for fulfilling these enforcement targets because attaining sufficient, trained personnel is a major stumbling block in many parts of the world, including in the LATAM region.

Improve collection of annual statistics in a comparable format for easy appraisal of the system performance, as well as completion of an assessment of unmanaged flows every five years.

LATAM countries should integrate mandatory data reporting and monitoring into the national/regional e-waste systems covering all e-waste categories for ease of comparison both within the region and at the global level. The monitoring system should cover annual statistics on EEE POM, e-waste, and e-waste POPs generation, preferably based on the UNU-KEYs, as well as collection and treatment across the six e-waste categories. Furthermore, import and export statistics of EEE and e-waste will need to be compiled. Every five years, there should be a provision of mapping unmanaged flows and lifespan revisions to allow for targeted and fact-based interventions as a means for improving e-waste collection.

Measuring e-waste is important as a means for identifying where policy interventions are required for initiating the necessary policy formulations. It is also important to measure progress in the sector nationally and regionally, as well as whether or not the countermeasures taken have the intended effect. Reliable statistics are essential tools for initiating policies for minimizing e-waste generation, preventing illegal dumping and emissions, promoting recycling, and creating jobs in the reuse, refurbishment, and recycling sectors. Also, progress toward attaining the SDGs and their 169 targets is measured by indicators and official statistics. Performance of the system and accurate mass balance calculations (for determining progress toward meeting established targets or the amounts of e-waste that end up in the informal sector) depend on collection and storage of quantitative data.



4. Treat Better, Pollute Less

Implement and enforce the prerequisites for environmentally sound management of e-waste and POPs.

It is imperative that LATAM countries introduce both e-waste and POPs policies and legislative instruments that are clear and tailored to the national context, but which also focus on harmonisation at the regional level, especially with regard to product classification, e-waste management responsibilities, and penalty systems. Such a balance will help to avoid transitional shipments to countries with more lax systems in place.

Few LATAM countries currently meet the prerequisites for ESM of e-waste, such as e-waste-specific legislation, collection mechanisms, and recycling infrastructure with appropriate EHS standards. Unclear definitions and misinterpretation of concepts (e.g. understandings of what e-waste is, what the EPR requirements are, etc.) complicate the implementation of existing legal and regulatory frameworks. In certain LATAM countries, additional legislative instruments that have not yet been enacted will coordinate the responsibilities of other e-waste actors, such as the monitoring of the country's entire e-waste system. Specific responsibilities should be clearly

assigned to each stakeholder, and the regular training of authorities is essential for achieving the desired system efficiency, accompanied by consistent guidelines.

Government and private-driven funding systems are required for financing adequate e-waste management.

Considering that the LATAM countries have varying cost and revenue dynamics as well as varying societal systems, there is no single financial model suitable for all 13 countries. However, the majority of operators are only active in the preliminary processing of e-waste and are restricted to dismantling and selling the more commercially attractive parts. The fragile economics behind e-waste management systems across the region's countries also affect the situation. Considering both the environmental and societal impacts of e-waste, the government can initiate a system that can be either fully or partly financed by taxpayers; this would require dedicating a fraction of tax revenues to mitigating the costs associated with an e-waste take-back system. But the caveat of such a ring-fencing of tax for e-waste management is often decided by the arm of the government that manages the financing – not environmental issues – and, so, ring-fencing is not always done in favour of e-waste environmentally sound e-waste management.

The adoption of an Extended Producer Responsibility (EPR) system – where the consumer pays for EoL management of the products via either an advanced recycling fee (ARF) on purchases or a recycling/disposal fee – presents an effective approach to e-waste management. The product's producer or manufacturer has the legal obligation to take up their responsibility (either by themselves or through licenced/authorized third parties) to handle their products POM at their end-of-life stage for proper disposal. In absence of such a system with formal financial flows, cherry-picking is rampant, and only the valuable material is selected for treatment, with the rest, especially the hazardous fractions, being dumped. In a formal system, the fees generated for e-waste management through EPR cover most of the hazardous/non-value fractions.

Engage the informal sector actors through incentives for collection and handover to licensed facilities.

Where informal collection systems exist, countries should engage them to collect e-waste, protect themselves with adequate personal protective equipment (PPE), and ensure that e-waste is sent to licensed recyclers. As well, a certain formalisation of the informal sector could be secured by providing recyclers with a fair share of the monetary value generated throughout the entire recycling chain.

Non-formal recycling activities of e-waste and landfills could mean that hazardous waste parts are disposed of in a non-environmentally sound way and processed with a low degree of efficiency and effectiveness. Such ineffectiveness leads to pollution of the environment, health problems for workers, and loss of resources. Illegal processors include open burning, direct plastics burning, toner extraction, and burial or dumping of less valuable parts, especially those containing such hazardous components as lead, polychlorinated biphenyls, and chlorofluorocarbons that directly affect the soil or contaminate water sources.



5. Pay Adequately

Integrate the informal sector actors.

LATAM countries could also benefit from integrating their informal sector into formal e-waste management. One approach could be for pre-processing (i.e. collection, separation at the source, and dismantling of non-hazardous fractions of e-waste) to be the informal sector's responsibility, provided that the pre-processing of e-waste is not satisfactorily formalised. End-processing (i.e. the technical steps that follow dismantling, such as recycling and disposal), some operations linked to pre-processing of hazardous components (CRTs, mercury, phosphor, POPs), and the recovery of complex but valuable parts (such as Printed Circuit Boards) should all be left to the formal sector. In so doing, labor-intensive manual dismantling could be implemented locally, providing job opportunities via low-tech investments. Manual dismantling is more environmentally and economically efficient than mechanical dismantling because mechanical dismantling requires advanced technology, high-energy consumption, and high investment costs and has both a lower yield of material liberation and pure part separation potential. LATAM countries could enable shipments of recovered materials to expert end-processor facilities in the region or elsewhere, where the overall detoxification and recovery of valuable materials is most efficient and state-of-the-art. This approach focuses on utilising the existing end-processing infrastructures regionally and globally as attractive to countries in terms of providing economies of scale technology and infrastructure and being the most economically viable for the country's value recovery stream. This 'best of both worlds' approach builds on an adequate and fair payment of all players involved in the reverse supply chain.

Illegal treatment and recycling of e-waste is common in all LATAM countries, as it offers lower operational costs than official processors can. When considering all types of waste management, the informal sector saves public authorities and taxpayers large sums of money, mostly due to avoidance of collection and disposal costs. This is also recognised by assigning the informal sector a role in the formal reverse supply chain and initiating a close cooperation. Otherwise, the formal operators are more economically disadvantaged than those in the informal sector, and there is no legal or regulatory framework stimulating the development and enhancement of formal operators. The establishment of a properly financed EPR system would also address this challenge.



6. Work More Safely

E-waste management standards should be introduced and enforced in all countries in the region.

Currently, five countries have adopted (and some are in the process of adopting) specific voluntary e-waste management standards⁽⁴¹⁾ developed by ILO, WHO, ITU, BRS, and others. The management of waste, including hazardous waste, is regulated by several national laws and rules in all countries in the region. EHS standards, in line with regional and international best practices, should be introduced by law in each country in the region.

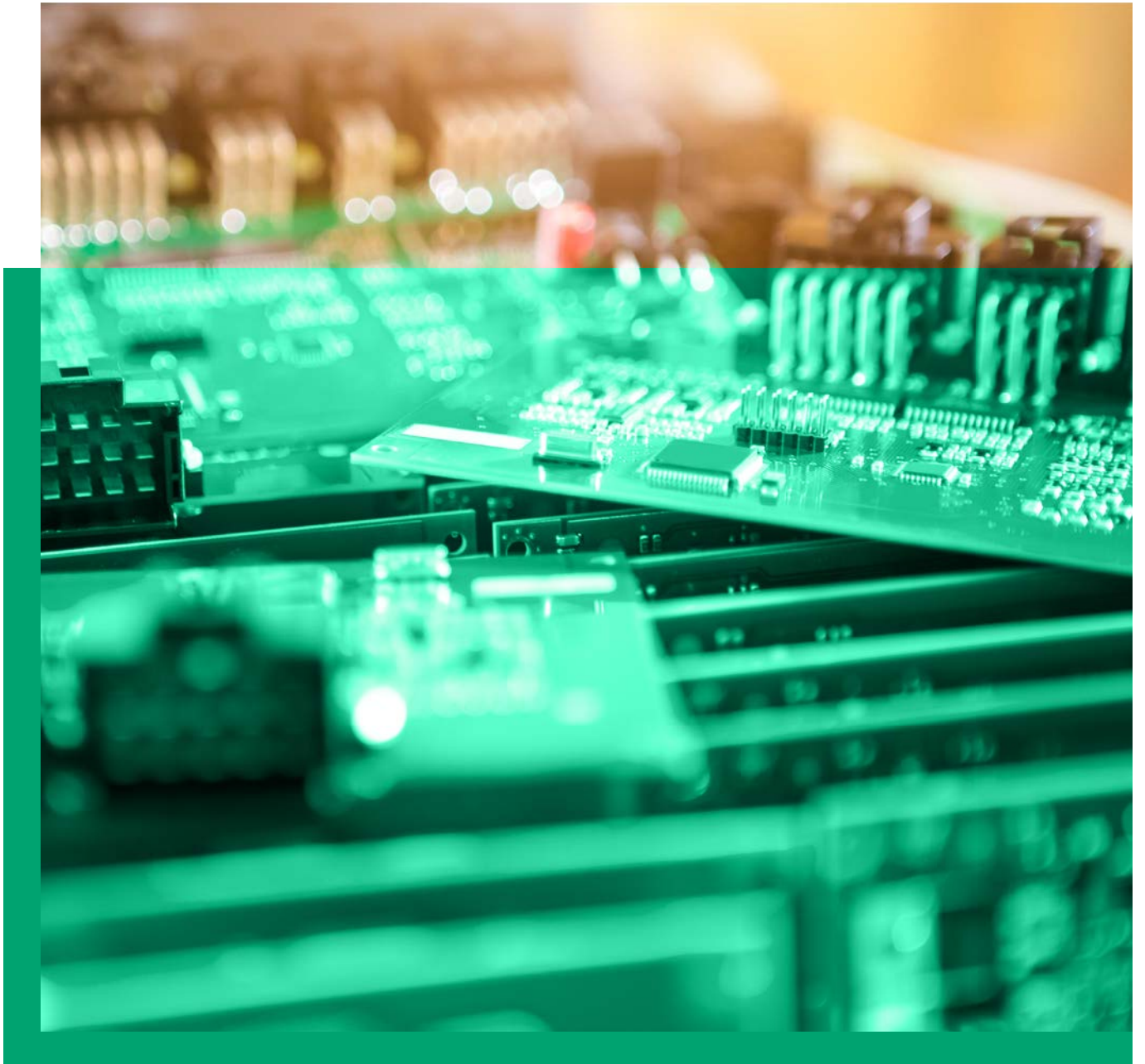
Countries with existing e-waste legislation may require reforms that implement mandatory e-waste EHS standards while increasing awareness and compliance among all involved actors.

The study observed that even in some of the countries with existing legislation and EPR schemes, there are implementation challenges – often linked to the absence of mandatory EHS standards – ensuring environmental health and the safety of workers. Such standards should detail the methodology for the organisation of collection, transportation, processing, depollution/ decontamination, treatment, and disposal of residual parts and should be accompanied by relevant training of all involved personnel.



7. Train More

EEE, resulting e-waste, and the hazardous substances (e.g. mercury, POPs) in e-waste raise concerns about resource efficiency and the immediate dangers to humans and the environment once all of these products become waste. There is a long and often complicated chain of events in the e-waste problem, beginning with the idea that someone has for a new product and continuing through the item's production, ending in its purchase and eventual disposal by the end user. But there is limited capacity for understanding and managing this complex waste stream, whether in the LATAM region or elsewhere. The E-waste Academies developed by UNU/UNITAR SCYCLE provide tailored and targeted training for different stakeholder groups. A strong emphasis on diversity in these trainings helps professionals to inform and learn from each other – among disciplines, stakeholders, and countries. These academies and other trainings provide a platform to access experts and networks. The more trainings LATAM representatives receive, the more access they have to models tailor-made for their specific needs in developing their own systems in their own countries – and a global network of alumni is an important reference resource.



9. COUNTRY PROFILES

The order of the country profiles reflects the outcomes of the e-waste management assessment described in Chapter 3 and is based on the number of indicators scoring A for each country. Countries scoring an equal grade have been listed in alphabetical order.



Argentina ●

Bolivia ●

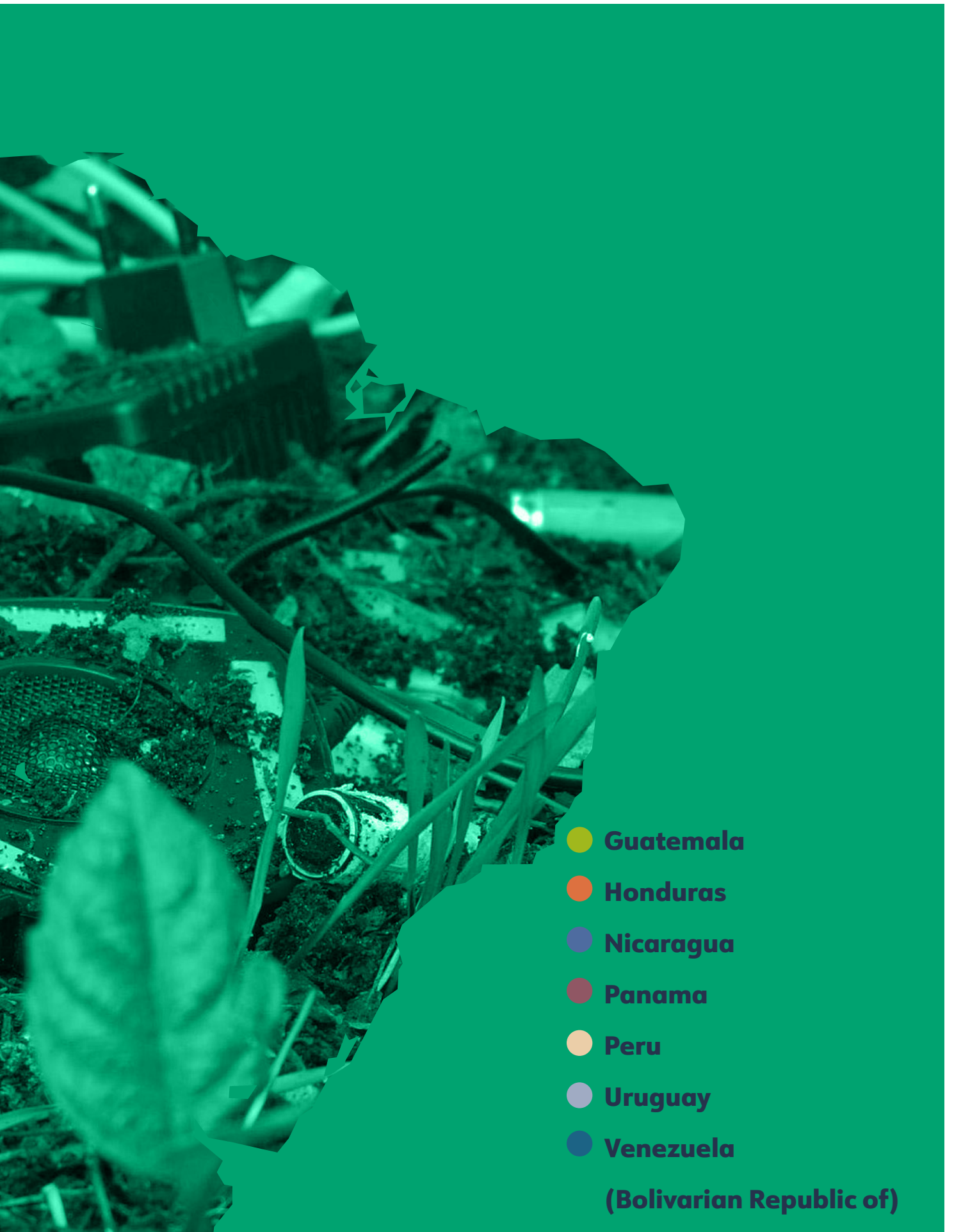
(Plurinational State of)

Chile ●

Costa Rica ●

Ecuador ●






El Salvador ●



- Guatemala
- Honduras
- Nicaragua
- Panama
- Peru
- Uruguay
- Venezuela
(Bolivarian Republic of)

Country:

Argentina

-  44.8 million inhabitants [28]
-  2,780,403 km²
-  **Borders:** Bolivia (Plurinational State of), Paraguay, Brazil, Uruguay, South Atlantic Ocean, and Chile
-  **GDP per capita PPP:** \$23,040 USD [29]
-  **Average household size:** 3.3 members [30]



Map source: United Nations Geospatial Information Section⁽⁴²⁾

E-waste Management:

Legislation: ●●●●●
 Infrastructure: ●●
 Collection Rate: 4%

E-waste POP Management:

Legislation: ●●●●●
 Infrastructure: ●●●●●
 Collection Rate: 0%

Legend: ● Advanced ● Transition ● Basic
 Each indicator is one circle.

National legislation on e-waste and POPs:

- Extended Producer Responsibility:** ✕ A number of initiatives are being considered and discussed
- National e-waste standards:** ⚙ In development
- National standards for POPs contained in e-waste:** ⚙ In development
- E-waste collection target:** ⚙ In development
- Legislation product coverage in UNU-KEYS:** 0 of 54
- Legislation product coverage in weight (%) on total and per category⁽⁴³⁾:** Total: 0% of the e-waste generated in 2019




International Conventions:

	Signature	Ratification	Entry into force
Basel Convention [31]	28/06/1989	27/06/1991	05/05/1992
Rotterdam Convention [32]	11/09/1998	11/06/2004	09/09/2004
Stockholm Convention [33]	23/05/2001	25/01/2005	25/04/2005
Minamata Convention [34]	10/10/2013	25/09/2017	

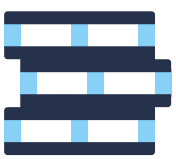

⁽⁴²⁾ <https://www.un.org/Depts/Cartographic/english/htmain.htm>.

⁽⁴³⁾ Percentage in weight of e-waste generated equipment covered by the national legislation illustrated per EU-6 collection category for 2019.



EEE Placed on Market (2019):	E-waste generated (2019):	E-waste formally collected (2019):
 <p>313 kt. 7.0 kg/inh.</p>	 <p>328 kt. 7.7 kg/inh.</p>	 <p>13 kt. 0.3 kg/inh.</p>

(Source: Ministry of Environment and Sustainable Development⁽⁴⁵⁾ / UNU / UNITAR)

Generated e-waste plastic:	Generated BFRs from e-waste:
 <p>87 kt. 1.9 kg/inh.</p>	 <p>6 kt. 0.2 kg/inh.</p>

(Source: UNDP / UNU / UNITAR)

Formal/environmentally sound e-waste management system in place:

- ✓ As of February 2020, The Ministry of Environment identified that 27 facilities were registered to manage e-waste. This includes recovery, treatment, and refurbishment facilities. Not all of these 27 facilities are registered at the national level within the framework of Law 24.051; in most cases, the facilities are registered at a provincial level⁽⁴⁴⁾⁽⁴⁵⁾.
- ✗ Argentina does not have facilities that process/treat POPs arising from e-waste, but one operator exports products generally containing PCB (e.g. pesticides, e-waste, etc.) for treatment⁽⁴⁶⁾.

⁽⁴⁴⁾ Estimations, provided by the Ministry of Environment and Sustainable Development, the information provided is at the moment of writing the report not considered official information. ⁽⁴⁵⁾ As a result of a survey implemented within the PREAL project it was identified that this number may vary, having installations not yet been identified as within the framework of Law 24.051 are only those at a national level (carry out interjurisdictional operations), there may be facilities registered in a provincial level. ⁽⁴⁶⁾ POP treatment facilities can be found in Argentina, however, there is no specific treatment facilities that treat POPs contained in e-waste.

National Legal Framework

The Republic of Argentina (hereafter, Argentina) has neither specific e-waste legislation nor a legal definition of e-waste yet in place. Substances (e.g. POPs) and components found in e-waste are regulated as hazardous waste.

No legal definition of e-waste exists in the country or any specific national law on the matter. However, despite the fact that there is. At the national level, their management is addressed by the law on household waste and the law on hazardous waste, which establishes how this type of waste should be managed and how it should be registered, and which defines requisites that certificate operators, transporters, and operators in general should have.

POPs are regulated as hazardous wastes within the relevant general legal framework. Below a list of the main legal and regulatory instruments concerning e-waste, and POPs are included:

- National Law No. 24.051 of December 17, 1991, on Hazardous Waste⁽⁴⁷⁾ and relevant implementing Decree 831 of 1993 on hazardous waste [35] and relevant implementing Resolution 897 of September 9, 2002⁽⁴⁸⁾.
- National Law 23,922 of March 21, 1991, on the Approval of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal [36].
- Law No. 25,675 of November 6, 2002, General Law on the Environment [37].
- Law No. 25,916 of August 24, 2004, on Comprehensive Management of Household Waste⁽⁴⁹⁾.
- Law No. 25,670 of 2002 on Minimum Standards for Environmental Protection for the Management and Elimination of PCBs, and relevant implementing Decree 853 of 2007⁽⁵⁰⁾.
- Resolution No. 522 of 2016 on the development of a National Strategy for the ESM of Special Waste⁽⁵¹⁾.
- Resolution No. 189 of May 17, 2019, for the implementation of the national strategy for the ESM of Special Waste established by Resolution 522/2016⁽⁵²⁾.

- Resolution 451/2019 for the Prohibition on Import, Manufacture, Use and Marketing of Persistent Organic Pollutants [39].

National Law 24.051 of December 17, 1991 regulates the generation, handling, transport, treatment, and final disposal of hazardous wastes. It includes wastes listed in Annex I as well as those having the characteristics outlined in Annex II, which are identical to Annexes I (Categories of Wastes to Be Controlled) and Annex III (List of Hazardous Characteristics) of the Basel Convention, to which Argentina has been Party since 1991 [40].

Law 24.051 covers the management of substances and component contained in EEE, and as such, the disassembly, modification, and refurbishment of EEE are included with this law.

Annex I of Law 24.051 defines the categories to be controlled as: batteries (Y26 Ni /Cd, Y35 basic solutions and Y42 Ion/Li) and printed circuit board-PCB (Y20 Be, Y21 hexavalent Cr, Y22 Cu, Y23 Zn, Y25 As, Y26 Cd, Y27 Sb, Y29 Hg and Y31 Pb)⁽⁵³⁾.

⁽⁴⁷⁾ <https://www.argentina.gob.ar/normativa/nacional/ley-24051-450>.

⁽⁴⁸⁾ <https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-897-2002-77374>.

⁽⁴⁹⁾ <https://www.argentina.gob.ar/normativa/nacional/ley-25916-98327/texto>.

⁽⁵⁰⁾ <https://www.argentina.gob.ar/normativa/nacional/decreto-853-2007-129850>.

⁽⁵¹⁾ <https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-522-2016-268583/texto>.

⁽⁵²⁾ <https://www.boletinoficial.gob.ar/detalleAviso/primera/207895/20190521>.

⁽⁵³⁾ See Annex I <https://www.argentina.gob.ar/normativa/nacional/ley-24051-450/actualizacion>.

Argentina does not make use of a predefined list of hazardous wastes; instead, it has a legally defined procedure for determining the characteristic of hazardousness of specific waste types [40].

There is no predefined list of hazardous wastes, due to the difficulty of establishing the hazardous characteristics of all types of waste. Decree 831/1992 of the hazardous waste Law 24.051 in Annex IV sets out the procedure for determining the characteristics of hazardousness.

Resolution 897/2002, which adds to the list in Annex I of the Law 24.051 Category Y48 subject to control all materials and/or various items contaminated with one or more of hazardous waste identified in Annex I or which have one or more of the hazardous characteristics listed in Annex II of the hazardous Waste Law. Waste stream Y48 shall consider contaminated various packaging materials, containers (and/or containers in general), tanks, silos, rags, lands, filters, articles, and/or garments sanitary and/or industrial and/or decontaminating hospital accommodation intended for reuse, among others.

Hazardous waste generators listed in the 'National Register of Generators and Operators of Hazardous Wastes' must present a plan to reduce the generation of hazardous wastes by means of change of technology and by recycling, when possible, in an environmentally sound manner. This requirement is in line with provisions of Article 17 of National Law 24.051. Article 17 of National Law 24.051 states that generators of hazardous waste shall:

- a) adopt measures to reduce the amount of hazardous waste they generate;
- b) adequately separate and not mix incompatible hazardous wastes;
- c) package the waste, identify the containers and their contents, number them, and date them, in accordance with the provisions of the enforcement authority;
- d) deliver hazardous waste not treated in their own plants to authorised transporters, with a precise indication of the final destination on the relevant manifest.

Argentina has adopted a National Strategy for the Sustainable Development of Special Waste, which includes e-waste.

In 2016, Argentina has adopted Resolution 522/2016, which foresees objectives, definitions, and guidelines for the development of a National Strategy for the Sustainable Development of Special Waste – which includes e-waste, among other waste.

The country has also a national plan for the reduction and elimination of PCBs. Additional Plans of Elimination (POPs and PTS, such as mercury compounds as well as products such as batteries) are under preparation.

A National Plan of Reduction and Elimination of PCBs was enacted by National Law 25.670 of 2002 and by Decree 853/07. In 2002, Argentina adopted the Law on the Management and Elimination of PCBs (law No 25.670), intended to: a) audit operations associated with PCBs management and disposal, b) decontaminate or eliminate PCBs-containing equipment, c) regulate the disposal of used PCBs, d) ban the import and export of PCBs, and e) ban the production and trade of PCBs.

Argentina has neither specific e-waste legislation nor a legal definition of e-waste yet in place. Substances (e.g. POPs) and components found in e-waste are regulated as hazardous waste.

The GHS system has been in force in Argentina since 2015.

The Globally Harmonised System of Classification and Labelling of Chemicals (GHS) has been mandatory in the country since 2015.

Currently, e-waste management legislations are implemented at a provincial level in eight provinces (i.e. Buenos Aires, Ciudad Autónoma de Buenos Aires (CABA), San Juan, Chubut, Chaco, San Luis, La Rioja and Santa Fé) [41].

- Law 14.321 Buenos Aires sets guidelines, obligations, and responsibilities for the sustainable management of e-waste, promoting reuse, recycling, valuation, and impact reduction [42]. Under the Resolution 269/2019 guidelines, obligations and responsibilities for e-waste operators carrying out disassembly, dismantling, and sorting for reuse are defined [43].
- With regard to CABA, Law 2.807 defines the management of unused EEE of the Executive Branch for the purpose of property disposal, promotes the reuse of unused EEE Awareness and narrowing of the digital gap while protecting the environment and ensuring an adequate recycling and final disposal⁽⁵⁴⁾.
- Under Provincial Law 1171, San Juan defines the management of end-of-life EEE and e-waste. The law creates the Program for Integral Management of Out-of-Use Computer Equipment and e-waste for large users and consumers, including collection, treatment, decontamination, and final disposal.
- In the province of Chubut, Law XI – N° 56 establishes an e-waste recycling program to minimise waste generation, promote reuse and recycle components and materials, involve generators in the responsibility, promote dissemination campaigns, minimise negative impacts on the environment, and define obligations for not disposing of e-waste inappropriately.
- Moreover, in the province of Chaco, Federal Law 7345 promotes the sound management and treatment of e-waste, as well as reuse, recycling, and other forms of recovery. The law also encourages the reduction of hazardousness of EEE components, and incorporates the life cycle analysis of EEE and e-waste as well as the full integration and participation of importers and producers of EEE in the development of the Regulatory Program, in order to achieve an integrated management of e-waste⁽⁵⁵⁾.
- Under Federal Law IX-0881-2014, the province of San Luis provides guidelines on the management of e-waste, obligations, and responsibilities for guaranteeing sustainable management. The main purposes of the law are to prevent the generation of e-waste and to promote reuse, recycling, recovery, and reduction of environmental impacts.
- Under Federal Law 9.373, the province of La Rioja establishes an e-waste recycling program and promotes reuse and recycling of components and materials for their recovery. As well, no e-waste disposal in municipal solid waste is allowed; dissemination campaigns are carried out as a means for achieving this regulation⁽⁵⁶⁾.
- Furthermore, in the province of Santa Fé under Federal Law 13.940, obligations and responsibilities for the integral and sustainable management of e-waste generated are defined that promote the reuse, recycling, and other forms of recovery in order to reduce final disposal in municipal landfills [44].

⁽⁵⁴⁾ http://www.ciudadyderechos.org.ar/derechosbasicos_h.php?id=3&

⁽⁵⁵⁾ <https://legislaturalarioja.gob.ar/consulta-de-leyes.html>.

⁽⁵⁶⁾ <https://legislaturalarioja.gob.ar/consulta-de-leyes.html#gsc.tab=0>.

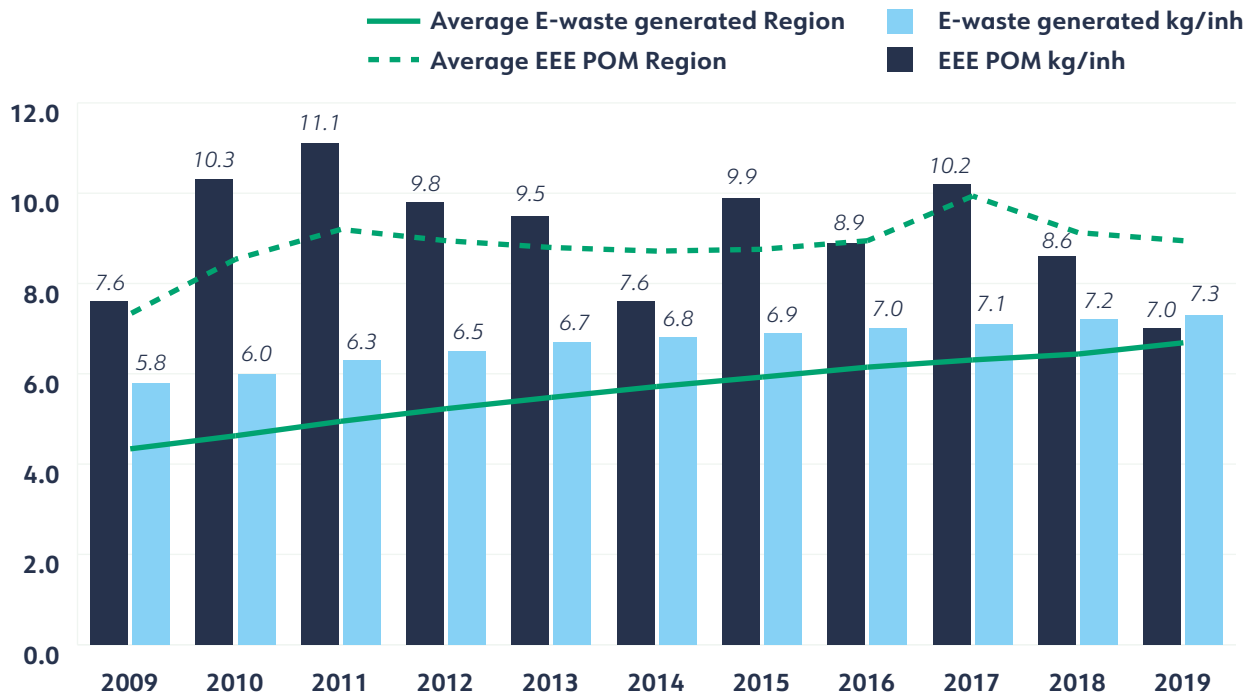
National Statistics on E-waste

Statistics on e-waste are not currently compiled in Argentina.

Prior to 2021, information on imports, exports, and national production of EEE was not carried out systematically in Argentina. However, official information is available at a national level in the National Institute of Statistics (from 2002), Ministry of Production, and General Directorate of Customs.

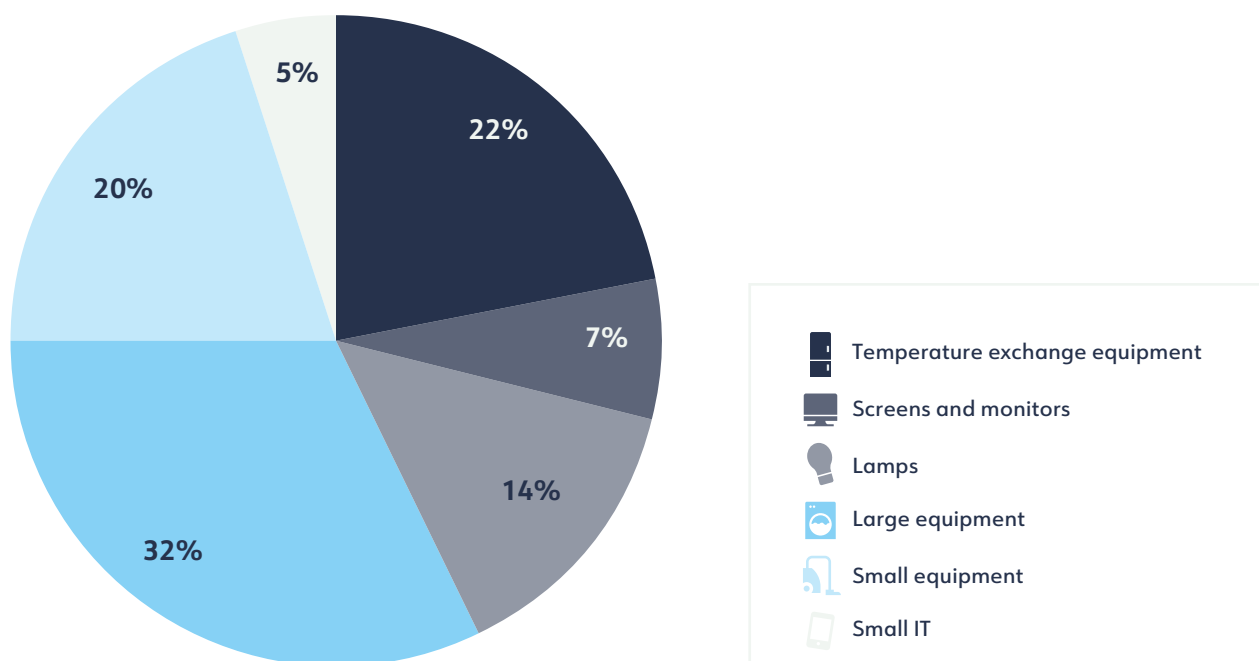
An analysis of information from 2002-2020 was undertaken and is illustrated in Figure 11-Figure 13. Figure 11 shows that that EEE POM has fluctuated over the past decade, from 7.6 kg/inh (306 kt) in 2009 to 7.0 kg/inh (313 kt) in 2019. The fluctuations observed over the past decade could be attributed to the impact of national and international economic crises experienced over the years.

Figure 11. EEE POM and e-waste generated in Argentina



Of the six categories for products placed on the market, large and temperature exchange equipment (Cat. IV with 2.2 kg/inh and Cat I with 1.5 kg/inh respectively) and small equipment (1.4 kg/inh, Cat. I) register the highest share (74 percent of the mass) (Figure 12). The smallest share was registered by small IT, with 0.4 kg/inh.

Figure 12. Share of EEE categories (2019)



Data on domestic production of EEE in Argentina are recorded internally in number of pieces.

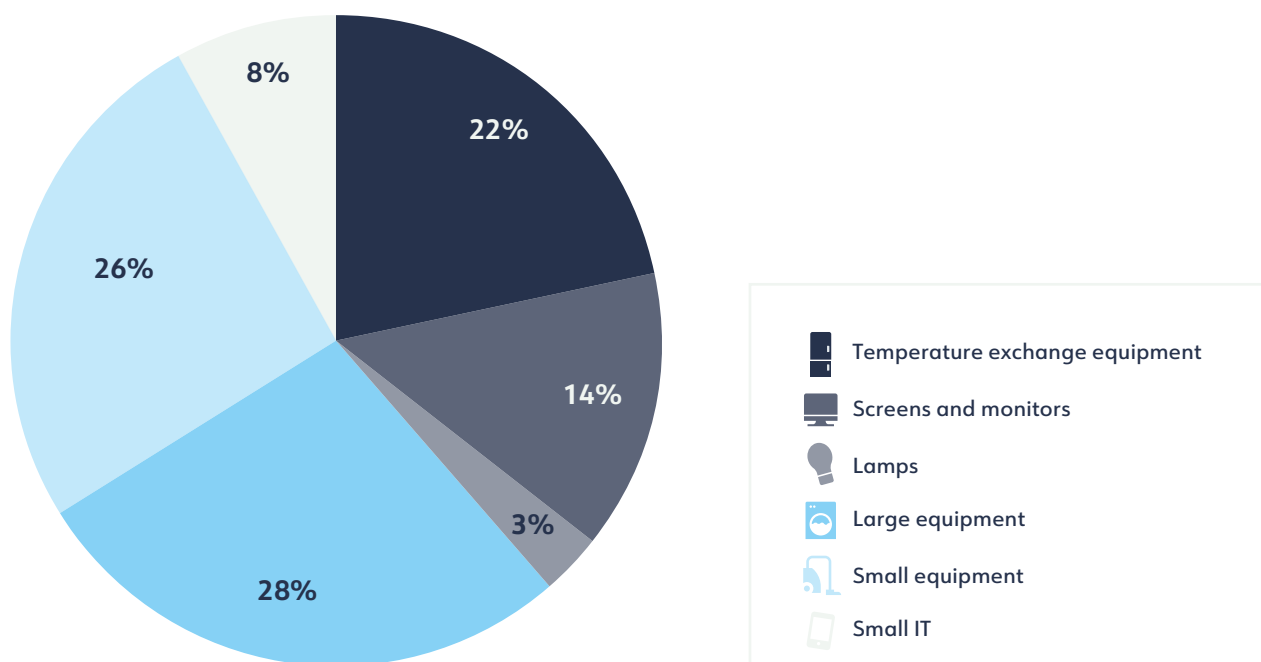
EEE internally produced in Argentina includes, e.g., washing machines, Flat Display Panel TVs, air conditioners, and fridges. These products are mainly produced in Tierra del Fuego.

Despite producing certain EEE at a domestic level, Argentina is mainly an importer. Based on data available from the National Institute of Statistics and Census of Argentina (INDEC) and collected in the framework of the PREAL project, Argentina exported 4.5 kt (0.10 kg/inh) of EEE in 2019, whereas it imported 118 kt (2.62 kg/inh). The majority of the amount of equipment exported corresponded to professional cooling (e.g. large air conditioners), washing machines, dryers, household tools, and central heating. The majority of imported equipment corresponded to fridges, air conditioning, monitoring equipment, lamps, and Household Tools (e.g. drills, saws, high-pressure cleaners, and lawnmowers).

E-waste Generated has slightly increased, from 5.8 kg/inh (232 kt) in 2009 to 7.3 kg/inh (328 kt) in 2019.

Of the share of the categories in e-waste generated for 2019, large equipment (Cat. IV) with 2 kg/inh (92 kt) and small equipment (Cat. V) with 1.9 kg/inh (85 kt) have the highest shares, followed by temperature exchange equipment (Cat. I) with 1.6 kg/inh (71 kt). The smallest share corresponds to lamps (Cat. III), with 0.2 kg/inh (9 kt) (Figure 13).

Figure 13. Share of the categories of e-waste generated (2019)



The *Waste Electrical and Electronic Equipment (E-WASTE) and Employment in Argentina* [45] report published in 2020 estimated that only 3 percent (equivalent to 0.13 kg/inh in 2018) to 4 percent (equivalent to 0.17 kg/inh in 2018) of e-waste was estimated to be collected and reportedly managed in an environmentally sound way.

This study analysed e-waste management and employment conditions management in Buenos Aires, Santa Fe, and Tierra del Fuego. It was estimated that within the e-waste value chain, more than 200 jobs are registered and approximately 2,000 informal workers perform collection, sorting, disassembly, and recovery of materials in very precarious conditions.

The statistic of POPs and non-POPs arising from e-waste as of this report's publication were unknown.

E-waste and POPs (Found in E-waste) Management System

Authorisation from the Ministry of Environment is required to operate hazardous waste (e.g. components and substances found in e-waste) facilities operating on an inter-jurisdictional basis.

Minimum standards and legislations for environmental protection are issued by the federal government⁽⁵⁷⁾. In turn, provincial and local authorities issue their own rules and laws (based on these minimum requirements/standards) and subsequently enforce their compliance⁽⁵⁷⁾.

The Ministry of Environment and Sustainable Development identified 27 companies that manage e-waste at a national level.

As of February 2020, the Ministry of Environment and Sustainable Development identified that there were 27 companies that manage e-waste at a national level. E-waste operators are mainly distributed in Buenos Aires and their surroundings, in provinces such as Santa Fé and Córdoba (cities with the highest populations, consumptions of EEE, and generation of e-waste), as well as in Tucumán, Catamarca, Chaco, and Mendoza. In order to have a complete overview of number of companies managing e-waste, a province-by-province consultation should be carried out.

The 27 companies identified perform disassembly and materials recovery from e-waste; these include those who are exclusively dedicated to the refurbishment of EEE (especially ICTs), extending their lifespan. Of the 27 companies, 22 specialise in the recovery and recycling of e-waste in the country, ranging from private companies to civil associations and workers, with the cooperatives generally being small and medium-sized enterprises.

As of this report's publication, an estimated 4 percent of e-waste generated (equivalent to 9.4 kt, 0.4 kg/inh) is formally treated by recycling companies.

As in many countries in Latin America, the collection and separation of e-waste include many actors from the formal sector (i.e. municipal systems, when available) who collect e-waste and others from the informal sector (e.g. scavengers, metal scrapers) who carry out collection on public roads. In the case of e-waste from businesses

or industries, they normally resort to companies who manage this type of waste.

Argentina doesn't have a differentiated collection system at the national level, though such collection can be done at the province level.

At the national level, there is no differentiated collection system, but such collection may vary from province to province as the collection and treatment of waste is the responsibility of each municipality. In some cities, such as the Autonomous City of Buenos Aires, e-waste is collected in green points, but such is not the case in all provinces. Furthermore, isolated e-waste collection campaigns promoted by municipalities or institutions can occur throughout the year.

From studies developed in Argentina⁽⁵⁸⁾, it was estimated that 50 to 60 percent of EEE is stored in homes, warehouses, or businesses. The aforementioned is mainly attributed to lack of monitoring or inventory of these products in governmental institutions, lack of knowledge with regard to appropriate disposal, and existing collection points in the country.

The informal sector in Argentina is operated by waste collectors and scrap dealers, without any environmentally safe measures.

Informal recycling of e-waste is common in municipalities that don't have any specific legislation on e-waste management, any recycling company, or authorised collection points. The transport of hazardous waste is regulated between provinces, and the regulation on inter-jurisdictional transport applies to hazardous waste in general, not specifically to e-waste. Some provinces prohibit the entry of hazardous waste into their territories. However, the transportation and management of e-waste between municipalities in the same province is possible. In the case of municipalities from different provinces, the transporter must be authorised by the Ministry of Environment and Sustainable Development of the Nation.

The informal sector consists mainly of waste collectors and/or dealers who go from street to street purchasing old e-waste or, in some cases, acquiring items for free, collecting from kerbsides or informal collection points. Informal collection and recycling of e-waste implies the

⁽⁵⁷⁾ <https://normas.gba.gov.ar/ar-b/ley/2011/14321/11491>.

⁽⁵⁸⁾ <http://www.opds.gba.gov.ar/sites/default/files/LEY%2025675.pdf>.

laborious, and often dangerous, manual dismantling of equipment by using simple tools to quickly separate materials, and such collection is mainly limited to extracting the most valuable and accessible components.

Under the framework of the PREAL project, Argentina is carrying out a pilot project using ITU standards to strengthen e-waste management capacity.

Argentina is carrying out a pilot project with ITU to implement their standard recommendation (ITU-T L.1031⁽⁵⁹⁾) in selected locations to strengthen its capacity to manage e-waste. Furthermore, aims to help establish an e-waste inventory that would provide valuable benchmarks for identifying management gaps and other crucial statistics⁽⁶⁰⁾.

Argentina doesn't have facilities that process and/or treat POPs arising from e-waste, but one operator exports products generally containing PCB (e.g. contained in pesticides, e-waste, etc.) for treatment.

According to the answer to questionnaires provided to countries and interviews held, Argentina has a poor separation of plastics resulting from e-waste, and the separation is mainly performed by plastic recyclers. Plastics in Argentina are classified according to their type (e.g. PC, PVC, PP, ABS), but the classifications do not identify the presence of POPs. There are some small-scale tests on an experimental basis that identify the plastic's typology, either by means of water-based solutions with salts and minerals or by buoyancy. These practices are not applied on a large scale by e-waste managers.

There is little (and sometimes no) identification and separation of plastics with brominated flame retardants.

E-waste plastic that treatment facilities do not commercialise with other recyclers are treated as appropriately as possible by these facilities. They are not disposed of with ordinary waste or landfilled.

Import & Export of E-waste and POPs Contained in E-waste

Argentina has ratified the Basel Convention and the Basel Ban Amendment. It is also Party to the Stockholm, Rotterdam, and Minamata Conventions.

The country is Party to the main relevant international conventions, i.e. the Basel, Rotterdam, and Stockholm conventions, in addition to the Minamata Convention. In December 2019, Argentina also ratified the Ban Amendment. The Directorate of Substances and Chemical Products oversees the fulfilment of international commitments, being the Secretary for Environmental Control and Monitoring the focal point [47].

The National Law 23922 of 'Approval of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal' of 1991 is applied when wastes are subject to a TBM for disposal or recovering. The Stockholm Convention on POPs was ratified by National Law 26.011 of December 2004. Based on the requirements of the Stockholm Convention, Argentina developed its National Implementation Plan (NIP) in 2007 and published its NIP update in 2018.

An import ban of hazardous wastes has been established by article 41 of the Constitution of Argentina.

By Constitution, Argentina bans the entry of current or potentially hazardous waste (Art. 41)⁽⁶¹⁾. Argentina bans import or transit operations of wastes defined as hazardous according to National Law 24.051. As well, Executive Decree 181/1992 prohibits import or transit operations of wastes. This import and transit restriction covers all countries and embraces every waste listed in the National Legislation (Law 24.051, Executive Decree 181/92).

For exports, the normal procedures envisaged by the Basel Convention are applied: the country proceeds with the Prior Informed Consent (PIC) notification system under the Convention. If the TBM is for a waste stream that does not have hazardous characteristics, the export is allowed, provided the destination country's requirements are met.

⁽⁵⁹⁾ Recommendation ITU-T L.1031 "Guideline for achieving the e-waste targets of the Connect 2030 Agenda". <https://www.itu.int/rec/T-REC-L.1031/en>.

⁽⁶⁰⁾ <https://www.itu.int/en/action/environment-and-climate-change/Pages/Partnerships.aspx>.

⁽⁶¹⁾ <https://www.argentina.gob.ar/normativa/nacional/ley-24051-450>.

Argentina has specific regulations in place regarding the importation of POPs.

Resolution No. 451 of November 28, 2019 prohibits the production, importation, formulation, trade, and use of chemicals achieved by the Stockholm Convention on POPs – PFOs flame retardants in plastics. The production or importation of articles containing prohibited chemicals is also prohibited⁽⁶²⁾.

Argentina has put in place regulations to prohibit the production, import, trade, and use of the initial 10 POPs (PCBs, aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, and toxaphene). The ratification of the 2013, 2015, and 2017 Stockholm Convention amendments is still pending; only after its ratification can Argentina start developing regulations for addressing new POPs.

In 2019, 106.85 t of PCBs, 11.02 t of printed circuit boards, and 96.19 t of mercury were exported from Argentina to European countries from treatment and final disposal.

Based on the annual reports to the Basel Convention, in 2019, an estimated 106.85 t of PCBs were exported to France for final disposal (D10, incineration on land, according to the legend about disposal operations in Annex IV of the Basel Convention). Additionally, 11.02 t of printed circuit boards were exported to Belgium, destined for recycling or for reclamation of metals and metal compounds (R4, according to the legend about disposal operations in Annex IV of the Basel Convention). No imports of these substances were reported. According to the Ministry of Environment and Sustainable Development, no illicit movements of e-waste have been detected in recent years.

Stakeholder Mapping






In Argentina, the stakeholders involved in the waste sector (that could be identified) and their roles are described below:

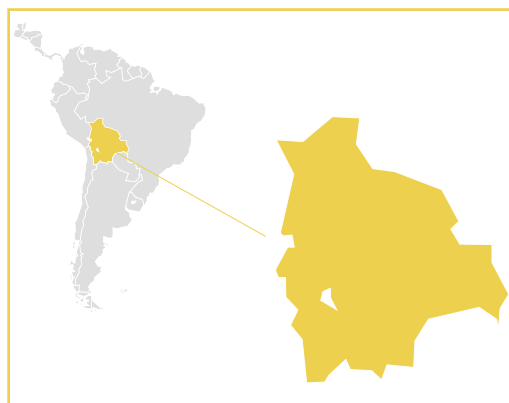
Stakeholder	Responsibility
Ministry of Environment and Sustainable Development Website	The Ministry of Environment and Sustainable Development was created in 2015. Its Chemicals Directorate was created in March 2018 to promote the sound management of chemicals following the national Laws and international commitments. The Secretariat sets the minimum standards for environmental protection, and each provincial authority has the responsibility to regulate and implement these requirements in their territory.
Ministry of Production and Labour Website	The Ministry of Production and Labour of Argentina is the government agency responsible for designing and executing plans related to the promotion of industrial production in the country, as well as foreign trade. The Mission of the Ministry consists of the creation of quality employment, the promotion of an international insertion at scale, fair competition, and federalisation of production.
General Directorate of Customs Website	The General Customs Bureau (Dirección General de Aduanas, DGA) applies, collects, and controls taxes under the Argentine Customs Code. It also regulates other taxes on import and export transactions on behalf of other entities. The DGA is part of the Federal Public Revenue Administration (Administración Federal de Ingresos Públicos, AFIP). AFIP is an autonomous authority at the administrative level, under the general supervision and legal control of the Treasury Ministry. It executes the tax and customs policies set by the Executive Branch.

Stakeholder	Responsibility
<p>The Basel Convention Regional Centre for Training and Technology Transfer for South America (CRBAS)</p> <p>Website</p>	<p>The regional centre based in Argentina since 2005 provides technical support to projects for the ESM of chemicals and waste mainly through training, information dissemination, awareness-raising, and technology transfer efforts.</p>
<p>E-waste managers</p>	<p>Companies, civil associations, cooperatives and programs involved in the e-waste management which perform tasks of reconditioning, disassembly, recovery and recycling of materials.</p>
<p>Academic Sector / Universities and Public Organizations linked to research</p>	<p>They are important points for the generation of research and development in Argentina.</p>
<p>Processing enterprises</p>	<p>Stakeholders performing sorting, extraction and recycling operations on waste in order to obtain secondary raw materials that will be included in new products manufacturing. They also process waste in order to facilitate their handling and reduce their volume and hazardous properties.</p>
<p>Municipalities</p>	<p>Responsibility for waste management in municipalities.</p>
<p>Consumers</p>	<p>When in the course of economic activities, individuals and legal entities generating waste are required to provide measures for their safe handling, comply with environmental and sanitary-epidemiological requirements, and take measures for their recycling and safe disposal.</p>

Country:

Bolivia (Plurinational State of)

-  11.5 million inhabitants [28]
-  1,098,581 km²
-  Borders: Brazil, Paraguay, Argentina, Chile, Peru
-  GDP per capita PPP: \$9,110 USD [29]
-  Average household size: 3.5 members [30]



Map source: United Nations Geospatial Information Section⁽⁶³⁾

E-waste Management:

Legislation: ●●●●●
 Infrastructure: ●●
 Collection Rate: 4%

E-waste POP Management:

Legislation: ●●●●●
 Infrastructure: ●●●●●
 Collection Rate: 0%

Legend: ● Advanced ● Transition ● Basic
 Each indicator is one circle.

National legislation on e-waste and POPs:

- Extended Producer Responsibility: ✓ In place since 201
- National e-waste standards: ✗ Voluntarily adoption, introduced in 2012
- National standards for POPs contained in e-waste: ⚙ In development
- E-waste collection target: ⚙ In development
- Legislation product coverage in UNU-KEYS: 0 of 54
- Legislation product coverage in weight (%) on total and per category⁽⁶⁴⁾: Total: 0% of the e-waste generated in 2019



International Conventions:

	Signature	Ratification	Entry into force
Basel Convention [31]	22/03/1989	15/11/1996	13/02/1997
Rotterdam Convention [32]	-	18/12/2003 (a)	17/03/2004
Stockholm Convention [33]	23/05/2001	03/06/2003	17/05/2004
Minamata Convention [34]	10/10/2013	26/01/2016	

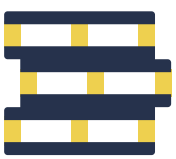

⁽⁶³⁾ <https://www.un.org/Depts/Cartographic/english/htmain.htm>.

⁽⁶⁴⁾ Percentage in weight of e-waste generated equipment covered by the national legislation illustrated per EU-6 collection category for 2019.



EEE Placed on Market (2019):	E-waste generated (2019):	E-waste formally collected (2019):
 <p>86 kt. 7.5 kg/inh.</p>	 <p>53 kt. 4.7 kg/inh.</p>	 <p>2 kt. 0.2 kg/inh. 4% of e-waste is recovered</p>

(Source: Ministry of Environment and Water of the Plurinational State of Bolivia / UNU / UNITAR)

Generated e-waste plastic:	Generated BFRs from e-waste:
 <p>14 kt. 1.2 kg/inh.</p>	 <p>7 kt. 0.1 kg/inh.</p>

(Source: UNDP / UNU / UNITAR)

🔄 Formal/environmentally sound e-waste management system in place:

- ✓ 6 licensed e-waste collection companies distributed in La Paz, Cochabamba, and Santa Cruz.
- ✗ Bolivia (Plurinational State of) does not have facilities that process/treat POPs arising from e-waste.

National Legal Framework

The Plurinational State of Bolivia (hereafter, Bolivia (Plurinational State of)) has a specific regulatory framework regarding e-waste management and EPR system for e-waste in 2016 introduced in their regulation Law No. 755 on Integral Solid Waste Management approved by Supreme Decree No. 2954. However, necessary secondary implementing instruments are not yet in force.

The following pieces of legislation relevant for e-waste management issues exist in Bolivia (Plurinational State of):

- Law No. 1333 'On the Environment' of April 27, 1992 [48], focused on safeguarding the environment and promoting the implementation of the concept of sustainable development.
- Norm NB. 69018 'On Solid Wastes-Waste Electric and Electronic Equipment Definition and Classification' of October 12, 2012.
- Norm NB. 69019 'On Solid Wastes-Waste Electric and Electronic Equipment Management' of October 12, 2012.
- Law No. 755 'On the Integrated Waste Management' of October 28, 2015[49].
- Supreme Decree No. 2954 'General Regulation of Law No. 755' of October 19, 2016 [50], which sets the timeline for the adoption of necessary regulatory and technical documents that implement the law on integrated waste management.
- Ministerial Resolution No. 432 of November 11, 2015, approving the Classification of Waste.

Law No. 755 on Integrated Waste Management of 2015 is the first legal instrument specifically dedicated to establishing a solid waste management agenda in Bolivia (Plurinational State of) [51] and refers to waste in general, including a section on 'special wastes' for which specific collection and management requirements are envisaged. Law No. 755 establishes the EPR for producers and distributors for specific sectors (including e-waste, but also PET bottles, tires, batteries, and pesticides). The law places prime responsibility for the management of waste on producers, who must be responsible for the products they sell, and complementary responsibility on consumers, government authorities, and municipal authorities.

The purpose of this Law is to establish the general policy and legal regime of integrated waste management in Bolivia (Plurinational State of), prioritising prevention for the reduction of waste generation, its use, and its sanitary and environmentally safe final disposal. Nevertheless, the law was not followed by necessary implementing bylaws and regulations (currently being drafted), so it does not establish applicable collection targets [3].

Supreme Decree No. 2954, of October 19, 2016, approves the General Regulations for the implementation of Law No. 755 on Integral Waste Management. It contains definitions and rankings of waste generators. It

Bolivia (Plurinational State of) has a specific regulatory framework regarding e-waste management and EPR system for e-waste and is working to adopt specific regulations on PCBs and POPs.

also lists the programs, information, and coordination system for integrated waste management; establishes measures of prevention, exploitation, and extended responsibility to the producer (separation and differentiated collection of waste), contains rules on infrastructure facilities for the transfer, treatment, and final disposal of waste; and lists authorised operators and the export of waste. The Regulations establish different deadlines and dates for the implementation of the central aspects of Integral Waste Management [52].

Ministerial Resolution No. 432 of November 11, 2015, approves the Classification of Waste, in which Waste Electrical and Electronic Equipment is classified as Special Waste.

Norm NB. 69018 'On Solid Wastes-Waste Electric and Electronic Equipment Definition and Classification' includes provisions on classification and definitions related to the generation of waste electrical and electronic equipment and e-waste management.

Norm NB. 69019 'On Solid Wastes-Waste Electric and Electronic Equipment Management' establishes the standards and measures that must be adopted for the environmentally safe management of e-waste, in order to prevent, reduce, and mitigate the negative impacts that this management may cause on health and the environment. A draft Norm on waste fluorescent lamps is currently under discussion [53].

Bolivia (Plurinational State of) is working to adopt specific regulations on PCBs and POPs.

Bolivia (Plurinational State of) plans to carry out activities related to ESM of PCBs, contaminated equipment and waste, and the strengthening of technical capacity. It also intends to put in place specific regulations for the gradual elimination of Persistent Organic Pollutants (POPs) until the year 2025 [54].

EHS standards for ESM of e-waste were introduced in 2012. The adoption of Norms NB. 69018 and NB. 69019 is voluntarily, not mandatory.

The above-mentioned Norm NB. 69019 'On Solid Wastes-Waste Electric and Electronic Equipment Management' establishes standards for the ESM of different types of products, including e-waste. Additional implementing bylaws are still required to enforce them.

Bolivia (Plurinational State of) Norm NB. 69018 of Solid Wastes-Waste Electric and Electronic Equipment's classification and definitions, published on the 12 of October 2012, classifies e-waste into six categories:

1. Consumer electrical and electronic equipment.
2. Computer and telecommunications equipment.
3. Electrical and/or electronic equipment and tools—drills, saws, and sewing machines.
4. Toys, sports, and leisure equipment.
5. Measuring and control instruments.
6. Miscellaneous Electrical and electronic materials (conductors, batteries, contacts, etc.).

National Statistics on E-waste

Statistics on e-waste are not currently being compiled in Bolivia (Plurinational State of).

Prior to 1998, information on imports and exports of EEE was not carried out systematically in the country. However official information is available at a national level in the National Institute of Statistics, Ministry of Environment and Water of Bolivia (Plurinational State of), and National Customs. In their statistics, Bolivia (Plurinational State of) doesn't differentiate between new and used equipment being imported or exported. As of this report's publication, the country uses EU-10 categories to develop their statistics: 1) large equipment, 2) small equipment, 3) IT and telecommunication equipment, 4) consumer equipment, 5) lighting equipment, 6) electrical and electronic tools, 7) toys, leisure, and sports equipment, 8) medical devices, 9) monitoring and control instruments, and 10) automatic dispensers.

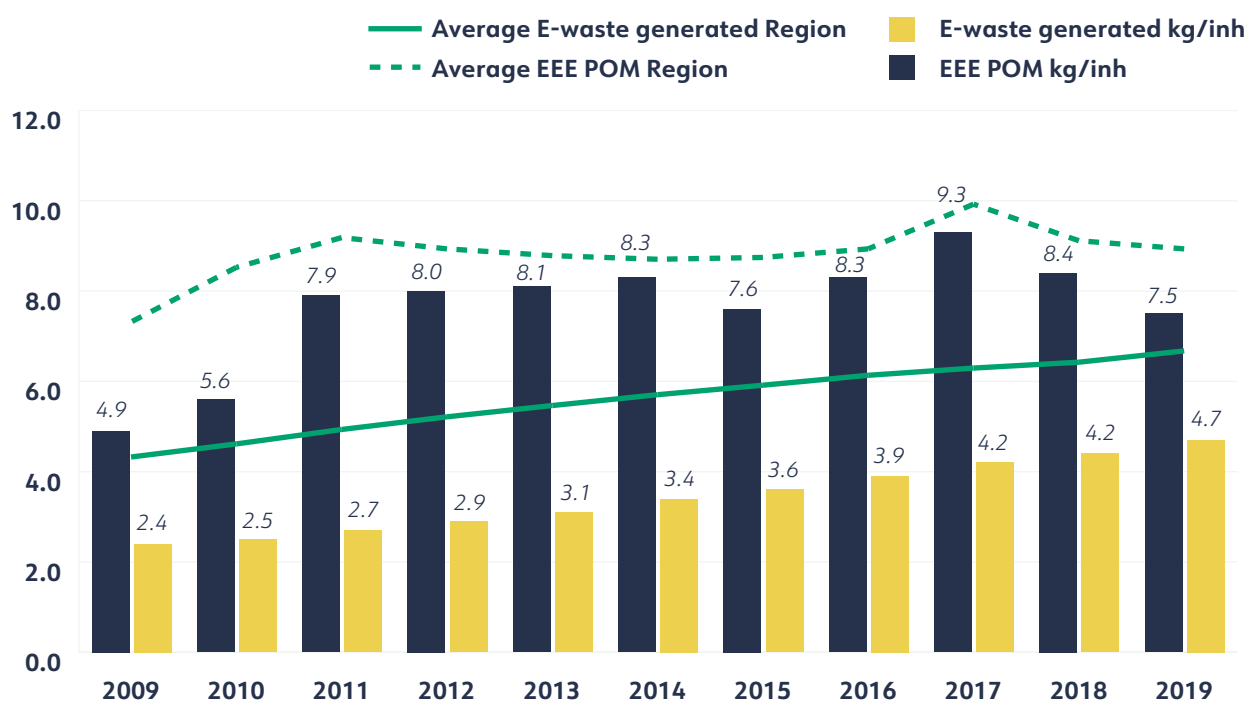
In 2009, a diagnostic of the e-waste situation in Bolivia (Plurinational State of) was published by the Swiss Foundation for Technical Development Cooperation (SWISSCONTATC) in Bolivia (Plurinational State of) via the Latin American Environment Project (LAMA) and the Bolivian Chamber of Information, Technology and Computing (CAINTEC). In this report, a baseline of e-waste POM and generation was developed from 1998-2008. The e-waste management analysis of the project included information from Santa Cruz, Cochabamba, La Paz, El Alto, Oruro, and Montero, which represented 43 percent of the total population.

Bolivia (Plurinational State of) does not have an electronic manufacturing industry, but it has companies that assemble and repair equipment. The analysis of information from 2009-2020 was undertaken using the information provided by the Ministry of Environment and Water and illustrated in Figure 14-Figure 16. For 2019, a total of 1.07 kg of small household equipment was reportedly exported, and in 2019, 22 kg of professional luminaires (offices, public space, and industry) were reported to be exported. The aforementioned illustrates that the exports of EEE is minimal and varies by year.

Figure 14 shows that EEE placed on the market (POM) has increased over the past decade, from 4.9 kg/inh (47.5 kt) in 2009 to 7.5 kg/inh (86 kt) in 2019. Figure 14 also shows that there was a slight increase in EEE POM.

From information acquired from the Ministry of Environment and Water of the Plurinational State of Bolivia, starting in 2013, a double Christmas bonus was decreed to the public and private sectors if the GDP was higher than 4.5 percent. In 2016, the GDP surpassed the 4.5 percent limit, providing consumers with enough resources to purchase electronic equipment (e.g. upgrading their mobile phones) [55]. As well, given that in 2018 the Russian World Cup would be played, the change and acquisition of plasma TVs can be seen, given the country's football culture⁽⁶⁵⁾.

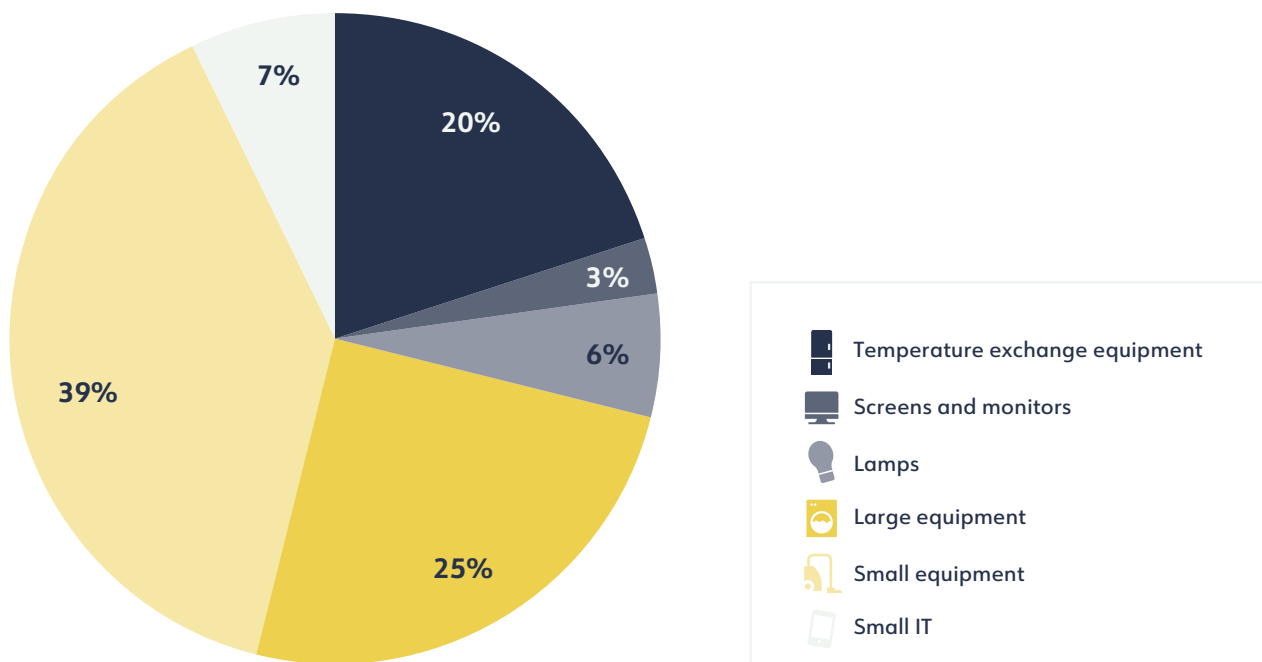
Figure 14. EEE POM and e-waste generated in Bolivia (Plurinational State of)



⁽⁶⁵⁾ <http://cbhe.org.bo/index.php/noticias/18267-incrementan-aranceles-de-importacion-para-equipos-electronicos>.

Based on the data provided by the Ministry of Environment and Water in 2019, Bolivia’s (Plurinational State of) POM was 86 kt (7.5 kg/inh) of EEE. The majority of the amount of equipment POM corresponded to professional tools (e.g. welding, soldering, etc.) and fridges. When looking at the POM EU-6 categories, small equipment (Cat. V with 2.9 kg/inh), large equipment (Cat. IV with 1.9 kg/inh), and temperature exchange equipment (1.5 kg/inh, Cat. I) register the highest share (84 percent of the total) (Figure 15). The share of the EU-6 categories has been calculated over the total mass. This trend (from 1995-2020) is clear from analysing the information.

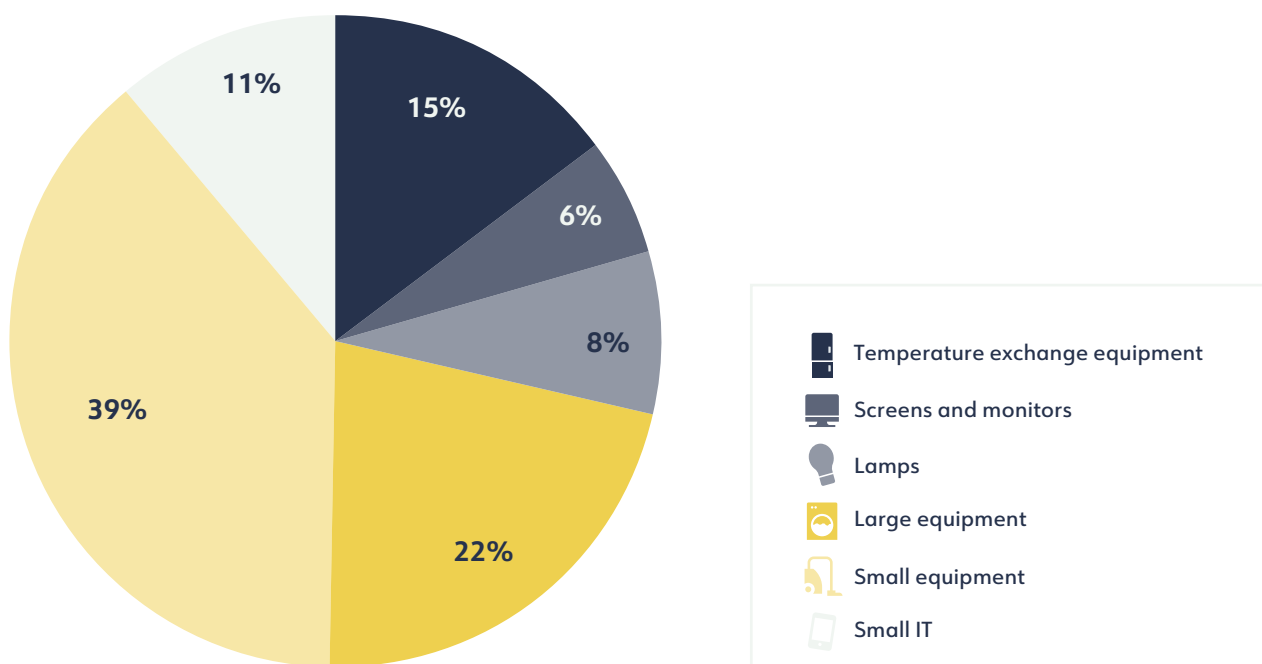
Figure 15. Share of the EU-6 categories in the EEE (2019)



E-waste generated has increased substantially, from 2.4 kg/inh (23 kt) in 2009 to 4.7 kg/inh (53.3 kt) in 2019.

Analysis of the time series of e-waste generation in the EU-6 categories shows that the categories increase linearly over the years. For 2019, small equipment (Cat. V) had the highest share with 1.8 kt (equivalent to 20.6 kg/inh), followed by large equipment (Cat. IV) with 11.7 kt (equivalent to 1.0 kg/inh) and temperature exchange equipment (Cat. I) with 7.8 kt (equivalent to 0.7 kg/inh) (Figure 16).

Figure 16. Share of the EU-6 categories in the e-waste generated (2019)



The statistic of POPs and non-POPs arising from e-waste were unknown as of this report's publication.

E-waste and POP Management System

A comprehensive e-waste management system is implemented in Bolivia (Plurinational State of), and information on how e-waste is handled in the country is available, to some extent. Bolivia (Plurinational State of) does not have official collection points and collection facilities for e-waste. It is estimated that approximately 4 percent of e-waste is collected through collection campaigns.

There are no formal collection systems for e-waste in Bolivia (Plurinational State of); consumers mostly dispose of their e-waste together with municipal waste, or they are abandoned on roads or in public areas and partly intercept by the informal sector and subjected to substandard treatments and subsequent improper dumping.

No information on the quantity of e-waste collected and treated by the informal sector could be found during the research for this report. The informal sector typically focuses on retrieving products that contain valuable materials and components which can be recovered (mainly ICT equipment). Normally, they carry out collection routes (e.g. acquiring e-waste directly from the public, kerbside pickup, etc.). The treatment carried out by the informal sector consists of disassembling the EEE and recovering reusable and profitable materials that are easy to recover. Unfortunately, there is no information on what they do with hazardous or non-valuable materials and components, which may subsequently be improperly dumped. From the information provided by the Ministry of Environment and Water of Bolivia (Plurinational State of), there are currently no partnerships or alliances between the formal and informal sector [56, 57].

The “*Guía de Baja Para Disposición de Residuos de Aparatos Eléctricos y Electrónicos en Instituciones Públicas y Privadas*” states that at the national level, most e-waste remains in storage in private and public institutions. As of this report’s publication, no estimation could be made as to the quantity of e-waste being stored, but the study states that the equipment being stored mostly corresponds to the ICT category. The report mentions that institutions stored e-waste for administrative reasons.

In recent years, Bolivia (Plurinational State of) has shown an increasing interest in, and is taking action on, the field of waste management.

Formal collection and transportation of e-waste are not implemented in any municipality in Bolivia (Plurinational State of). However, in municipalities with high density (e.g. La Paz, Cochabamba, Santa Cruz), e-waste is collected through collection campaigns organised by different entities (e.g. Autonomous Municipal Governments [GAM]) that then store the collected e-waste or transfer them to companies that disassemble them [57].

Bolivia (Plurinational State of) does not have e-waste recycling plants; most companies collect, separate, and recover the materials contained in this type of waste.

Bolivia’s (Plurinational State of) formal recycling companies normally manage e-waste as follows: 1) eliminate any information that ICT equipment may contain, 2) decontaminate by separating components that contain any hazardous material, 3) separate and recover valuable materials, and 4) classify and store the rest of the materials. The elements of value are accumulated until they reach a quantity that makes it economically feasible to be exported for treatment to other countries or profitable in the market. Some companies and institutions are dedicated to the reconditioning or repair of equipment such as laptops or mobile phones for reuse. Hazardous components found in e-waste are exported to a final disposal plant outside the country [56, 57].

Bolivia (Plurinational State of) doesn’t have PCB or POP treatment facilities. Plastic resulting from e-waste is exported, and no separation of brominated and non-brominated e-waste plastic.

The final destination of e-waste plastics that have not been harnessed and for which capacitors are suspected of hazardous material are typically disposed of in landfills, and no proper treatment is provided.

Import & Export of E-waste and POPs Contained in E-waste

The diagnostic of the e-waste situation in Bolivia (Plurinational State of) published in 2007 estimated that the TBM of e-waste was approximately 65 million units (meaning that out of 10 electronic equipment items that enter the country, 7 were illegally imported)⁽⁶⁶⁾. From 2005-2008, the TBM was estimated to represent 72 percent of the total amount of formal imports. From 2005-2008, illegal imports mainly comprised (in weight) small IT and large equipment. During this period, 177.35 pieces of electronic equipment were seized in Santa Cruz, Oruro (being the department that seized the most), La Paz, and Cochabamba. Lamps (Cat. III) were seized, primarily, followed by small and IT equipment (Cat IV and Cat. VI).

As of 2019, the amendment to the Basel Convention (Decision III/1) has not been implemented in the country, and there are no restrictions on the export of hazardous wastes and other wastes for final disposal and recovery.

However, there is a national restriction and prohibition on the import of hazardous wastes and other wastes for recovery and final disposal found under the Integrated Waste Management Legislation No. 755 (Ley 755 de Gestión Integral de Residuos), published on October 28, 2015. Moreover, a prohibition on the transit of hazardous wastes and other wastes through their territory is defined under their Environmental legislation No. 13333 (Ley 13333 de Medio Ambiente), published on April 27, 1992.

Based on the annual reports to the Basel Convention, no exports of e-waste, PCBs, and mercury were reported in 2018 and 2019.

In December 2020, Bolivia (Plurinational State of) reported that no exports of e-waste, PCBs, or mercury had been carried out in 2019.

Stakeholder Mapping

In Bolivia (Plurinational State of), the stakeholders involved in the waste sector (that could be identified) and their roles are described below:

Stakeholder	Responsibility
Ministry of Environment and Water of the Plurinational State of Bolivia (Plurinational State of) Website	The entity in charge of developing waste management policies and legislation.
National Customs (Aduana Nacional) Website	The national customs control the commercial international exchange (imports and exports), assess and collect customs duties and taxes at the State's border, and monitor and control smuggling activity and counteracting customs fraud.
National Institute of Statistics (Instituto Nacional de Estadísticas) Website	The National Institute of statistics supports and monitors national statistics in general. This includes waste statistics, imports, and exports.
Ministry of Public Works, Services and Housing (Ministro de Obras Públicas, Servicios y Vivienda) Website	Promotes and manages national infrastructure and services in telecommunications, transportation, and housing, in harmony with nature. The Ministry is in charge of developing a national waste management strategy.
Processing enterprises	Stakeholders performing sorting, extraction, and recycling operations on waste to obtain secondary raw materials that will be included in new products manufacturing. They also process waste to facilitate its handling, reducing the waste's volume and hazardous properties.
Municipalities	Responsibility for waste management in municipalities.
Consumers	Individuals and legal entities generating waste during the course of economic activities are required to provide measures for the waste's safe handling in order to comply with environmental and sanitary-epidemiological requirements and take measures for the waste's recycling and safe disposal.
Vice-Ministry of Biodiversity, Forest Resources and Environment Website	Within the framework of the economic and social development plan, the Ministry of Environment and Water promotes equitable and reciprocal development in harmony with the environment through the integrated management of water resources, access to drinking water and sanitation, irrigation for food security, and integrated management of the environment and life systems.
Chamber of Informatics, Computing and Technology of Bolivia (Plurinational State of) (Cámara de informática, computación y tecnología de Bolivia, CAINTEC) Website	Trade association that brings together computer and technology companies in Bolivia (Plurinational State of). Its members are dedicated to the activities of representation, marketing, distribution and sales of equipment, software, supplies and services of computer products, and technologies. CAINTEC promotes the awareness, collection, management, recycling, and final disposal of e-waste.
Foundation for Recycling (Fundación para el reciclaje, FUNDARE) Website	FUNDARE is a non-profit organisation whose mission is to be a nexus of coordination of organisations to promote the culture of recycling.
Departmental Governments	In accordance with the responsibilities established in Law No. 755, it establishes provisions to execute the regime and policy for the integral management of special, hazardous and industrial waste.

Country:

Chile

-  18.952 million inhabitants [28]
-  756,096.3 km²
-  **Borders:** Peru, Bolivia, Argentina, and Pacific Ocean
-  **GDP per capita PPP:** \$25,154 USD [29]
-  **Average household size:** 3.6 members [30]



Map source: United Nations Geospatial Information Section⁽⁶⁷⁾

E-waste Management:

Legislation: ●●●●●
 Infrastructure: ●●
 Collection Rate: 5%

E-waste POP Management:

Legislation: ●●●●●
 Infrastructure: ●●●●●
 Collection Rate: 0%

Legend: ● Advanced ● Transition ● Basic
 Each indicator is one circle.

National legislation on e-waste and POPs:

- Extended Producer Responsibility:** ✓ Introduced for six categories of products including e-waste since 2016
- National e-waste standards:** ⚙ In development
- National standards for POPs contained in e-waste:** ✗
- E-waste collection target:** ⚙ In development
- Legislation product coverage in UNU-KEYs:** 54 of 54
- Legislation product coverage in weight (%) on total and per category⁽⁶⁸⁾:** Total: 0% of the e-waste generated in 2019






International Conventions:

	Signature	Ratification	Entry into force
Basel Convention [31]	31/01/1990	11/08/1992	09/11/1992
Rotterdam Convention [32]	11/09/1998	20/01/2005	20/04/2005
Stockholm Convention [33]	23/05/2001	20/01/2005	20/04/2005
Minamata Convention [34]	10/10/2013	27/08/2018	



⁽⁶⁷⁾ <https://www.un.org/Depts/Cartographic/english/htmain.htm>.

⁽⁶⁸⁾ Percentage in weight of e-waste generated equipment covered by the national legislation illustrated per EU-6 collection category for 2019.



EEE Placed on Market (2019) ⁽⁶⁹⁾ :	E-waste generated (2019) ⁽⁶⁹⁾ :	E-waste formally collected (2019) ⁽⁶⁹⁾ :
 <p>251 kt. 13.4 kg/inh.</p>	 <p>149 kt. 7.9 kg/inh.</p>	 <p>7kt. 0.4 kg/inh.</p>

(Source: Ministry of Environment of Chile / UNU / UNITAR)

Generated e-waste plastic:	Generated BFRs from e-waste:
 <p>40 kt. 2.1 kg/inh.</p>	 <p>3 kt. 0.2 kg/inh.</p>

(Source: Ministry of Environment of Chile⁽⁷⁰⁾ / UNDP / UNU / UNITAR)

Formal/environmentally sound e-waste management system in place:

- ✓ From an analysis developed in 2019, there are 11 e-waste management companies identified that collect, transport, and dismantle EEE.
- ✓ In 2019, 11 companies carry out e-waste treatment and final disposal processes.
- ✗ Chile doesn't have facilities that process/treat POPs arising from e-waste.

⁽⁶⁹⁾ Estimation from E2Biz were modified excluding equipment not corresponding to engines and contemplate within the UNU-KEYs.

⁽⁷⁰⁾ This was the result of a survey implemented to 6 recycling companies within the framework of the PREAL project-component 2. Caracterización de plantas de gestores de Residuos Eléctricos y Electrónicos en Chile 2019, developed by Fundación Chile and the Ministry of Environment and funded by the GEF-UNIDO Project "Fortalecimiento de iniciativas nacionales y mejoramiento de la cooperación regional para el manejo ambientalmente adecuado de COP en Residuos de Aparatos Electrónicos o Eléctricos (RAEE) en países Latinoamericanos".

National Legal Framework

The Republic of Chile (hereafter, Chile) has had a legislation incorporating e-waste since 2016, having introduced an Extended Producer Responsibility scheme for six product types.

The regulations in Chile regarding the environmental management of waste electrical and electronic equipment are governed by different acts and regulations, under the responsibility of the Ministry of the Environment, the Ministry of Health, and the Ministry of Transport. The main legal instruments concerning e-waste are:

- Law 20.920 of August 9, 2016 'Framework Law for Waste Management, Extended Producer Responsibility and promotion of Recycling' of the Ministry of the Environment (MMA) [58].
- Decree 298/2005 of November 25, 1994 'Regulation for the Transport of Hazardous Cargoes on Roads and Highways'⁽⁷¹⁾.
- Supreme Decree of the Ministry of Transportation and Telecommunications 148/2003 'the Hazardous Waste Sanitary Management Regulations' of the Ministry of Health⁽⁷²⁾.
- Law 19.300 of March 1, 1994 'On the General Basis for the Environment'⁽⁷³⁾.
- D.S. N° 1/2013 of MMA, RETC, pollutant release and transfer register⁽⁷⁴⁾.
- Decree 298/2006 approves regulations for the certification of electrical and fuel products, Ministry of Economy.⁽⁷⁵⁾

The main piece of legislation concerning e-waste is Law 20.920⁽⁷⁶⁾ of 2016 (entered into force on June 1, 2016), which establishes a legal framework for ESM of waste, involving the 'Extended Responsibility of the Producer', imposed on producers of priority products⁽⁷⁶⁾⁽⁷⁷⁾.

The law defines six products that are considered a priority and thus are submitted to regulation. New products can be added via a regulatory process, via the enacting of a Supreme Decree from the Environment Ministry.

The products specifically included in the law are:

1. Lubricating oil.
2. Car batteries.
3. Electrical and electronic products.
4. Tires.

5. Small batteries.
6. Wrappings and Packaging.

Waste generators of priority products governed by Law 20.920 must meet certain waste recovery targets goals, which will be established by specific Supreme Decrees.

Law violations are punished with fines up to 10,000 UTM, in addition to the civil liability from damages caused by the mismanagement of hazardous waste. Criminal liability is related to the transboundary movements of hazardous waste – and the liability applies to prohibited exports, imports, or transits of hazardous waste or to such transports without respective authorisations⁽⁷⁶⁾. In addition to the targets established by the Supreme Decrees, other associated aspects – such as product labelling, information that must be given to distributors and retailers, and preventive measures, among others – can be specified on the corresponding Supreme Decree⁽⁷⁶⁾.

Hazardous waste management in Chile is regulated by the Supreme Decree No. 148 of 2003 (the Sanitary Regulations on Hazardous Waste Sanitary Management Regulations), which establishes the minimum sanitary and safety conditions that apply to the generation, possession, storage, transportation, treatment, reuse, recycling, final disposal, and other forms of hazardous waste disposal. The Decree defines hazardous waste as 'waste or a combination of residues that pose a risk to public health and/or adverse effects on the environment, either directly or due to their current or foreseeable management, as a result of presenting the characteristics envisaged under Article 11 (toxicity, flammability, reactivity and corrosiveness)'.⁽⁷⁶⁾

⁽⁷¹⁾ [https://www.bcn.cl/leychile/navegar?idNorma=12087&idParte=.](https://www.bcn.cl/leychile/navegar?idNorma=12087&idParte=)

⁽⁷²⁾ [https://www.bcn.cl/leychile/navegar?idNorma=226458&idParte=.](https://www.bcn.cl/leychile/navegar?idNorma=226458&idParte=)

⁽⁷³⁾ [https://www.bcn.cl/leychile/navegar?idNorma=30667&idParte=.](https://www.bcn.cl/leychile/navegar?idNorma=30667&idParte=)

⁽⁷⁴⁾ Regulates the reporting of information related to air emissions and the generation of hazardous and non-hazardous waste from establishments located in the national territory.

⁽⁷⁵⁾ <https://www.bcn.cl/leychile/navegar?idNorma=246921>.

⁽⁷⁶⁾ <https://www.broking.cl/law-no-20-920-extended-producer-responsibility/>.

⁽⁷⁷⁾ Producer of a priority product or producer: Person who, regardless of the marketing technique: a) sells a priority product for the first time on the national market; b) sells under his own brand a priority product acquired from a third party that is not the first distributor; c) imports a priority product for his own professional use.

The transboundary movements of hazardous waste are regulated by the Basel Convention, considering the definition provided by Article 2(1).

In both regulations, one part of e-waste is regarded as hazardous waste, and another part is regarded as non-hazardous.

Law No. 19.300 of March 1, 1994 provides the general framework on environmental protection ('Bases Generales') and regulates different areas of environmental management in Chile. Among other things, the Law establishes the environmental impact assessment system (SEIA) and sets out the projects that must be submitted to an environmental impact assessment process. These projects include projects on the production, storage, transportation, disposal, or reuse of hazardous substances. Therefore, in the case of accrediting the management of e-waste with hazardous characteristics, it must be submitted to the SEIA.

There are health and safety standards for electrical products and fuels.

Decree 298 of 2006 of the Ministry of Economy, Development and Reconstruction introduced the certification of electrical products and fuels. This regulation establishes certain procedures for the safety and quality certification of electrical equipment that must be followed. Large and small electrical equipment must comply with this regulation, guided by environmental protocols. Prior to marketing, EEE must be certified in accordance with the protocols. [59]

The Supreme Decree on electrical and electronic equipment and batteries is currently being developed. There are health and safety standards for electrical products and fuels.

The first proposal of categories, which was elaborated for the declaration process, without the existence of the decree of goals, has some differences with the categories of the UNU Keys. This proposal considers six categories of Electrical and Electronic Equipment, together with small batteries:

- a. Temperature exchange devices, such as refrigerators and air conditioners.
- b. Monitors, screen, and equipment with a surface area greater than 100 cm².
- c. Lamps, Fluorescent and LED bulbs.

- d. Photovoltaic panels.
- e. Large equipment not included in the above.
- f. Small equipment (without any external dimension greater than 50 cm).

In relation to the UNU-KEYS and the EEE identified in Chile (which have been associated with the Tariff Codes used by the National Customs Service), the UNU-KEYS do not cover the entire spectrum of EEE identified in Chile [60]. Three main categories created for EEE that are not corresponding to the UNU-KEYS categories include: i) Engines and other long-life EEE, ii) Medium-life EEE, and iii) Short-lived EEE [60]. On the other hand, the tariff codes identified as EEE do not specifically include the following UNU-KEYS: 0001, 0502, 0505. However, the subcategories of Chilean legislation do include the subcategory of 'LED Lamps' (corresponding to UNU-KEY 0505), as well as UNU-KEY 0001 (corresponding to 'Central Heating'), both of which can be considered within the subcategories belonging to the category of Temperature Exchange Devices [60].

Chile has a legislation incorporating e-waste since 2016, having introduced an Extended Producer Responsibility scheme for six product types. There are health and safety standards for electronic products.

National Statistics on E-waste

In 2010 Chile developed e-waste statistics on IT equipment and Screens (i.e. computers, screens, printers, mobile phones, printed circuit boards, and keyboards) in their *Evaluation Study of the Economic, Environmental and Social Impacts of the Implementation of the REP in Chile applied to electrical equipment* [61]. In 2019, Fundación Chile and the Ministry of Environment compiled statistics on all e-waste to support Law 20.920, Framework Law for Waste Management, Extended Producer Responsibility and Promotion of Recycling.

Chile's e-waste statistics are based on the UNU's apparent consumption methodology. The records for imports and exports used (i.e. from 2016) are derived from the National Customs service⁽⁷⁸⁾, and the historical import and export records of EEE (from 1991-2017) are retrieved from United Nations Commodity Trade Statistics Database⁽⁷⁹⁾ (UN Comtrade). National production information is extracted from their only producer's (Electrolux) annual reports for 2013-2017, and from 2005-2012, those reports were retrieved from the *Evaluation Study of the Economic, Environmental and Social Impacts of the Implementation of the REP in Chile applied to electrical equipment*, developed in 2010 [60].

To estimate the imports of PV panels, Chile uses data on the installed capacity over time as a way of obtaining data on quantities and weights of panels installed from year to year [60]. The Ministry of Environment and Fundación Chile developed an e-waste calculation and projections for the period of 2009-2027 for the 'Background for the elaboration of economic analysis of collection and recovery goals for prioritizing Electrical and Electronic Equipment' contained in law 20.920 report. The Excell solver tool (based on the Weibull distribution) was used for the calculations and projections of EEE POM using lifespans of products.

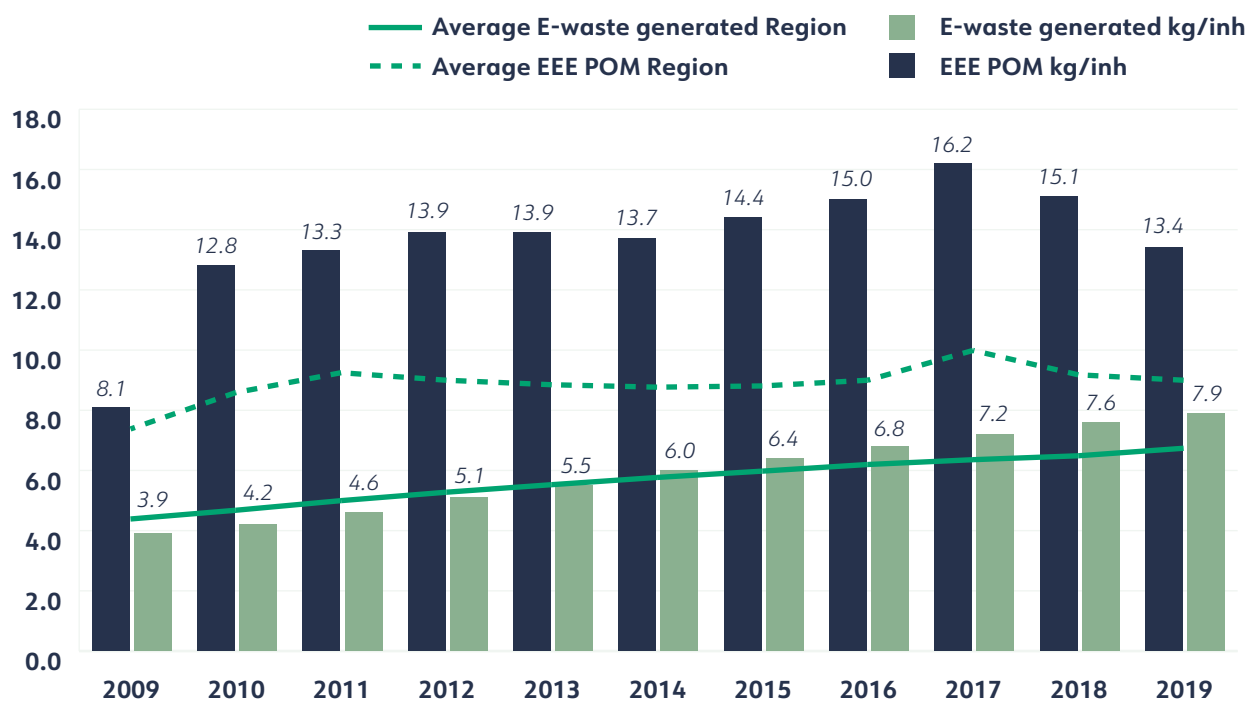
⁽⁷⁸⁾ http://datos.gob.cl/organization/servicio_nacional_de_aduanas.

⁽⁷⁹⁾ <https://comtrade.un.org/data/>.

Unlike the original calculations, the following estimates don't include 1) motors/engines (e.g. HS code 841210 'Engines reaction engines, other than turbo-jets') 2) short lifespan of EEE (e.g. HS code 842511 'Pulley tackle and hoists; powered by an electric motor', HS 852341 'Optical media unrecorded'), etc.) 3) medium lifespan of EEE (e.g. HS code 841330 'Pumps for fuel, lubricating or cooling medium pumps for internal combustion piston engines' etc.).

Figure 17-Figure 19 illustrates the analysis of information from 2009-2019. Figure 17 shows that EEE POM has increased over the past decade, from 8.1 kg/inh (136.5 kt) in 2009 to 13.4 kg/inh (251.1kt) in 2019. A slight increase in EEE POM (approximately 1.2 kg/inh) is shown for 2017, due to the increase of photovoltaic capacity in the Chilean National Electric System (from 12 MW to 1,914 MW) at the end of 2017⁽⁸⁰⁾. Information for 2018 and 2019 include projections made by the Ministry of Environment.

Figure 17. EEE POM and e-waste generated in Chile



⁽⁸⁰⁾ <https://www.broking.cl/law-no-20-920-extended-producer-responsibility/>.

From the information provided by the Ministry of Environment, it is clear that Chile is mainly an EEE-importing country, with an estimated domestic production of 7 percent of the total EEE sold in the country.

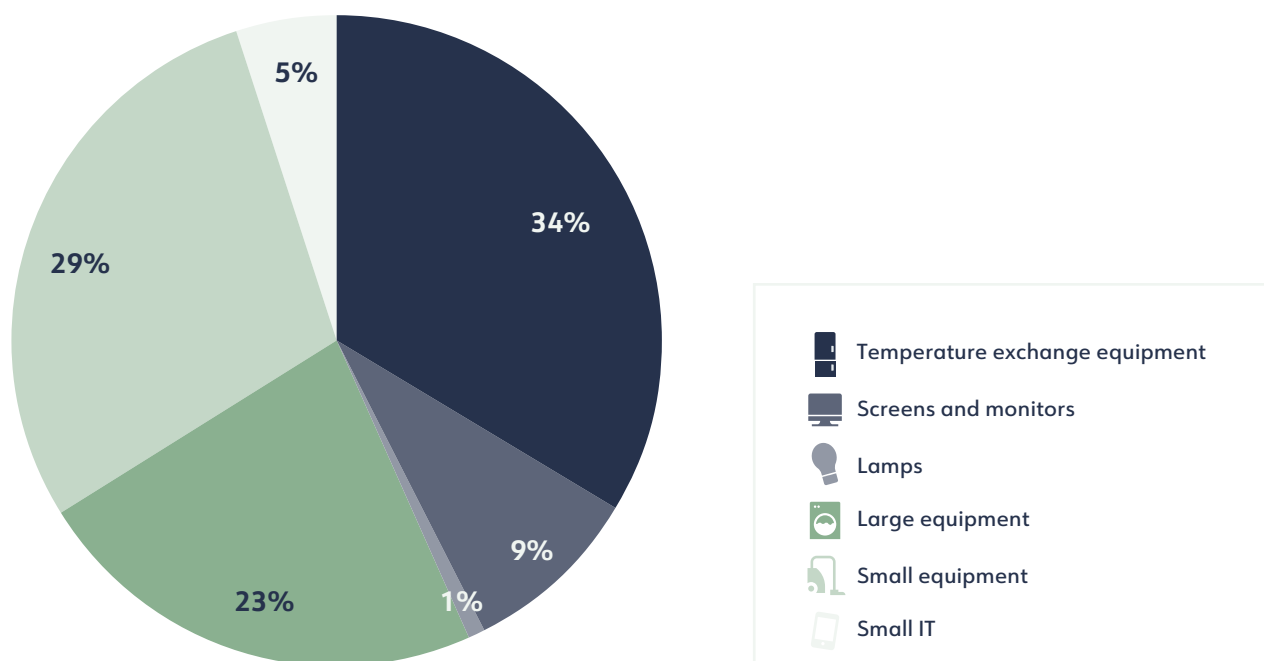
In the *Background for the elaboration of economic analysis of collection and recovery goals for prioritizing 'Electrical and Electronic Equipment' contained in law 20.920* report, the Ministry of Environment identified importing and exporting companies of EEE. In their analysis, a total of 17,602 importing companies and 1,411 exporting companies were identified. It was estimated that 98 percent of the importers and exporters for the different EEE categories correspond solely to companies and that the remaining percentage corresponds to individuals.

In Chile, the information on national production is not associated directly within the country with any trade code. However, in the analysis conducted by the Fundación Chile and the Ministry of Environment, Electrolux manufactures only refrigerators, kitchen, stoves, and washing machines. Therefore, the estimate of the national production can easily be correlated to international trade codes.

As indicated in the *Background for the elaboration of economic analysis of collection and recovery goals for prioritizing 'Electrical and Electronic Equipment' contained in law 20.920 [60]* report, **approximately 80 percent of the national production in Chile corresponds to refrigeration equipment, while the rest of the products correspond to washing machines and other equipment** (e.g. kitchen, stoves)⁽⁸¹⁾. In this report, the national production of refrigeration equipment and washing machines was estimated from 2005-2017, showcasing a slight decrease in the national production from 2005 (45,260 t) to 2017 (42,233 t)⁽⁸²⁾.

The graph (see Figure 18) of the six categories for products placed on the market shows that small equipment (Cat. V with 3.8 kg/inh), temperature exchange equipment (Cat. I with 4.6 kg/inh), and large equipment (Cat. IV with 3.0 kg/inh) register the highest share (85 percent of the total mass of EEE POM), while lamps (Cat. III) register the smallest share with 0.1 kg/inh.

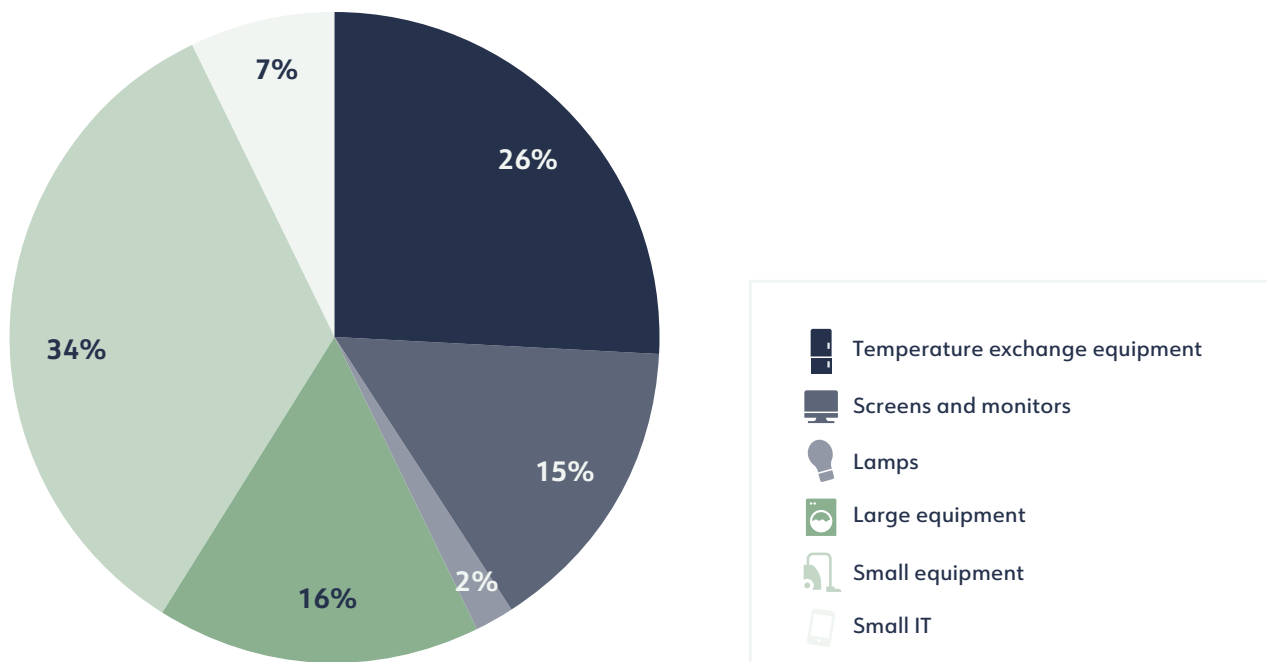
Figure 18. Share of the EEE categories (2019)



The amount of e-waste generated in Chile nearly doubled from 3.9 kg/inh (65.3 kt) in 2009 to 7.9 kg/inh (148.8 kt) in 2019.

The highest shares in the amount of e-waste generated for 2019 in Chile are those of small equipment (Cat. V) with 2.7 kg/inh (34 percent) and temperature exchange equipment (Cat. I) with 2.1 kg/inh (26 percent), whereas the smallest shares are for lamps (Cat. III) with 0.1 kg/inh (2 percent) and small IT (Cat. VI) with 0.6 kg/inh (7 percent) (Figure 19).

Figure 19. Share of the categories in e-waste generated (2019)



According to the Ministry of Environment, the amount of e-waste managed environmentally soundly in Chile corresponds to 6.8 kt/year (equivalent to 0.4 kg/inh).

E-waste and POP Management System

A comprehensive e-waste management system is in place in Chile.

The regulations in Chile regarding the environmental management of waste electrical and electronic equipment are governed by more than one regulation and are the responsibility of the Ministry of the Environment, the Ministry of Health and the Ministry of Transport as indicated in the National legislation section.

Law No. 20.920 of 2016 establishes that the companies involved in the waste recovery and disposal need to receive authorisation for the correct management of waste according to the current legal framework focused on the ESM of e-waste. Ultimately, the responsibility lies with the producer or importer to organise and finance the proper collection and treatment of waste independently or by joining an authorised waste management scheme. The producer must also sign up with the Producer Register held and presented by the Ministry of Environment and declare data annually to the Ministry, as well as meeting recycling and reuse targets. To help companies, there is a 5-year transition period for implementing the necessary changes⁽⁸³⁾.

The General Basis for the Environment (Law No. 19.300 of 1994) requires that projects or activities related to the production, storage, transportation, disposal, or reuse of hazardous substances, including e-waste recycling plants, are subject to an environmental impact assessment. Specific rules and procedures are also envisaged for the transport of hazardous cargoes or substances (Decree No. 298). As well, the Supreme Decree No. 148 of 2003 of the Ministry of Health establishes a Sanitary Regulation on the Management of Hazardous Waste that establishes the minimum sanitary and safety conditions to which the generation, possession, storage, transportation, treatment, reuse, recycling, final disposal, and other forms of hazardous waste disposal must be subjected.

A specific e-waste regulation envisaging collection and recycling and recovery targets is in the process of being drafted.

Chile is now working on specific e-waste regulation, which will include collection, recycling and recovery targets and set the guidelines for the implementation of formal collection systems [3].

Chile is actively addressing the informal sector's role with respect to e-waste management [3].

Law No. 20.920 attempts to incorporate the existing informal waste sector into the regulated market as a recognised, certified trade. The Framework Law contains a stepped certification and licencing process for waste pickers, including:

- education and awareness activities on existing legal requirements for managing waste;
- a certification scheme for successful program participants as waste;
- mandatory registration of waste contractors under the EPR scheme;

⁽⁸³⁾ <https://www.valpak.co.uk/news-blog/blog/how-argentina-is-following-chile-s-lead-on-epr-regulations-in-latin-america>.

- the possibility for these waste contractors to enter into waste collection contracts with municipalities and producer responsibility organisations;
- mandatory health and safety requirements for waste pickers [62].

According to an analysis developed by Fundación Chile and the Ministry of Environment in 2019, **Chile has 11 e-waste operators**. E-waste operators are authorised to transport hazardous and non-hazardous waste around the country. The *Study Characterization of WEEE management plants in Chile* identified between 2019 to 2020, 11 e-waste operators collect and provide pre-treatment and treatment of e-waste. Of the 11 e-waste operators, only information of 9 e-waste operators was acquired of which they mentioned provide some sort of treatment to e-waste plastic. The study obtained information (via surveys and interviews) from 9 of the 11 e-waste operators that treat the e-waste plastic.

It is estimated that approximately 94.5 percent of the collection in Chile is done through agreements with private companies, 4 percent of e-waste is collected directly through deliveries, 1 percent is collected through collection campaigns with companies or municipalities, and 0.1 percent is collected through green points installed in the country⁽⁸⁴⁾.

As previously mentioned, most collection of e-waste in Chile is carried out through agreement with private companies, and a lesser amount is done through collection campaigns, direct deliveries, and green collection points established in the country [63]. Pañiwe is the only e-waste operator in Chile whose main collection (80 percent) is done by a network of the informal sector, which sells them electronic equipment [60]. This is in line with the inclusion policy established by the Ministry of Environment, which promotes the formalisation process of the informal sector at fair market prices (46). As with other e-waste operators, the rest (20 percent) is collected through agreements with private companies or via EEE importers whose equipment is faulty or returned consumers, etc [60].

According to the analysis done in 2019 by the Ministry of Environment and Fundación Chile, it was estimated that in 2017, approximately 70.5 percent of the collected e-waste was treated in Chile and 19 percent was exported to international recycling plants.

The pre-treatment process in Chile consist of classification between e-waste and products for refurbishment (corresponding to 110.6 t in 2017), disassembly and separation (corresponding to 5,273 t in 2017), cutting and destruction (corresponding to 1,512 t in 2017), crushing (corresponding to 2.8 t in 2017), cable washing (corresponding to 0.1 t in 2017), removal of information in hard disks (corresponding to 399 t in 2017), and compression (corresponding to 404.5 t in 2017). In 2019, it was surveyed that 9 of the 11 e-waste operators in Chile treat Cooling and Freezing equipment, two operators treat them without any refrigerant, and three operators extract gases found in the compressor into a cylinder, which is then sent for final disposal to a certified safety landfill [60].

Lamps are treated by three e-waste operators, of which one disposes them to safety cells in the landfill and the other two separate the mercury from the lamps and the fluorescent tubes and further dispose of them in the safety cell in the landfill as the other operator. There is no recovery for lamps or PV panels. E-waste operators in Chile don't have treatment capacity for PV panels, so they are typically stored [63]. According to the Ministry of Environment, the PV panel generation is very low.

Moreover, screens and monitors are processed by 9 of the 11 e-waste operators⁽⁸⁵⁾. The study developed by the Ministry of Environment and Fundación Chile stated that four operators disassemble and sort the working components for the refurbishment of products. The hazardous waste, such as cathode ray tube (CRT) screens, connectors, and capacitors, are stored until enough volume is acquired for them to be exported to Belgium, where recyclers treat and purify the glass from CRT monitors – obtaining as a final product, raw material for the manufacture of ceramic materials or concrete blocks. Other treatment facilities send the hazardous fractions to a secure cell in the region’s landfill. Currently, one of the screen operators is involved in a pilot project where strategic metals (such as indium from Liquid Crystal Displays) are recovered [60].

Large and small equipment are considered the most coveted products to treat, as they contain valuable parts (e.g. printed circuit boards); 9 of the 11 e-waste operators collect them and dismantle them. Non-recyclable parts are typically disposed of in landfills (e.g. mixed plastics that are not received by the companies that recover this material, etc.)⁽⁸⁵⁾.

It was estimated that **0.49 kt of e-waste plastic (i.e. 7.2 percent of the total e-waste generated) were properly managed between 2019-2020**⁽⁸⁶⁾.

Most e-waste plastic are sorted using visual identification. E-waste plastic containing POPs are disposed of in official or safety landfills.

The study estimated that of the six e-waste operators surveyed/interviewed, 67 percent (i.e. 4 e-waste operators) use some type of methodology for the identification and separation of plastics, with visual identification methodology being the main tool⁽⁸⁵⁾. In this sense, visual identification consists of:

- Review and sorting by code and labels (4/4 e-waste operators).
- Deformation of the material when interacting with heat (2/4 e-waste operators).
- Identification by colour (1/4 e-waste operators).

The remaining 33 percent do not carry out any type of identification and separation by type of plastic, sending all such material to sanitary landfills or safety landfills⁽⁸⁷⁾. Furthermore, the study identified that 2 of 9 e-waste

operators don’t make any type of differentiation when disposing of e-waste plastic; such plastic is disposed of in landfills. The other 7 e-waste operators differentiate when disposing of the e-waste plastic. Depending on how they are classified and on their conditions (clean or contaminated), they may be disposed of as follows⁽⁸⁷⁾:

- National recycling (e.g. Comberplast and Tradepro).
- Sent for energy recovery (Polpaico, Hidronor).
- Exported abroad for recovery (i.e. Belgium, Japan, Korea (Rep. of)).
- Sent to final disposal (landfill).

Currently, there is no specific treatment of materials, components, and products from e-waste that contain POPs.

From the surveys/interviews conducted with six e-waste operators, the Ministry of environment from Chile and Fundación Chile identified that only one performs a sort of sterilisation⁽⁸⁷⁾.

Import & Export of E-waste and POPs Contained in E-waste

Chile is Party to the Basel, Stockholm, and Rotterdam Conventions, and in 2018 also ratified the Minamata Convention.

Although no specific piece of legislation in Chile explicitly refers to the import or export of e-waste, Chile is Party to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes. Article 8 of Law 20.920 includes a section on ‘Obligations of importers and exporters of waste’, which establishes that importers of waste must observe the provisions of the Basel Convention. Imports of hazardous waste for its elimination are prohibited, and the importation of hazardous waste for its recovery will only be authorised if it is accredited before the Ministry of the Environment and if such work is carried out by authorised operators who have Environmental Qualifications that qualify them for such work.

⁽⁸⁵⁾ At the time of writing the report only 11 operators have been surveyed, there is no available information of the services provided by 3 e-waste operators.

⁽⁸⁶⁾ <http://ewastemonitor.info/>.

⁽⁸⁷⁾ Situación actual sobre el manejo del plástico proveniente de RAEE en Chile, con foco en COP – 2021.

Article 38 states that 'The export of hazardous waste for recovery shall only be authorised if the exporter proves to the Ministry of the Environment that the consignee has the respective sanitary and environmental permits. Similarly, the export of hazardous waste for disposal is prohibited, as long as the country has the technical capacity to dispose of it via environmentally sound and efficient management.

There is a specific directive that regulates the authorisation of TBM of hazardous waste consisting of lead-acid batteries DS N° 2, which entered into force in January 2010. This directive is based on the Basel Convention, which, in Article 4.9, authorises Member States to allow the TBM of hazardous waste only if the state of export does not have the technical capacity and the required services or places of proper disposal for eliminating waste rationally and efficiently. Chile can treat waste consisting of lead-acid batteries [64].

Exports of e-waste are mainly carried out to countries in Europe, Asia and North America.

In 2017, Japan accounted for 74 percent of all e-waste exported from Chile, mainly consisting of steel, aluminium, cables with non-ferrous casing, casings, iron, plastic, and glass. PCBs are exported to Japan, Korea (Rep. of), the United States, Belgium, and the Netherlands for further treatment and recovery of materials⁽⁸⁸⁾.

Stakeholder Mapping

In Chile, the stakeholders involved in the waste sector (that could be identified) and their roles are described below:






Stakeholder	Responsibility
Chilean Ministry of Environment (MMA) Website	<p>The Chilean Ministry of Environment is responsible for designing and applying policies, plans, and programs related to the environment and to the protection and conservation of biological diversity and natural resources (renewable resources and water). It promotes sustainable development as well as the integrity of environmental policy and related regulations. It is responsible for the monitoring and sound management of e-waste in Chile.</p>
Fundación Chile Website	<p>Fundación Chile is a nonprofit corporation created in 1976 through a joint agreement between the Chilean government and ITT Corporation. It is essentially a technological do tank that has worked successfully to foster Chilean business and industry growth through technological innovation and implementation.</p>
Chilean National Customs Service Website	<p>The National Customs Service performs key functions for Chile's development, playing a leading role in foreign trade, especially in facilitating and expediting import and export operations by simplifying customs procedures and processes. It determines the duties and taxes related to goods that may be considered dangerous do not enter the country. The Service has 2,200 officers, distributed among the National Directorate, headquartered in Valparaíso, ten Regional Directorates, and six Customs Administrations. The Institution has a total of 90 control points, including ports, airports, and border outposts.</p>
MIDAS Website	<p>MIDAS is a Limited Liability Company, founded in 2003. The company incorporates recycling as one of its basic activities to obtain raw materials; its branches are in the Atacama and Biobío Regions, and its headquarters are in Santiago. Currently, MIDAS is the management company that processes the largest amount of e-waste in Chile and is the only operator that processes e-waste to obtain raw materials, generating copper, aluminium, and brass ingots, through smelting processes. As well, 100 percent of its processes are carried out with clean energy, as result of the installation of photovoltaic panels.</p>
DEGRAF Website	<p>DEGRAF is a joint-stock company founded in 1982 in the field of graphic, photographic, and radiological waste recycling, starting the recycling of e-waste in 2007. Currently, it provides recycling services for electrical and electronic products, certified destruction of data and assets, secure disposal/valuation of IT assets, and integrated management of hazardous and non-hazardous waste.</p> <p>DEGRAF works together with several companies (such as SODIMAC) on the 'Que Nada Se Pierda' campaign and with Paris on the 'Recicambio' campaign, both of which allow customers to bring in a used equipment and access discounts when buying a new one.</p>
CHILEREICLA Website	<p>CHILEREICLA is a joint-stock company which began operations at the end of 2008 with customers such as Cementos Biobío (as one of its main customers), LG Electronics, Sony, Xerox, and others. The company carries out assortment and disassembly of e-waste for the recovery of hazardous waste in authorised plants in Chile and obtaining recoverable materials for the recovery of precious metals.</p> <p>CHILEREICLA carries out e-waste recycling campaigns in different municipalities throughout the country, covering both the southern and central areas, including the Metropolitan Region.</p>

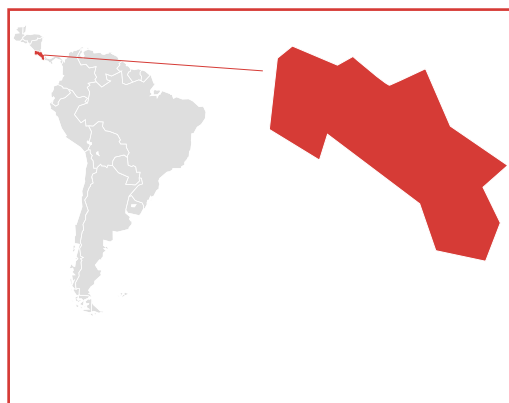
Stakeholder	Responsibility
RECYCLA Website	<p>RECYCLA Chile is a closed corporation, composed of a five-member board of directors, founded in 2003. RECYCLA is focused on providing a solution for the management of electronic, electrical, and industrial waste. It currently has a capacity of 4,000 tons of e-waste per year.</p> <p>In 2012, RECYCLA created a non-profit foundation, Recyclápolis, whose mission is to promote the development of sustainable communities in Chile through waste recycling, environmental education, and sustainable tourism. Recyclápolis, together with RECYCLA, were part of the '100 containers for Chile' program, which included, in its first stage, the installation of 100 green points for e-waste in different educational establishments and public and private institutions. In total, the association has 262 public green points, from Arica to Puntarenas.</p>
CHILENTER Website	<p>CHILENTER is a non-profit association founded in 2002 with the mission of contributing to overcoming poverty by reducing the digital divide in Chile. Since 2009, CHILENTER has been dedicated to the pre-treatment of electronic equipment for subsequent reuse or recycling –mainly of computer equipment such as notebooks, screens, and projectors. These devices correspond to equipment that has been discarded by public and private institutions and/or individuals. The equipment is reviewed and, if it meets certain standards, reconditioned. Otherwise, the equipment goes to the pre-treatment stage for subsequent recycling. Reconditioned equipment is given to educational establishments, through the existing agreement with the Ministry of Education, or to non-profit social organisations.</p>
VOLTA (ECOSER) Website	<p>Founded in 2014, VOLTA includes (as of January 2018) the companies ECOSER, SERVINOR, and ECOBIO. With its different companies, the services offered by VOLTA correspond to the management of household waste, debris, and other non-hazardous industrial waste, liquid, and solid hazardous waste, sludge, grease, and other organic waste, septic tank cleaning, and unclogging of chambers.</p> <p>Specifically, the company ECOSER is dedicated to the proper treatment of lamps. It has a plant located in the Metropolitan Region of Santiago, in the municipality of Quilicura. ECOSER's services include waste collection and transportation from the client's facilities, pre-treatment, and treatment, including final disposal of hazardous waste in a secure landfill.</p>
Traperos de Emaús Website	<p>The Traperos de Emaús is a Social Association that began in France in 1949, arriving in Chile in the 1960s. Los Traperos de Emaús is located in San Luis N° 1019, Pudahuel, Metropolitan Region, and also has communities in Temuco, Concepción, Talca, San Bernardo, and Valdivia. The Traperos de Emaús collects electrical equipment or furniture directly from households, free of charge. If these devices are in good condition or can be repaired, they are sold for reuse. If they cannot be repaired, they are dismantled and sold.</p>
NGO REMAR Website	<p>REMAR is a Non-Governmental Organisation (NGO) focused on the rehabilitation of marginalised people and aims to help rehabilitate young people with drug and alcohol problems. It was founded in 1982 in Spain and began in Chile in 1994. REMAR receives mainly furniture, white goods, household equipment, new and used clothing, toys, and tools. Fundación REMAR is currently in charge of disposing of E-WASTE from the green point in Las Condes and conducts collection campaigns with the municipalities of Calera de Tango, Paine, Quinta Normal, and Chicureo.</p> <p>They begin with selecting artifacts that are in good condition and that can be reused. Artifacts that are not in good condition are separated and classified according to their material. Metal scrap is sold to the company AZA, metals are sold to Sudmetal, and plastic is taken to the landfill.</p>

Stakeholder	Responsibility
Gerdau Aza (recovery) Website	<p>Gerdau Aza produces steel mainly for the construction, metal-mechanical, and mining industries. Its steel production is based exclusively on the recycling of ferrous scrap, and it is the largest recycling company in Chile. The utilised scrap comes from discarded steel from domestic industry, as well as from equipment such as automobiles and household equipment – thus avoiding its accumulation in landfills and the resulting environmental pollution.</p>
Sudmetal (recovery) Website	<p>Through its subsidiary Sudtrade, Sudmetal is part of the regional non-ferrous metal recycling sector. The metals recovered include surplus stainless steels in all grades, refractory alloys based on nickel, chromium, and molybdenum, aluminium alloys, and carbon steels for mechanical and structural construction. The Solarix-Sudmetal alliance is currently financing the first photovoltaic panel dismantling and treatment plant.</p>
Difeza (Recovery) Website	<p>Difeza selects and classifies materials provided, then shreds and compacts the scrap. For this process, Difeza has two shears that have a monthly production capacity of 3,500 tons. The resulting scrap is sold to steel mills such as AZA.</p>
Cemento Polpaico (recovery) Website	<p>The Coactiva Plant, located in the town of Cerro Blanco in the commune of Tiltil, Metropolitan Region, allows for replacing traditional fuels with thermal energy generated through the co-processing of waste in the furnace of the Cerro Blanco Plant (Polpaico, 2017). The plant has two furnaces, with a capacity of 70 tons/hr and 10 tons/hr. Additionally, both have an alternative raw material utilisation limit of 15 percent.</p> <p>The waste received by the Coactiva Plant comes from important companies in the country, belonging to different industries. This waste includes e-waste plastic.</p>
RECIMAT (recovery) Website	<p>RECIMAT is a recycling company that has been transporting, storing, and recycling hazardous lead waste, such as anodic blooms and disused lead anodes. In 2007, it expanded its resolutions and adjusted its processes to properly dispose of lead-acid batteries that are no longer in use. RECIMAT is the only company in the country that has the permits and technology for recycling batteries, separating their elements, and putting them to a new use.</p>
Hidronor (final disposal) Website	<p>Hidronor Chile is a treatment facility founded in 1997 with the technology to treat industrial waste and provide adequate final disposal of hazardous waste – which are sent by waste generating companies or by e-waste operators.</p>

Country:

Costa Rica

-  5.8 million inhabitants [28][65]
-  51,179,92 km² [65] 572,877 km² marine⁽⁸⁹⁾
-  **Borders:** Nicaragua, terrestrial Caribbean Sea, Panama, Pacific Ocean
-  **GDP per capita PPP:** \$20,443 USD [29]
-  **Average household size:** 3.2 members [30][67]



Map source: United Nations Geospatial Information Section⁽⁹⁰⁾

E-waste Management:

Legislation: ●●●●●
Infrastructure: ●●
Collection Rate: 8% in 2019

E-waste POP Management:

Legislation: ●●●●●
Infrastructure: ●●●●●
Collection Rate: 0%

Legend: ● Advanced ● Transition ● Basic
 Each indicator is one circle.

National legislation on e-waste and POPs:

- Extended Producer Responsibility:** ✓ Introduced in May 2010
- National e-waste standards:** ✓ Introduced in December 2016
- National standards for POPs contained in e-waste:** ⚙ In development
- E-waste collection target:** ⚙ In development
- Legislation product coverage in UNU-KEYS:** 54 of 54
- Legislation product coverage in weight (%) on total and per category⁽⁹¹⁾:** Total: 0% of the e-waste generated in 2019



International Conventions:

	Signature	Ratification	Entry into force
Basel Convention [31]	-	07/03/1995 (a)	05/06/1995
Rotterdam Convention [32]	17/08/1999	13/08/2009	11/11/2009
Stockholm Convention [33]	16/04/2002	06/02/2007	07/05/2007
Minamata Convention [34]	10/10/2013	19/01/2017	

⁽⁸⁹⁾ Centro de Investigación en Ciencias del Mar y Limnología (Cimar) 2021.

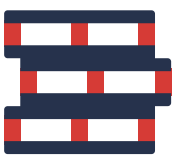

⁽⁹⁰⁾ <https://www.un.org/Depts/Cartographic/english/htmain.htm>.

⁽⁹¹⁾ Percentage in weight of e-waste generated equipment covered by the national legislation illustrated per EU-6 collection category for 2019.



EEE Placed on Market (2019):	E-waste generated (2019):	E-waste formally collected (2019):
 <p>78 kt. 15.4 kg/inh.</p>	 <p>67 kt. 13.2 kg/inh.</p>	 <p>5 kt. 1 kg/inh.</p>

(Source: Ministry of Environment of Chile / UNU / UNITAR)

Generated e-waste plastic:	Generated BFRs from e-waste:
 <p>21 kt. 4.1 kg/inh.</p>	 <p>2 kt. 0.4 kg/inh.</p>

(Source: UNDP / UNU / UNITAR)

Formal/environmentally sound e-waste management system in place:

- ✓ As of May 2021, Costa Rica had 60 e-waste operators authorised for the management of e-waste, of which 13 have authorisation for collection, storage, and transportation and 47 are authorised for dismantling and separation, recovery, export, import, treatment, and disposal⁽⁹²⁾.
- ✓ CEMEX cement plant is authorised for co-processing of e-waste plastics, including parts containing with BFR.

⁽⁹²⁾ <https://www.ministeriodesalud.go.cr/index.php/informacion/gestores-de-residuos-ms>.

National Legal Framework

In the Republic of Costa Rica (hereafter, Costa Rica), a specific regulation on e-waste management was introduced in 2010, implementing the General Law on waste management.

The main legal and regulatory tools relevant for e-waste management in Costa Rica are as follows:

- General Law No. 8839 on Integrated Waste Management, of July 13, 2010.
- Regulation on Integrated Management of Electronic Waste Management No. 35933 of May 5, 2010⁽⁹³⁾.
- General Regulation implementing the Law on Integrated Waste Management No. 37567, of 2013.
- Regulation for the Declaration for Waste requiring Special Management enacted with the Decree No.38272-S of 2014⁽⁹⁴⁾.
- Technical Guide for the Integrated Waste Management of Electric and Electronic Waste Management of December 15, 2016 [68].
- Decreto 41052 - S Reglamento de Centros de Recuperación de Residuos Valorizables of junio, 01, 2018⁽⁹⁵⁾.
- Proposal of Modification of the Regulation on Integrated Management of Electronic Waste Management.

The General Law for Integral Waste Management No. 8839 was enacted in Costa Rica in 2010, with the purpose of regulating the integral management of residues and the efficient use of resources, through the planning and execution of regulatory actions (operational, financial, administrative, educational, environmental, and health-related) and relevant monitoring and evaluation.

General Law No. 8839 covers: ordinary wastes, hazardous wastes, and wastes requiring special management (including e-waste). This General Law is accompanied by implementing Regulations on integrated waste management in general, and also on integrated waste management of e-waste and other waste streams requiring special management.

Specifically, the Regulation on Integrated Management of Electronic Waste Management No. 35933 of 2010 prohibits discarding e-waste together with household waste and creates a National System for the Integrated Management of Electronic Waste Management

(‘Sistema Nacional para la Gestión Integral de los Residuos Electrónicos’ – SINAGIRE), implemented by the National Executive Committee (CEGIRE) with relevant government institutions, representatives of importers, consumers, and academia which will establish the annual targets, treatment fees, etc.

Costa Rica has introduced an EPR system on specific waste streams, including e-waste.

General Law No. 8839 for the Integrated Waste Management (and its implementing regulations) has established the Extended Producer Responsibility system. With regard to e-waste, Regulation No. 35933 foresees that the compliance entities (individual or collective EPR schemes) must present their plans for e-waste treatment, which must be approved by the Ministries of Health and Environment. The processors must show full compliance with national legal and regulatory framework regarding the operation, permit, environmental impact assessment, add labour safety, in addition to the Basel Convention for what concerns transboundary waste shipments [69].

Every producer is required to annually report the weight of the EEE collected to the Coordinator of CEGIRE, according to Regulation on Integrated Management of Electronic Waste Management No. 35933.

Regulation for the Declaration for Waste requiring Special Management, introduced by Decree No.38272-S of 2014.

According to this regulation, wastes requiring special management are those that, due to their composition, transport needs, storage conditions, volume, modalities of use, or recovery value, pose significant risks to health and an adverse impact on the environment. According to the principle of Extended Producer Responsibility, producers or importers have responsibility for the product throughout its life cycle, including the post-industrial and post-consumer phases: importers and producers will facilitate the collection from consumers of the products they put on the market, once they reach the end of their useful life. E-waste is among the 13 categories by this regulation:

1. Used tires.
2. Lead acid batteries.
3. Watch batteries, batteries: carbon-manganese, carbon-zinc, lithium-cadmium, lithium, and zinc.
4. Air conditioners, refrigerators, cold transport, and

⁽⁹³⁾ http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=67850&nValor3=80550&strTipM=TC.

⁽⁹⁴⁾ https://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?nValor1=1&nValor2=76879.

⁽⁹⁵⁾ https://residuoselectronicosal.org/wp-content/uploads/2020/05/ALCA112_01_06_2018.pdf.

-
- industrial refrigeration equipment.
5. Used lubricating oil.
 6. Plastic containers for lubricating oils; metal, plastic, and glass containers for agrochemicals (after triple washing).
 7. Electrical equipment (white line).
 8. Electronic devices (regulated by Executive Decree No. 35933-S of February 12, 2010 'Regulation for the Comprehensive Management of Electronic Waste').
 9. Fluorescent and compact bulbs.
 10. Refrigerants.
 11. Mattresses.
 12. Polystyrene.
 13. Scrap.

E-waste collection and recycling targets are envisaged by law, but the methodology for the definition of such targets has not yet been approved.

The establishment of e-waste collection targets is envisaged via the General Law on Integrated Waste Management, by the Regulation on Integrated Management of Electronic Waste Management No. 35933, and by the Regulation for the Declaration for Waste requiring Special Management, enacted in 2014. The actual definition of the targets is the CEGIRE's responsibility. For the first five years (2015-2020), collection targets were established on a voluntary basis, pending the definition of a proper national methodology for their definition. The adoption of national collection and recycling targets is expected for 2021, but national targets have not yet been established.

Specific EHS Standards for e-waste management were introduced by the Ministry of Health in December 2016. In December 2016, a Technical Guide for the Integrated Waste Management of Electric and Electronic Waste Management was published, defining the guidelines by the Ministry of Health regarding the management of e-waste.

A Plan of Action on POPs has been enacted by the Ministry of the Environment, but the necessary implementing regulatory framework is not yet fully in place.

Costa Rica ratified the Stockholm Convention in 2007. Accordingly, there is a national legislation that controls POPs such as pesticides or hazardous products in some cycles of their lives.

In 2009, the first National Implementation Plan (NIP) [70] for the Stockholm Convention considered both the elimination of 12 pesticides used in agriculture such as PCBs, which are used in the electric industry, and the decrease of unintentional emissions of dioxins and furans⁽⁹⁶⁾. An Information System of POPs has been established, focused on PCBs⁽⁹⁷⁾. NIP was updated in 2015. Nonetheless, the necessary implementing regulatory tools are still lacking. The Information System is not able yet to register or manage information about other POPs.

In 2017, the regulation on the identification and environmentally sound elimination of PCBs has been approved, requiring registration of POPs in the Information System [71]. Related to the responsibility to residues containing POPs, the General Law for Integrated Management of Wastes No. 8839 of 2010 also clearly defines the residue generators' responsibilities. They are obligated to keep an updated plan on integrated residue-handling (Article 14), and they are also responsible for damages.

Costa Rica has a specific regulation and EHS standards on e-waste management. In addition, a Plan of Action on POPs has been enacted by the Ministry of the Environment.

⁽⁹⁶⁾ <https://www.informea.org/fr/node/458324>.

⁽⁹⁷⁾ <http://cops.digeca.go.cr/#>.

National Statistics on E-waste

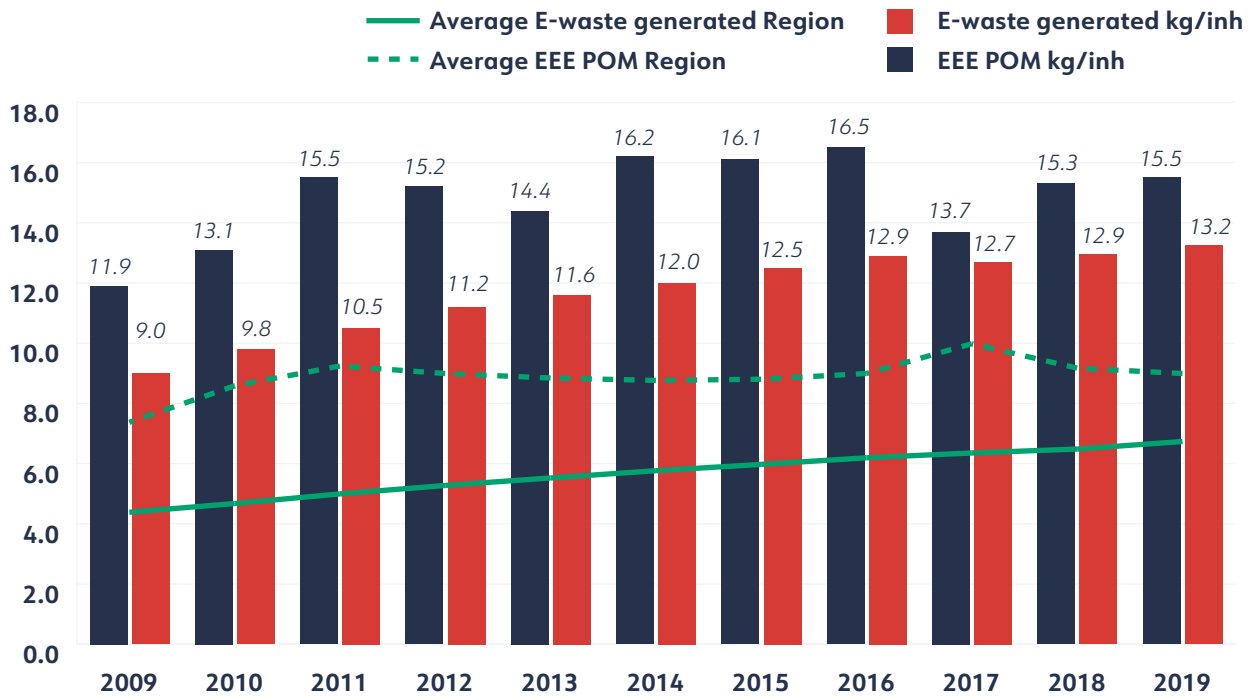
Costa Rica began compiling statistics on e-waste in 2018.

Prior to 2018, information on imports and exports of EEE was not carried out systematically. However, official information was available at the national level in the National Institute of Statistics and National Customs Institute of Costa Rica. In 2018, the Executive Committee for Integral E-waste Management (CEGIRE) began compiling statistical information on e-waste, using their own proposed guidelines, and since 2019, the Costa Rican Ministry of Health has continued this activity. In their statistics, Costa Rica, differentiates whether an EEE item being exported or imported is new or used.

In the late 1980s and early 1990s, investments in electronic component manufacturing, especially for power conditioning components and sensors for industrial or medical equipment, were done by companies such as Espion, Reliability, Cortek, Trimpot, Pharos, and Precision. Since 1994, components related to power conditioning (coils and transformers), electronic sensors (thermistors and load sensors), and power conditioning components (i.e. wave filters and radio frequency amplifiers) have been produced⁽⁹⁸⁾. Since 1997, Intel's presence in Costa Rica has promoted the production of integrated circuit and software solutions of components and currently represents 60 percent of the country's research and development exports. When performing the estimates of e-waste generated using apparent consumption methods, they only take into consideration the imports of EEE (i.e. EEE POM = imports). Though Costa Rica has a small national production of EEE, their statistics on EEE were not included in this report, as they are not POM. This is due to the fact that currently, all national production is from the Free Trade Zone, and all is exported based on the research performed by MICITT, meaning that nothing stays on the domestic market. The Atlas company, later acquired by MABE, produced items in Costa Rica for export and the local market until 2016 (when it closed local operations). National exports averaged 18,400 tons of EEE during the period 2010-2015, but with the closure of MABE operations, local exports fell to 4,200 tons for 2019. POM statistics by MABE during the period of operations in Costa Rica are not available.

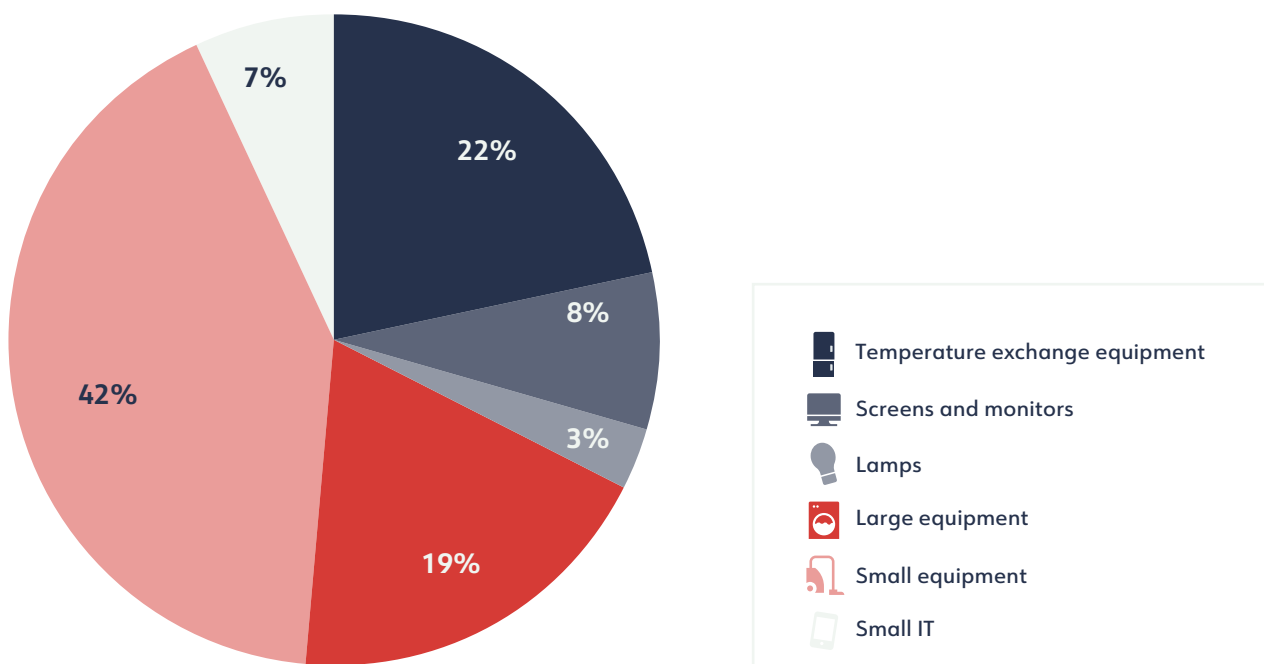
Figure 20 shows that EEE placed on the market (POM) has increased over the past decade, from 11.9 kg/inh (53kt) in 2009 to 15.4 kg/inh (78.2 kt) in 2019. In 2017, there was a slight decrease in EEE POM, from 16.5 kg/inh (81kt) in 2016 to 13.7 kg/inh (68.3 kt) in 2017. Overall, Costa Rica's EEE POM and e-waste generated is higher than the regional average.

Figure 20. EEE POM and e-waste generated in Costa Rica



In the POM EU-6 categories (Figure 21), small equipment (Cat. V with 6.4 kg/inh), temperature exchange equipment (3.3 kg/inh, Cat. I), and large equipment (Cat. IV with 3.0 kg/inh) register the highest share (83 percent of the total). The share of the EU-6 categories has been calculated over the total mass. This trend could be noticed from 1995-2020.

Figure 21. Share of the EU-6 categories in the EEE (2019)

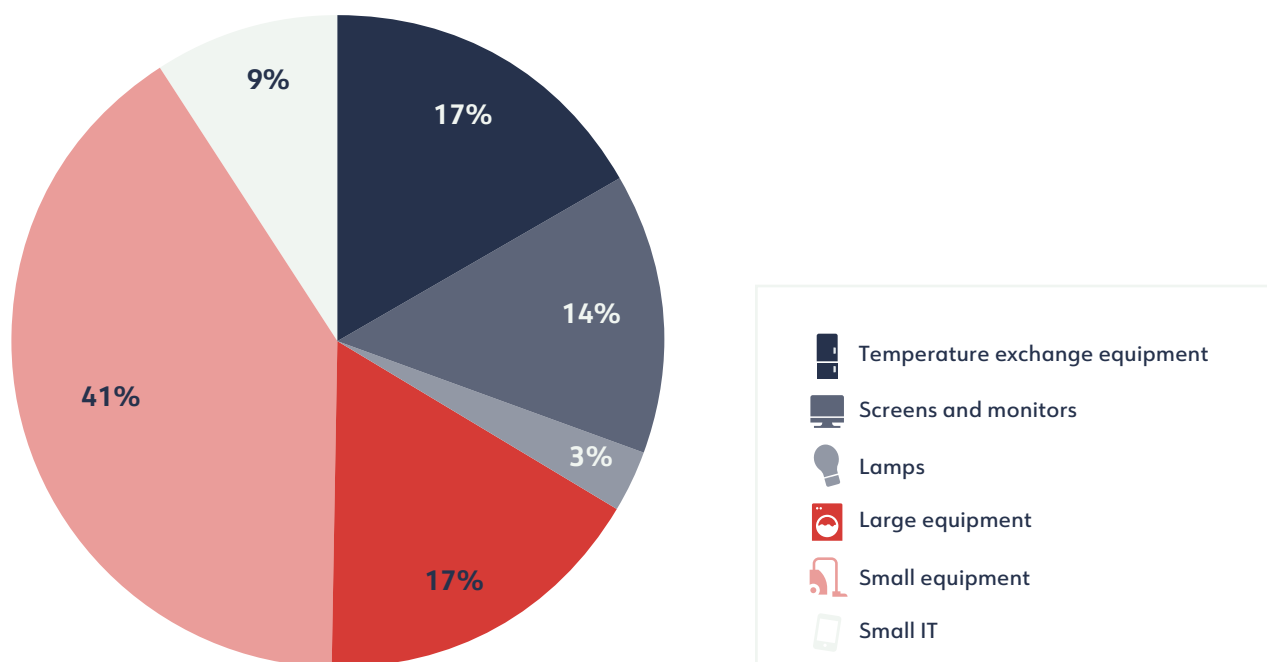


Based on the data provided by the Ministry of Health of Costa Rica and based on the National Custom Institute and Dirección General de Aduanas, the country's POM was 78.2 kt (15.4 kg/inh) of EEE in 2019. The majority of the amount of equipment POM for 2018-2020 corresponded to cooling and freezing equipment, such as refrigerators, washing machines, and electric toys.

E-waste Generated has increased substantially, from 8.0 kg/inh (36 kt) in 2009 to 13.7 kg/inh (66.9 kt) in 2019.

Analysis of the time series of e-waste generation using the EU-6 categories shows that e-waste generation has increased linearly throughout the years. For 2019, small equipment (Cat. V) had the highest share with 27.1 kt (equivalent to 5.34 kg/inh), followed by temperature exchange equipment (Cat. I) with 11.7 kt (equivalent to 2.30 kg/inh) and large equipment (Cat. IV) with 11.4 kt (equivalent to 2.24 kg/inh) (Figure 22).

Figure 22. Share of the EU-6 categories in the e-waste generated (2019)



In 2017, it was estimated that approximately 17,604 kg of c-OctaBDE found in plastics from CRT computer monitors and televisions were in use. In 2015, during the preparation of the National Implementation Plan (NIP) for the Stockholm Convention on the management of POPs in Costa Rica, an approximation of the amount of PBDEs found in e-waste was done, based on the UNEP guidelines. To estimate the amount of PBDEs on e-waste, a pilot test to analyse the capability for bromine screening in e-waste was performed by sampling 160 CRT TVs and computer monitors from authorised management centres. It was estimated that on average, computer monitors contain 5.4 percent content of bromine and TVs contain 3.8 percent. The average values of Octa-PBDE were calculated for monitors (6.79 percent) and televisions (4.76 percent), illustrating that computer monitors have a greater percentage of Octa-PBDE than televisions. This sampling estimated that approximately 17,604 kg of c-OctaBDE found in plastics from CRT computer monitors and televisions were in use.

E-waste and POP Management System

Costa Rica does not currently have an official e-waste classification, but the effort is underway to create one that will be aligned with all countries in the region. As of this report's publication, Costa Rica had developed a study conducted by the Ministry of Health and CEGIRE estimating the Alpha and Beta to calculate their e-waste (Table 9) assisted by UNU/UNITAR.

Table 9. The parameter of Alpha and Beta developed by CEGIRE that the Ministry of Health and UNU/UNITAR used to calculate e-waste generation in Costa Rica⁽⁹⁹⁾

UNU-KEY	UNU-KEY Description	Alpha	Beta
0001	Central Heating (household-installed)	2.00	12.59
0002	Photovoltaic Panels	3.50	22.49
0101	Professional Heating & Ventilation (excl. cooling equipment)	1.92	14.26
0102	Dishwashers	1.79	15.24
0103	Kitchen (e.g. large furnaces, ovens, cooking equipment)	2.00	15.00
0104	Washing Machines (incl. combined dryers)	1.85	10.00
0105	Dryers (wash dryers, centrifuges)	2.58	10.00
0106	Household Heating & Ventilation (e.g. hoods, ventilators, space heaters)	2.00	11.94
0108	Fridges (incl. combi-fridges)	2.20	10.00
0109	Freezers	1.28	17.19
0111	Air Conditioners (household-installed and portable)	2.00	18.26
0112	Other Cooling (e.g. dehumidifiers, heat pump dryers)	2.36	11.84
0113	Professional Cooling (e.g. large air conditioners, cooling displays)	1.60	13.77
0114	Microwaves (incl. combined, excl. grills)	2.07	7.00
0201	Other Small Household (e.g. small ventilators, irons, clocks, adapters)	1.22	10.00
0202	Food (e.g. toaster, grills, food processing, frying pans)	2.02	8.00
0203	Hot Water (e.g. coffee, tea, water cookers)	1.18	4.00
0204	Vacuum Cleaners (excl. professional)	1.22	10.00
0205	Personal Care (e.g. tooth brushes, hair dryers, razors)	1.20	7.00
0301	Small IT (e.g. routers, mice, keyboards, external drives & accessories)	1.30	5.68
0302	Desktop personal computers (excl. monitors, accessories)	1.80	8.00
0303	Laptops (incl. tablets)	1.94	5.00
0304	Printers (e.g. scanners, multi-functionals, faxes)	1.88	5.75
0305	Telecom (e.g. [cordless] phones, answering machines)	1.32	10.00
0306	Mobile Phones (incl. smartphones, pagers)	1.52	5.00
0307	Professional IT (e.g. servers, routers, data storage, copiers)	1.46	5.00
0308	Cathode Ray Tube Monitors	1.40	15.94
0309	Flat Display Panel Monitors (LCD, LED)	2.30	10.00

UNU-KEY	UNU-KEY Description	Alpha	Beta
0401	Small Consumer Electronics (e.g. headphones, remote controls)	1.30	5.00
0402	Portable Audio & Video (e.g. MP3, e-readers, car navigation)	1.50	9.04
0403	Music Instruments, Radio, Hi-Fi (incl. audio sets)	2.30	8.50
0404	Video (e.g. Video recorders, DVD, Blu-ray, set-top boxes)	1.14	7.95
0405	Speakers	1.13	12.00
0406	Cameras (e.g. camcorders, photo & digital still cameras)	1.19	6.36
0407	Cathode Ray Tube TVs	2.49	10.72
0408	Flat-Panel TVs (LCD, LED, Plasma)	1.88	7.00
0501	Lamps (e.g. pocket, Christmas, excl. LED & incandescent)	1.42	7.93
0502	Compact Fluorescent Lamps (incl. retrofit & non-retrofit)	1.42	10.00
0503	Straight Tube Fluorescent Lamps	1.75	5.16
0504	Special Lamps (e.g. professional mercury, high & low pressure sodium)	1.60	6.19
0505	LED Lamps (incl. retrofit LED lamps & household LED luminaires)	1.42	10.00
0506	Household Luminaires (incl. household incandescent fittings)	2.34	14.70
0507	Professional Luminaires (offices, public space, industry)	2.00	11.08
0601	Household Tools (e.g. drills, saws, high-pressure cleaners, lawnmowers)	1.77	10.00
0602	Professional Tools (e.g. for welding, soldering, milling)	2.50	10.00
0701	Toys (e.g. car racing sets, electric trains, music toys, biking computers)	1.43	2.00
0702	Game Consoles	1.14	5.00
0703	Leisure (e.g. large exercise, sports equipment)	2.40	10.25
0801	Household Medical (e.g. thermometers, blood pressure meters)	1.99	11.93
0802	Professional Medical (e.g. hospital, dentist, diagnostics)	2.41	11.99
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	1.55	5.30
0902	Professional Monitoring & Control (e.g. laboratory, control panels, and invertors)	1.92	10.25
1001	Non-Cooled Dispensers (e.g. for vending, hot drinks, tickets, money)	2.00	8.92
1002	Cooled Dispensers (e.g. for vending, cold drinks)	2.00	13.29
2001	Engines and other long life EEE – Non-UNU	2.00	12.59
2002	Medium EEE Lifespan – Non-UNU	3.50	22.49
2003	Small EEE Lifespan – Non-UNU	1.92	14.26

According to Executive Decree N° 35933-S, Regulation for the Integral Management of Electronic Waste (5 May 2010), all companies in Costa Rica that import EEE are responsible for providing management for the devices once their life cycles are over. This principle is established in the Law for Integrated Waste Management, as well as in the National Policy for Integrated Waste Management. The same decree establishes the obligation for these companies to form Compliance Units (CUs) to guarantee adequate e-waste management. The CUs require the support of authorised waste operators specialised in e-waste to take charge of their management⁽¹⁰⁰⁾.

Costa Rica has operators with different levels of specialisation; only some can disassemble and recover e-waste, while others function more as intermediary operators. To take care of e-waste, an e-waste operator must be registered and authorised by the Ministry of Health. The registration process for operators is established in Decree 37567-S, General Regulations to the Law for the Integral Management of Waste.

With the support of the German Development Cooperation (GDC), the Executive Committee for the Integral Management of Electrical and Electronic Waste (CEGIRE) developed a Technical Guide for the Integrated Management of Electronic and Electrical Waste (WEEE) in 2016. The technical guideline presents a synthesis of the normative references that regulate the Integrated Management of e-waste in Costa Rica and describes the general guidelines for such management in the following stages: reception, storage, disassembly and recovery, export, and transport (from one stage to another).

As of May 2021, Costa Rica had 60 e-waste operators authorised to manage e-waste, of which 13 have authorisation for collection, storage, and transportation and 47 are authorised for dismantling and separation, recovery, export, import, treatment, and disposal. Of these 47, several operators do not provide services, but have registered to manage their own waste or are municipalities, leaving 33 e-waste operators who exclusively provide services to others⁽¹⁰¹⁾.

As in many Latin-American countries, Costa Rica has companies dedicated exclusively to the repair of equipment (repair shops), such as computers, monitors, and printers. A 2003 study estimated that

the main customers of repair shops were businesses, the government, families, or individuals and, to a lesser extent, commerce [72].

The temporary reception points of e-waste must have an up-to-date record of the volume and type of e-waste they receive, as well as of e-waste manifests and delivery slips they deliver to the authorised operator. Authorised recovery centres or e-waste management companies can receive waste in various ways:

- Directly from the users (natural or legal person) if the users are in charge of taking it to their facilities.
- From collection events.
- From temporary reception points.
- Through the intermediation of other Authorised managers.
- From door-to-door collection carried out by authorised collectors.
- Delivered by municipalities as result of previous selective collection in households.

Every recovery centre in Costa Rica must have an Integrated Waste Management Programme, in accordance with the provisions of Law 8839, and comply with conditions established in Executive Decree N° 35906-S Regulation of Recovery Centres for Recoverable Waste, published in the Official Journal La Gaceta, Number 86 of 05 May 2010.

Under the framework of the PREAL project, since 2020 Costa Rica is carrying out a pilot project using ITU standards to strengthen e-waste management capacity.

Under the framework of the PREAL project, Costa Rica is carrying out with ITU a pilot project to implement ITU standards (ITU-T L.1031⁽¹⁰²⁾ and ITU-T L.1032⁽¹⁰³⁾) to help establish minimal criteria (on occupational safety and health and environment) which e-waste operators have to implement in their establishments to guarantee the proper management of e-waste in an environmental sound manner. Furthermore, it seeks to establish a pathway to integrate the informal sector and formalize them according to Costa Rican legal standards.

The facility where the disassembly and recovery are carried out must as well have all required permits, such as the land use permit granted by the respective municipality, the environmental viability for the specific

activity granted by SETENA, the sanitary operation permit, and its registration as an e-waste operator authorised to carry out disassembly, decontamination, recovery, and export.

Costa Rica has a tariff that allows the import of used equipment, which may facilitate the entry of outdated technology or damaged equipment in the country. PCBs and pesticides regulated by the Stockholm Convention are banned in Costa Rica. With regard to POP management, Costa Rica doesn't have any restriction on the import and use of articles containing PFOS. In 2004 and 2005, preliminary PCB inventories were conducted in Costa Rica. For 2004, the inventory was performed by the Costa Rican Electricity Institute (ICE) and the National Power and Lighting Company (CNFL); for 2005, the inventory was performed by such cooperatives and municipal administration entities as the Heredia Public Services Company (ESPH) and the Administrative Board of Electricity Services in Cartago (JASEC). The results were the basis for defining the priorities for ESM and disposal of PCBs in Costa Rica as part of the National Implementation Plan for the Stockholm Convention in 2009. The 'Integrated PCB Management in Costa Rica' project was implemented from 2014-2018 by the Ministry of Environment, Energy, and Telecommunications (MINAE) and focused on four main components:

1. Strengthening institutional capacity in Costa Rica for the ESM of PCBs.
2. ESM and interim storage of PCBs.
3. Environmentally sound destruction of PCBs and management of contaminated equipment.
4. Raising awareness.

As a result of the project, **Costa Rica eliminated 140 t of equipment, oils, and waste contaminated with PCBs and 10 t of pesticides (DDT) that were in storage in 2018. Furthermore, Costa Rica's inventory identified 134,000 pieces of PCB-containing electrical equipment owned by 453 private and public companies⁽¹⁰⁴⁾.** These substances were exported to an authorised operator in France for safe disposal, and other parts were treated in **local PCB treatment facilities**. In order to give sustainability to this effort, and thus guarantee better control of PCBs in the future, the **Executive Decree N°40697-MINAE-S** of 10 November 2017 was issued, titled *Regulation for the identification and environmentally safe disposal of Polychlorinated Biphenyls*⁽¹⁰⁵⁾.

The regulation applies to natural or legal, public or private persons who are owners of equipment containing dielectric oils or oils and wastes containing or contaminated with PCBs. One of the most important aspects of the Regulation is that it creates an **official register** for anyone in possession of products containing PCBs and **technical guidelines** on reporting and eliminating equipment, oils, or waste containing PCBs. On the other hand, the Decree requires companies or institutions to keep inventories⁽¹⁰⁶⁾.

To export PCBs for destruction, the choice of technology must be approved by the competent authority of the Ministry of Health, following the provisions of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. As stipulated in Decree 27000-MINAE, 'Regulation on the characteristics and listing of hazardous industrial wastes', and Decree 27001-MINAE, 'Regulation for the management of hazardous industrial wastes', PCB wastes must be treated or disposed of within one year of storage.

Some e-waste plastic is exported, and no separation of brominated and non-brominated e-waste plastic is done.

⁽¹⁰⁴⁾ <http://www.digeca.go.cr/proyectos/manejo-integral-de-pcb-en-costa-rica>.

⁽¹⁰⁵⁾ http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=85265&nValor3=110216&strTipM=TC.

⁽¹⁰⁶⁾ <http://www.digeca.go.cr/documentos/manual-para-la-inscripcion-al-sistema-de-informacion-cops>.

Import & Export of E-waste and POPs Contained in E-waste

Costa Rica is Party to the main multilateral environmental agreements regulating TBM of hazardous wastes and POPs.

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was approved by Costa Rica through Act No. 7438 on October 6, 1994. Costa Rica has also enacted the Ban Amendments and is Party to the Rotterdam, Stockholm, and Minamata Conventions.

The import of hazardous wastes is not permitted. Lead-acid batteries and e-waste considered Waste requiring Special Management can be imported and treated by two specialised companies in Costa Rica.

The import of hazardous wastes is not permitted, per article 34 of Law N° 8839, Law on Residue (Waste) Management, 13/07/2010. The only exceptions are lead-acid batteries and e-waste, and two facilities treat these types of waste, which can be imported as raw material for their processing⁽¹⁰⁷⁾.

As stated in the Stockholm Convention, imported waste and residues that have or are composed of POP are prohibited for the Classification and Handling of Hazardous Residues, so the residues of pesticides included in the Stockholm Convention cannot be imported into Costa Rica⁽¹⁰⁸⁾.

Based on the annual reports to the Basel Convention, in 2018, Costa Rica exported 30 t to the United States and 336 t of e-waste and computer parts for recycling/reclamation of metals, metal compounds (R4), and exchange of wastes to other operations, numbered R1-R11 of the Basel convention (R12).

Stakeholder Mapping

In Costa Rica, the stakeholders involved in the waste sector (that could be identified) and their roles are described below:

Stakeholder	Responsibility
Costa Rican Ministry of Health (MINSALUD) Website	The Ministry is responsible to lead actors in the development of actions that protect and improve the physical, mental, and social health of the inhabitants, through the exercise of the steering role of the National Health System. This is performed with a focus on health promotion and disease prevention, promoting a healthy and balanced human environment, under the principles of equity, ethics, efficiency, quality, transparency, and respect for diversity. MINSALUD is responsible for the monitoring and proper management of waste, including e-waste in Costa Rica. It is the focal point of the Basel Convention.
Dirección de Gestión de Calidad Ambiental (DIGECA) of Ministry of Environment, Energy and Telecommunications (MINAE) Website DIGECA Website MINAE	The General Directorate of Environmental Quality Management (DIGECA) was enacted after Law 7554, and since 2002, it has been in charge of pollution issues from a preventive perspective, promoting environmental management (through voluntary mechanisms and regulations) in order to ensure that activities, works, and projects, both public and private, are framed within a vision of sustainable development. MINAE is the Governmental agency responsible for the environmental management conservation and sustainable use of environmental and natural resources. It is the focal point of the Stockholm Convention.






⁽¹⁰⁷⁾ <http://www.basel.int/Countries/ImportExportRestrictions/tabid/4835/Default.aspx>.

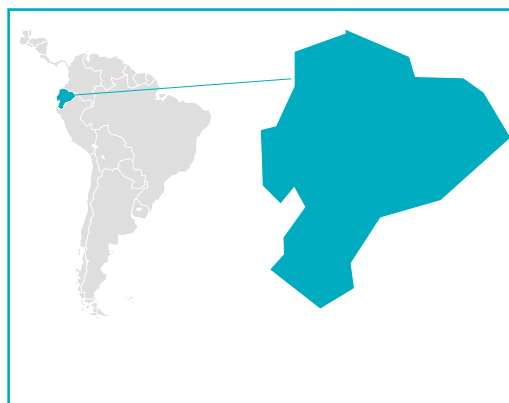
⁽¹⁰⁸⁾ <http://chm.pops.int/Portals/0/download.aspx?d=UNEP-POPS-NIP-CostaRica-COP4.English.pdf>.

Stakeholder	Responsibility
Ministry of Science, Innovation, Technology and Telecommunications (MICITT). Directorate of the Radiological Spectrum and Telecommunications Networks Website	Member of CEGIRE. Generate and promote compliance with public policies in the field of science, innovation, technology, and telecommunications in the country through the exercise of sectoral leadership and the effective execution of its substantive and management processes – to improve competition for the benefit of social welfare, the equality and prosperity of Costa Rican society in the framework of digital transformation and the fourth revolution.
Servicio Nacional de Aduanas (SNA), Ministerio de Hacienda Website	With exclusive competence in customs matters, the SNA is in charge of participating as a facilitator and controller in the international trade of merchandise, protecting the superior interests of the community, such as health, safety, environment, intellectual property, and archaeological heritage.
Institute of Municipal Advice and Development (IFAM) Website	Member of CEGIRE representing the municipality sector. Rectory of the municipal sector. Contributes to the improvement of the Municipal Regime by providing technical assistance, financing, and training services.
Asociación de Empresarios para la Gestión Integral de Residuos Electrónicos (ASEGIRE) Website	Member of CEGIRE representing Compliance Units (CUs). The first and bigger Compliance Unit of the country, focused on WEEE.
Unión Costarricense de Cámaras y Asociaciones del Sector Empresarial Privado (UCCAEP) Website	Member of CEGIRE, representing the private sector. Contributes to the socioeconomic development of Costa Rica by promoting progress, competition, and responsible business practices within the private production sector.
Cámara de Industrias de Costa Rica (CICR) Website	The Costa Rican Chamber of Industries, CICR, is a business organisation that promotes the sustainable development of the industrial sector. It is focused on strengthening Costa Rican industry, promoting its successful performance in the context of globalisation, and ensuring the continuity of its valuable contribution to national development.
ACEPESA. Asociación Centroamericana para la economía, salud y el ambiente Website	Member of CEGIRE. A WEEE expert entity representing NGOs. ACEPESA is an organisation recognised by its innovative actions to address climate change with emphasis on water and sanitation, integrated waste management, and local economic development, in order to promote the local development with a gender and diversity perspective.
Consejo Nacional de Rectores, CONARE Website	Member of CEGIRE. Representing the academic sector. Innovative management of the systematic action of public universities to promote national development.

Country:

Ecuador

-  17.4 million inhabitants [28]
-  283,561 km²
-  **Borders:** Colombia, Peru, Pacific Ocean
-  **GDP per capita PPP:** \$11,878 USD [29]
-  **Average household size:** 3.8 members [30]



Map source: United Nations Geospatial Information Section⁽¹⁰⁹⁾

E-waste Management:

Legislation: ●●●●●
 Infrastructure: ●●
 Collection Rate: 4%

E-waste POP Management:

Legislation: ●●●●●
 Infrastructure: ●●●●●
 Collection Rate: 0%

Legend: ● Advanced ● Transition ● Basic
 Each indicator is one circle.

National legislation on e-waste and POPs:

- Extended Producer Responsibility:** ✓ Introduced in December 2012
- National e-waste standards:** ✓ Post consumption policy for electrical and electronic equipment published in 2013
- National standards for POPs contained in e-waste:** ⚙ In development
- E-waste collection target:** ✓ 3% of the total number of mobile phones put on the market
- Legislation product coverage in UNU-KEYs:** 1 of 54
- Legislation product coverage in weight (%) on total and per category⁽¹¹⁰⁾:** Total: 0.02% of the e-waste generated in 2019



International Conventions:

	Signature	Ratification	Entry into force
Basel Convention [31]	22/03/1989	23/02/1993	24/05/1993
Rotterdam Convention [32]	09/11/1998	05/04/2004	02/08/2004
Stockholm Convention [33]	28/08/2001	06/07/2004	05/09/2004
Minamata Convention [34]	10/10/2013	29/07/2016	16/08/2017

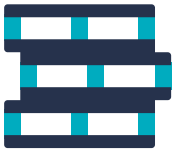

⁽¹⁰⁹⁾ <https://www.un.org/Depts/Cartographic/english/htmain.htm>.

⁽¹¹⁰⁾ Percentage in weight of e-waste generated equipment covered by the national legislation illustrated per EU-6 collection category for 2019.



EEE Placed on Market (2019):	E-waste generated (2019):	E-waste formally collected (2019):
 <p>130 kt. 7.5 kg/inh.</p>	 <p>88 kt. 5.1 kg/inh.</p>	 <p>3 kt. x kg/inh.</p>

(Source: Ecuadorian Ministry of Environment, Water and Ecological Transition (MAATE) / UNU / UNITAR)

Generated e-waste plastic:	Generated BFRs from e-waste:
 <p>30 kt. 1.7 kg/inh.</p>	 <p>3 kt. 0.2 kg/inh.</p>

(Source: UNDP / UNU / UNITAR)

Formal/environmentally sound e-waste management system in place:

- ✓ 5 companies have environmental permits for different phases of e-waste management (storage, transport, dismantling, and treatment).
- ✗ Ecuador does not have facilities that treat POPs arising from e-waste.

National Legal Framework

The Republic of Ecuador (hereafter, Ecuador) has a comprehensive legal and regulatory framework around hazardous wastes and chemicals, including specific secondary laws related to e-waste and, specifically, mobile phones.

Among the main legal and regulatory instruments related to e-waste, the following should be noted:

- Ministerial Agreement No. 026 'Procedures for registration of hazardous waste generators, management of hazardous waste before environmental licensing, and for the transport of hazardous materials' published by Official Register No. 334 of May 12, 2008 [73].
- Ministerial agreement No. 142 'National list of hazardous chemicals, hazardous and special waste', published by the Official Register No. 856 of December 21, 2012⁽¹¹¹⁾.
- Ministerial Agreement No. 190 National Post-Consumption Policy for Electrical and Electronic Equipment' published in the official registry 29/01/2013⁽¹¹²⁾.
- Ministerial Agreement No. 191 on 'Instructions for the Application of the Principle of Extended Responsibility in the Management of Disused Cellular Equipment' published in the official registry 29/01/2013[74].
- Organic Environmental Law (COA) published by the Official Register Supplement 983 of April 12, 2017⁽¹¹³⁾.
- Regulation of the Organic Environmental Code, Decree No. 752, published in the Official Register No. 507 of June 12, 2019 [75].

The Organic Environmental Law (COA) of 2017 consolidates the national environmental regulatory framework within a single document [76]. The purpose is to guarantee and protect the rights of people to live in a healthy and ecologically balanced environment. The law also regulates several environmental issues at the national level. The Title IV of the third book regarding environmental quality has established the principles

for the national integrated management of chemical substances [77].

E-waste is regulated in the Organic Environmental Code Regulation, Decree No. 752, published in the Official Register No. 507 of June 12, 2019.

Title VI details the integrated management of chemical substances in depth. Title VII details the integrated management of waste and residues. Title VIII details the Extended Producer Responsibility, and Title IX details the sustainable production and consumption [75].

Among other objectives, one focus of the Ecuador National Development Plan of 2017-2021⁽¹¹⁴⁾ is to implement comprehensive management systems for environmental liabilities, solid waste, liquid discharges, and atmospheric emissions, as well as toxic and dangerous waste. It also sets the target at 2021 for increasing recycling of solid wastes in general from 17 percent to 35 percent (of the total waste generated) [78].

In December 2012, Ecuador introduced an EPR scheme for producers and importers of EEE.

The National Policy on Post-consumption of Disused Electrical and Electronic Equipment was published in the Official Gazette in 2013, with the objective of regulating the management of electrical and electronic equipment. It introduces the REP system aimed at producers and importers of electrical and electronic equipment (articles 2 and 4). Ministerial Agreement No. 191, dated 2013, specifies the application of the REP system regarding the management of cell phones and establishes an annual recycling rate of 3% of the total number of cell phones placed on the market during the regulatory year.

With regard to POPs, Ecuador maintains lists of hazardous materials and chemicals requiring specific permits.

Ministerial agreement No. 026 of 2008 establishes that any person (natural, legal, national, or foreign) who generates or handles hazardous waste or who transports hazardous materials in Ecuador must obtain the respective authorisation from the Ministry of

⁽¹¹¹⁾ <https://www.ambiente.gob.ec/wp-content/uploads/downloads/2018/08/Acuerto-142-2012-Listado-Nacional-de-Sustancias-Quimicas-Peligrosas.pdf>.

⁽¹¹²⁾ <https://www.ambiente.gob.ec/wp-content/uploads/downloads/2013/01/Acuerto-Ministerial-190-Pol%C3%ADtica-Nacional-de-Post-Consumo-de-Equipos-El%C3%A9ctricos-y-Electr%C3%B3nicos.pdf>.

⁽¹¹³⁾ <https://apel.ec/biblioteca/decreto-752-2019-reglamento-al-codigo-organico-del-ambiente/>.

⁽¹¹⁴⁾ https://www.planificacion.gob.ec/wp-content/uploads/downloads/2017/10/PNBV-26-OCT-FINAL_OK.compressed1.pdf.

Environment, Water and Ecological Transition (MAATE), based on the procedures defined in the Annexes of this Ministerial agreement (A, B, and C, respectively) [77].

Ministerial Agreement No. 142 includes the list of chemical substances considered to be prohibitively dangerous or hazardous with intense and chronic toxicity (Annex A). Annex B of the Ministerial Agreement shows the details of hazardous waste by specific and non-specific sources, and Annex C indicates the national list of special waste.

Going forward, Ecuador will classify electric and electronic equipment according to six categories.

As a result of the implementation of the PREAL project and the development of the technical draft standard, the following EEE classification will be established:

- Temperature exchange devices.
- Monitors, screens, and apparatus with a screen area greater than 100 cm².
- Large appliances (with an external dimension greater than 50 cm).
- Small apparatuses (with no external dimension greater than 50 cm).
- Small computing and telecommunication apparatus (with no external dimension greater than 50 cm).
- Photovoltaic panels.

Ecuador has EHS standards related to chemicals and hazardous wastes.

The Organic Environmental Code establishes regulations, procedures and standards for obtaining the different environmental permits. The permit required will depend on the activity and its environmental impact. The supreme authority is the Ministry of Environment, Water and Ecological Transition (MAATE), which will oversee the establishment of procedures and permits to ensure strict environmental standards [76].

Executive Decree 2393 'Safety and health regulation for workers', enacted with Official Register 565 of November 17, 1986 (as last modified in 2003) was approved with the objective to prevent, reduce, or eliminate occupational hazards. Chapter V deals with environmental and occupational hazards due to physical, chemical, and biological factors, while Chapter VII focuses on safe conditions in the workplace during management, storage, and transport of dangerous goods [77].

The Ecuadorian Standardization Service (INEN) has issued the following technical standards on hazardous chemicals:

- NTE INEN 2288 Hazardous Industrial Chemicals. Precautionary Labelling. Specifications in 2000.
- NTE INEN 2266 Transport Storage and Handling of Hazardous Materials. Requirement in 2013 [77].

Ecuador has a comprehensive legal and regulatory framework around hazardous wastes and chemicals, including secondary laws related to e-waste. Ecuador has EHS standards related to chemicals and hazardous wastes.

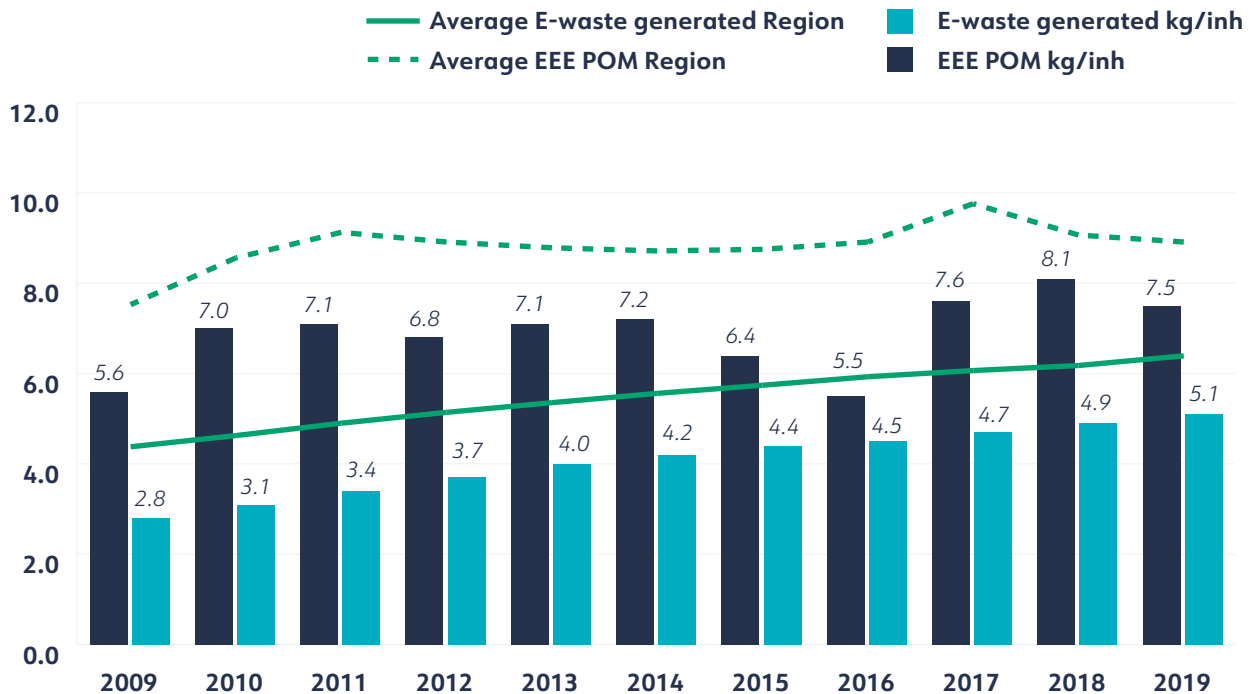
National Statistics on E-waste

Statistics on e-waste are not currently compiled in Ecuador.

The Ministry of Environment, Water, and Ecological Transition (MAATE) developed a baseline quantifying e-waste generation in Ecuador in 2015. However, before 2010, information on imports and exports of EEE was not carried out systematically in the country by customs in Ecuador. Nonetheless, official information is available at the national level from the Ministry of Production, Foreign Trade, Industries and Fisheries (MPCEIP), MAATE and the National Customs Service of Ecuador (SENAE). Ecuadorian statistics do not differentiate between new or used equipment being imported and exported. Furthermore, SENAE processes and stores the information on imports and exports using the gross weight of EEE (i.e. including packaging weight); they do not differentiate between equipment weight and package weight. As such, the total gross weight of EEE was used in estimating POM and e-waste generated.

Ecuador does not have an electronic manufacturing industry, but it has companies that assemble and repair equipment. The analysis of information from 1996-2020 was undertaken using the information provided by MAATE, as illustrated in Figure 23.

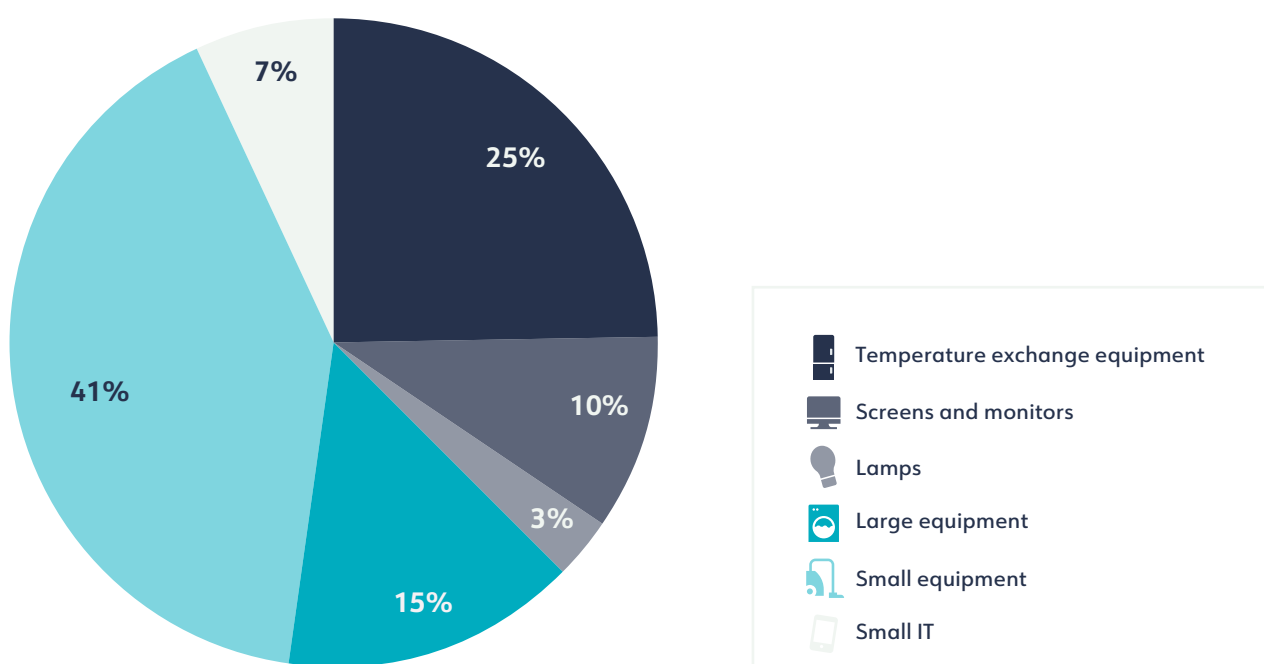
Figure 23. EEE POM and e-waste generated in Ecuador



Based on data provided by MAATE, Ecuador's EEE POM was 129.9 kt (7.5 kg/inh) in 2019. Figure 23 shows that EEE POM has increased over the past decade, from 5.6 kg/inh (82.1 kt) in 2009 to 7.5 kg/inh (129.9 kt) in 2019. As compared to the regional average, both the EEE POM and e-waste generated are lower than the 13 countries analysed.

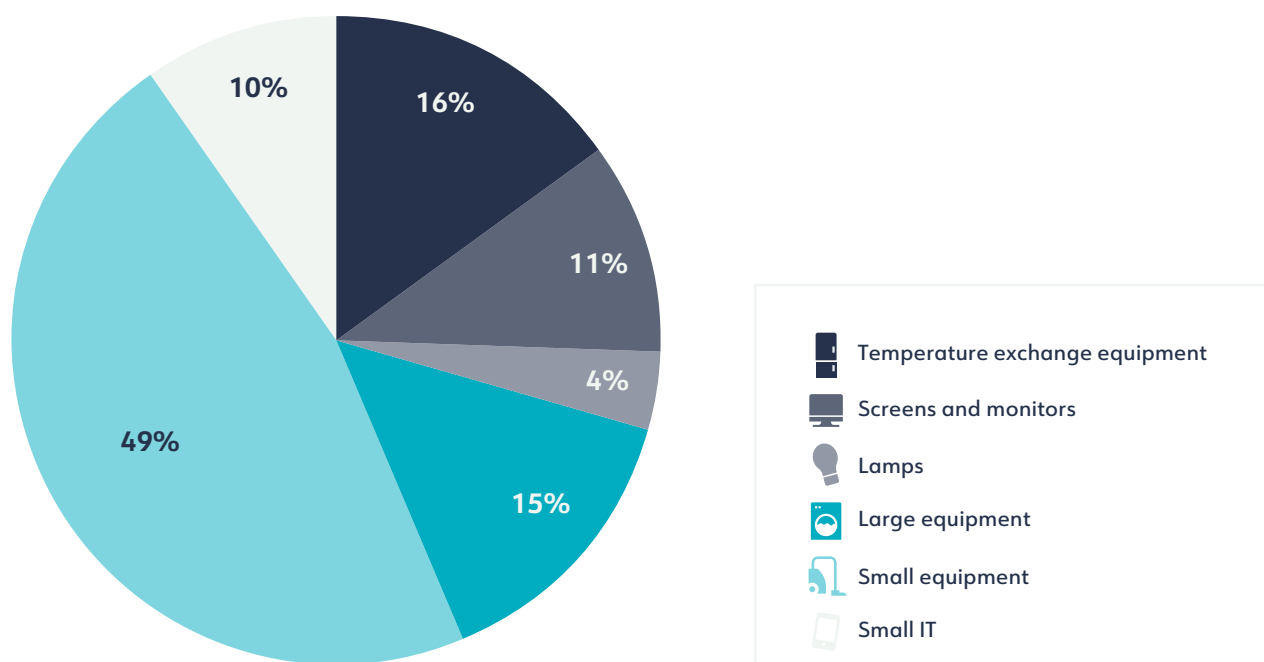
For POM EU-6 categories, small equipment (Cat. V with 3.1 kg/inh), temperature exchange equipment (1.9 kg/inh, Cat. I), and large equipment (Cat. IV, with 1.1 kg/inh) register the highest share (80 percent of the total). Lamps (Cat. III with 0.2 kg/inh) and screens (Cat. II with 0.7 kg/inh) registered the smallest share (Figure 24). The share of the EU-6 categories has been calculated over the total mass.

Figure 24. Share of the EU-6 categories in the EEE (2019)



Ecuador primarily imports EEE. Based on the data provided by MAATE, Ecuador exported only 1.64 kt (0.10 kg/inh) of EEE in 2019, whereas it imported 130.79 kt (7.68 kg/inh). The majority of exported equipment corresponded to refrigerators, household monitoring equipment, and professional cooling equipment. The majority of imported equipment included washing machines, electronic toys, and flat-panel TVs. E-waste generated has increased substantially, from 2.8 kg/inh (41.8 kt) in 2009 to 5.1 kg/inh (87.6 kt) in 2019.

Figure 25. Share of the EU-6 categories in the e-waste generated (2019)



Analysis of the time series of e-waste generation in the EU-6 categories shows that they increase linearly throughout the years. For 2019, small IT (Cat. VI) had the highest share with 40.6 kt (equivalent to 2.3 kg/inh), followed by temperature exchange equipment (Cat. I) with 13.9 kt (equivalent to 0.8 kg/inh) and large equipment (Cat. IV) with 12.4 kt (equivalent to 0.7 kg/inh) (Figure 25).

The statistic of POPs and non-POPs arising from e-waste are unknown as of the publication of this report.

E-waste and POP Management System

Ecuador has 5 treatments facilities, located in Quito and Guayaquil, for all categories with an annual capacity of 20,000 t. A total of 3,000 t/year of e-waste are treated by the formal sector. Current environmental legislation prohibits the disposal of e-waste in municipal residual waste. From information acquired from the Ministry of Environment, Water, and Ecological Transition (MAATE), Ecuador has five treatment facilities with an annual capacity of 6,000 t. However, according to reports presented to MAATE from formal recyclers' plants and operators in 2016, 3,000 t of e-waste are treated formally each year. Moreover, a preliminary study developed under the PREAL project stated that the collection rate has been consistent through the years. Of the five plants identified as e-waste managers, 2 account for approximately 80-85% of the total management.

No studies or statistics quantifying the amount of e-waste treated by the informal sector have been developed in Ecuador.

The informal sector typically collects e-waste door-to-door. They dismantle equipment to extract the valuable parts for trade to local treatment facilities, and the less valuable parts are disposed of informally in landfills. There are no known partnerships or alliances between the formal and informal sector.

Voluntary initiatives for recycling e-waste are carried out through municipalities that perform consumer campaigns. Over the years, some campaigns were carried out to replace old refrigerators and lamps with more efficient ones. Additionally, telephone operators perform consumer campaigns in compliance with Ministerial Agreement 191. In the past, the Ministry of the Environment, through the National Program for the Integral Management of Solid Waste (PNGIDS), has collaborated with various cell phone stakeholders for phones' recovery and recycling.

Ecuador is currently developing technical standards and a National Initiative and Improvement of Regional Cooperation for the Environmentally Rational Management of POPs in e-waste.

Ecuador has a strong repair culture, and there are several repair shops in the country, especially for household equipment.

Used electronic equipment disposed of and still suitable for reuse is mainly sold as second-hand equipment.

E-waste plastic is separated by type (e.g. PP, ABS, PC, etc.) and by plastic containing PCBs. According to questionnaires and interviews, Ecuador separates e-waste plastic. However, Ecuador doesn't have a treatment plant that can recycle plastic, so the plastic is shredded and is exported without pretreatment. Ecuador has a company that separates brominated and non-brominated e-waste plastic. Studies are currently being conducted to evaluate the feasibility for reusing plastic in Ecuador or to provide an adequate final disposition.

Import & Export of E-waste and POPs Contained in E-waste

Ecuador is Party to the Basel, Rotterdam, and Stockholm Conventions, and it has implemented the Basel ban amendment. It has also ratified the Minamata Convention on Mercury.

Under Article 15, the Ecuadorian Constitution of 2008 prohibits, among other things, the importation of POPs, international agrochemicals, and technologies, as well as the importation of toxic and nuclear waste into national territory.

Additionally, as part of its annexes, the Ministerial Agreement 142 (AM 142) has a list of banned substances with PBDEs listed.

The Ecuadorian constitution and the Organic Environmental Code prohibit the introduction of POPs and other hazardous waste into the country, with the exception of substances or materials used exclusively for laboratory use.

There is no specific legislation for the export related to final disposal, but there are restrictions related to the export generally. MAATE will allow exportation of dangerous waste, provided that:

1. the exporter has obtained the environmental license given by MAATE;
2. the packing, identification, and transportation are made per established law, technical guides, and international practices;
3. the environmental authority of the importing country has approved the import;
4. the exporter includes the corresponding insurance that covers damages potentially caused to the environment or to legal and natural people.

The Ecuadorian Environment Ministry will not allow the export of dangerous waste in the following instances:

1. If the waste can be recycled or reused within the country in safe environmental conditions.
2. If the dangerous waste can have a technically suitable final disposition in the country.
3. When the entity tried to export the waste to places beyond the 60 degrees south latitude.
4. For the states that, within legislation, have prohibited the import of dangerous waste.
5. When the export is made to a state that cannot demonstrate that they will suitably handle the waste.
6. Toward states that are not part of the Basel Agreement, unless a bilateral or multilateral agreement with those states exists.
7. When the conditions of their transportation through the national territory imply unacceptable risks.

Ecuador has not provided annual reports to the Basel Convention for 2018 and 2019, so exports of e-waste, PCBs, and mercury were not reported for those years.

In 1998, Ecuador implemented the Basel Convention Ban Amendment, partly restricting the export of hazardous wastes and other wastes for final disposal (as described in Annex IV A of the Basel Convention). The country has subscribed to the Basel Convention applying their regulations at a national level. Article 646 of the *Regulation on the Organic Environmental Code* states that for the export of hazardous and/or special wastes or residues, an export permit issued by the National Environmental Authority can be obtained, provided that the following requirements are met, as applicable:

- a. The exporter must have the corresponding environmental authorisation for its activity, granted by the Competent Environmental Authority.
- b. The exporter is registered as a generator of hazardous and/or special wastes or residues.
- c. The exporter has the appropriate insurance, bond or guarantee covering damage to the environment or persons, as well as re-importation or alternative environmentally sound management of the waste or residues in cases where the transboundary movement cannot be completed (for whatever reason).
- d. The packaging, identification, and transportation are carried out in accordance with national and international standards.
- e. The competent authorities of the importing country and of the countries of transit have approved the importation or have indicated their non-objection to the importation.
- f. Other requirements as determined by the National Environmental Authority.

If hazardous waste contains radioactive content, the requirements established by the radiation regulatory authority and the applicable regulations must be complied with. In the case of hazardous waste, the requirements of the prior notification and consent mechanism under the Basel Convention must be fulfilled. In the case of restrictions on export of wastes for recovery as described in Annex IV B of the Basel Convention). Exports are restricted in its Environmental Law using the following conditions:

The Ecuadorian Environment Ministry (MAE) will not allow the export of dangerous waste, in following cases:

1. *If the waste can be recycled or reused within the country in safe environmental conditions for these cases.*
2. *If the dangerous waste can have a technically suitable final disposition in the country.*
3. *When it tried to export the waste to places beyond the 60 degrees south latitude.*
4. *For the states that within legislation have prohibited the import of dangerous waste*

5. *When exportation is made to a state that cannot demonstrate that they will make a suitable handling of the waste.*
6. *Toward states that be not part of the Basel Agreement, unless a bilateral or multilateral agreement with those states exists.*
7. *When the conditions of their transportation through the national territory imply unacceptable risks.*

Imports of hazardous waste for recovery and final disposal or any purpose are not allowed in Ecuador.






Stakeholder Mapping

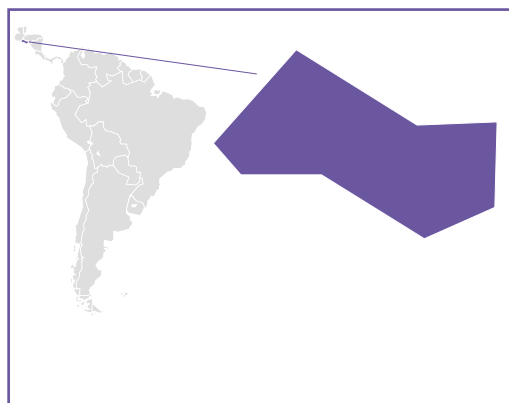
In Ecuador, the stakeholders involved in the waste sector (that could be identified) and their roles are described below:

Stakeholder	Responsibility
Ministry of Environment, Water and Ecological Transition (MAATE) Website	The environmental authority of Ecuador, which effectively and efficiently exercises the guiding role of environmental management to ensure a healthy and ecologically balanced environment – as a way of making the country a nation that conserves and sustainably uses its biodiversity, maintaining and improving its environmental quality.
National Customs Service of Ecuador (SENAE, Servicio Nacional de Aduana de Ecuador) Website	The National Customs Service is focused on serving users with integrity and commitment in public management in order to promote competition while maintaining a balance between effective control and trade facilitation.
Ministry of Production, Foreign Trade, Investments and Fisheries (Ministerio de Producción, Comercio Exterior, Inversiones y Pesca) Website	The Ministry focused on promoting productive development, improving competition, and developing investments.
Foreign Trade Committee (COMEX, Comité de Comercio Exterior) Website	The Foreign Trade Committee (COMEX) is the body that approves national public policies on trade policy. It is a public inter-sectoral collegiate body in charge of regulating all matters and processes related to trade policy.
Ecuadorian Institute for Standardization (INEN, Instituto Ecuatoriano de Normalización) Website	The institute focused on increasing the quality infrastructure in Standardisation, Technical Regulation and Conformity Assessment oriented to the development of the productive and service sectors.
Chambers of Commerce in Ecuador (Cámaras de Comercio) Website	Cámaras de Comercio leads the business community and promotes an efficient business environment for the country's development.
National Institute of Statistics and Census (INEC, Instituto Nacional de Estadística y Censos) Website	The National Institute of Statistics and Census in Ecuador coordinates, regulates, and evaluates the production of official statistical information from the national statistical system through the planning, execution, and analysis of timely and reliable statistical operations, as well as the generation of specialised studies that contribute to public and private decision-making and national planning.

Country:

El Salvador

-  6.5 million inhabitants [28]
-  21,041 km²
-  **Borders:** Guatemala, Honduras, Pacific Ocean
-  **GDP per capita PPP:** \$9,164 USD [29]
-  **Average household size:** 4.1 members [30]



Map source: United Nations Geospatial Information Section⁽¹¹⁵⁾

E-waste Management:

Legislation: ●●●●●
 Infrastructure: ●●
 Collection Rate: 1%

E-waste POP Management:

Legislation: ●●●●●
 Infrastructure: ●●●●●
 Collection Rate: 0%

Legend: ● Advanced ● Transition ● Basic
 Each indicator is one circle.

National legislation on e-waste and POPs:

- Extended Producer Responsibility: ✗
- National e-waste standards: ✓ Decree No. 527, published in 2020
- National standards for POPs contained in e-waste: ⚙ In development
- E-waste collection target: ✗
- Legislation product coverage in UNU-KEYS: 0 of 54
- Legislation product coverage in weight (%) on total and per category⁽¹¹⁶⁾: Total: 0% of the e-waste generated in 2019



International Conventions:

	Signature	Ratification	Entry into force
Basel Convention [31]	22/03/1990	13/12/1991	05/05/1992
Rotterdam Convention [32]	16/02/1999	08/09/1999	24/02/2004
Stockholm Convention [33]	30/07/2001	27/05/2008	25/08/2008
Minamata Convention [34]	-	20/06/2017 (a)	

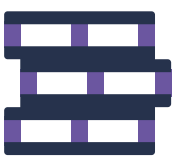

⁽¹¹⁵⁾ <https://www.un.org/Depts/Cartographic/english/htmain.htm>.

⁽¹¹⁶⁾ Percentage in weight of e-waste generated equipment covered by the national legislation illustrated per EU-6 collection category for 2019.



EEE Placed on Market (2019):	E-waste generated (2019):	E-waste formally collected (2019):
 <p>50 kt. 7.5 kg/inh.</p>	 <p>33 kt. 5.0 kg/inh.</p>	 <p>0.4 kt. 0.1 kg/inh.</p>

(Source: Ministry of Environment and Natural Resources from El Salvador / UNU / UNITAR)

Generated e-waste plastic:	Generated BFRs from e-waste:
 <p>10 kt. 1.5 kg/inh.</p>	 <p>1 kt. 0.1 kg/inh.</p>

(Source: UNDP / UNU / UNITAR)

Formal/environmentally sound e-waste management system in place:

- ✓ El Salvador has three e-waste operators. All three operators are authorized to carry out transportation and storage activities. However, only one of them has the corresponding permit to carry out disassembly [79].
- ✗ El Salvador doesn't have facilities that process/treat POPs from e-waste. However, there is one company in the cement industry in El Salvador that has a kiln with the capacity to co-process POPs.

National Legal Framework

The Republic of El Salvador (hereafter, El Salvador) does not have a specific legal and regulatory framework for e-waste, which currently falls under the general waste management that is in the process of being created by the Government.

The legal and regulatory framework of El Salvador regards hazardous waste management as composited, with some of the main instruments dating back to the end of the 1990s/early 2000s. Because of this, the government is in the process of updating existing instruments and enacting new tools, including the Law on Integral Management of Waste and Promotion of Recycling as well as the Special Regulation on Hazardous Wastes. The main relevant instruments around e-waste issues are:

- Law on the Environment, enacted by Law Decree No. 233 of March 2, 1998.
- Revision of the Legal Decree No. 233 'Law on the Environment', enacted by Legislative Decree No. 1.045 [79].
- General Regulation implementing the Law on the Environment of March 21, 2000 [80].
- Law on Integral Management of Waste and Promotion of Recycling, enacted by Decree No. 527 of February 20, 2020 [81].
- Special Regulation on Hazardous Substances, Residues and Wastes, enacted by Decree 41 of January 25, 2021⁽¹¹⁷⁾.

The Law on the Environment of 1998 adopts the definitions of residues and hazardous wastes envisaged by the Basel Convention. The Environment and Natural Resources Ministry (MARN) is responsible for classifying activities with environmental risk and for issuing permits for the entry, transit, distribution, and storage of hazardous substances, per the provisions in Article 57 of the Law on Environment of 1998.

The Special Regulations in the Field of Hazardous Substances, Residues, and Wastes of June 1, 2000, as amended in January 2021, are focused on introducing measures to minimise the risks of pollution by hazardous substances, residues, and wastes. Specifically, these regulations empower the MARN to: identify hazardous substances, residues, and wastes, and to publish lists of them; issue technical regulations in the field; authorize

the export of hazardous wastes; promote citizen participation in hazardous waste monitoring; and, in the productive sector, advocate the use of technologies or other alternatives to reduce the generation of hazardous wastes.

ESM of waste and circular economy concepts introduced the Law on Integral Management of Waste and Promotion of Recycling in 2020, which has also established the obligations of creating a dedicated Information System, SIGIR, for reporting and monitoring purposes.

On February 20, 2020, El Salvador approved the Law on Integral Management of Waste and Promotion of Recycling (Decree No. 527). The objective of this law is to promote the ESM and disposal of waste and the promotion of circular economy. These objectives will be achieved by reducing waste generation and by promoting repair, reuse, and recycling [82].

The MARN is also responsible for the preparation of the National Plan for Integral Waste Management. It is also responsible for the issuance of implementing regulations, technical standards, and other regulations related to waste management.

El Salvador does not have a specific regulatory framework for e-waste falling under the general waste management. El Salvador has adopted the National Plan for the Implementation of the Stockholm Convention.

The Law establishes obligations for waste operators (i.e. those who carry out their own or third-party waste management operations); waste generators (i.e. those producing waste resulting from their activities); and consumers, to incentivize the adoption of measures for waste minimisation. An Information System of the Integrated Waste Management is also being established ('Sistema de Información de la Gestión Integral de Residuos' - SIGIR).

The Law distinguishes between municipal waste, special handling waste, and hazardous waste to determine the treatment that will be given to each type of waste.

In its Decree No. 41, El Salvador adopted a Special Regulation on hazardous wastes in 2000.

With respect to hazardous waste, it has been established that the Special Regulation on Hazardous Substances, Residues and Waste, enacted by Decree No. 41 of 2000, applies.

As for POPS, El Salvador adopted the National Plan for the Implementation of the Stockholm Convention in 2012 [83].

El Salvador has also developed the general technical guidelines for the ESM of waste consisting of POPs.

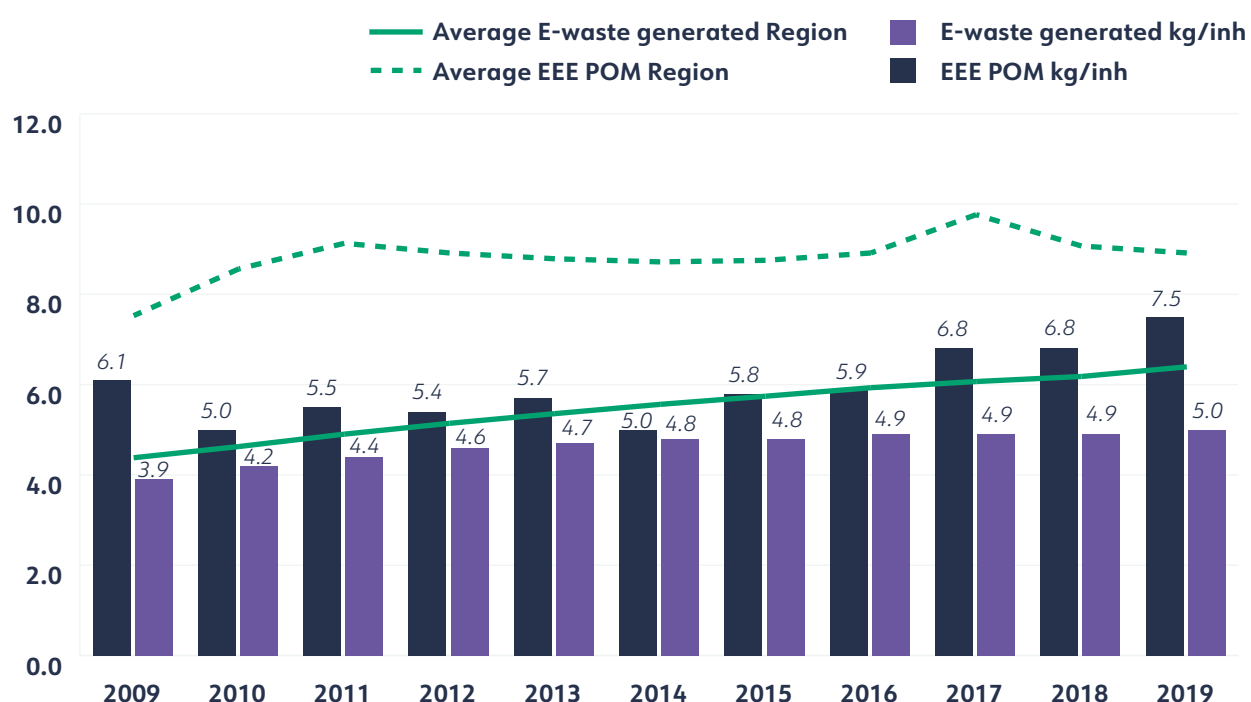
National Statistics on E-waste

Statistics on e-waste are not currently being compiled in El Salvador.

Prior to 2019, information on imports, exports, and national production of EEE was not carried out systematically in the country. However, official information is available at the national level in various Institutions. The three authorised e-waste managers are obliged to report to the Ministry of Environment regarding their operations. Import and export data is handled by the Ministry of Economy. Import and export permits of EEE generally only require approval from the General Directorate of Customs and in some specific cases from the National Energy Center. The Central Reserve Bank is the entity in charge of managing information on the volume of imports and exports in El Salvador.

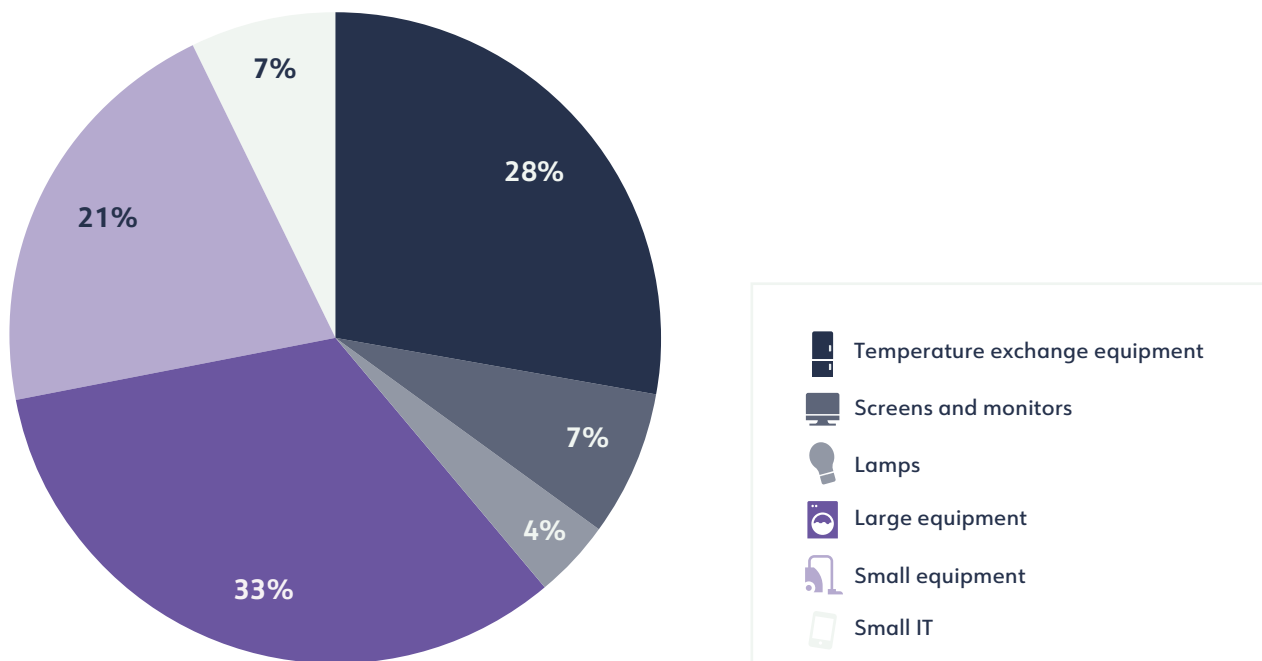
An analysis of information from 2009-2019 was undertaken and is illustrated in Figure 26-Figure 28. Figure 26 shows that EEE POM has fluctuated slightly over the past decade but has steadily increased, from 6.1 kg/inh (38 kt) in 2009 to 7.5 kg/inh (50 kt) in 2019. In comparing the EEE POM of El Salvador with other countries of the region, Figure 26 shows that El Salvador's EEE POM is below the average.

Figure 26. EEE POM and e-waste generated in El Salvador



Based on the data provided by MARN in 2019, El Salvador’s EEE POM was 50 kt (7.5 kg/inh). The majority of the amount of EEE POM included fridges, washing machines, and small equipment, such as microwaves. For the six categories of products placed on the market, large equipment (Cat. IV) with 2.5 kg/inh (equivalent to 16kt), temperature exchange equipment (Cat. I) with 2.1 kg/inh (equivalent to 14 kt), and small equipment (Cat. V) with 1.6 kg/inh (equivalent to 11 kt) registered, together, the highest share (82 percent of the mass) (Figure 27). The smallest share corresponded to lamps with 0.3 kg/inh.

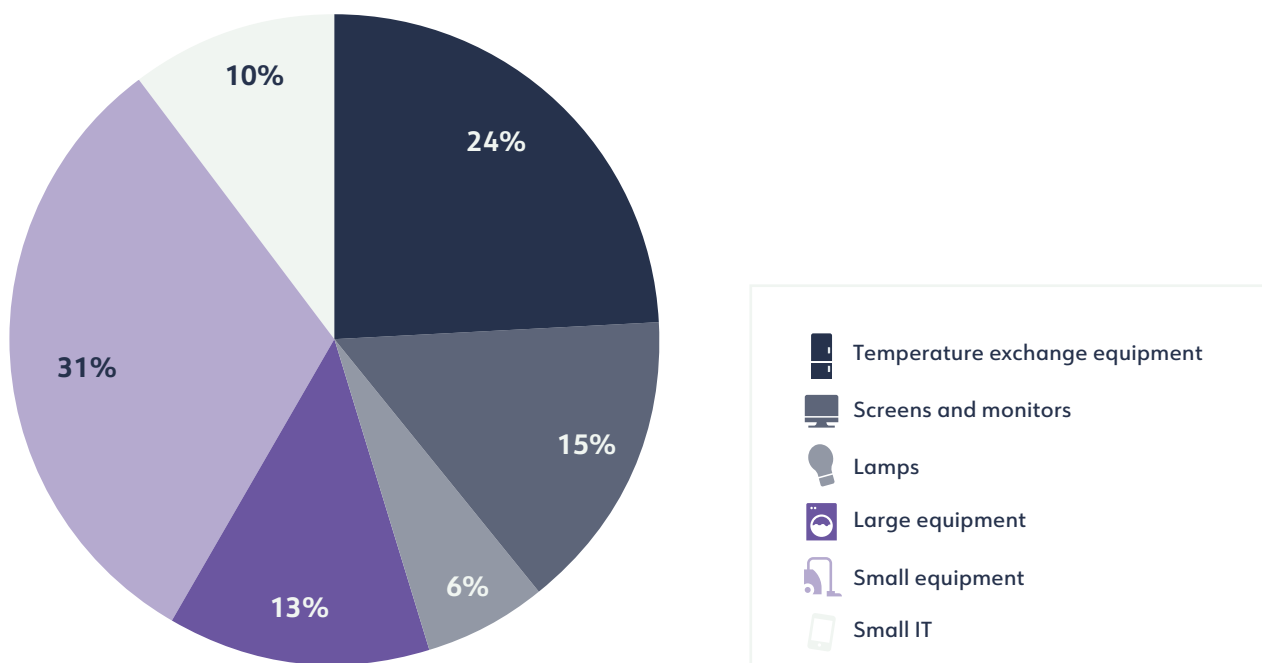
Figure 27. Share of the categories in the EEE (2019)



E-waste generated has increased from 3.9 kg/inh (24.2 kt) in 2009 to 5.0 kg/inh (33.3 kt) in 2019.

Figure 28 shows that e-waste generation in the EU-6 categories increases linearly over the years. For 2019, small equipment (Cat. V) had the highest share with 1.6 kg/inh (equivalent to 10.5 kt), followed by temperature exchange equipment (Cat. I) with 1.2 kg/inh (equivalent to 8.1 kt) and screens and monitors (Cat. II) with 0.7 kg/inh (equivalent to 5.0 kt). Together, these categories represent 71 percent of all e-waste generated.

Figure 28. Share of the categories in the e-waste generated (2019)



According to official reporting, the amount of e-waste environmentally soundly collected and recycled in El Salvador was equal to 0.44 kt (0.1 kg/inh) in 2019.

The statistic of POPs and non-POPs arising from e-waste were unknown as of this report's publication.

E-waste and POP Management System

El Salvador will create a national register of industry, commerce, and service activities that use hazardous substances.

According to the Law on Integral Management of Waste and Promotion of Recycling (Decree No.527), this database will be available for use by government institutions, such as the Ministry of Health, which can authorize and monitor these activities to ensure that chemicals and waste are properly managed and disposed of while also improving the surveillance and control systems for tasks that may pose environmental risks.

Specific responsibilities are borne by actors based on the Law on Integral Management of Waste and Promotion of Recycling of 2020 (Decree No.527). These obligations are:

- *For waste generators:* implement measures to reduce waste generation; classify and separate waste and deliver it to an authorised waste operator; implement the use of cleaner alternatives; etc.
- *For waste operators:* have authorisation from MARN to carry out waste management activities; have its Waste Management Manual approved; submit reports to MARN of its activities, etc.
- *For consumers:* carry out the primary separation from the source of the waste and deliver it to the municipal collector or the authorised operator in the manner established by each municipality.

MARN has drafted an information guide for citizens on hazardous waste management in general and two information guides on e-waste management in particular.

An Informative guide on the management of hazardous residues and household wastes, as well as one specifically dealing with the responsible management of e-waste [84], were issued in 2015 to present options for safe and responsible management through appropriate techniques such as recycling, treatment, and final disposal.

In 2015, the Ministry of Environment published the “Lineamientos Técnicos para el Adecuado Manejo de los Residuos de Aparatos Eléctricos y Electrónicos, RAEE” [85]. According to these technical guidelines, specific practices are to be adopted for the safe management of e-waste.

As a first step and based on Article 2 (section f) of the Environmental Law, prevention is a priority measure to be implemented before a substance, material, or product becomes waste. In the case of EEE, this means that all electronic equipment purchased should have manufacturing characteristics that make it as environmentally friendly as possible. To achieve this objective, the Environmental Unit of MARN has established environmental criteria for the procurement of supplies and governmental contracts [85].

Moreover, it established the management of cooling and freezing equipment, computer and telecommunications equipment, used batteries and accumulators, devices with monitors, and screens and lamps. Before disposing of refrigerators or air conditioners, MARN suggests the following:

- a. Refrigerant gas should be properly labelled to guarantee its proper transport and treatment.
- b. The owner of the equipment or the installer who wishes to dispose of refrigerant gas should not release it into the atmosphere but should recover it and seek the most appropriate alternative for final disposal. In El Salvador, three collection centres are collaborating with MARN that have specialised equipment for the recovery of the most ozone-depleting gases.

The Salvadorian Association of Air Conditioning and Refrigeration (ASAIRE) also has equipment provided by MARN to recover and reuse refrigerant.

- c. If consumers are upgrading to a newer model and their refrigerator or air conditioner is in good working order, they can donate it to an organisation, someone close to them, or a training centre accredited by the Salvadoran Institute of Vocational Training (INSAFORP).

Of computer and telecommunications equipment, MARN's guidelines advise:

- a. to reuse and refurbish;
- b. to recycle by authorised operators, allowing the recovery of materials that can be used in the manufacturing process of new equipment;
- c. to reduce: upgrade or lease a computer or any other telecommunication equipment instead of buying a new one;
- d. to donate the equipment to a social organisation, school, or any other person or entity that needs it;
- e. that if equipment cannot be repaired, it should not be thrown in the street or sold to scrap dealers or informal actors;
- f. that consumers may use collection campaigns to dispose of their unused/broken electronic equipment in stores, distribution shops, supermarkets or municipality points;
- g. that EEE should not be burned, as such items contain chemicals that can cause serious health problems;
- h. that e-waste and equipment parts should be handed over to persons or companies authorised by national authorities.

For devices with monitors and screens, the technical guidelines state:

- a. that computers and monitors can be repaired in authorised and specialised centres. Waste generated during equipment's repair should be sent to authorised WEEE operators;
- b. that used equipment that still works can be sold privately to second-hand shops; sold to consumers (advertisements in newspapers or magazines); or donated to relatives or friends;
- c. that if a MARN-authorized collection campaign is underway, damaged equipment should be handed over to authorised e-waste operators or disposed of;
- d. that broken/damaged monitors and screens need to be kept intact and packed in a way that minimizes the risk of breakage;
- e. that if the consumer has monitors and televisions with broken or shattered tubes, the shards of glass should be packed in a container.

El Salvador does not currently have a selective collection system for lamps, nor are there companies authorised to treat and dispose of used luminaires containing mercury and other heavy metals; as such, lamps and such luminaries cannot be disposed of in authorised landfills. MARN recommends that this type of equipment should be stored in roofed places and in deposits that guarantee that they will not be exposed to breakage or to release of polluting substances. For disposal, they should be handed over during authorised collection campaigns⁽¹¹⁸⁾.

According to MARN, 2.1 t of e-waste were collected in collection campaigns organised in 2020.

There are currently no statistics on how much electronic equipment is repaired or disposed of as mixed in with residual waste.

The e-waste generated resulting from the repair of the equipment that is generally disposed of is mixed in with residual waste. However, MARN recommends that if the repair company can't repair the equipment, it should be transported to the Judicial Body's Used Goods warehouse, where the equipment would await disposal.

El Salvador has three electronic waste managers. All three companies are authorized to carry out transportation and storage activities. However, only one of them has the corresponding permit to carry out disassembly.

El Salvador has 3 collection centres with specialised equipment for the recovery of most ozone-depleting gases located in the East, West, and Central areas. These centres collaborate closely with MARN for the proper extraction and recovery of ozone-depleting gases⁽¹¹⁸⁾.

It used to be common that wherever e-waste is generated (government institutions, businesses, or households), the municipal waste disposal service was used at some point to dispose of obsolete or damaged equipment, so it was common to find keyboards, cables, computer cases, and even monitors mixed in with residual waste. However, in recent years, this has changed, due to e-waste collection campaigns carried out by e-waste operators, mobile providers, etc. with the support of MARN and municipalities; these campaigns collect, transport, store, and separate e-waste throughout the year. During the e-waste collection campaigns, the temporary collection points function as mobile voluntary drop-off points (VMDPs) and are implemented according to the size and quantity they plan to collect in accessible locations to the population [86]. MARN states the following regarding reception and temporary storage during the e-waste collection campaigns:

- a. They should classify the e-waste by category or size to facilitate its subsequent transportation.
- b. They should temporarily deposit e-waste in mobile containers: grid or wooden boxes, facilitating their loading during transport to the storage point, according to the characteristics of the containers and the site conditions. The containers should be properly labelled.
- c. They should establish control mechanisms to prevent theft.
- d. E-waste deposited at the collection point should not be disassembled or mishandled.
- e. A contingency plan should be in place in case of emergency as established in the technical guidelines for the proper management of Waste Electrical and Electronic Equipment (WEEE).
- f. Storage in the VMDPs should not exceed 24 hours, counted from the opening time of the delivery point.
- g. There should be a registry of the e-waste collected/received during the collection campaigns, as well as the destination e-waste operator responsible for their management.

Voluntary collection points from e-waste operators should be authorised by MARN and, besides fulfilling the requirements previously described, should provide them with the following information:

- a. Operations manual, including a description of daily procedures, road safety measures, occupational safety measures, personal protective equipment (PPE) to be used, first aid kit, facility cleaning procedures, and vector and rodent control measures.
- b. Signage plan, both for roads and areas, to indicate the entry and exit of vehicles in accordance with the guidelines of the competent authority, emergency exits, location of fire extinguishers, areas of shelter in case of emergency, among others.
- c. Risk study and contingency plan on possible adverse situations that may arise during the operation of the activity, including measures to be taken in the event of an emergency.
- d. Registry of the e-waste collected/received, storage, and final disposal, if provided.
- e. Baseline survey of the project site including environmental baseline for heavy metals in soil. This should be provided as well when inspections are performed by MARN.

The Voluntary Delivery Points (VDPs) are monitored by MARN during the operation and closure stage (if applicable) and are focused on verifying the application of the technical guidelines and the adoption of corrective measures⁽¹¹⁹⁾.

El Salvador does not have e-waste treatment facilities. Exports for the treatment of e-waste require an environmental permit, per El Salvador's current regulations.

There are disassembly/dismantling plants involved in the recovery and extraction of plastics and metals (iron, copper, and aluminum), as well as precious metals. The extracted materials are commercialised in local companies and exported to countries and regions such as the United States, Mexico, and Asia, where they are further processed. The technical guidelines developed by MARN also defined the requirement for disassembly/dismantling plants. The facilities must ensure the integrated management and handling of the hazardous waste generated during the disassembly process of e-waste. Each plant must have a record of the quantities of e-waste sent for recycling and disposal (the balance of each disassembly plant must match that of each recipient). Furthermore, MARN requests that each stage of the disassembly process should have a safety plan in case of emergency. Emergency plans should be known and practiced by all company personnel. Moreover, the removal of personal information is required from certain types of e-waste (e.g. hard drives) before their disassembly. This removal is done by physical means (e.g. by drilling) or electronically (e.g. specialised data destruction software).

El Salvador does not have PCB or POP treatment facilities.

The final destination of e-waste plastics that have not been harnessed and which are suspected of containing hazardous material are typically disposed of in landfills, without proper treatment provided.

⁽¹¹⁹⁾ <https://cidoc.marn.gob.sv/documentos/guia-ciudadana-para-la-gestion-responsable-de-residuos-de-aparatos-electricos-y-electronicos-raee>.

Import & Export of E-waste and POPs Contained in E-waste

The country is Party to the relevant international and regional multilateral agreements on e-waste and POPs and is reviewing the existing legislation regarding imports and exports of hazardous substances.

El Salvador is a party to the Stockholm, Rotterdam, Basel (including the Ban Amendment), and Minamata conventions and is in the process of strengthening its national regulatory framework, updating banned substances, and prohibiting the use of equipment and materials containing mercury, while also improving waste management and preventing exposure to pollutants [87]. Article 59 of the Environment Act of 1998 prohibits the introduction of hazardous wastes into the national territory and also prohibits their transit, release, and storage.

The Special Regulation Relating to Hazardous Substances, Residues and Wastes of June 2000 allows for recovered waste to enter the country, but transporters must request an Environmental Permit before final disposition can be assured. The Environment Law prohibits the introduction, transit, release, and storage of hazardous wastes that cannot be recovered.

The Executive Agreement No. 151 of June 28, 2000 establishes the prohibition of registration, importing, exporting, manufacturing, marketing, and distribution of 23 chemicals listed in Annex III of the Rotterdam Convention. This is a limitation in case new POPs are considered hazardous and banned by the International Community: the legislation of public policies should allow for the prompt adaptation of the list of POPs.

Additionally, the Regional Agreement of Transboundary Movement of Hazardous Wastes, December 11, 1992⁽¹²⁰⁾ should also be considered. The objective of this regional agreement is to control the TBM of hazardous wastes and prevent the illegal traffic and disposal of such wastes in Central America. The Agreement bans imports of any type of hazardous wastes from outside of the Central American region. In addition to El Salvador, Parties to this Agreement include Costa Rica, Guatemala, Honduras, Nicaragua, and Panama.

No restrictions on the export of hazardous wastes and other wastes for final disposal or recovery are being imposed in El Salvador⁽¹²¹⁾.

An electronic tracking system of imports and exports of hazardous wastes is also being established.

El Salvador will also work to put in place an electronic platform that tracks the importation and exportation of hazardous waste; such a platform will assist authorities in identifying companies that are subject to surveillance and will help maintain the exchange of information between different national authorities involved in the authorisation, control, and monitoring of such waste's importation/exportation. This platform could be linked to other countries in Central America as a way of improving regional cooperation [87].

Based on the annual reports to the Basel Convention, in 2016, El Salvador exported a total of 3,978 t of lead-acid batteries to Dem. People's Rep. of Korea (3440 t) and Costa Rica (538 t) for their recycling/reclamation of metals and metal compounds⁽¹²⁰⁾. Since 2016, El Salvador hasn't provided further annual reports to the Basel Convention.

⁽¹²⁰⁾ https://www.sica.int/busqueda/busqueda_archivo.aspx?Archivo=leys_6811_1_27032006.pdf.

⁽¹²¹⁾ <http://www.basel.int/Countries/ImportExportRestrictions/tabid/4835/Default.aspx>.





Stakeholder Mapping

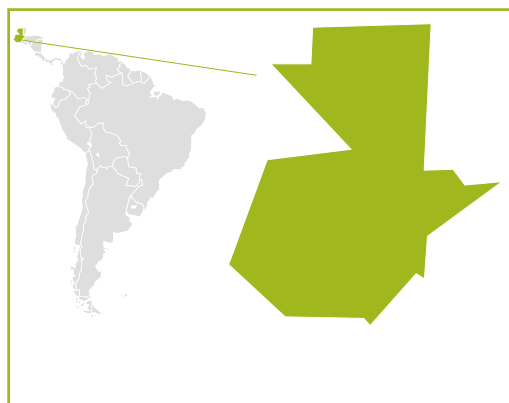
In El Salvador, the stakeholders involved in the waste sector (that could be identified) and their roles are described below:

Stakeholder	Responsibility
Ministry of Environment and Natural Resources (MARN) Website	The Ministry of the Environment and Natural Resources of El Salvador fulfils its mandate as the leader of national environmental management and is a cohesive and respected institution that promotes the culture to recover the environment and reduce socio-environmental risks. Furthermore, they are in charge of the management and supervision of e-waste in El Salvador.
General-Directorate for Statistics and Census (DIGESTYC) Website	The General-Directorate for Statistics and Census (DIGESTYC) is a state institution of El Salvador, in charge of the elaboration of statistical studies.
Ministry of Finance (Ministerio de Hacienda) Website	he Ministry of Finance supervises the different customs offices in El Salvador.
Chamber of Commerce and Industry Website	The mission of the Chamber of Commerce and Industry is to permanently promote and defend the free initiative system, fostering national unity and business development with social responsibility, leading actions and facilitating services that promote competition and innovation of our members, protecting their rights. They have records of all industry registration and production.
Almacenamiento todo Verde Website	The company authorised to provide storage of all types of electronic equipment, lead-acid batteries, mercury, computers, accessories, and electrical waste with heavy materials.
Zartex SA De CV Website	The company authorised to provides collection, storage, and dismantling of e-waste.
Autoconsa, S.A. de C.V. Website	The company authorised to provide collection and transportation of e-waste.
INTCOMEX Website	Wholesale importer of electrical and electronic equipment.
5ND PRODUCTOS ELECTRONICOS S.A. Website	Wholesale importer of electrical and electronic equipment.
Tecno Avance S.A. de C.V Website	Wholesale importer of electrical and electronic equipment.
Tigo El Salvador Website	Mobile phone operator in El Salvador.
Digicel El Salvador Website	Mobile phone operator in El Salvador.

Country:

Guatemala

-  17.6 million inhabitants [28]
-  108,889 km²
-  **Borders:** Mexico, Belize, Honduras, El Salvador, Pacific Ocean
-  **GDP per capita PPP:** \$17,677 USD [29]
-  **Average household size:** 4.8 members [30]



Map source: United Nations Geospatial Information Section⁽¹²²⁾

E-waste Management:

Legislation: ●●●●●
 Infrastructure: ●●
 Collection Rate: 0%

E-waste POP Management:

Legislation: ●●●●●
 Infrastructure: ●●●●●
 Collection Rate: 0%

Legend: ● Advanced ● Transition ● Basic
 Each indicator is one circle.

National legislation on e-waste and POPs:

- Extended Producer Responsibility: ✕
- National e-waste standards: ✕
- National standards for POPs contained in e-waste: ✕
- E-waste collection target: ✕
- Legislation product coverage in UNU-KEYS: 0 of 54
- Legislation product coverage in weight (%) on total and per category⁽¹²³⁾: Total: 0% of the e-waste generated in 2019



International Conventions:

	Signature	Ratification	Entry into force
Basel Convention [31]	22/03/1989	15/05/1995	13/08/1995
Rotterdam Convention [32]	-	19/04/2010 (a)	18/07/2010
Stockholm Convention [33]	14/01/2007	22/04/2008	02/01/2009
Minamata Convention [34]	10/10/2013	-	



⁽¹²²⁾ <https://www.un.org/Depts/Cartographic/english/htmain.htm>.

⁽¹²³⁾ Percentage in weight of e-waste generated equipment covered by the national legislation illustrated per EU-6 collection category for 2019.



EEE Placed on Market (2019):	E-waste generated (2019):	E-waste formally collected (2019):
 <p>83 kt. 4.7 kg/inh.</p>	 <p>51kt. 2.9 kg/inh.</p>	 <p>Information not available.⁽¹²⁴⁾</p>

(Source: Ministry of Environment and Natural Resources / UNU / UNITAR)

Generated e-waste plastic:	Generated BFRs from e-waste:
 <p>16 kt. 0.9 kg/inh.</p>	 <p>1.4 kt. 0.1 kg/inh.</p>

(Source: UNDP / UNU / UNITAR)

Formal/environmentally sound e-waste management system in place:

- ✓ There are 2 e-waste managers operating in Guatemala that carry out activities ranging from collection, disassembly and processing of electronic waste.
- ✗ Guatemala does not have facilities that process/treat POPs arising from e-waste.

⁽¹²⁴⁾ At the moment of writing the report the information was not available.

National Legal Framework

The Republic of Guatemala (hereafter, Guatemala) does not have specific e-waste legislation, which falls under the general waste management legal and regulatory framework.

The Republic of Guatemala (hereafter, Guatemala) does not have any e-waste-specific legislation. E-waste is regulated within the general waste management legal and regulatory framework, which encompasses the following main instruments:

- Decree No. 68 of 1986 'Law on the Protection and Improvement of the Environment' [88].
- Government Agreement No. 341 'National Policy for Environmentally Rational Management of Chemical Products and Hazardous Waste,' of 2013 [89].
- Government Agreement No. 281 of December 15, 2015 'National Policy of the Comprehensive Management of Solid Waste' [90].
- Government Agreement No. 137 of July 11, 2016 'Regulation for Environmental Evaluation Control and Monitoring' [91].

The Law on the Protection and Improvement of the Environment includes only one specific article (Article 7) regarding hazardous wastes (prohibiting relevant importation into the country). Wastes and chemicals are regulated by Government Agreement 281 and 341, respectively.

Waste-related matters are included in the Environmental Impact Assessment conducted for each activity. Waste management and disposal is generally regulated locally by the municipalities. According to the Municipal Code (Decree 12-2002), each municipality is in charge of formulating and coordinating policies, plans, and programmes regarding waste collection, treatment, and disposal. Some specific types of waste are subject to special regulation.

The Ministry of Environment and Natural Resources (MARN) issues 19 different types of environmental permits related to the following general categories:

- Projects, works, industries, or activities (approved environmental instruments).
- Import or export of products, substances, and raw materials.
- Import of refrigeration and air conditioning equipment.

- Controlled final disposal.
- Environmental consultants (for individuals or companies) [92].

MARN has a Coordinating Unit, established by Ministerial Agreement 240-2007, for the management of chemical products and hazardous waste.

In 2009, Guatemala has adopted a National Implementation Plan on Persistent Organic Pollutants (NIP-POPs).

The National Implementation Plan on Persistent Organic Pollutants (NIP-POPs) provide the guidelines on the management of POPs for 9 substances: alpha hexachlorocyclohexane, beta hexachlorocyclohexane, chlordecone, hexabromobiphenyl, lindane, pentabromodiphenyl ether, octabromodiphenyl ether, pentachlorobenzene, and perfluorooctane sulfonate [93].

In recent years, various municipalities have begun to enact regulations prohibiting the use and distribution of single-use plastics and polystyrene in their territorial jurisdictions. The central government extended this prohibition to the entire country through Government Accord 189-2019, granting a period of two years to substitute all such products for those using compostable materials, in accordance with EU norm UNE-EN 13432. However, there are plans to repeal this regulation, so it is not known whether the obligation will in fact become effective after the two-year period.

Guatemala does not have an EPR system regarding e-waste in place.

There is no national EPR system relating to e-waste, and waste management is regulated at the local level by each of Guatemala's 340 municipalities.

No specific e-waste management standards are in place in Guatemala.

As part of the response to the pandemic, Guatemala has also developed COVID-19 guidelines and protocols for waste management and hospital wastes.

In 2013, Guatemala enacted the National Policy for the Environmentally Sound Management of Hazardous Chemicals and Waste.

The National Policy for the Environmentally Sound Management of Hazardous Chemicals and Waste was

enacted by Government Agreement No. 341-2013⁽¹²⁵⁾. It regulates chemical hazardous wastes' life cycle. In 2018, Guatemala published Decree No. 194-2018, which focuses on the management of PCBs contained in dielectric oil, transformers, capacitors, capacitors, and containers, among others [94]. As a result, nine guidelines regarding PCB management were developed.

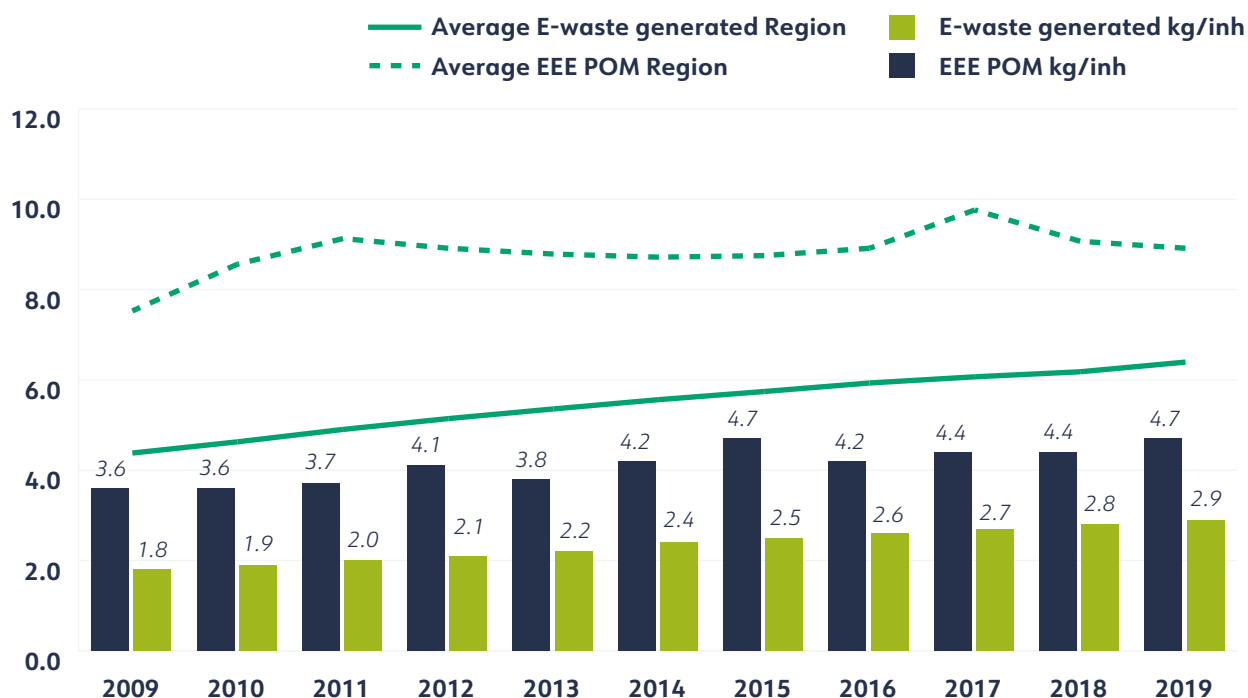
National Statistics on E-waste

Statistics on e-waste are not currently being compiled in Guatemala.

Before 2021, information on imports and exports of EEE was not carried out systematically in Guatemala. Nonetheless, official information is available at a national level in the Ministry of Commerce, Ministry of Environment and Natural Resources (MARN), and The Superintendency of Tax Administration (SAT). Guatemalan statistics don't differentiate between new and used equipment being imported and exported. Guatemala also does not have an electronic manufacturing industry, but it does have companies that assemble and repair equipment. The analysis of information from 2000-2020 was undertaken using the information provided by the Ministry of Economy, which is illustrated in Figure 29-Figure 31.

Guatemala does not have specific e-waste legislation nor e-waste management standards in place. E-waste is regulated within the general waste management legal and regulatory framework. Guatemala has adopted a National Implementation Plan on Persistent Organic Pollutants.

Figure 29. EEE POM and e-waste generated in Guatemala

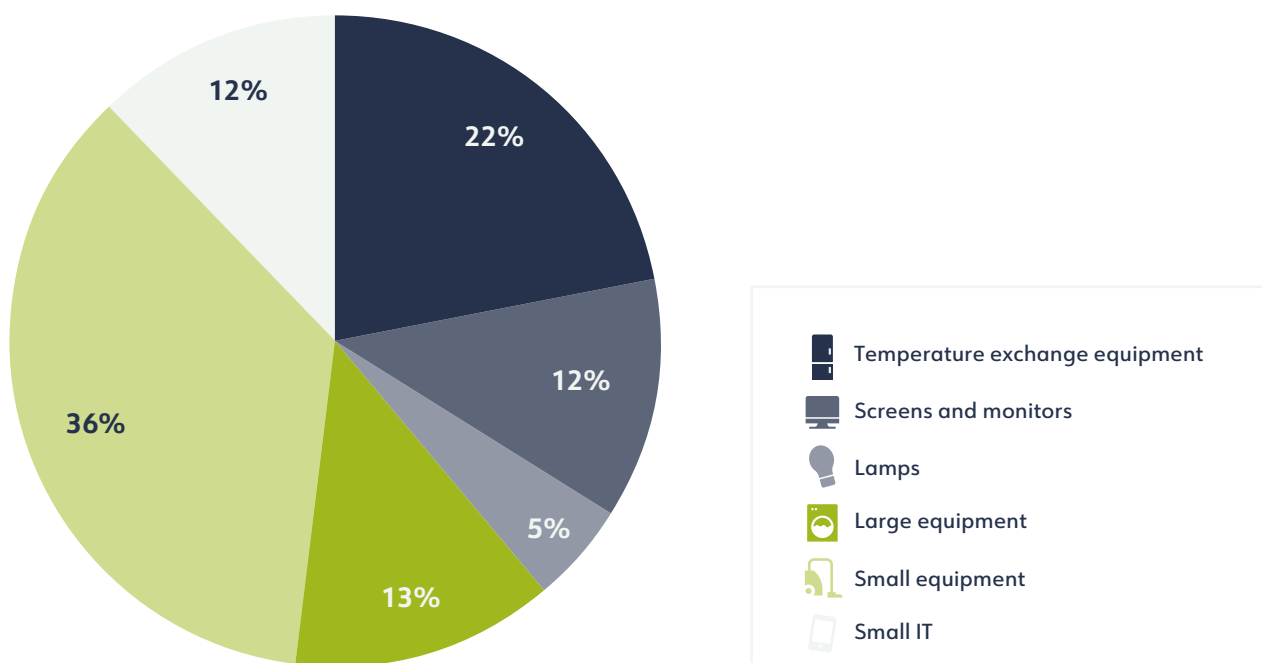


⁽¹²⁵⁾ <http://www.sia.marn.gob.gt/publicaciones/Politic%C3%ADtica%20Nacional%20de%20Productos%20Qu%C3%ADmicos.pdf>.

EEE POM has fluctuated slightly over the past decade, but has steadily increased, from 3.6 kg/inh (51 kt) in 2009 to 4.7 kg/inh (83.3 kt) in 2019. The e-waste generated has also increased steadily in recent years, from 1.8 to 2.9 kg/inh.

In comparing the EEE POM and e-waste generated of Guatemala with other countries of the region, Figure 29 shows that Guatemala is below the average. The amount of EEE POM in Guatemala did not fluctuate much over the years, ranging from a minimum of 3.6 kg/inh (51 kt) in 2009 to a maximum of 4.7 kg/inh in 2015, slightly decreasing in 2016 with 4.2 kg/inh, and increasing in the subsequent years to 4.7 kg/inh in 2019.

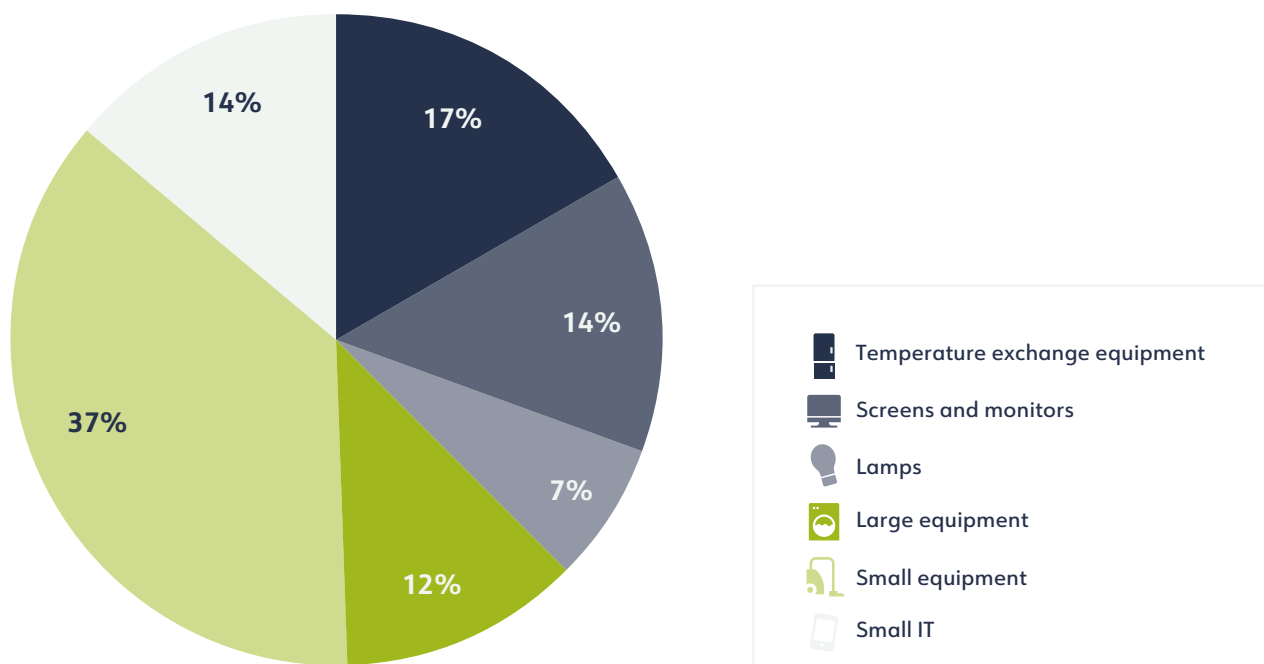
Figure 30. Share of categories in EEE POM (2019)



The largest shares observed for 2019 are small equipment (Cat. V) with 1.7 kg/inh (30.1 kt) and temperature exchange equipment (Cat. I) with 1.0 kg/inh (18.3kt), equivalent to 36 percent and 22 percent of the total EEE POM. The smallest shares are for lamps (Cat. III) and screens (Cat. II), equal to 0.2 kg/inh (4.0 kt), or 5 percent, and 0.6 kg/inh (10.1 kt), or 12 percent, respectively (Figure 30). The share of the EU-6 categories has been calculated over the total mass.

Guatemala is an importer of EEE. Based on the data provided by MARN, Guatemala exported 9.7 kt (0.55 kg/inh) of EEE and imported 87.9 kt (4.99 kg/inh) of EEE in 2019. The majority of equipment exported included ovens, freezers, and fridges. The majority of imported equipment corresponded to fridges, washing machines, televisions, and small household equipment.

Figure 31. Share of categories in e-waste generated (2019)



Analysis of the time series of e-waste generation in the EU-6 categories for 2019 shows that the highest shares were for small equipment (Cat. V) with 1.7 kg/inh (37 percent) and temperature exchange equipment (Cat. I) with 1.0 kg/inh (17 percent), whereas the smallest is for lamps (Cat. III) with 0.2 kg/inh (7 percent) (Figure 31).

As of this report's publication, the Ministry of Environment and Natural Resources of Guatemala was assessing and quantifying the ESM of e-waste collection.

The statistic of POPs and non-POPs arising from e-waste as of this report's publication were unknown.

E-waste and POP Management System

Guatemala does not have a strong formal e-waste management system in place, and landfilling is the most common practice.

The process of waste management and disposal is carried out by each municipality, either directly or indirectly. When done indirectly, operators require a municipal permit to transport waste, which will be granted only if they meet certain criteria, mostly related to the type and characteristics of the vehicles to be used and the location and procedures for carrying the waste to landfills – which are administered and operated by the municipality.

Guatemala does not have an official e-waste classification.

Guatemala does not currently have an official e-waste classification in their legislation. However, as a result of the PREAL project activities, the country is currently examining, and in talks of developing and aligning, the implementation of a regional e-waste classification.

Guatemala has a strong repair culture, and there are several repair shops in the country, especially for household equipment.

Some e-waste operators in Guatemala provide customers with reverse logistical solutions and refurbishing services and also place second-hand equipment for sale.

Most e-waste is managed by the informal sector or ends up in landfills.

As of this report's publication, the Ministry of Environment and Natural Resources of Guatemala identified two e-waste operators that collect, dismantle, store, and export e-waste for treatment [95]. Surveys conducted by MARN found that most e-waste is either stored at home or given to informal scrap dealers. Remaining e-waste is likely to be managed informally, undergoing substandard treatments to recover valuable materials without proper reclamation of the hazardous substances.

The informal sector in Guatemala is very active in the collection of used and waste electrical and electronic equipment, both for resale purposes and for extracting valuable materials.

Informal sector actors are involved in the collection of used, functional electronic equipment for resale and in the collection of nonfunctioning equipment for the extraction of ferrous and non-ferrous metals. Most valuable materials (e.g. precious, ferrous, and non-ferrous metals), as well as components and assemblies suitable for reuse as spare parts, are extracted from medium and large sized e-waste, whereas the remaining parts, including hazardous substances, usually end up in landfills.

To date, information concerning the quantity of e-waste informally collected and recycled is unknown.

Guatemala doesn't have PCB or POP treatment facilities. e-waste plastic is landfilled. Brominated and non-brominated e-waste plastic are not currently being separated.

E-waste plastics that have not been harnessed and that are suspected to have capacitors or hazardous material are typically disposed of in landfills; no proper treatment is provided.

Import & Export of E-waste and POPs Contained in E-waste

Ministerial Agreement 413-2006 specifies the requirements Applicable to the Import, Marketing, Use, and Export of Ozone Depleting Substances and Import of Equipment and Articles containing Chlorofluorocarbons [96].

Guatemala is Party to the Basel, Rotterdam, and Stockholm Conventions. It has signed the Minamata Convention, but the ratification process has not yet been completed.

Guatemala ratified the Basel Convention in 1995 and is also Party to the Rotterdam and Stockholm Conventions. Guatemala signed the Minamata Convention in 2013, but the ratification has not yet been completed.

The country prohibits imports of hazardous wastes, including chemicals mixtures and asbestos.

According to Decree No. 68 of 1986 'Law on the Protection and Improvement of the Environment' (Article 7), imports of household or municipal wastes and their by-products, as well as industrial processes' toxic wastes that contain hazardous substances (including mixtures or chemical compounds, heavy metal residues, and residues of radioactive materials) are prohibited⁽¹²⁶⁾. In 1997, Guatemala enacted the Law Prohibiting Import and Regulating the Use of Chlorofluorocarbons (CFCs) with Decree No.110-97 [97], which banned all imports of CFCs by 2015.

According to Regulation 137-2016⁽¹²⁷⁾, asbestos cannot be imported or exported without a permit issued by MARN. MARN has issued guidelines for the handling and disposal of asbestos through the Department of Chemical Products and Hazardous Waste; the guidelines give general information about asbestos and its effects, as well as recommendations for identifying asbestos-containing materials in construction and other areas as well as rules for its final disposal.

Guatemala does not impose any restriction on exports of hazardous wastes or other wastes for final disposal, nor does the country impose restrictions on recovery of such waste⁽¹²⁶⁾.

⁽¹²⁶⁾ <http://www.basel.int/Countries/ImportExportRestrictions/tabid/4835/Default.aspx>.

⁽¹²⁷⁾ http://ers.basel.int/Yvonne_KendoApp2/downloadFile.aspx?fileid=%203181.

Based on annual reports to the Basel Convention, Guatemala exported 17.6 t of used lead-acid batteries for their recycling/reclamation of metals and metal compounds to Japan in 2018⁽¹²⁷⁾.

Stakeholder Mapping






In Guatemala, the stakeholders involved in the waste sector (that could be identified) and their roles are described below:

Stakeholder	Responsibility
Ministry of Environment and Natural Resources (MARN) Website	MARN is the entity of the public sector specialising in environmental and natural goods and services of the Public Sector, and is responsible for protecting natural systems in Guatemala that preserve and rationally use natural resources. This Ministry is responsible for monitoring the proper management and disposal of e-waste.
E-waste de Guatemala (recycler) Website	A Guatemalan non-profit association dedicated to the management of e-waste. One of its main objectives is to administer outreach and education programmes, as well as to implement campaigns for the collection and sorting of e-waste.
RECELCA (collector) Website	Service provider of reverse logistics that works with collection and provides data security using international standards (5220.22M) for the deletion and destruction of information, refurbishment, and recovery of products sold both nationally and internationally.
SCRAPEX (recycler) Website	Waste exporting company and service provider that processes, shreds, and recycles electronics, PCBs, plastics (ABS/PS), rechargeable batteries, and metallic and other materials. Furthermore, they provide composition analysis by x-ray fluorescence. Compositional analysis of plastic polymers by near infrared spectroscopy. Soil analysis, mine mapping.
REPELSA (recycling) Website	The company provides environmental and customisable services for the operational management of hazardous and non-hazardous solid waste. REPELSA also provides complete services for the export of waste that complies with the Basel Convention, as well as treatment of fluorescent lamps through the crushing and encapsulation of mercury gas and phosphorous vapour. They also provide treatment and disposal of industrial waste, dismantling of asbestos-containing structures, evaluation of contaminated sites, and sampling of hazardous materials.
RECUPERA (collector, repairer)	Guatemalan company that, through environmental innovation, generates value to environmental programs that promote sustainable development.
Ministry of Education (MINEDUC) Website	The Ministry of Education is focused on educating citizens with the necessary knowledge for achieving their integral development, with principles, values, and convictions that underpin their conduct.
Ministry of Public Health and Social Assistance (MSPAS) Website	The Ministry of Public Health and Social Assistance of the Republic of Guatemala (MSPAS) is responsible for formulating the policies and enforcing the legal regime related to preventive and curative health, as well as to protecting, promoting, recovering, and rehabilitating the physical and mental health of the country's inhabitants and the environment's preservation.

⁽¹²⁷⁾ http://ers.basel.int/Yvonne_KendoApp2/downloadFile.aspx?fileid=%203181.

Country:

Honduras

-  9.7 million inhabitants [28]
-  112,492 km²
-  **Borders:** Caribbean Sea, Nicaragua, El Salvador, Guatemala
-  **GDP per capita PPP:** \$5,981 USD [29]
-  **Average household size:** 3.9 members [30]



Map source: United Nations Geospatial Information Section⁽¹²⁸⁾

E-waste Management:



Legislation: ●●●●●
 Infrastructure: ●●
 Collection Rate: 1%

E-waste POP Management:

Legislation: ●●●●●
 Infrastructure: ●●●●●
 Collection Rate: 0%

Legend: ● Advanced ● Transition ● Basic
 Each indicator is one circle.

National legislation on e-waste and POPs:

- Extended Producer Responsibility:  In development
- National e-waste standards:  Implemented voluntarily
- National standards for POPs contained in e-waste:  In development
- E-waste collection target: 
- Legislation product coverage in UNU-KEYs: 0 of 54
- Legislation product coverage in weight (%) on total and per category⁽¹²⁹⁾: Total: 0% of the e-waste generated in 2019



International Conventions:

	Signature	Ratification	Entry into force
Basel Convention [31]	-	27/12/1995 (a)	26/03/1996
Rotterdam Convention [32]	-	26/09/2011 (a)	25/12/2011
Stockholm Convention [33]	17/05/2002	23/05/2005	21/08/2005
Minamata Convention [34]	24/09/2014	22/03/2017	

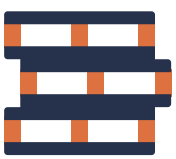

⁽¹²⁸⁾ <https://www.un.org/Depts/Cartographic/english/htmain.htm>.

⁽¹²⁹⁾ Percentage in weight of e-waste generated equipment covered by the national legislation illustrated per EU-6 collection category for 2019.



EEE Placed on Market (2019):	E-waste generated (2019):	E-waste formally collected (2019):
 <p>28 kt. 2.9 kg/inh.</p>	 <p>25 kt. 2.6 kg/inh.</p>	 <p>0.1 kt. 0.1 kg/inh.</p>

(Source: Secretariat of Natural Resources and Environment / UNU / UNITAR)

Generated e-waste plastic:	Generated BFRs from e-waste:
 <p>7.7 kt. 0.8 kg/inh.</p>	 <p>1 kt. 0.6 kg/inh.</p>

(Source: UNDP / UNU / UNITAR)

Formal/environmentally sound e-waste management system in place:

- ✓ 7 e-waste operators licenced to store and treat e-waste.
- ✗ Honduras has cement kilns that are being adapted to eliminate certain POPs (PBDE, PCBs).

National Legal Framework

The Republic of Honduras (hereafter, Honduras) does not have a specific national e-waste legislation.

The management of e-waste falls under the general legal and regulatory framework related to hazardous waste management. The general legal and regulatory framework applying to waste management issues also regulates e-waste. The following are the main, relevant legal tools:

- Decree No. 131 of January 11, 1982 'Constitution of the Republic of Honduras'⁽¹³⁰⁾.
- Decree No.65, 1991 'Compilation about chemical substances regulations'⁽¹³¹⁾.
- Decree 104-93 of June 8, 1993 'The General Law on the Environment' [98].
- Act No. 32/2009 Environmental Protection and Management [99].
- Agreement Number 189-2009 'Table of Environmental Categorization'⁽¹³²⁾.
- Executive Agreement No. 1567-2010 'Regulation on Solid Waste Management'⁽¹³³⁾.
- Governmental Regulation Number 101-2014 on Hazardous Waste Management⁽¹³⁴⁾.
- Ministerial Agreement No. 0740-2019 approving 'Environmental Categorization Table'⁽¹³⁵⁾.
- Regulation for the environmentally sound management of mercury and mercury-containing products, including luminaires, and other waste, published on the 25th of June 2021 [100].

The protection of the environment is enshrined in Art. 45 of the Constitution of Honduras, establishing that 'The state will conserve the environment appropriate to protect the individual's health'. The State has the responsibility for the implementation of all guidelines to ensure correct conservation of the environment [101].

The General Law of the Environment (Decree 104-93) has established the National Environmental Impact Assessment Evaluation System (SINEIA) for the environmental assessment and control of all new human activities or operations that may potentially have a harmful impact on the environment [102].

In 2009, the Regulation of the National Environmental Impact Assessment System introduced the following principles: prevention, precaution, environmental

responsibility, proportionality, and audit-based certifications [103]. It also introduces four categories related to three environmental impacts: low environmental impact, moderate environmental impact, and high environmental impact.

In general, the existing legal framework appears to have some inconsistencies with international treaties and conventions ratified by Honduras⁽¹³⁶⁾.

Honduras has a national waste list, applying the international Harmonized System Code, with four categories of hazardous wastes.

The Government Regulation (GR) No. 101/2014 (as amended in 2019) regarding Hazardous Waste Management, Annex I includes the list of hazardous waste as follows:

- Table 1: List of hazardous waste from non-specific sources.
- Table 2: List of hazardous waste from expired chemicals, spilled chemicals, off-specific action products, and used chemical or toxic material packaging.
- Table 3: List of hazardous waste from particular specific sources.
- Table 4: List of hazardous waste from general specific sources.

⁽¹³⁰⁾ https://www.oas.org/dil/esp/Constitucion_de_Honduras.pdf.

⁽¹³¹⁾ <http://www.basel.int/Portals/4/download.aspx?d=UNEP-CHW-NAT-LEG-NOTIF-Honduras02-DECREE65.91.Spanish.pdf>.

⁽¹³²⁾ <https://www.libroscentroamericanos.com/pages/books/CA43555/statutes-honduras-laws-etc/reglamento-del-sistema-nacional-de-evaluacion-e-impacto-ambiental-acuerdo-no-189-2009-publicado>.

⁽¹³³⁾ <http://extwprlegs1.fao.org/docs/pdf/hon107527.pdf>.

⁽¹³⁵⁾ https://www.tsc.gob.hn/web/leyes/Acuerdo_0740-2019.pdf.

⁽¹³⁶⁾ <https://www.cepal.org/es/publicaciones/47248-plan-desarrollo-integral-salvador-guatemala-honduras-sur-sureste-mexico-sintesis>.

Honduras has adopted the National Action Plan on PCBs and has established the National Commission for the Environmentally Sound Management of Chemical Products.

The 'Policy for the Environmentally Sound Management of Chemical Products in Honduras' was adopted with Executive Decree PCM-029-2013 [104].

Also, the Regulation for the Environmentally Sound Management of Hazardous Chemical Substances in Honduras regulates the integrated management of all hazardous chemical substance and residue in the national territory [107].

The Ministerial Agreement for 'Environmentally Sound Management of Equipment and Waste that contain or are contaminated with Polychlorinated Biphenyls' establishes the procedures, measures, terms, and responsibilities of the ESM of equipment and waste that consist of, contain, or are contaminated with PCBs in order to prevent contamination and protect the environment.

Honduras has established the 'National Commission for the Environmentally Sound Management of Chemical Products' as an intersectoral mechanism for coordination, consultation, and socialisation between the sectors involved with the issue, as well as the instance that recommends resolutions, opinions, action plans, etc. that must be approved through decision-makers at the policy level in order to succeed on this matter. The Commission was approved through Executive Decree PCM - 035 - 2013 [104].

No EHS standards for e-waste management or POPs exist in Honduras.

Adequate environmental standards for ensuring adequate environmental protection and oversight are lacking in Honduras. Environmental standards currently in place cover only a few environmental areas (such as wastewater discharges into sewerage systems and gas emissions), and additional environmental standards are required for hazardous waste management and POPs⁽¹³⁷⁾.

Honduras does not have a specific national e-waste legislation. In addition, no EHS standards for e-waste management or POPs exist in Honduras.

Honduras has adopted the National Action Plan on PCBs and has established the National Commission for the Environmentally Sound Management of Chemical Products.

⁽¹³⁷⁾ <https://www.cepal.org/es/publicaciones/47248-plan-desarrollo-integral-salvador-guatemala-honduras-sur-sureste-mexico-sintesis>.

National Statistics on E-waste

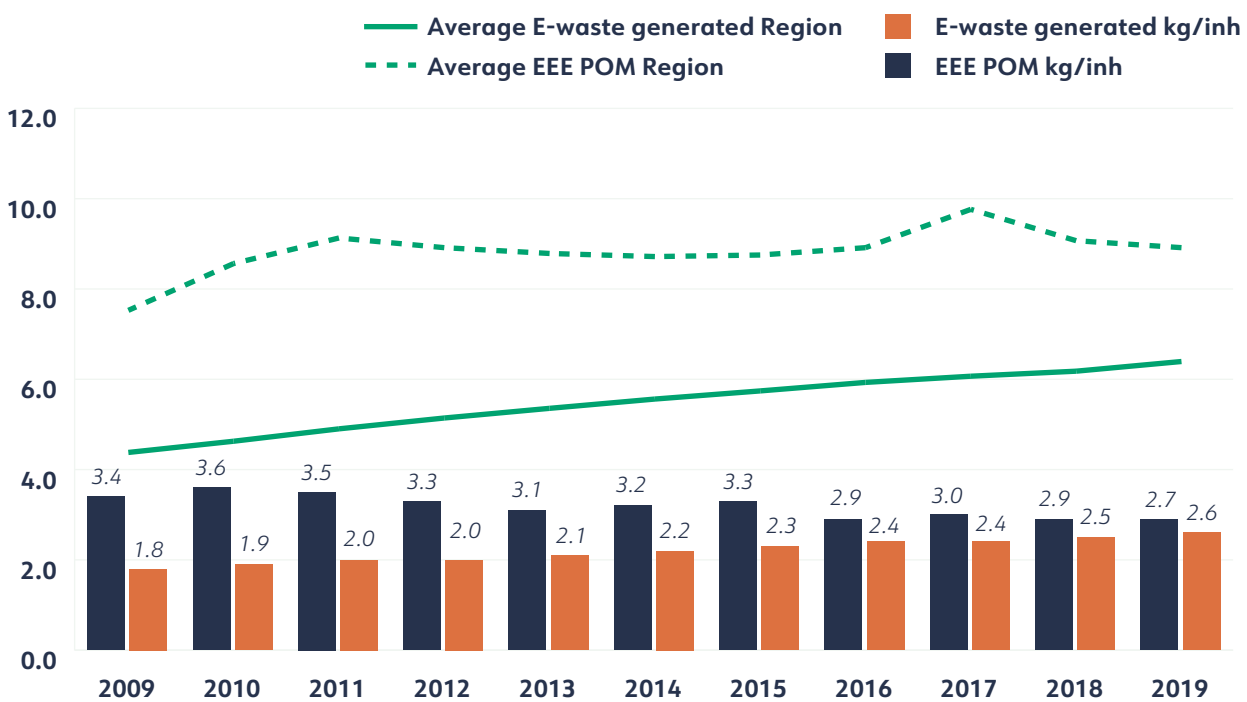
Official e-waste statistics are currently not being compiled at the national level in Honduras.

Honduras has redeveloped two main publications related to e-waste management and statistics. In 2014, the study ‘Estimation of the Generation of Waste Electrical and Electronic Equipment (WEEE) in Honduras’ was published, and in 2019 the ‘Environmentally Sound Management of Waste Electrical and Electronic Equipment (WEEE) in Honduras’ report was produced. Both reports were developed by the Centre for Contaminant Studies and Control (CESCCO), working under the Secretariat of Natural Resources and Environment (SERNA - MIAMBIENTE+) and the Department of Chemical Engineering of the National Autonomous University of Honduras.

Both publications used the e-waste statistic harmonised framework methodology defined in UNU’s E-waste Statistic Guidelines, where EEE POM and e-waste generated for EU6 collection Category 5 and Category 6 were estimated for 2012. The import and export data used for the estimation was provided by the Executive Directorate of Revenue (DEI).

Though these studies were developed and provide an overview of e-waste management and statistics, Honduras is currently in the initial stages of developing an e-waste infrastructure and EPR system. As such, the authorities still have to implement a regular data accounting process. In the framework of the PREAL project, CESCCO is currently beginning to harmonise and record EEE producers and products as an initial step in the process of implementing an EPR system. Given that information on imports and exports was not available in preparing this report, UNU/UNITAR internal data has been used to estimate Honduras’s main indicators. Figure 32 shows that both POM and e-waste generated are below the region’s average.

Figure 32. EEE POM and e-waste generated in Honduras



The amount of EEE placed on the market in Honduras decreased from 3.4 kg/inh in 2009 to 2.9 kg/inh in 2019.

As illustrated in Figure 32, the EEE placed on the market decreased mildly, from 3.4 kg/inh (27 kt) in 2009 to 3.3 kg/inh in 2015, and subsequently decreased further, to 2.9 kg/inh (28 kt) in 2019. There is a positive correlation between EEE POM in kg/inh and the purchasing power parity (PPP) per inhabitant, indicating that the EEE POM increases when the PPP increases.

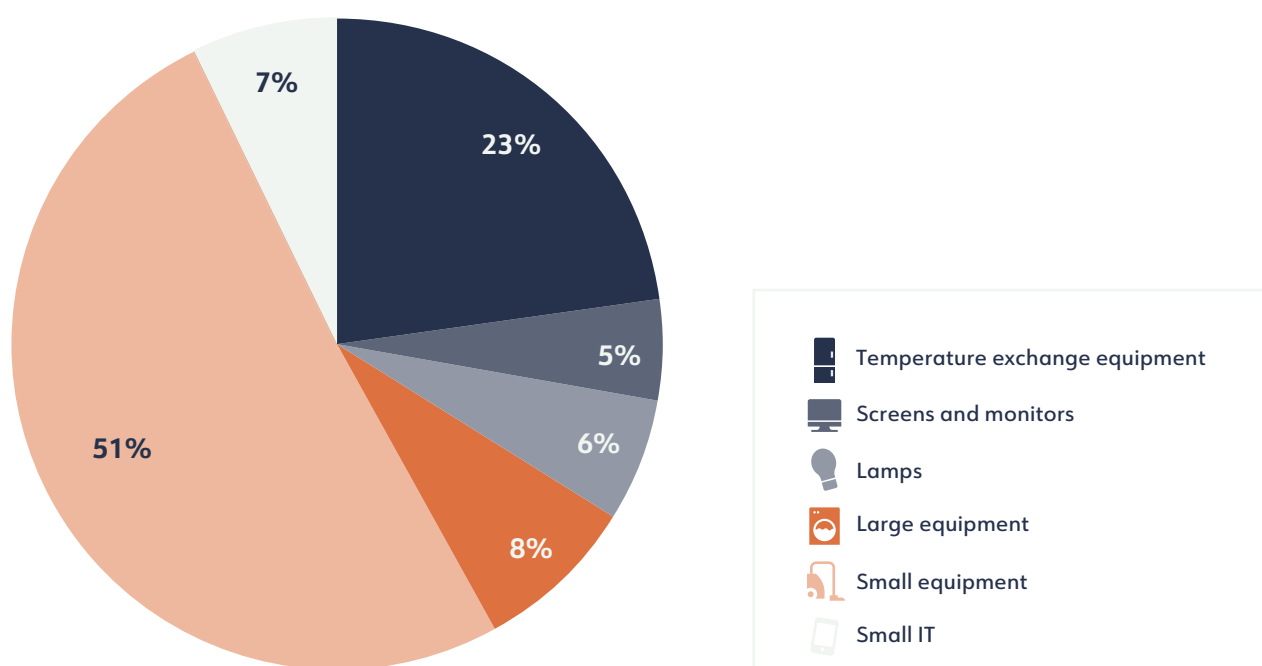
There is no EEE production or manufacturing in Honduras.

All electronic products are imported from several wholesalers or retailers (e.g. Diunsa, La Curacao, Corporación LADY LEE, EL Gallo más Gallo, ELecktry, and Jetstereo, among others). Companies typically provide customers with technical after-sale services, either directly or indirectly providing repair options to their broken or malfunctioning electronics.

The number of purchases of EEE via the internet increased significantly in recent years.

In Honduras, there are more than 10 companies through which purchases from the United States can be made in stores. Companies such as G-Box Mall and TransExpress have the business model of receiving, transporting, and delivering purchased equipment from eBay, Amazon, and the Apple Store, among others. At the time of this report's writing, the specific flow had not been quantified, but the quantification was included in the overall EEE POM and e-waste generated totals.

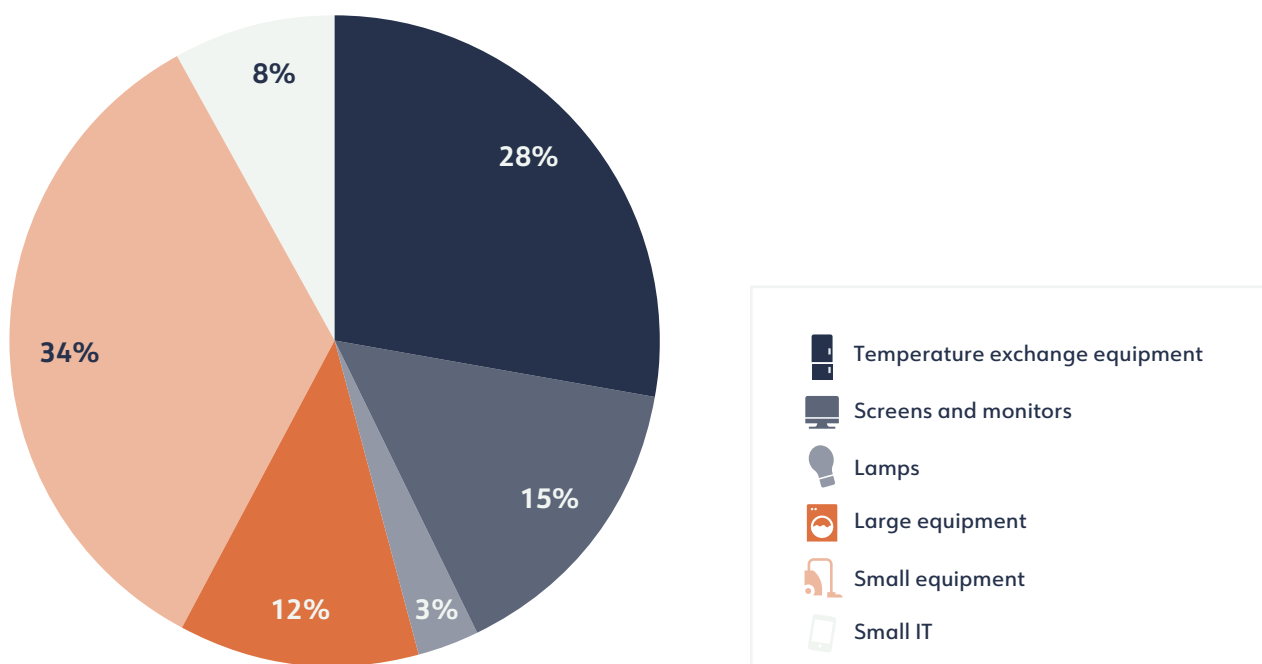
Figure 33. Share of the EU-6 categories in the EEE (2019)



Of the POM EU-6 categories, small equipment (Cat. V with 1.5 kg/inh), temperature exchange equipment (0.7 kg/inh, Cat. I), and large equipment (Cat. IV with 0.2 kg/inh) register the highest share (82 percent of the total) (Figure 33). By contrast, the smallest shares are for screens and monitors (Cat. II) and lamps (Cat. III), equal to 0.1 kg/inh (5 percent) and 0.2 kg/inh (6 percent), respectively. The share of the EU-6 categories has been calculated over the total mass. This trend was evident from 2009-2020.

The amount of e-waste generated in Honduras increased from 1.8 kg/inh (14.5 kt) in 2009 to 2.6 kg/inh (24.8 kt) in 2019.

Figure 34. Share of the EU-6 categories in e-waste generated (2019)



The highest shares of e-waste generated for 2019 in Honduras are those of small equipment (Cat. V) with 0.9 kg/inh (34 percent) and temperature exchange equipment (Cat. I) with 0.7 kg/inh (28 percent), and the smallest share is lamps (Cat. III) with 0.1 kg/inh (3 percent) (Figure 34).

According to the National authorities, the amount of e-waste environmentally soundly collected and recycled in Honduras was equal to 0.12 kt (0.01 kg/inh) in 2019.

The statistic of POPs and non-POPs arising from e-waste were unknown as of this report’s publication.

E-waste and POP Management System

At the national level, there are two institutions with guiding and regulatory functions related to solid waste management in Honduras: the Secretariat of Natural Resources and Environment (SERNA – MIAMBIENTE+) and the Secretariat of Health (SESAL).

MIAMBIENTE+ is responsible for guaranteeing the correct management and monitoring of e-waste in Honduras. The Secretariat of Health (SESAL) is responsible for monitoring that the management of e-waste does not affect the health of people throughout its management. At the local level, responsibility for solid waste management is assumed by the municipal governments, which have little coordination with central government institutions.

In February 2018, a national strategy draft for post-consumer management of products containing mercury was proposed.

Honduras proposed a pilot program for the luminaire stream (e.g. compact fluorescent lamps (CFLs), sodium and mercury vapor bulbs etc.), which was outlined to comply with the Minamata Convention. The post-consumer program will take place in the Municipality of the Central District (i.e. Tegucigalpa and Comayagüela) based on the principle of extended responsibility of the producer/importer, who is obliged to formulate, present, and implement (at its own cost) the systems of selective collection and environmental management of light bulb waste.

The pilot program is being developed on the basis of an estimate of the number of lamps at the national level (based on imports) and on the operators' processing capacity. In developing the proposal, it was estimated that Honduras imports 1,400 tons/year (5.5 million units per year). Three e-waste operators that can process luminaires (EU col.cat 3) using 'bulb crusher' technology were identified. These operators are located in the city of San Pedro Sula (the second-largest city in Honduras) and have the ability to process 10 percent of all luminaires imported in Honduras. The waste is collected and transported from different parts of the country to their central facilities.

With the pilot program, collection points for lighting equipment in different parts of the Municipality of the Central District will be established to facilitate consumers depositing their equipment as well as the operators' weekly collection. Once the operators collect the lighting equipment, it will be transferred to storage facilities for further treatment. The management costs were determined on the basis of information from national and international operators, establishing a range between \$3.00 to \$3.50 USD/kg. The program will set progressive collection targets ranging from 50 tons in 2019 to 150 tons in 2021, with estimating costs ranging from \$240,000 USD to \$590,000 USD for that period, including awareness campaigns. The pilot program will set the basis for an EPR system in the country that can be broadened to other e-waste collection categories. CESSCO is currently collecting approximately 5 million luminaires from public lighting and households throughout the country through one of the Ministry of Energy's projects, in which the disposal of all related wastes will be sent out to international tender.

To improve e-waste management in Honduras, CESSCO, working under MiAmbiente+, has been carrying out information and awareness-raising activities on e-waste, as well as collection campaigns (titled 'ECOLECTA RAEE') in different parts of the country for various years. They have the support of 75 public-private institutions (e.g. municipalities, NGOs, academia, and the private sector) by organizing 42 events where they trained 6,000 people on e-waste management and collected approximately 97 tons, provided to the treatment facilities. Furthermore, CESSCO has established an agreement with the national goods department and MiAmbiente+, in which 15 collection campaigns collected approximately 300 tons of e-waste were delivered to the authorised company for e-waste dismantling.

In interviews, CESSCO informed that, in early 2021, they established collection points (*puntos limpios* in Spanish) for all EU6 collection categories in the main cities (i.e. Tegucigalpa and San Pedro Sula), allowing consumers to dispose of their electronics and allowing e-waste operators to collect them. However, due to COVID-19 restriction this was postponed until the end of 2021.

Via awareness campaigns, e-waste operators in Honduras usually collect e-waste through alliances with the private sector/retailers, universities, NGOs, and CESSCO.

E-waste recycling companies are typically engaged in the conditioning of e-waste for subsequent export and the dismantling of equipment to obtain valuable parts. Dismantling of equipment to obtain valuable parts – such as ferrous and non-ferrous metals, circuit boards, and possibly plastic – is done in their facilities. At the national level, only metals are processed by smelting, although most of them are exported (i.e. mainly non-ferrous metals). The dismantling and material recovery processes are carried out manually.

Honduras currently has seven e-waste operators licensed to store and manage e-waste. Exporting for the treatment of e-waste is administered by the operators.

Honduras has seven e-waste operators who manage e-waste. E-waste operators in Honduras typically disassemble/dismantle e-waste and separate the valuable parts (e.g. printed circuit boards) from the non-valuable parts. The valuable parts are either sold in the internal market (e.g. aluminum, iron, etc.) or stored in containers, and once enough material is accumulated (e.g. printed circuit boards, batteries, etc.), it is exported to other countries (e.g. Panama) for treatment. The non-valuable parts are likely to be disposed of as mixed in with residual waste. Honduras's e-waste operators are:

1. INVEMA

Recycling company with facilities containing technology for plastic, cardboard, ferrous and non-ferrous metals, batteries, and, to a lesser extent, e-waste recycling.

2. RECACEL

The company is dedicated to the management of special and non-special solid waste, particularly the recycling of cell phones and e-waste. They have an e-waste processing capacity of 2 tons/day and collect 50 percent of the e-waste in Honduras. Recovered materials (circuit boards) are exported to Korea (Rep. of), Panama, and Mexico (Sims Recycling Solutions). Metals are eventually sold locally (INVEMA) in Guatemala. Moreover, they provide hard disk destruction services and have an electronics workshop where they carry out repairs and recover components, which are given to their

employees or donated.

3. SERVICIOS AMBIENTALES DE HONDURAS

The company is dedicated to waste management and environmental monitoring of the industrial sector. They disassemble e-waste. Recycling activities are administered through alliances with recyclers within and outside of the country.

4. RECYCLE

Company dedicated to the management of hazardous and non-hazardous industrial waste throughout Honduras. It collects electronic equipment and exports it to Canada and the USA for processing, charging the industries for the waste management service.

This company has collaborated with the e-waste collection campaigns organised by CESSCO. MiAmbiente+.

5. RECICLAJE DIAMANTE

The company is dedicated to the purchase, stockpiling, and export of ferrous and PET scrap. The company owns the largest share of the PET market and is considered the largest recycling company in Honduras.

6. RECICLATECC

A company dedicated to e-waste management, providing services such as e-waste collection from homes or offices and recycling of e-waste. They work with foundations and organisations, forming alliances to carry out e-waste collection campaigns. They also have provided training in the past, and they organise workshops in various schools and universities in Honduras. As part of their services, they provide recycling certificates to companies.

7. RECYPORCO

Company dedicated to e-waste management that receives all types of materials, including e-waste from various origins.

The informal sector is involved in the informal collection and dismantling of e-waste, but there are no estimates quantifying the amount of e-waste treated by them.

In Honduras, the vast majority of recyclable material is e-waste collected/scavenged/purchased by collectors that operate informally (locally known as pepenadores). Only a few microenterprises, cooperatives, companies, and a few more organised collectors that operate mainly with post-industrial waste have some degree of formalisation. The informal sector in Honduras is grouped into the following categories:

- **Waste pickers operating in landfills**

It is estimated that around 600-1,000 people work at the Tegucigalpa and San Pedro Sula landfills (each), numbers that increase during the dry season and decrease during the rainy season. According to garbage collectors' testimonies, some people have been working in the landfills for many years. However, several have left because the business has been getting worse over time and they are earning less and less money. In San Pedro Sula, the gangs (maras in Spanish) maintain a certain level of control over the collectors or scavengers working at the landfill.

- **Garbage collectors working in the streets**

Some informal collectors acquire recyclable materials directly from the streets, markets, and clandestine garbage dumps, as well as wherever waste collection containers are parked. This type of collection has been growing in recent years, and it is estimated that thousands of people are engaged in this type of collection. After a very basic separation, they typically sell the materials to small collectors, distributors, or e-waste operators in different parts of the cities. The e-waste operators are the ones who set the prices and instruct the informal collectors on the type of materials to be collected.

- **Collectors operating in homes, workplaces, or condominiums**

These collectors have recently emerged and are typically divided into two groups of people, the first being those who do not collect recyclables for their livelihood, but rather, collect small quantities of recyclable materials at home, from neighbours or workplaces, etc. These collectors store the materials for varying lengths of time and sell them when they reach certain volumes.

The second group of informal collector includes individuals who have permission from the companies

at which they work to be able to collect waste. Typically, both groups of collectors initially sort the materials and have agreements with e-waste operators or other formal collectors who visit them periodically and to whom they sell the collected materials. In other cases, these informal collectors operate as family microenterprises and sell directly to exporting or recycling companies.

- **Municipal collection truck workers**

In Tegucigalpa and in some parts of San Pedro Sula, the urban solid waste collection service has been subcontracted to private companies. During waste collection, workers on the trucks separate the materials, which they then sell on their own. The situation has caused serious friction with the garbage collectors. In San Pedro Sula, the maras that operate in landfills are trying to prevent this modality from being practiced.

- **Collectors who collect recyclables using vehicles**

These collectors are generally informal, mainly small businesses that collect in pick-up trucks or small trucks from streets, shopping malls, mechanics shops, and businesses. They are distinguished from other informal collectors that have an organised network of fixed suppliers because they handle smaller volumes of materials, their activity is mainly collection, and they do not have storage capacity.

- **Waste pickers organised in cooperatives or micro-enterprises**

The existing micro-enterprises have been especially driven by the large recyclers, and they operate mainly in the collection of post-industrial materials. There are also some informal cooperatives that operate partially in the collection of post-consumer materials, and they could not be quantified as of this report's publication. They usually have a place where they collect, separate, and classify larger volumes of solid waste. This allows them to add value to the materials and sell them at a better price to collectors further up the value chain.

In Tegucigalpa in 2011, the 'Cooperativa de pepenadores del relleno municipal' (a municipal landfill waste collectors' cooperative) was developed, which is comprised of approximately 800 people: 500 men and 300 women.

- **Informal collection companies**

In order to have a regular supply of recyclable raw materials, some exporters and recyclers have been promoting the creation of micro-collection companies. Some microenterprises have grown over time, and micro-collection has transitioned from being an informal activity to a formal economy. These are companies that handle large quantities of recyclable materials and operate mainly as collectors and resellers. They have collection sites and vehicles (often small trucks) with which they collect in various areas.

The informal sector usually dismantles the equipment and extracts the valuable parts in order to sell them to local treatment facilities, and the less valuable parts are disposed of in official or informal landfills. Interviewees mentioned that there is knowledge of informal partnerships or alliances between formal operators (e.g. INVEMA) and the informal sector, but such partnerships could not be confirmed. It is estimated that Honduras has approximately 16 informal companies distributed in its main cities (Puerto Cortés, San Pedro Sula, and Tegucigalpa).

There are currently no statistics regarding how many electronic equipment items are repaired, imported, and exported as second-hand, nor of how many items are disposed of as mixed in with residual waste.

It is estimated that imports of second-hand EEE represent a minor portion of the total EEE placed on the market. Honduras has different types of repair shops: warranty service shops, recycler workshops, and general repair shops. These shops often collaborate with each other; for example, products discarded by warranty repair shops might be delivered to recycling companies whose workshops work to attempt to recover the less damaged equipment.

In general, contacts are established via social networks, which make it possible to find specific parts for the repair of EEE with relative ease. In 2019, it was estimated that there are approximately 50 repair shops buying and selling cell phone parts and electronic items in general. The valuable e-waste generated resulting from equipment's repair is sold to e-waste operators, and

non-valuable material is generally disposed of as mixed in with residual waste and/or disposed of in municipal landfills.

There is an informal separation per plastic type in Honduras.

The collected plastic is separated and classified into six categories: PET (polyethylene terephthalate), LDPE (low-density polyethylene), HDPE (high-density polyethylene), PP (polypropylene), PVC (polyvinyl chloride), and PS (polystyrene). Interviews with CESSCO yielded that in general, other types of plastic are not recycled and are most likely disposed of in landfills. PET, PE, and PP are primarily collected and processed. They are milled and pelletised for use within the country or to be exported. PET plastic flakes are produced and generally exported. ABS is compacted and sold, but certain companies, such as RECACEL, store a large amount of the dismantled material.

INVEMA, a recycling company in San Pedro Sula, has the technology for plastic recycling in its facilities. It also works with cardboard, ferrous and nonferrous metals, batteries, and e-waste. RECIPLAST, also located in San Pedro Sula, grinds plastic to be exported to other Latin American countries and Asia. Located in Tegucigalpa, RECICLAJE DIAMANTE seizes most of the PET market.

Honduras does not have PCBs or POPs treatment facilities. E-waste plastic not considered valuable is landfilled.

CESSCO interviews revealed that the formal and informal sectors classify e-waste plastic as plastic that can be sold but which is not valuable. As aforementioned, the plastic that can be sold is either sold in the internal market or exported to other countries.

The final destination of e-waste plastics that have not been harnessed (non-valuable parts) is landfills. RECACEL is currently selling and exporting printed circuit boards and capacitors to Panama. Capacities for the elimination of PCBs and brominated plastics are being developed through the COPS 4 project at *Cementos del Norte*, a cement plant located in the city of Choloma.

CESCCO has the capability to analyze various materials (e.g. heavy metals, Hg, PCBs, pesticides, brominated plastics), as they have mass chromatography and a lab that detects contaminant in soils and toxicology. They provide lab services to both private and public institutions. This year, CESCCO is planning to inspect the various e-waste operators' facilities and identify hazardous content (e.g. Hg and PCB) in order to quantify and ensure proper disposal of the material.

As for plastic containing BFR, CESCCO is conducting a national inventory of brominated plastics with XRF equipment - labelling, weighing, and storing cases for later disposal; so far, more than 2 tons have been analysed, and 1 ton has been labelled as contaminated (i.e. as containing more 600 ppm).

Import & Export of E-waste and POPs Contained in E-waste

Honduras has ratified the Basel, Rotterdam, and Stockholm Conventions and has also implemented the Ban Amendment and the Minamata Conventions on Mercury.

Honduras implements the Basel Convention provisions. Accordingly, the country restricts the import of all hazardous wastes and other wastes for final disposal and for recovery from all countries.

Honduras does not restrict the export of hazardous wastes and other wastes for recovery or final disposal⁽¹³⁸⁾.

Honduras does not restrict the transit of hazardous wastes and other wastes, based on Basel Prior Informed Consent (PIC) procedure.

E-waste operators in Honduras export valuable parts such as printed circuit boards to Korea (Rep. of), Panama, Mexico (Sims Recycling Solutions), Canada, and the U.S.

Through MiAmbiente+, in collaboration with the United Nations Development Program (UNDP) and with funding from the Global Environment Facility (GEF), the Government of Honduras launched the POPs4 Project in

2018. The project has a duration of five years and enables the implementation of the National Chemicals Policy, approved in Honduras in 2013, specifically to comply with the National Plan of the Strategic Approach to Chemicals Management (SAICM), the Stockholm Convention on POPs, and the Basel Convention on Transboundary Movements of Hazardous Wastes. An estimated 110 t of pesticides containing PCB were exported to Switzerland for treatment through this project.

Stakeholder Mapping

In Honduras, the stakeholders involved in the waste sector (that could be identified) and their roles are described below:

Stakeholder	Responsibility
Secretariat of Natural Resources and Environment (MiAmbiente+) Website	<p>Governmental institution responsible for promoting the sustainable development of Honduras through the formulation, coordination, execution, and evaluation of public policies focused on preserving natural resources and conserving the environment; the institution contributes to improving the quality of life of its inhabitants. The Secretariat is responsible for guaranteeing the correct management and monitoring of e-waste in the country.</p>
Centre for Contaminant Studies and Control (CESCCO) Website	<p>A Directorate of the Secretariat of Natural Resources and Environment (MiAmbiente+), whose mission is to provide scientific support and services to protect citizens from the effects of environmental pollution. In 2006, CESCCO was designated as the official contact point for the Stockholm Convention on the Management of Persistent Organic Pollutants (POPs) and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. It was also designated as the focal point for the Strategic Approach to International Chemicals Management (SAICM), also in 2006. CESCCO led the updating of the Stockholm Convention National Implementation Plan (NIP) on the management of POPs, which includes, among other issues, the management of e-waste in which plastics with brominated flame retardants are classified as POPs. CESCCO integrates and hosts the headquarters of the National Commission for the Environmentally Rational Management of Chemical Products (CNG) in Honduras. Furthermore, it is currently the Directorate in Honduras in charge of leading e-waste management projects.</p>
General Directorate of Environmental Evaluation and Control (DECA) Website	<p>The General Directorate of Environmental Evaluation and Control (DECA) is the agency of the Secretariat of Natural Resources and Environment that oversees the mandatory application of the Environmental Impact Assessment (EIA) for all projects or companies with the potential to pollute the environment and degrade natural resources. Through DECA, SERNA-MIAMBIENTE is the competent authority in charge of issuing environmental permits for all activities that may have a polluting effect. The Reglamento del Sistema Nacional de Evaluación de Impacto Ambiental, in effect since 1994, requires that all projects, including waste disposal projects, must have an environmental impact assessment (EIA).</p> <p>All solid waste collection centres have to have a permit issued by SERNA-MIAMBIENTE.</p>

Stakeholder	Responsibility
<p>Environmental Directorate of Environmental Management (DGA)</p> <p>Website</p>	<p>The Environmental Directorate of Environmental Management contributes to the sustainable development of the country through the implementation of policies, strategies, projects, and tools that encourage, promote, and guide the environmental management actions of both the public and private sectors, academia, and society in general.</p> <p>One of its primary functions is to promote sustainable consumption and production in order to make efficient use of natural resources, contributing to sustainable development in Honduras. Furthermore, they promote an integrated solid waste management and cleaner production at all levels and sectors. They have three main departments: Solid Waste, Environmental Promotion and Prevention, and Environmental Education, and the departments work in an integrated manner. Through the Solid Waste Department, created in January 2012, SERNA - MIAMBIENTE has become the institution of reference and coordination in the area of solid waste management. The Solid Waste Department promotes and implements the 'National Strategy for Integrated Solid Waste Management' with the participation of various stakeholders. Furthermore, they develop legal and technical standards, as well as administrative, financial, and methodological instruments for the Integral Management of Solid Waste at the level of local governments and both public and private institutions. Moreover, they develop and implement 'Municipal Master Plans for Integrated Solid Waste Management'.</p>
<p>National Commission for the Environmentally Sound Management of Chemicals (CNG)</p> <p>Website</p>	<p>The National Commission for the Environmentally Sound Management of Chemicals (CNG) is an intersectoral mechanism for coordination, consultation, and socialisation among the sectors involved in Chemicals Management, as well as the body that recommends to decision-makers at the policy level what resolutions, opinions, and action plans (among other actions) must be approved in order to ensure the success of this matter. The CNG encompasses various sectors involved in the management of chemicals throughout their life cycle. Its actions help to ensure the execution of the strategic actions of the Implementation Plan of the Strategic Approach to International Chemicals Management (SAICM). The Commission is headquartered at CESCOO of the Secretariat of Natural Resources and Environment (MiAmbiente+).</p>
<p>Secretariat of Health (SESAL)</p> <p>Website</p>	<p>The Secretariat of Health has the strategic functions of environmental health management and of integrating the environmental component in regulation, surveillance, and health promotion actions. With the support of the Municipalities and SERNA, it is the body responsible for coordinating inspections and other surveillance activities regarding the protection of people's health in relation to solid waste.</p>

Stakeholder	Responsibility
Municipalities	<p>Health Decree 65-91, the General Environmental Law, and the General Environmental Health Regulations (Agreement No. 94-97) delegate the collection, recycling, treatment, and final disposal of non-hazardous waste to the municipalities. The Regulation for Solid Waste Management (Reglamento para el Manejo de Residuos Sólidos) defines that the municipalities are responsible for the management of solid waste generated in their jurisdictions. This is managed through municipal ordinances that regulate the municipal sanitation service and establish how the service is collected. The Municipal Tax Plans are the instruments that establish the taxes, rules, and procedures related to the municipal tax system.</p> <p>In some cases, such as in Tegucigalpa and San Pedro Sula, the solid waste collection service has been outsourced.</p>
Customs Website	<p>The customs authority plays a relevant role in the control of TBM by preventing the illegal import or export of waste.</p>
INVEMA Website	<p>A company dedicated to the purchase, recycling process, and commercialisation of recyclable material that seeks to contribute to sustainable management of waste.</p>
RECACEL	<p>RECACEL is a company dedicated to the management of special and non-special solid waste, particularly the recycling of cell phones and e-waste. They have an e-waste processing capacity of 2 tons/day and collect 50 percent of Honduras's e-waste.</p> <p>Recovered materials (circuit boards) are exported to Korea (Rep. of), Panama, and Mexico (Sims Recycling Solutions). Metals are first sold locally (INVEMA) and eventually sold in Guatemala. Moreover, they provide hard disk destruction services and have an electronics workshop where they repair and recover components that are given to employees or donated. The company is in the process of installing equipment for the recovery of refrigeration gases, as established by the Ozone Technical Unit (UTOH). They also have equipment for processing lamps and fluorescent tubes. The CRTs are vacuum-broken and disposed of in a municipal landfill.</p>
RECYCLE	<p>A company dedicated to the management of hazardous and non-hazardous industrial waste throughout Honduras. RECYCLE collects electronic equipment, exporting it to Canada and the USA for processing and charging the industries for the waste management service.</p> <p>RECYCLE has collaborated with the e-waste collection campaigns organised by CESSCO.</p>
RECICLATECC Website	<p>RECICLATECC is a company dedicated to e-waste management that provides services such as collection of e-waste from home or offices and recycling of e-waste. They work with foundations and organisations forming alliances for carrying out e-waste collection campaigns. Moreover, they have provided training and organize workshops in various schools and universities in Honduras. As part of their services, they provide recycling certificates to companies.</p>
RECYPORCO Website	<p>Company dedicated to e-waste management that receives all types of materials, including e-waste, from various origins.</p>

Stakeholder	Responsibility
RECICLADOS DE HONDURAS	<p>Recycling company that receives all types of materials, including e-waste, from various origins, including warranty services from various brands and public auctions. E-waste accounts for 50 percent of their business.</p> <p>They have an electronics workshop, and, if feasible, they repair the equipment for subsequent sale on the same premises. This workshop also recovers electronic equipment cards that are sold to specialised repair companies. If the equipment cannot be repaired, they proceed to manual disassembly and separation by type of material. The manual disassembly is not particularly specialised; e.g., circuit boards are not processed. In some cases, specific equipment parts are sold prior to disassembly.</p> <p>Recoverable materials are sold locally to exporters, while non-recoverable materials, including ABS plastics, are disposed of in landfills. Mixed material parts are sold to micro-sorters (families) that divide and sell them. Any circuit boards that are found are sold to INVEMA or RECACEL.</p>
CORUMO INTERNACIONAL	<p>Company dedicated to the recycling of ferrous and non-ferrous metals, cardboard, e-waste, batteries, and catalysts.</p>
INVEMA	<p>Recycling company with facilities containing technology for plastic recycling. INVEMA also works with cardboard, ferrous and non-ferrous metals, batteries, and, to a lesser extent, e-waste.</p> <p>The company has a register of individuals and supplier organisations that collect and provide products. They have established a single purchase price that puts these two actors on an equal competitive footing. INVEMA establishes a credit line for regular suppliers and offers training in environmental education and financial responsibility. It also has an advance payment system for regular suppliers.</p>
SERVICIOS AMBIENTALES DE HONDURAS	<p>The company is located in Choloma, Cortés, and is dedicated to waste management and environmental monitoring of the industrial sector. They disassemble e-waste. Recycling activities are carried out through alliances with recyclers both within and outside of the country.</p>
RECICLAJE DIAMANTE	<p>The company is located in Tegucigalpa and is dedicated to the purchase, stockpiling, and export of ferrous and PET scrap. The company owns the largest share of the PET market and is considered the largest recycling company in Honduras.</p>
GRUPO DE RECICLADORES DE HONDURAS	<p>The company is located in San Pedro Sula. It compromises and aligns its working activity with RECIMETAL, which buys all types of scrap and exports it to the Asian market, as well as with RECIPLAST, which works with plastic milling for exportation to countries in the Latin American region and in Asia.</p>
RECICLA DE HONDURAS	<p>Located in the municipality of Comayagüa and dedicated to the purchase-collection, sorting, cleaning, compacting, storage, and commercialisation of recyclable solid waste.</p>

Country:

Nicaragua

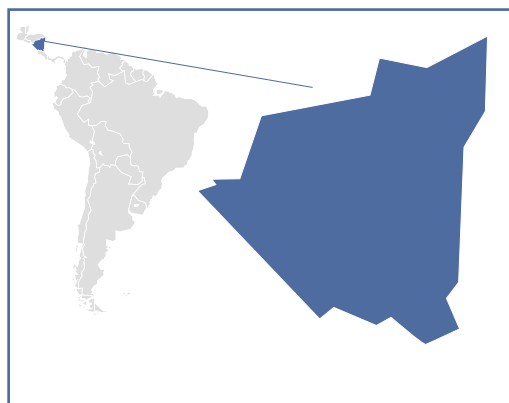
6.5 million inhabitants [28]

129,494 km²

Borders: The Republic of Honduras (north), the Atlantic or Caribbean Ocean (east), the Republic of Costa Rica (south), and the Pacific Ocean (west)

GDP per capita PPP: \$1,905.26 USD (2020) [29]

Average household size: 5 members [30]



Map source: United Nations Geospatial Information Section⁽¹³⁹⁾

E-waste Management:

Legislation: ●●●●●

Infrastructure: ●●

Collection Rate: 0.4%

E-waste POP Management:

Legislation: ●●●●●

Infrastructure: ●●●●●

Collection Rate: 0%

Legend: ● Advanced ● Transition ● Basic
Each indicator is one circle.

National legislation on e-waste and POPs:

Extended Producer Responsibility: ✕
National e-waste standards: ⚙ In development
National standards for POPs contained in e-waste: ⚙ In development

E-waste collection target: ✕
Legislation product coverage in UNU-KEYS: 0 of 54

Legislation product coverage in weight (%) on total and per category⁽¹⁴⁰⁾: Total: 0% of the e-waste generated in 2019






International Conventions:

	Signature	Ratification	Entry into force
Basel Convention [31]	-	03/06/1997 (a)	01/09/1997
Rotterdam Convention [32]	-	19/09/2008 (a)	18/12/2008
Stockholm Convention [33]	23/05/2001	01/12/2005	01/03/2006
Minamata Convention [34]	10/10/2013	29/10/2014	

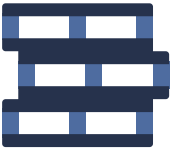

⁽¹³⁹⁾ <https://www.un.org/Depts/Cartographic/english/htmain.htm>.

⁽¹⁴⁰⁾ Percentage in weight of e-waste generated equipment covered by the national legislation illustrated per EU-6 collection category for 2019.



EEE Placed on Market (2019):	E-waste generated (2019):	E-waste formally collected (2019):
 <p>20 kt. 3.2 kg/inh.</p>	 <p>16 kt. 2.5 kg/inh.</p>	 <p>0.1 kt. 0.01 kg/inh.</p>

(Source: UNU / UNITAR)

Generated e-waste plastic:	Generated BFRs from e-waste:
 <p>5 kt. 0.8 kg/inh.</p>	 <p>0.4 kt. 0.1 kg/inh.</p>

(Source: UNDP / UNU / UNITAR)

Formal/environmentally sound e-waste management system in place:

- ✓ Nicaragua has 11 e-waste operators authorised by the Ministry of the Environment and Natural Resources (MAREMNA) for collecting and managing e-waste, of which 8 export e-waste for treatment under the procedures of the Basel Convention and are involved in the crushing of fluorescent lamps.
- ✗ Nicaragua does not have facilities that process/treat POPs arising from e-waste. The country has one cement company that could potentially carry out co-processing. This would be subject to improvements in its facilities/infrastructure and compliance with environmental procedures.

National Legal Framework

The Republic of Nicaragua (hereafter, Nicaragua) regulates e-waste as part of the general legal and regulatory framework on waste management and hazardous wastes.

Nicaragua does not have a specific national legislative instrument dealing with e-waste that is managed as part of hazardous wastes. The main relevant legal and policy instruments adopted in the country are as follows:

- Law No. 217 'General Law of the Environment and Natural Resources' with its Incorporated Amendments. National Assembly, January 31, 2014 [106].
- Law No. 168 of 1 December 1993 Prohibiting the Illegal Traffic of Hazardous and Toxic Wastes.
- Law No. 274, Basic Law for the Regulation and Control of Pesticides, Toxic, Hazardous and Similar Substances. Approved on November 5, 1997, Published in the Gazette N°30 of February 13, 1998. National Assembly, 1998 [107].
- Law No. 839, Law on Amendments and Additions to Law No. 272, "Electricity Industry Law", Law No. 554, "Energy Stability Law", on Amendments to Law No. 661, "Law for the Distribution and Responsible Use of the Public Electricity Service" and Law No. 641, "Penal Code". Approved on June 12, 2013. Published in the Official Gazette, Official Gazette N°113 of June 19, 2013.
- National Policy on Integrated Solid Waste Management. Executive Decree N°47-2005. July 21, 2005. Official Gazette No. 163 of August 23, 2005⁽¹⁴¹⁾.
- Nicaragua has a draft proposal for a "Special Law for the Integral Management of Hazardous and Non-Hazardous Waste and Solid Waste" approved in general by the National Assembly. this draft proposal contains the regulation of hazardous waste and electronic waste, on page 25, in Articles 61 to 65.
- Presidential Decree No. 26-2020, on the adherence the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, approved on November 19, 2020. The Decree was published in the Official Gazette No. 219, of November 25, 2020. The Amendment makes specific reference to establish regulations to the Waste Electrical and Electronic Assemblies, for transboundary movement.

- Decree No. 20-201, Environmental Assessment System for Permits and Authorisations for sustainable management of natural resources, approved on November 29, 2017. Published in the Official Gazette, Official Gazette N° 228 [109].
- National Plan of Human Development 2018–2021 of December 2017 [110], which includes an e-waste management strategic axis.
- National Plan of Action and Updated Plans of Action 2016-2026.
- National Human Development Plan 2012-2016 (November 8, 2012): it contemplates different policies associated with each of the national sectors. This refers to the "Protection of Mother Earth, Adaptation to Climate Change and Comprehensive Disaster Risk Management" Policy, where it specifies "Regulating and Controlling Environmental Pollution for the Conservation of Ecosystems and Human Health". In its development it establishes the Integral Management of Solid Waste; the Promotion of Investment for Recycling; the Development of Social and Economic Alternatives and the Regulation of Hazardous Substances and Hazardous Waste. P. 156, numeral 693, 694, 695, 696 and 697.
- National Human Development Program 2018-2021, which includes 18 National Policies, No. 12 corresponds to the Environmental and Natural Resources Protection Policies, and No. 4 refers to the Policy "To regulate and control environmental pollution for the conservation of ecosystems and human health" (associated with the 2012-2016 plan), implicitly including electronic waste.

The Management and Export of WEEE is regulated and controlled with the provisions of the Environmental Law No. 217. For the management, national collection, and export, the procedure of the Environmental Evaluation System for Permits and Authorizations for the Sustainable Use of Natural Resources, Decree No. 20-2017 has also been implemented.

Nicaragua does not have an EPR system for e-waste.

No EPR system regarding e-waste has been introduced in Nicaragua. However, environmental legislation includes the principles of prevention and environmental precaution, applicable to activities and persons that deteriorate the environment.

Nicaragua has EHS standards regarding waste management and hazardous waste in general. No specific e-waste management standards are in place in the country.

Nicaragua has three technical standards regarding waste management:

- Technical Standard (05 013-01) for Environmental Control of Solid Waste Landfill for non-hazardous materials.
- Mandatory Technical Standard Environmental Management, Treatment and Disposal of Solid Waste for non-hazardous materials (05 014-01).
- Technical Standard for the Management and Disposal of Hazardous Solid Waste (05 015-02).

These standards are focused on establishing environmental technical requirements for storage, collection, transportation, treatment, and disposal of hazardous solid waste generated in industrial activities and on creating establishments that provide medical

care, such as clinics and hospitals, clinical laboratories, laboratory production of human and veterinary rabies centres, as well as biological agents, teaching, and research [111].

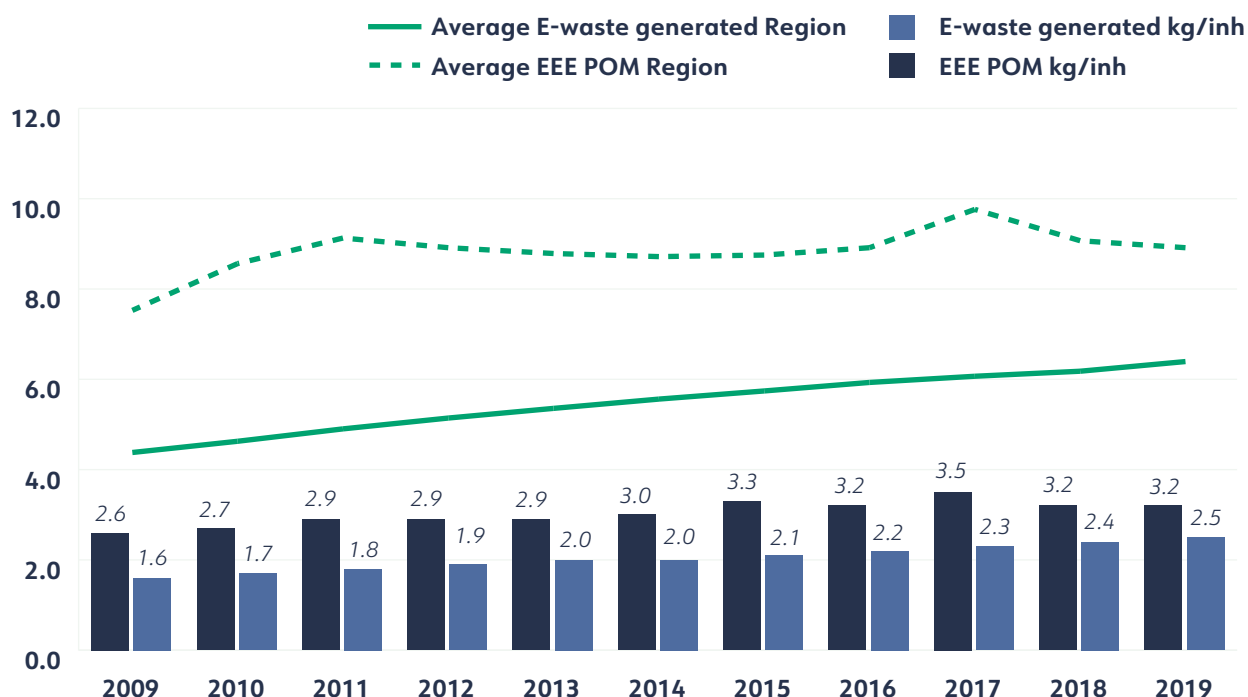
Nicaragua does not have a specific national regulation on their integrated management with respect to e-waste POPs.

National Statistics on E-waste

E-waste statistics are not compiled in Nicaragua, and e-waste is not quantified separately from other waste streams.

Considering that no official data could help the quantification of e-waste in the country, UNU/UNITAR internal data has been used to estimate the main e-waste statistics indicators (i.e. EEE POM and e-waste generated) for the country. The analysis of information from 2009-2019 was undertaken and is illustrated in Figure 35-Figure 37.

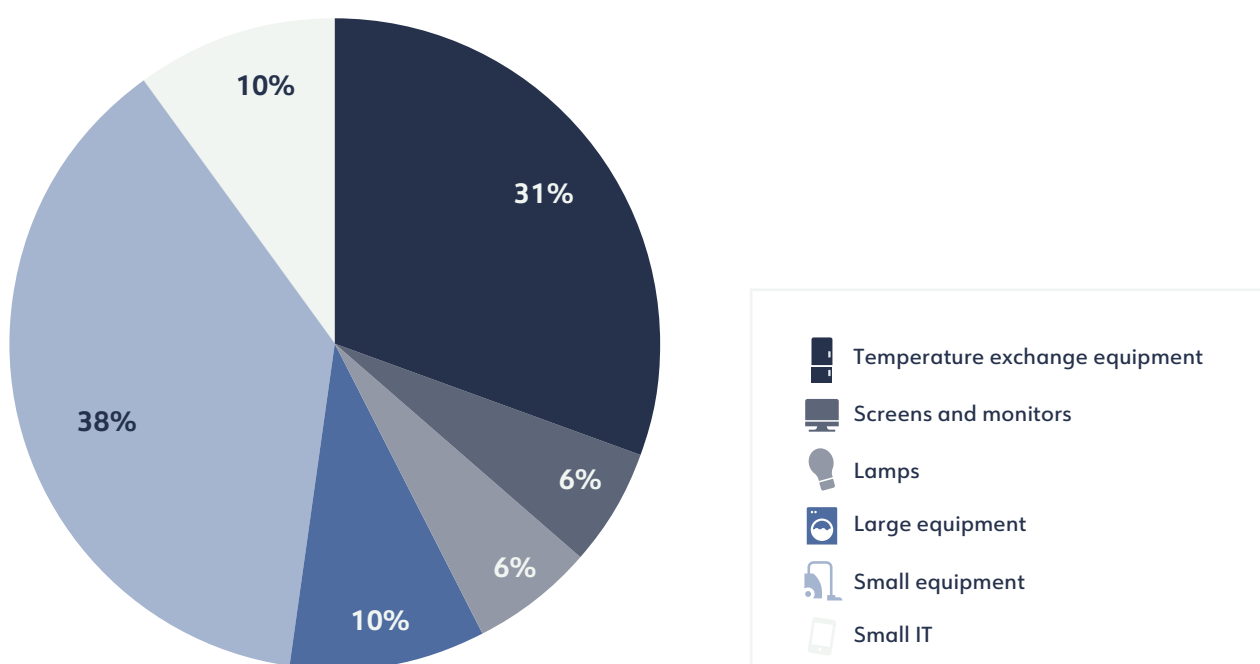
Figure 35. EEE POM and e-waste generated in Nicaragua



EEE POM has fluctuated slightly over the past decade but has steadily increased, from 2.6 kg/inh (14 kt) in 2009 to 3.2 kg/inh (20 kt) in 2019. The e-waste generated has also increased, from 1.6 to 2.5 kg/inh.

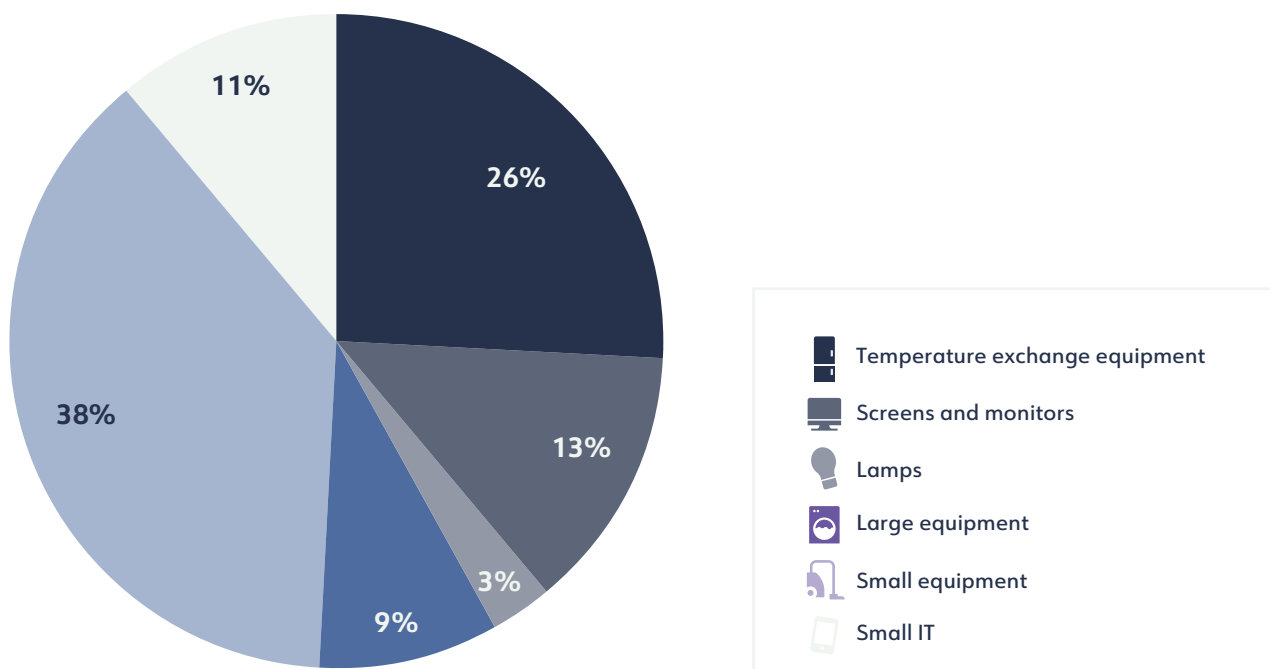
In comparing the EEE POM and e-waste generated of Nicaragua with other Latin American countries, it is clear, as shown in Figure 35, that Nicaragua is below the average. The amount of EEE POM in Nicaragua did not vary much over the span of years, ranging from a low of 2.6 kg/inh (14 kt) in 2009 to a maximum of 3.5 kg/inh (22 kt) in 2017. From there, it decreased slightly to 3.2 kg/inh (20 kt) in 2019. From information provided by the Ministry of Environment and Natural Resources (MARENA), the Central Bank of Nicaragua reported that from January to December 2019 and in the same period of 2020, foreign purchases of home appliances increased by about 3%, from \$90.4 million to \$92.7 million. This increase is reported in the context of the economic crisis caused by COVID-19⁽¹⁴²⁾.

Figure 36. Share of categories in EEE POM (2019)



The largest shares observed for 2019 (Figure 36) were small equipment (Cat. V) with 1.2 kg/inh (8kt) and temperature exchange equipment (Cat. I) with 1.0 kg/inh (6kt) – equivalent to 68 percent of the total share of EEE POM. The smallest shares are those of lamps (Cat. III) and screen and monitors (Cat. II), equal to 0.2 kg/inh (1kt representing 6 percent) and 0.2 kg/inh (1kt representing 6 percent), respectively.

Figure 37. Share of categories in e-waste generated (2019)



Regarding e-waste categories, the highest shares of e-waste generated for 2019 in Nicaragua are those of small equipment (Cat. V) with 0.9 kg/inh (5.9 kt representing 38 percent) and temperature exchange equipment (Cat. I) with 0.6 kg/inh (4.1 kt representing 26 percent), whereas the smallest share is that of lamps (Cat. III) with 0.1 kg/inh (0.5 kt), representing 3 percent of the total share (Figure 37).

In 2019, Nicaragua exported approximately 60 tons of e-waste from households and businesses for ESM.

This mainly corresponds to printed circuit boards and CRT TVs.

In 2019, Nicaragua managed 5,199 tons of hazardous waste through authorised hazardous waste-exporting companies; this management consisted mainly of used lead-acid batteries and electronic printed circuit boards.

The statistics of POPs and non-POPs arising from e-waste were unknown as of this report's publication.

E-waste and POP Management System

Municipalities in Nicaragua have the responsibility of waste management of non-hazardous and construction waste. There are no public policies for waste separation and differentiated waste collection in Nicaragua.

The process of waste management for non-hazardous and construction waste and disposal is carried out by each municipality, either directly or indirectly. When done indirectly, operators require a municipal permit for transporting waste, which will be granted only if the municipality meets certain criteria, mostly related to the type and characteristics of the vehicles to be used, and the location and procedures for carrying the waste to the landfill, which is administered and operated by the municipality. The collection of hazardous waste and e-waste is governed by the provisions established by the Ministry of Environment and Natural Resources (MARENA), with the support of the municipality, for collection, storage, transfer, and/or export.

Nicaragua does not yet have an official system for collection and treatment of e-waste, but activities are ongoing to begin improving waste management.

Under the framework of the PREAL project, a working group led by MARENA has been created to coordinate the activities at a national level.

Nicaragua does not have an official e-waste classification.

Nicaragua does not currently have an official e-waste classification in their legislation. However, as a result of the PREAL project activities, they are currently studying – and in talks of developing and aligning – the implementation of a regional e-waste classification. The working group is currently mapping key stakeholders and is developing plans to improve the collection, sorting, and disposal of e-waste.

Nicaragua does not have e-waste treatment facilities. The country has 11 e-waste operators for the collection and management of e-waste, of which 8 perform exports under the procedures of the Basel Convention and are involved in the crushing of fluorescent lamps.

Nicaragua has 11 e-waste operating companies that collect, stockpile, store, and separate large parts and also extract printed circuit boards and aluminium, copper, and bronze materials before exporting them separately; 8 of these 11 companies export materials for reuse or recovery/treatment. The other 3 e-waste operators are involved in the crushing of fluorescent lamps.

The informal sector is involved in the informal collection and dismantling of e-waste, but there are no estimates quantifying the amount of e-waste treated by them. However, efforts are being implemented for quantifying the volume of e-waste informally collected.

In Nicaragua, the vast majority of recyclable material is e-waste collected/scavenged/purchased by collectors that operate informally (known as *pepenadores*). The informal sector typically acquires e-waste either door-to-door, via waste pickers in landfills, via municipal collection truck workers, etc. As part of the efforts of MARENA to map the various flows of e-waste in Nicaragua, a 2020 analysis of the volume of e-waste collected was done in two companies. One company stated that 54.79 percent of e-waste was purchased from informal e-waste collectors and that 45.21 percent corresponded to formal collectors. The second company stated that 80 percent of collected e-waste corresponded to the informal sector, and only 20 percent resulted from formal collectors.

Nicaragua has more than 13,500 informal recyclers through 50 cooperatives, most of which are all members of the Nicaraguan Recycling Entrepreneurs Network (REDNICA)⁽¹⁴³⁾.

The Ministry of Environment and Natural Resources is implementing a national strategy for the sound management of solid waste where various cooperatives (e.g. Red de Emprendedores Nicaragüenses de Reciclaje [REDNICA]) of the informal sector (locally known as recicladores de base) have been identified. Not all members of the cooperative collect and disassemble e-waste. The Ministry of Environment and Natural Resources has implemented training on the sound management of e-waste, health, safety, etc. of members of these cooperatives. They are also currently mapping all stakeholders involved in e-waste management. Considering that the country does not have an ESM system for e-waste management in place, the entire quantity of e-waste generated is likely either mixed by consumers with other residual waste and destined for landfilling or incineration, or is informally collected and recycled with substandard treatments for recovering valuable materials.

Nicaragua has a strong repair culture, and there are several repair shops in the country, especially for household equipment. However, there are no statistics as to how many electronic equipment items are repaired.

Used electronic equipment that is disposed of and is still suitable for reuse is mainly sold as second-hand equipment. There are no statistics on the amount of EEE formally repaired. The e-waste generated resulting from the equipment repair is generally disposed of as mixed in with residual waste.

The informal sector is very active in the collection of used and waste electrical and electronic equipment in Nicaragua, both for resale purposes and for the extraction of valuable materials.

Informal sector actors are involved in the collection of used functioning electronic equipment for resale, but also in the collection of non-functioning equipment for the extraction of ferrous and non-ferrous metals. Most valuable materials (e.g. precious, ferrous, and non-ferrous metals), as well as components and assemblies suitable for reuse as spare parts, are extracted from medium and large-sized e-waste, whereas the remaining parts, including hazardous substances, usually end up in landfills.

Nicaragua does not have PCB or POPs treatment facilities. E-waste plastic in the country is typically landfilled, which is regarded as unauthorised and bad practice. Brominated and non-brominated plastics from e-waste are not separated.

The final destination of e-waste plastics that have not been harnessed and which are suspected of containing hazardous material is typically landfills, with no proper treatment provided. These are considered unauthorised and bad practices in Nicaragua.

⁽¹⁴³⁾ <https://barricada.com.ni/nicaragua-lanza-por-primera-vez-el-plan-de-gestion-para-el-manejo-adecuado-de-los-residuos-electricos-y-electronicos/>.

Import & Export of E-waste and POPs Contained in E-waste

Nicaragua has ratified the Basel, Rotterdam, and Stockholm Conventions, as well as the Minamata Convention on Mercury.

Nicaragua has ratified the Basel, Rotterdam, Stockholm and Minamata Conventions.

It is prohibited in Nicaragua to import e-waste, but the country allows transit of e-waste through its territory.

There are currently 8 e-waste operators that export e-waste to Panama for re-exporting purposes.

Nicaragua has 8 e-waste operators that are authorised to export e-waste under the Basel Convention procedures; the companies that export to Panama handle only printed circuit boards and whole WEEE parts; the other 7 companies export lead acid batteries.

Based on the annual reports to the Basel Convention, Nicaragua exported 40 t and 60 t of e-waste, respectively, to Panama for re-exporting purposes in 2018 and 2019, according to Panama's non-objection (D14 and 15 of the Basel codes).






Stakeholder Mapping

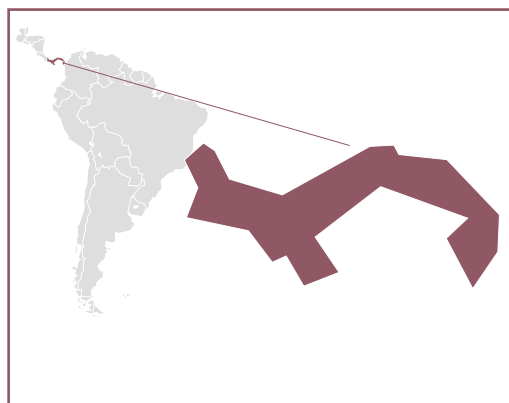
In Nicaragua, the stakeholders involved in the waste sector (that could be identified) and their roles are described below:

Stakeholder	Responsibility
Ministry of Environment and Natural Resources (MARENA) Website	Ministry responsible for promoting the sustainable development of Nicaragua through the formulation, coordination, execution, and evaluation of public policies focused on preserving natural resources and conserving the environment; the Ministry works to improve its inhabitants' quality of life. The Ministry is also responsible for guaranteeing the correct management and monitoring of e-waste in the country.
Ministry of Health (MINSA) Website	The Ministry of Health has the strategic functions of environmental health management and of integrating the environmental component in regulation, surveillance, and health promotion actions.
General Directorate of Customs Services (DGA) Website	The General Directorate of Customs Services is in charge of the administration of customs services for the control and facilitation of foreign trade through the development and constant improvement of customs techniques. It is also in charge of administering taxes established in favor of the State that are levied on the international traffic of goods and the legal relations derived from them.
Ministry of Finance and Public Credit Website	Through the General Directorate of State Assets (DGBE), the Ministry of Finance and Public Credit is in charge of administering and managing the assets that are decommissioned from state institutions (e.g. e-waste).
Ministry of Energy and Mines (MEM) Website	The Ministry of Energy and Mines (MEM) is in charge of the administration and distribution of electric power and its components.
Municipalities	The Regulation for Solid Waste Management (Reglamento para el Manejo de Residuos Sólidos) defines that the municipalities are responsible for the management of solid waste generated in their jurisdictions. Municipalities regulate this management through municipal ordinances that regulate the municipal sanitation service and establish how the service is collected. The Municipal Tax Plans are the instruments that establish the taxes, rules, and procedures related to the municipal tax system.
Nicaraguan Institute of Telecommunications and Postal Services (TELCOR) Website	<p>The Institute of Telecommunications and Postal Services (TELCOR) is the 'Regulatory Entity' of the Telecommunications and Postal Services (a state institution), which works with regulations, technical planning, supervision, application, and control of compliance of the Laws and Norms that govern the installation, interconnection, operation, and provision of Telecommunications Services and Postal Services.</p> <p>TELCOR is responsible for the Administration and Regulation of the Radio Frequency Spectrum, as well as granting a concession, license, permit, or certificate of registration (in accordance with the Law and other applicable legal provisions) to Companies interested in providing Telecommunications Services and Postal Services or in making use of Radio Spectrum Frequencies.</p>

Country:

Panama

-  4.2 million inhabitants [28]
-  74,177 km²
-  **Borders:** Costa Rica, Caribbean Sea, Colombia, Pacific Ocean
-  **GDP per capita PPP:** \$32,850 USD [29]
-  **Average household size:** 3.7 members [30]



Map source: United Nations Geospatial Information Section⁽¹⁴⁴⁾

E-waste Management:⁽¹⁴⁵⁾

Legislation: ●●●●●
 Infrastructure: ●●
 Collection Rate: 0.2%

E-waste POP Management:

Legislation: ●●●●●
 Infrastructure: ●●●●●
 Collection Rate: 0%

Legend: ● Advanced ● Transition ● Basic
 Each indicator is one circle.

National legislation on e-waste and POPs:

- Extended Producer Responsibility: ⚙ In development
- National e-waste standards: ✘ Implemented voluntarily
- National standards for POPs contained in e-waste: ⚙ In development
- E-waste collection target: ✘
- Legislation product coverage in UNU-KEYs: 0 of 54
- Legislation product coverage in weight (%) on total and per category⁽¹⁴⁶⁾: Total: 0% of the e-waste generated in 2019



International Conventions:




	Signature	Ratification	Entry into force
Basel Convention [31]	22/03/1989	22/02/1991	05/05/1992
Rotterdam Convention [32]	11/09/1998	18/08/2000	24/02/2004
Stockholm Convention [33]	23/05/2001	05/03/2003	17/05/2004
Minamata Convention [34]	10/10/2013	29/09/2015	16/08/2017

⁽¹⁴⁴⁾ <https://www.un.org/Depts/Cartographic/english/htmain.htm>.

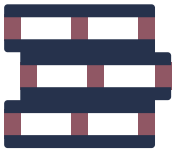

⁽¹⁴⁵⁾ Collection rate in Panama is an approximation of e-waste collected made by the national technical team of the e-waste project in Latin America - PREAL UNIDO.

⁽¹⁴⁶⁾ Percentage in weight of e-waste generated equipment covered by the national legislation illustrated per EU-6 collection category for 2019.



EEE Placed on Market (2019):	E-waste generated (2019):	E-waste formally collected (2019):
 <p>64 kt. 15.2 kg/inh.</p>	 <p>36 kt. 8.6 kg/inh.</p>	 <p>0.08 kt.⁽¹⁴⁷⁾ 0.02 kg/inh.</p>

(Source: Ministry of Health / UNU / UNITAR)

Generated e-waste plastic:	Generated BFRs from e-waste:
 <p>10 kt. 2.5 kg/inh.</p>	 <p>1 kt. 0.2 kg/inh.</p>

(Source: UNDP / UNU / UNITAR)

Formal/environmentally sound e-waste management system in place:

- ✓ As of July 2021, the national technical team of the e-waste project in Latin America – PREAL UNIDO GEF – made several visits to the facilities of the seven (7) e-waste management companies located in the provinces of Panama and West Panama. Of these companies, five carry out collection activities, five carry out transportation activities, five receive waste at their facilities, four carry out disassembly activities, three carry out sales activities, and two export materials. As well, six are formal waste management companies, and one provides the service informally. Furthermore, only one has the mandatory sanitary operating permit issued by the Ministry of Health (MINSa) for managing e-waste in the country.
- ✗ Panama does not have facilities that process/treat POPs arising from e-waste.

⁽¹⁴⁷⁾ E-waste formally collected in Panama is an approximation made as a result of information provided by e-waste operators to the national technical team of the e-waste project in Latin America – PREAL UNIDO.

National Legal Framework

The Republic of Panama (hereafter, Panama) regulates e-waste and POPS as part of its comprehensive legal and regulatory framework related to hazardous wastes. Some necessary bylaws for the full implementation have not yet been adopted.

Panama does not yet have a specific legislative tool relating to e-waste and POPs, which are regulated as hazardous waste. The following are the main relevant legal and policy instruments in place in the country:

- Decree No. 176 of May 27, 2019, 'Activities related to situations of high public risk due to their implications for health or the environment, the types of establishment that due to their activity are of sanitary interest and dictates other provisions'.
- Law 33 of March 30, 2018 'Zero Waste policy and its framework of action for comprehensive waste management and dictates other provisions [112]'.
- National Plan for Comprehensive Waste Management 2017-2027 [113].
- Political Constitution of the Republic of Panama of April 5, 2016 [114].
- Resolution 169 of 2011 of the Ministry of Health 'Restriction and prohibition measures in the use and final disposal of Polychlorinated Biphenyls (PCBs)'.
- Executive Decree No. 34 of February 26, 2007 'National Policy for Integrated Management of Hazardous and not Hazardous Wastes, principles, objectives and execution lines' [115].
- Resolution 1029 de 2011 'Requirements and procedures for obtaining the sanitary operating permit, for any economic agent that is dedicated to or wishes to engage in activities related to classification, packaging, collection, transport, temporary storage, treatment, crushing, neutralisation, recycling, encapsulation, recovery, reuse, and final disposition of hazardous wastes [116].
- Law 51 of September 29, 2010 creating the Urban and Home Cleaning Authority and adopting provisions for the effectiveness of its management [117].
- Executive Decree 34 of February 26, 2007 approving the national policy for the comprehensive management of non-hazardous and hazardous waste, its principles, objectives, and lines of action [115].

- Law No. 41 of July 1, 1998 'General environmental law' (as amended)⁽¹⁴⁸⁾.
- Political constitution of the Republic of Panama of April 5, 2016⁽¹⁴⁹⁾.

According to the Constitution, it is a fundamental duty of the State to guarantee that the population lives in a healthy and pollution-free environment (art. 118). The State and all the inhabitants have the duty to promote social and economic development that prevents pollution of the environment, maintains ecological balance, and avoids destruction of ecosystems (art. 119)⁽¹⁴⁹⁾.

The Law No. 51 of 2010 established the National Waste Authority (AAUD), which is responsible for the administration, planning, operation, and inspection of municipal, commercial, and industrial waste management, as well as the landfills. AAUD is also responsible for waste collection in Panama City [118].

Law No. 33 of 2018 introduced the Zero Waste Policy as part of comprehensive waste management framework, based on the concept of a circular economy. The Zero Waste Policy is also modelled on a closed-cycle waste system, where the end-of-life products and waste are treated as resources. The Policy follows the following fundamental principles:

- Shared responsibility (social waste management responsibility).
- Extended Producer Responsibility for importers, producers, manufacturers, distributors, marketers, and service providers that generate waste in their activity.
- Hierarchy of waste management in the following order: prevention, minimisation or reduction of volume, and reuse or recycling.
- Energy recovery using the most environmentally friendly treatment.
- Proximity (disposing of waste close to its origin).
- Precautionary (caution in waste management).
- Polluter pays (those who produce pollution bear the costs of managing it to prevent damage to human health or the environment).
- Internalisation of waste based on disposal costs [119].

The law also creates a National Education Program to promote a Zero Waste Culture (3Rs).

⁽¹⁴⁸⁾ <http://www.css.gob.pa/ley%2041%20general%20de%20ambiente%20disminuida.pdf>.

⁽¹⁴⁹⁾ <https://ministeriopublico.gob.pa/wp-content/uploads/2016/09/constitucion-politica-con-indice-analitico.pdf>.

The Zero Waste Policy also mandates the adoption of bylaws for the establishment of the EPR system and for collection and recycling targets that are currently under discussion but not yet adopted.

The Zero Waste Policy of 2018 required generators of special waste (i.e. substances that represent a significant risk to health and the ecosystem) to establish an effective recycling program and use packaging in order to minimise waste generation. The establishment of collection and recycling targets is mandated for relevant institutions. Necessary bylaws are missing for the actual implementation of the Policy.

Finally, Resolution 169 of 2011 establishes restriction and prohibition measures in the use and final disposal of Polychlorinated Biphenyls (PCBs) and establishes the institutional framework mandated to PCBs management, while the management of POPs is governed by Decree No. 176 of May 27, 2019, which introduces a classification system for activities related to situations posing high public risk due to their possible impact on human health or the environment.

A draft law including provisions on e-waste, including an EPR system for e-waste, is currently being discussed.

Draft Law No. 17 intends to introduce the waste hierarchy system and a waste classification system involving, *inter alia*, waste subject to special management for the following waste streams:

- Scrap.
- Electronics and lighting systems.
- Equipment and household goods.

This draft law is also focused on establishing an EPR system with special responsibilities for producers, manufacturers, importers, distributors, traders, and service providers.

EHS standards exist in Panama for POPs and hazardous wastes, but not specifically for e-waste.

Resolution 1029 de 2011 Requirements and Procedures for Obtaining the Sanitary Operating Permit foresees specific standards for hazardous wastes, while Resolution 169 of 2011 covers measures in the use and final disposal of PCBs, and Decree No. 176 of 2019 covers POPs.

Panama regulates e-waste and POPs as part of its comprehensive legal and regulatory framework related to hazardous wastes. EHS standards exist in Panama for POPs and hazardous wastes, but not specifically for e-waste

National Statistics on E-waste

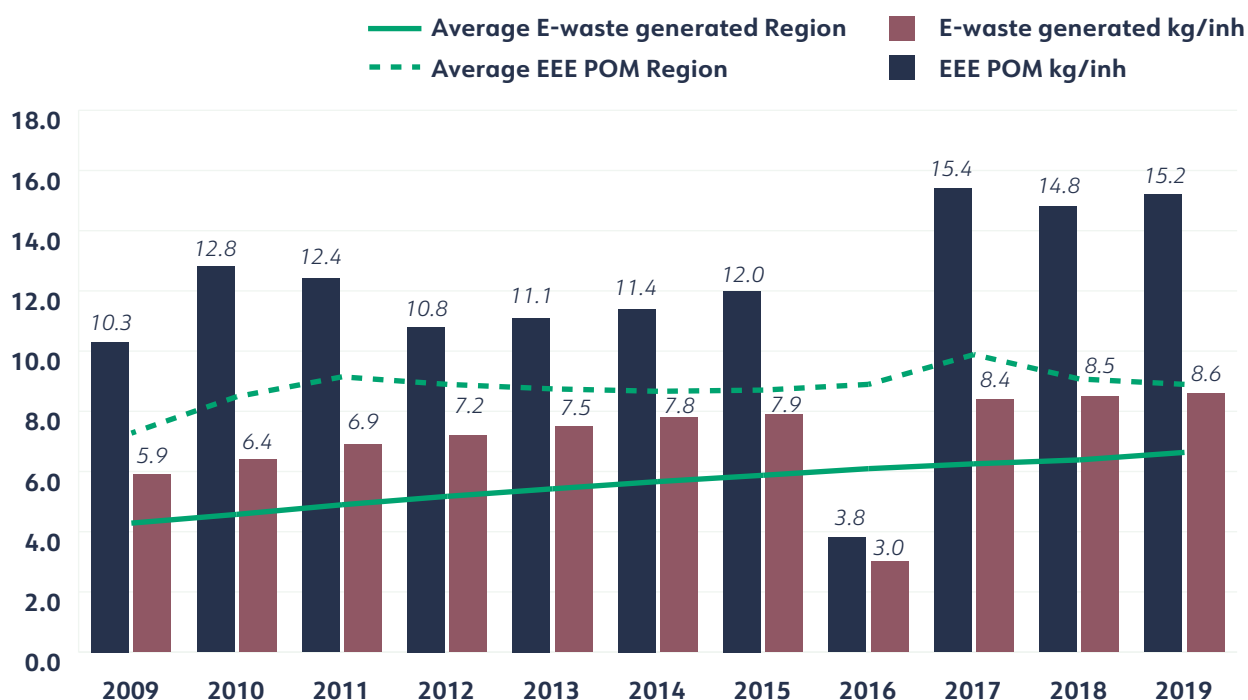
Statistics on e-waste are not currently being compiled in Panama.

Prior to 2019, information on imports and exports of EEE were not carried out systematically in the country. However, official information is available at a national level at the Ministry of Health and Environment and Directorate General of Customs (DGA). Panama’s Import Tariff is based on the Harmonized Commodity Description and Coding System (HS). Panamanian statistics don’t differentiate between new or used equipment being imported and exported.

Panama does not have an electronic manufacturing industry, but it has companies that assemble and repair equipment. The analysis of information from 2009-2018 was undertaken using information provided by the Ministry of Health and Environment, and for 2019, UNU/UNITAR internal data has been used to estimate the main e-waste statistics indicators (i.e. EEE POM and e-waste generated) for the country, as shown in Figure 38-Figure 40.

Figure 38 shows that EEE POM has fluctuated over the past decade, increasing from 10.3 kg/inh (37 kt) in 2009 to 15.2 kg/inh (64 kt) in 2019. In comparing Panama’s EEE POM with other countries of the region, Figure 38 shows that Panama’s is above the regional average. This is mainly due to the fact that Panama has a free trade zone, where electronic equipment can be bought at reasonable prices either via retail or wholesale. As a result, many stores’ main services are of import and sale of products.

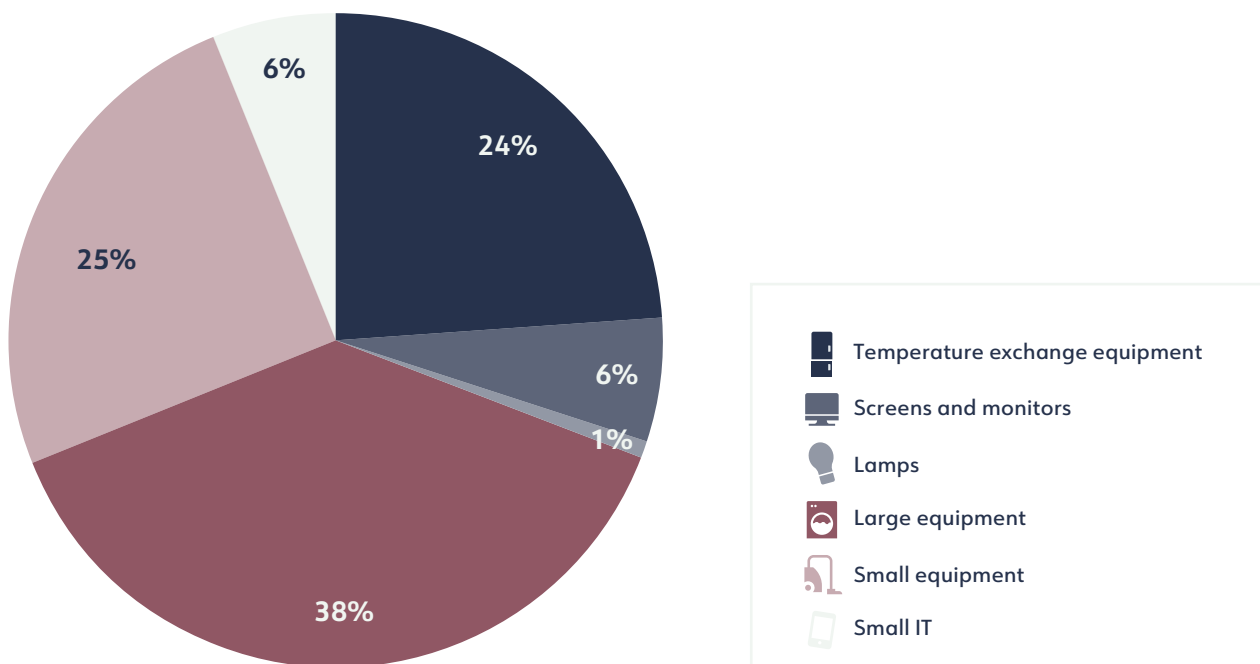
Figure 38. EEE POM and e-waste generated in Panama



When looking at the POM EU-6 categories, large equipment (Cat. IV with 5.8 kg/inh), small equipment (Cat. V with 3.9 kg/inh), and temperature exchange equipment (Cat. I with 3.6 kg/inh), register the highest combined share (91 percent of the total). The share of the EU-6 categories has been calculated over the total mass.

This trend could be seen for most of the years (from 1995-2019). In 2016, an increase of temperature exchange equipment could be observed, representing 38 percent (Cat. I with 5.6 kg/inh), followed by small equipment (Cat. V with 3.8 kg/inh) at 26 percent and large equipment with a share of 19 percent (Cat. IV with 2.8 kg/inh), representing 83 percent of POM for this year (Figure 39).

Figure 39. Share of the EU-6 categories in the EEE (2019)



Based on the data provided by the Ministry of Health and Environment, Panama's POM in 2018 was 61 kt (14.8 kg/inh) of EEE, which – from using UNU/UNITAR's database for 2019 – corresponded to 64 kt (15.2 kg/inh). The majority of equipment POM in 2019 corresponded to large equipment (washing machines, dishwashers, professional IT, etc.), temperature exchange equipment (freezers, fridges, air conditioners, etc.), and small equipment (irons, etc.). This trend was visible as well for 2018.

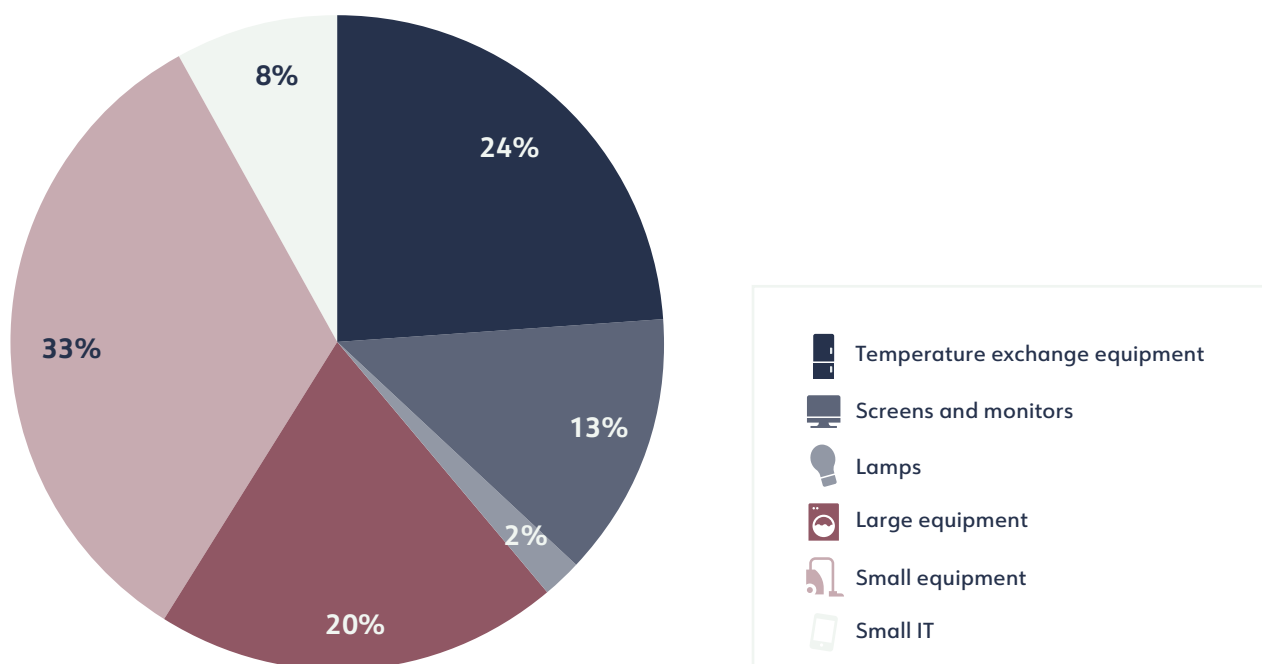
Panama imports all of their EEE.

Based on the data provided by the Ministry of Health and Environment, Panama exported 1.05 kt (0.25 kg/inh) of EEE in 2018, whereas it imported only 48.10 kt (11.57 kg/inh). The majority of the amount of equipment exported included washing machines, Telecom, and Music/radio Hi-fi equipment. The majority of imported equipment included air conditioners, washing machines, flat-panel TVs, and electronic toys.

E-waste Generated has increased substantially, from 5.9 kg/inh (21.16 kt) in 2009 to 8.0 kg/inh (33.38 kt) in 2018.

Analysis of the time series of e-waste generation in the EU-6 categories shows that the categories increase linearly throughout the years. For 2019, small equipment (Cat. V) had the highest share with 11.8 kt (equivalent to 2.8 kg/inh), followed by temperature exchange equipment (Cat. I) with 8.7 kt (equivalent to 2.1 kg/inh) and large equipment (Cat. IV) with 7.2 kt (equivalent to 1.7 kg/inh) (Figure 40). This trend was also visible for 2018, using the information provided by the Ministry of Health.

Figure 40. Share of the EU-6 categories in the e-waste generated (2019)



According to the waste management report of the Urban and Home Cleaning Authority (AAUD), in 2019 and 2020, approximately 700 kt of general waste was collected between the districts of Panama and San Miguelito. Both districts belong to the Province of Panama. Of the approximately 700 kt of general waste, e-waste represented 1% to 5% of the collected waste (i.e. 7 kt – 35 kt). For the moment, there is no information on the data of waste formally collected by the rest of Panama’s municipalities.

Given that there is no specific regulation on e-waste management at a national level, all types of waste that end up in landfills are not previously separated; at landfills, some informal sector actors separate it by scavenging the valuables parts.

The statistic of POPs and non-POPs arising from e-waste was unknown as of this report’s publication.

E-waste and POP Management System

The Ministry of Health and the Ministry of the Environment, with the technical advice of the Urban and Household Cleaning Authority, are responsible for the steering, planning, regulation, control, supervision, and management of the country's waste (hazardous and non-hazardous).

By Law No. 51 of September 29, 2010, the Urban and Household Cleaning Authority (AAUD) is a specialised autonomous body that provides the waste collection service in a centralised manner in the district of Panama and in the metropolitan region of the Province of Panama. For the rest of the municipalities of the Panamanian territory, waste management is developed at the municipal level by their governing bodies. In Panama, the waste collection and transportation service may be:

- **Public Agency:** Municipal (for the rest of the country), AAUD (service offered only in the capital).
- **Concession:** For those cases in which the municipality has subcontracted this service to a private company for its execution.
- **Private companies:** Companies that, without a concession from the municipality, are carrying out this service contracted directly by the citizens or are the citizens themselves who are responsible for the collection in a particular way.

According to data from the last census (2010), and estimated 66% of households in Panama have access to a waste collection system – 56.8% public and 43.2% private. The country has 63 landfills, 61 of which collect e-waste, equivalent to 97%; for the rest (3%), there is no information on the collection of e-waste. Much of this waste is not accepted in landfills in some regions of the country. Some residents choose to dispose of them in inappropriate places or give them to informal recyclers.

MINSA oversees regulating the management of electronic waste because the waste is categorised as '**hazardous waste**', according to the Basel Convention definition. To manage e-waste, the management companies must obtain a series of permits from the Ministry of Health. For the districts of Panama and San Miguelito (Metropolitan Region), the sanitation fee is collected through water billing. **The National Institute of Aqueducts and Sewerage (IDAAN)** is the public entity responsible for collecting the sanitation fee for the two districts in the metropolitan region of the Province of Panama and for forwarding the payment to the two waste collection companies. In accordance with Law No. 51 of September 29, 2010, the AAUD will set the rates for the service provided, based on the socioeconomic level of the communities in each region, and will charge for ordinary and special services provided directly or through third parties. The approximate minimum charge for residents of the metropolitan region is approximately \$6 USD per month. For the rest of the country – according to Law No. 106 of October 8, 1973, on the Municipal Regime, modified by Law No. 52 of December 12, 1984, Article 76, paragraph 9 – the municipalities will set fees for septic tank collection and cleaning services. The rates vary according to the agreements made between the municipalities and the subcontracted collection companies.

There are no effective public policies for waste separation and differentiated waste collection in Panama.

According to the National Waste Management Plan of 2017 (INECO, 2017), 86 percent of Panamanians do not separate their waste, and none of the municipalities have separated collection routes for recyclable waste. Under the framework of the PREAL project, the Ministry of Health will coordinate activities at the national level to promote the separation of e-waste from other types of waste.

The E-waste Project (PREAL – UNIDO – GEF) is focused (in its second component) on the strengthening of national capacities in facilities/infrastructure for the proper and sound e-waste management. For this work, it requires the identification of the current processes, practices, and operations carried out by the selected operators for the management of e-waste plastic. To achieve this, the Ministry of Health developed a baseline of e-waste operators and companies in Panama City in 2019. This analysis was performed through surveys sent to companies and via field inspections. E-waste operators identified by the Ministry of Health include:

RENUEVO Panamá: As of July 2021, Renuevo Panama does not have the appropriate Sanitary Operation Permit for e-waste management. A study developed by the Ministry of Health showed that RENUEVO Panamá has an estimated 7 years of being in operation. Its area of influence is concentrated in the metropolitan region of the province of Panama. They typically collect, transport, temporarily store, and export electronic equipment through a company called BG Metal. They usually specialise in providing the aforementioned services for all electronics, with the exception of cooling and freezing equipment and toners/cartridges from printers. Foam found in electronic equipment is disposed of in national landfills [120].

Recicla Panamá: As of 2019, this company had all operational permits and had an ISO 9001 certificate. The company has been operational since 2008 and provides e-waste management to Panama City (Panama), La Chorrera (West Panama), and the Colon District (Colon). They typically receive equipment from Chiriqui by making alliances with electronics companies (e.g. Multimax). Their services consist of collecting, transporting, temporarily storing, exporting, and selling electronic equipment. The e-waste plastic is usually exported. It is unknown whether it is exported for treatment or as material for economic revenue. Their core business is providing services to all electronics, except for cooling and freezing equipment, and they charge for the exportation of the printers (they do not receive printer toner or cartridges). As of 2019, they had some alliances with Multimax through collection campaigns using Ecobalboas. Ecobalboas is a virtual currency launched in 2019 used to motivate recycling in the country. Through this alliance, they provide capacity-building in schools in Panama City [120].

BG METAL TRADE: As of July 2021, BG Metal Trade does not have the appropriate Sanitary Operation Permit for e-waste management. They provide services for final reception, import, and export, specifically of printed circuit boards. On a national level, the company receives e-waste from the Colon district and Panama City. BG Metal Trade exports to Japan, Korea (Rep. of), and countries of the European Union [120].

Bliss Panama: As of July 2021, Bliss Panama does not have the appropriate Sanitary Operation Permit for e-waste management. The company has been operational since 2006 and provides e-waste management to Panama city, and sporadically to Colón. The company only collects and transports e-waste to their customers (i.e. Servicios Ecológicos S.A.). They usually collect all types

of waste, and printer toner/cartridges are sent to HP for final disposal. They have a portfolio of clients whose e-waste is managed in general (through a web application). They keep statistics and assign them an environmental value (e.g., number of trees saved), receiving a monthly management report indicating the amount of waste by type, including e-waste [120].

ECOLOGIC S.A.: Before the closure of activities due to the COVID-19 pandemic, ECOLOGIC S.A.'s permit was in order, and the Ministry of Health provided an extension for the company to renew it. However, as of July 2021, they have not renewed their Sanitary Operation Permit for e-waste management. ECOLOGIC S.A. has been in operation since 2017. It is estimated that they receive approximately 90 percent of e-waste from Panama City. They provide the following services: collection, transportation, reception, and storage of e-waste, wholesale, and treatment for lamps. E-waste and components that cannot be recovered are disposed of in landfills, with the exception of lamps, which are encapsulated in concrete. They provide services for all electronic equipment, except cooling and freezing equipment, fluorescent lamps, electric cables, and batteries of all type. They encapsulate in concrete an estimated 22,000 fluorescent lamps, 3 tons of batteries, and 6 tons of metals extracted from e-waste each year [120].

ATLANTIC RECYCLING: As of July 2021, Atlantic Recycling does not have the appropriate Sanitary Operation Permit for e-waste management. The company has been in operation since 2018 and provides e-waste management to Panama City and Chiriqui. They receive e-waste parts from informal recyclers from the landfill of the metropolitan region of the Province of Panama, known as Cerro Patacón. They provide the following services to all electronic equipment: collection, transportation, reception and storage of e-waste, wholesale, and dismantling of components from electronic equipment. Plastics are usually disposed of in landfills. It is estimated that they process 1 t of e-waste per month, equivalent to 12 t/year [120].

EcoServices (Servicios Ecológicos S.A): As of July 2021, EcoServices (Servicios Ecológicos S.A) does not have the appropriate Sanitary Operation Permit for e-waste management. EcoServices provides logistic services (transportation, collection, and storage) for the recycling of EEE, cables, metal, and other materials. They also provide services for demagnetising and destroying such electronic media as hard disks, flash cards, USB flash drives, and magnetic tapes [120].

RECICLADORA BETSY: They provide their services to the Province of West Panama for collecting all types of e-waste (e.g. monitors and computers) [120].

The Ministry of Health surveyed the e-waste operators listed above and determined the following:

- 2 companies manage screens, monitors, and lamps; 1 manages large equipment; and all of them provide services for small equipment and small IT.
- Of the e-waste operators surveyed, 67 percent receive the entire electronic equipment item, and 33 percent either receive the item as a whole (i.e. complete product) or parts of it.
- If cooling and freezing equipment is collected, 33 percent stated that they didn't contain any refrigerant gas, and 67 percent expressed that it did.
- Exported e-waste is typically sent to Europe, Canada, Costa Rica, Korea (Rep. of), and the U.S.

As of June 2021, the following e-waste operators' activities and practices have not been evaluated by the Ministry of Health, though they will be evaluated by the end of the year:

ALDIVA PANAMÁ: ALDIVA Panamá receives, collects, and recycles electronics such as laptops, desktop computers, monitors, small IT equipment (i.e. printers, keyboards, and mice). Their official Facebook page implies that they support universities with collection campaigns, but no information is provided on the methods they use to recycle e-waste or whether items collected are exported or refurbished. From discussions with the Basel Convention Focal Point in the Ministry of Health, Aldiva Panamá does not have the appropriate Sanitary Operation Permit for e-waste management.

E.waste.Panama: The organisation's official Facebook page indicates that they provide services of e-waste collection (by contacting them by phone and/or collection campaigns) to the Province of West Panama. No information is provided on the methods they use to recycle e-waste or whether items collected are exported or refurbished. From discussions with the Basel Convention Focal Point in the Ministry of Health, E.Waste.Panama does not have the appropriate Sanitary Operation Permit for e-waste management.

Leafsync: LEAFSINC was founded in 2016 as a youth social enterprise dedicated to creating recycling projects and promoting the education and recycling culture among young people in educational, residential centres, neighbourhoods, restaurants, companies, and institutions. They provide services to collect, transport, and recycle cans, Tetra Pak containers, plastic, glass, paper and cardboard, pallets, oils, and EEE. They also issue recycling and organic waste management certificates. No information is provided on the methods they use to recycle e-waste or whether items collected are exported or refurbished. From discussions with the Basel Convention Focal Point in the Ministry of Health, Leafsync does not have the appropriate Sanitary Operation Permit for e-waste management.

The informal sector is involved in the informal collection and dismantling of e-waste, but there are no estimates quantifying the amount of e-waste treated by them.

In Panama, the vast majority of recyclable material is e-waste collected/scavenged/purchased by collectors operating informally. The informal sector typically acquires the e-waste from kerbside collection, waste pickers operating in landfills, municipal collection truck workers, and from purchasing e-waste on the streets, among other methods [118].

There are currently no statistics as to how many electronic equipment items are repaired, imported, and exported as second-hand or disposed of as mixed in with residual waste.

Panama does not have PCB or POP treatment facilities.

E-waste plastic that does not contain POPs is typically recycled, sold, or sent to landfills. It is likely that e-waste plastics containing POPs and components with capacitors that are suspected of hazardous material are usually disposed of in landfills, with no proper treatment provided.

As of July 2021, the national technical team of the E-Waste Project in Latin America – PREAL UNIDO GEF – approached cement companies to evaluate the possibility of co-processing in their facilities; of these companies, only one (Cemex Panama) has ovens for the processes they carry out. Conversations have been held with CEMEX, and better technical information on plastic volumes generated in Panama, types of plastics, and the way in which the plastics would be delivered to the company for co-processing is likely forthcoming.

Import & Export of E-waste and POPs Contained in E-waste

Panama is Party to the Basel, Rotterdam, Stockholm, and Minamata Conventions.

The Basel Convention was approved by Law No. 21 of December 6, 1990, while the Stockholm Convention was domesticated by Law No. 3 of January 20, 2003. Law 13 of April 21, 1995, ratifies the Central American regional agreement on the Transboundary Movement of Hazardous Wastes [121] in order to prohibit the importation of hazardous waste from countries that are not party to the agreement (namely: Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama).

All imports of hazardous and toxic wastes are prohibited, while exports require authorisation of the Ministry of Health.

Panama prohibits all imports of hazardous wastes and toxic wastes for final disposal and recovery. Export of hazardous wastes and other wastes for final disposal are also restricted⁽¹⁵⁰⁾. After the Ratification of the Basel Convention, it was established that all exports of hazardous waste require the authorisation of the Ministry of Health in order to comply with the requirements established in the Convention and its amendment.

Stakeholder Mapping

In Panama, the stakeholders involved in the waste sector (that could be identified) and their roles are described below:

Stakeholder	Responsibility
Ministry of Health of Panama (MINSA) Website	<p>The Ministry of Health provides comprehensive care access to the Panamanian population through public health services based on the primary care strategy; it also provides the development of the steering, management, and transformation functions, giving priority to equity, efficiency, and quality ensuring the processes of transparency in the use of resources and the development of health actions with citizen participation, in the construction of the necessary conditions for the social production of health.</p> <p>They are the Ministry responsible for monitoring, surveillance, and the proper management of e-waste.</p>
The Center for Research and Information on Medicines and Toxics (CIIMET) Website	<p>The Center for Research and Information on Medicines and Toxics (CIIMET) serves as the Stockholm Convention Regional Center for Central America and the Dominican Republic, and in 2019 was approved to serve as the Basel Convention Regional Center for Central America and Mexico. CIIMET's work focuses on training and the transfer of knowledge and technologies to support countries in the process of implementing chemical conventions.</p>
Ministry of Environment (MiAmbiente) Website	<p>Within its regulatory framework and in accordance with the Sustainable Development Goals, the Ministry of Environment must create awareness and educate the population through the dissemination of good management practices and the creation of employment opportunities. Likewise, they must ensure compliance with the provisions established by the State with respect to waste.</p>
National Customs Authority (ANA) Website	<p>The National Customs Authority (NCA), attached to the Ministry of Economy and Finance (MEF), is the institution in charge of overseeing and controlling aspects related to the entry and exit of goods through Panama's borders.</p>






⁽¹⁵⁰⁾ <http://www.basel.int/Countries/ImportExportRestrictions/tabid/4835/Default.aspx>.

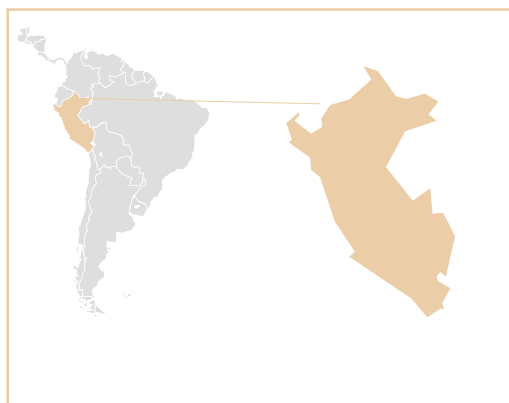
Stakeholder	Responsibility
Urban and Household Cleaning Authority (AAUD) Website	<p>The Urban and Household Sanitation Authority is responsible for the administration, planning, operation, use and control of services related to urban and household and commercial sanitation and sanitary landfills in the metropolitan region of the Province of Panama.</p>
National Institute of Statistics and Census Panama (INEC) Website	<p>The Institute collects, processes, elaborates, analyses, publishes, and disseminates statistics that contribute to better information and to the solution of the different economic, social, demographic, and environmental problems faced by the State and individuals. With regard to e-waste, the institute assists the Ministry of Health with statistical information.</p>
Municipalities	<p>The Regulation for Solid Waste Management defines that the municipalities are responsible for the management of solid waste generated in their jurisdictions. Municipalities regulate this management through municipal ordinances that regulate the municipal sanitation service and establishes how the service is collected. The Municipal Tax Plans are the instruments that establish the taxes, rules, and procedures related to the municipal tax system.</p>
Association of Municipalities of Panama (AMUPA) Website	<p>The Association of Municipalities of Panama (AMUPA) is an organisation that represents the interests of the municipalities of the Republic, bringing together all municipal authorities. The main objective of the Association of Municipalities of Panama is that of political advocacy at all levels of the State, defining the interest of the members and their institutions, within the legal and democratic frameworks that exist for the municipalities and their communities. For the PREAL Project, AMUPA has supported us in the approaches with various municipal authorities.</p>
Samsung Electronics Panama Website	<p>Samsung Electronics is a multinational electronics and information technology company whose best-known distributed products in the country are LED televisions, smartphones, and tablets. Samsung Electronics Panama was among the guests who presented at the launch of the E-Waste Project in Latin America – PREAL UNIDO GEF – organised by the national technical team of the project.</p>
Rodelag, S.A. Website	<p>Rodelag, S.A. is one of the national distributors of gardening, household, hardware, camping, electrical and electronic equipment, etc. The PREAL Project has been participating with Rodelag, S.A. in awareness and dissemination activities such as E-WASTE recycling campaigns.</p>
Recicla Panama Website	<p>As of 2019, this company had all operational permits and had a ISO 9001 certificate. The company has been operational since 2008 and provides e-waste management to Panama City (Panama), La Chorrera (West Panama), and the Colon District (Colon). They typically receive equipment from Chiriqui by forming alliances with electronic companies (e.g. Multimax). Their services consist of collecting, transporting, temporarily storing, exporting, and selling electronic equipment. E-waste plastic is usually exported. It is unknown whether it is exported for treatment or as material for economic revenue. Their core business is that of providing services to all electronics except for cooling and freezing equipment, and they charge for the export of printers (they do not receive printer toner or cartridges). As of 2019, they had some alliances with Multimax through collection campaigns using Ecobalboas. Ecobalboas is a virtual currency launched in 2019 used to motivate recycling in the country. Through this alliance, they provide capacity-building in schools in Panama City.</p>

Stakeholder	Responsibility
Renuevo Panamá Website	Renuevo Panamá is a company specialised in the management of e-waste with 7 years of experience. Their aim is to provide a sustainable solution for e-waste recycling in Panama.
BG Metal TRADE Website	BG Metal TRADE manages electronic scrap and offers services relating to the recycling of ferrous and non-ferrous metals, for which logistical and commercial facilities are offered.
Servicios Ecológicos S.A, (Eco Services) Website	Eco Services is a company dedicated to the management of all types of ferrous and non-ferrous materials, electronic equipment, electrical cables, and backup batteries, among other materials.
ATLANTIC RECYCLING Website	ATLANTIC RECYCLING is a company dedicated to the management of all types of ferrous and non-ferrous materials, including electronic equipment.
EcoServices (Servicios Ecológicos S.A) Website	Servicios Ecológicos S.A (Eco Services) is a company dedicated to the management of all types of ferrous and non-ferrous materials, electronic equipment, electrical cables, backup batteries, and other materials.
Leafsinc Website	LEAFSINC was founded in 2016 as a youth social enterprise dedicated to creating successful recycling projects and to initiating the education and recycling culture of young people in educational centres as well as in residential centres, neighborhoods, restaurants, companies and institutions. In 2019, they won the call for Social Innovation in Waste Management awarded by SENACYT as a prize for the benefit that the entrepreneurship means for many young people and the environment throughout Panama. The company recycles cans, plastic, glass, paper and cardboard, pallets, oils, and EEE.

Country:

Peru

-  32.5 million inhabitants [28]
-  1,285,220 km²
-  **Borders:** Ecuador, Colombia, Brazil, Bolivia (Plurinational State of), Chile, Pacific Ocean
-  **GDP per capita PPP:** \$13,416 USD [29]
-  **Average household size:** 3.8 members [30]



Map source: United Nations Geospatial Information Section⁽¹⁵¹⁾

E-waste Management:

Legislation: ●●●●●○
Infrastructure: ●●
Collection Rate: 1.5%

E-waste POP Management:

Legislation: ●●●●○
Infrastructure: ●●●●○
Collection Rate: 0%

Legend: ● Advanced ● Transition ● Basic
 Each indicator is one circle.

National legislation on e-waste and POPs:

- Extended Producer Responsibility:** ✓ Introduced in 2017
- National e-waste standards:** ✓ Introduced in 2012, on the generation, collection, classification, storage, and treatment of screens
- National standards for POPs contained in e-waste:** ⚙ In development
- E-waste collection target:** ✓ For some collection categories
- Legislation product coverage in UNU-KEYs:** 17 of 54
- Legislation product coverage in weight (%) on total and per category⁽¹⁵²⁾:** Total: 6 % of the e-waste generated in 2019






International Conventions:

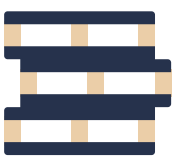

	Signature	Ratification	Entry into force
Basel Convention [31]	-	23/11/1993 (a)	21/02/1994
Rotterdam Convention [32]	11/09/1998	14/09/2005	13/12/2005
Stockholm Convention [33]	23/05/2001	14/09/2005	13/12/2005
Minamata Convention [34]	10/10/2013	21/01/2016	17/08/2017

⁽¹⁵¹⁾ <https://www.un.org/Depts/Cartographic/english/htmain.htm>. ⁽¹⁵²⁾ Percentage in weight of e-waste generated equipment covered by the national legislation illustrated per EU-6 collection category for 2019. Collection targets for 2020: Large household equipment 4 percent, Small household equipment 4 percent, IT and telecom equipment 16 percent, Consumer equipment 16 percent. Other collection categories have a voluntary collection target.



EEE Placed on Market (2019):	E-waste generated (2019):	E-waste formally collected (2019):
 <p>244 kt. 7.5 kg/inh.</p>	 <p>195 kt. 6.0 kg/inh.</p>	 <p>3 kt. 0.1 kg/inh.</p>

(Source: Ministry of Environment / UNU / UNITAR)

Generated e-waste plastic:	Generated BFRs from e-waste:
 <p>56 kt. 1.7 kg/inh.</p>	 <p>5 kt. 0.2 kg/inh.</p>

(Source: UNDP / UNU / UNITAR)

🔄 Formal/environmentally sound e-waste management system in place:

- ✓ As of May 18, 2021, Peru has 6 official e-waste operators that provide transportation, collection, and recovery of e-waste in the City of Lima and in Callao.
- ✗ Peru does not have facilities that process/treat POPs arising from e-waste.

National Legal Framework

E-waste management in the Republic of Peru (hereafter, Peru) is framed in the compliance with the national environmental and solid waste policies.

E-waste management in Peru is outlined within the National Environmental and Waste Management policies; the policies also address regulations governing its operation, which must be complied with by all actors in the value chain.

1. NATIONAL ENVIRONMENTAL AND WASTE MANAGEMENT POLICIES:

a. General Environmental Law No. 28611.

Enacted on October 15, 2005, this law dictates a series of principles to be considered by the Public Administration with respect to environmental management, including solid waste. Of particular relevance to waste management are the guidelines related to the principle of recovery and environmental responsibility⁽¹⁵³⁾.

b. National Environmental Policy and National Environmental Action Plan 2011 – 2021 (PLANAA).

The National Environmental Policy mentions and incorporates e-waste management. As part of the National Environmental Policy, in 2011 the Ministry of Environment prepared the National Environmental Action Plan 2011-2021 (PLANAA). This plan identified increasing the reuse and proper disposal of waste electrical and electronic equipment as a strategic action with prioritised goals: by 2012 to have an updated baseline and instruments for multisector and integrated environmental management of e-waste, by 2017 to have 50 percent of e-waste properly disposed of, and to promote reuse, increasing the reuse percentage to 100 percent by 2021. A detailed roadmap and public budget for achievement of these goals were not provided in the National Environmental Policy and National Environmental Action Plan 2011-2021. Prioritisation of the approval of a regulation for the management of e-waste and that the private sector contribution to the achievement of the goals through the implementation of EPR schemes was done [122].

c. Strategic Axes of Environmental Management.

The Strategic Axis developed in 2012 by the Peruvian Government's Multisector Commission was focused on improving environmental and social conditions in

the country, as well as on organizing the intervention of public entities in environmental management. Though e-waste management was not included in this strategic axis, which proposes the modification of the General Waste Law, ensuring proper waste management and handling, focused on minimisation, reuse, prevention, and protection of the environment and health, among other goals. Furthermore, this strategic axis differentiates the legal norms for waste that are under municipal responsibility from the waste generated by companies and other actors [123].

d. National Plan for Integrated Solid Waste Management 2016-2024 (PLANRES).

The National Plan for Integrated Solid Waste Management 2016-2024 (PLANRES) was prepared by the Ministry of Environment (MINAM) and is one of the main instruments for integrating environmental management policies and harmonising plans for urban and industrial waste. Its main objective is the reduction of national production of solid waste and the control of associated sanitary and environmental risks, incorporating policy guidelines, and priorities and technical-political criteria (SINIA). PLANRES mentions three policy objectives relevant to solid waste management. The first is related to achieving quality and national coverage of solid waste management services; the second is focused on promoting the adoption of sustainable consumption patterns and the minimisation of waste generation, as well as increasing reuse and recycling; and the third is focused on strengthening integrated management that articulates the corresponding institutions, corporate responsibility, citizen participation, and free access to information. PLANRES also established specific policy guidelines that refer to the definition of cross-sectoral programs for solid waste management [123, 124].

With respect to e-waste management, PLANRES identifies their intention to 'Strengthen the current process of implementation of the EPR principle in the management of e-waste at the national level', indicating that the strengthening will include the execution of a baseline study and the implementation of e-waste collection goals for the various categories by means of technical and legal instruments⁽¹⁵⁴⁾.

⁽¹⁵³⁾ <https://sinia.minam.gob.pe/normas/modificacion-ley-no-28611-ley-general-ambiente>.

⁽¹⁵⁴⁾ <https://sinia.minam.gob.pe/documentos/plan-nacional-gestion-integral-residuos-solidos-2016-2024>.

2. REGULATORY FRAMEWORK:

a. Legislation relating to solid waste.

i. National Regulation for the Management of E-waste (2012) [125].

In compliance with the goal set in the PLANAA to have instruments for environmental management of e-waste, an e-waste Regulation was approved by Supreme Decree No. 001-2012-MINAM, published in the newspaper *El Peruano* on June 27, 2012 [126]. The National Regulation stated that producers must guarantee the adequate environmental management of their waste through their delivery to e-waste operators registered and with all operational permits [127]. This norm has been derogated and replaced by Supreme Decree N° 009-2019-MINAM.

ii. Legislative Decree No. 1278 Law on Integral Solid Waste Management and the regulation of the Integral Solid Waste Management Law (LGIRS) No. 014-2017 (MINAM).

In 2017, the Legislation on Integrated Solid Waste Management – LGIRS (D.L. N° 1278) and its regulation (D.S. N° 014-2017-MINAM) were approved by the Peruvian Government. The LGIRS defines MINAM as the governing body for solid waste at the national level, being responsible for regulating and promoting its proper management. It introduces several changes to the previous law regarding the vision of waste, establishing the need to reduce such waste as a top priority, generating efficiency in the use of materials and considering them as resources as opposed to threats to health and the environment [127, 128].

The principle of circular economy is proposed and includes all actors in the management and treatment of solid waste.

It introduces the possibility of using treatment technologies to increase the waste value as a new raw material and strengthens companies linked to the waste sector, involving key public and private actors and citizens in the management and treatment of solid waste. The Law proposes a principle, the circular economy (understood as the re-entry of waste as inputs for other products), and that the proper disposal of those wastes cannot be recovered.

LGIRS establishes that companies that carry out operations related to solid waste management must be registered in the Authorized Registry of Solid Waste Operating Companies (including e-waste operators).

LGIRS establishes that companies that carry out operations related to solid waste management must be registered in the Authorized Registry of Solid Waste Operating Companies (EPS-RS), administered by MINAM. As a result, these waste regulations promote the development of enterprises and the generation of employment, since formal companies are required to comply with labour regulations whose compliance is regulated, supervised, and monitored by the Ministry of Labour and Employment Promotion (MTPE) [129].

Registration in the aforementioned registry will have an indefinite term, in accordance with the provisions of Article 41 of the Sole Ordered Text of Law No. 27444, 'Law of General Administrative Procedure (Article 87 of Supreme Decree No. 014-2017-MINAM)' [129].

The report should provide information that the Companies Providing Solid Waste Services (EPS-RS) and Companies Commercializing Solid Waste (EC-RS) be registered before DIGESA and maintain their registration under the same conditions that were granted to them until the end of the term of their registration. They may then register before MINAM (Third Transitory Complementary Provision of Supreme Decree No. 014-2017-MINAM) [129].

LGIRS establishes that EPR applies to mass consumption goods.

Furthermore, the LGIRS establishes that EPR applies to mass consumption goods that directly or indirectly affect the generation of waste or require special management due to their hazardous nature, defining them as Prioritized Goods. The regulation states that these must be subject to a Special Waste Management Regime, whose objectives, goals, and implementation deadlines for the producers' management systems are established by MINAM [129].

Producers must present an e-waste management plan (individual or collective) for the management of their waste.

Among the responsibilities, the LGIRS also establishes that producers must present an e-waste management plan (individual or collective) to the competent authorities for their approval, which must include the annual collection goals and actions to be developed for its adequate management [129]. Likewise, producers are responsible for the implementation of the approved e-waste management plan and for providing information to their clients when selling EEE on the environmental management of e-waste once it is generated, pointing out the need to separate it from municipal solid waste and to have it handled by specialised operators. Correspondingly, they should indicate where on the web they can find more information on the subject [129].

b. Standards related to the management of e-waste.

i. The National Regulation for the Management of E-waste (RNGMRAEE) (D.S. No. 001 2012 MINAM).

It must be noted that this norm has been derogated and replaced by Supreme Decree N° 009-2019-MINAM. However, it established the conditions for the proper management of e-waste as well as the rights and obligations of those involved, during its various stages [130]. At the time, the Regulation established 10 categories of e-waste as follows:

1. Large household equipment
2. Small household equipment
3. IT and telecom equipment
4. Consumer equipment
5. Lighting equipment
6. Electrical and electronic tools
7. Toys, leisure, and sports equipment
8. Medical equipment
9. Monitoring and control instruments
10. Automatic dispensers

c. Peruvian technical standards (NTP) related to the management of e-waste.

The increase in the generation of e-waste, the hazardous elements and valuable materials they contain, and the approval of the *National Regulation for the Management of e-waste* (RNGMRAEE) contributed to the development of

technical standards for the proper management of e-waste. Between 2012 and 2016, three standards were developed and approved that establish technical specifications or quality requirements for the standardisation of products, processes, and services applicable to the management of e-waste. According to the RNGMRAEE, the technical requirements outlined in them are mandatory. The NTPs are applied by producers constituted in individual and collective systems and e-waste operators that operate recovery plants.

i. Environmental Management.

General information NTP 900.064:2012.

This standard applies to e-waste that has completed its useful life cycle and cannot be used for the purpose for which it was manufactured or which has been discarded by its owners. The e-waste whose management is standardised corresponds to the waste of the categories illustrated in Table 11. It establishes measures for the ESM of e-waste (collection, classification, storage, transportation, reuse, refurbishment, recycling, and final disposal). It excludes EEE containing radioactive substances and used in electrical transmission systems because they contain POPs [131].

ii. Environmental Management.

Generation, internal collection, classification, and storage. NTP 900.065:2012.

This standard covers the management stages common to all e-waste categories: generation, internal collection, classification, storage at the generator's facilities, as well as collection centres. Establishes measures for the management of e-waste within the generator's facilities and the characteristics of the collection centres, for all e-waste categories included in NTP 900.064:2012 [131].

iii. Environmental Management.

E-waste treatment with monitors, screens, and other EEE. NTP 900.066:2016.

Establishes measures for handling e-waste during treatment carried out at the operator's facilities, applicable to class 1 e-waste (devices with monitors and screens) and class 2 (computer equipment, sound, and video equipment, and fixed and mobile telecommunications) [132].

d. Proposals for modification of e-waste management regulations.

In April 2019, MINAM pre-published and put out for public consultation a regulatory project for the approval of the Special E-waste Management Regime, which, once approved, will replace the RINGMRAEE [133]. The proposal was developed within the framework of the LGIRS's provisions and regulations and is focused on promoting the recovery of e-waste and strengthening the EPR principle. This will be done through the responsible participation of manufacturers, importers, and assemblers in the management of e-waste from the time it is POM to the post-consumption phase [133].

The proposal emphasizes that disassembly must be carried out in authorised infrastructures and that the e-waste operators must not only collect and transport the e-waste, but also transfer it to recovery plants to guarantee its adequate and environmentally responsible treatment. As such, those who wish to recover e-waste will be obliged to have a recovery infrastructure with an approved environmental management instrument that must comply with the technical and legal requirements; the instrument must also guarantee adequate management, safety, and health in the establishments and comply with current labor regulations [133].

e. Proposal to modify and adapt NTP 900.064:2012 and NTP 900.065:2012 to current national solid waste regulations.

Every 5 years, NTPs are either updated or ratified, depending on whether there are technical updates or other changes in the standards or law. Currently, NTP 900.064:2012 and NTP 900.065:2012 are being updated because the baseline norm has been derogated.

f. Legislative Decree No. 1501 Modifying Legislative Decree No. 1278, which approves the Law on Integral Solid Waste Management⁽¹⁵⁵⁾.

This legislative decree establishes an amendment of Articles 9, 13, 16, 19, 23, 23, 24, 28, 32, 34, 34, 37, 52, 60, 65, and 70 of Legislative Decree No. 1278, which approves the Law of Integral Solid Waste Management in order to include provisions regarding the management of solid waste in emergency situations and the corresponding provision of the integral solid waste management service⁽¹⁵⁷⁾.

g. Decreto Supremo N° 009-2019 aprueba el Régimen Especial de gestión y manejo de residuos de aparatos eléctricos y electrónicos.

The Legislative Decree's goal is to establish a special regime for the handling and management of e-waste as prioritised waste goods by determining a set of obligations and responsibilities of the actors involved in the various stages of management and handling. This includes activities focused on separation, storage, collection, dismantling, transport, recovery, and final disposal of e-waste, taking into account conditions for environmental protection and human health [134].

Art. 4 defines guidelines to be considered in the management and handling of e-waste:

- Prioritize recovery and valorisation over final disposal (elimination) of e-waste.
- Establish the EPR and the shared responsibility of the generator, e-waste operator, and municipalities.
- Involve retailers and distributors so that they facilitate the collection of e-waste in collaboration with management systems.
- Carry out awareness actions for the general population regarding an efficient, effective, and sustainable management and handling of solid waste and focused on the minimisation and recovery of e-waste.
- Promote the minimisation of e-waste generation [134].

Furthermore, Art. 5 defines the responsibilities of the Ministry of Environment:

- To regulate and establish strategies on the management and handling of e-waste at the national level.
- Incorporate the management and handling of e-waste in the national solid waste management planning.
- Approve the e-waste management targets and the gradual fulfillment of these targets by the e-waste management systems.
- Evaluate and approve the e-waste Management Plans and their updates.
- Coordinate, with the competent authority, the development of guidelines and directives for the acquisition of EEE in the public sector and for the adequate management and handling of e-waste.

- Register the companies in the Authoritative Registry of Solid Waste Operating Companies (EO-RS), authorising the operations for the management of e-waste, when applicable.
- Include systematised information on e-waste in the National Environmental Information System (SINIA), such as awareness campaigns, compliance with goals, statistics, etc.
- Promote capacity-building of the authorities involved in the management and handling of e-waste.
- Develop guidance material on e-waste management and handling, directed to the actors involved, for the adequate compliance with the regulations [134].

Art. 6 addresses the functions of the National Service of Environmental Certification for Sustainable Investments:

- Conduct, within the framework of its competences, the environmental impact assessment process of the investment projects for the e-waste recovery plants owned by an EO-RS.
- Manage and keep the Administrative Registry of Environmental Certifications (RCA) updated with the certifications granted or denied for e-waste valorisation plants [134].

In Art. 7, Environmental Assessment and Audit Agency responsibilities are established:

- Supervise and oversee compliance with the obligations of producers through the e-waste management systems, according to its competence.
- Supervise and oversee compliance with the obligations of e-waste generators with Environmental Study or Environmental Management Instrument complementary to the National System of Environmental Impact Assessment (SEIA), according to its competence.
- Supervise and oversee the management of e-waste in the valorisation plants in charge of the EO-RS and sanction non-compliance [134].

In Art. 8, the municipalities are defined, highlighting that they must support the implementation of Management Plans for e-waste generated by the population within its jurisdiction [134].

In its chapter 1, producers (Art. 9), their obligations (Art. 10), and a guideline on the Producer's Annual Statement (Art. 11) are provided [134]. In this sense, a producer

is considered to be any natural person or private entity that carries out activities related to EEE for commercial purposes – whether as manufacturer, assembler, or importer – and that places the EEE on the market for the first time, regardless of the sales technique used, including distance and electronic sales. He/she is exempt from liability for damages caused by the inadequate handling of e-waste, delivering it to an e-waste operator, unless it is proven that its negligence, fraud, omission, or concealment of information on the handling, origin, quantity, and/or hazardous characteristics of such waste contributed to causing its damage [134].

Their responsibilities include:

- Design, implement, and administer e-waste management systems, individually or collectively, that guarantee the adequate management and handling.
- Submit an E-waste Management Plan to MINAM.
- Comply with the commitments assumed in the approved Management Plan regarding the management and handling of e-waste, including individual and collective collection goals.
- Receive without cost, within the national territory, the e-waste from its clients or those collected by distributors and traders that participate in the value chain of the EEE it places in the market; without prejudice of voluntarily receiving, without cost, the e-waste from other generators.
- Directly inform its customers, distributors, and marketers about the proper management and handling of e-waste.
- Disseminate the handling and management of e-waste in its electronic portal.
- Deliver the e-waste to an authorised e-waste operator through an individual or collective system, as well as inform the e-waste operator about the parts or components that contain hazardous substances or materials.
- Comply with the procedure established by MINAM for the export of e-waste or its components.
- Report the producer's annual statement, according to the provisions of article 11. If collective systems exist, the producer's annual statement is submitted by the representative of the referred system.
- Submit the update of the E-waste Management Plan for its evaluation [134].

It also provides guidelines on how they can migrate from an individual to a collective collection system and vice versa (Art. 13), procedures to take when ceasing activities as a producer (Art. 14), and a clear guideline on the content (Art. 16 and 17) of the E-waste Management Plan presented by producers or EEE producer associations to present to MINAM every year, among other items. Most importantly, Art. 18 defines deadlines and targets as seen in Table 11:

Peru regulates e-waste and POPS as part of its comprehensive legal and regulatory framework. Peru has EHS standards for POPs and e-waste.

Table 10. Collection target per year [134]

EU10 Col. Cat. + Pv Panel	Collection target/year								
	2016	2017	2018	2019	2020	2021	2022	2023	2024
Large household equipment	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	4%	7%	10%	13%	16%
Small household equipment	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	4%	7%	10%	13%	16%
IT and telecom equipment	4%	7%	10%	13%	16%	19%	22%	25%	28%
Consumer equipment	4%	7%	10%	13%	16%	19%	22%	25%	28%
Lighting equipment	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾ +PCT ⁽¹⁵⁷⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾
Electrical and electronic tools	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾
Toys, leisure, and sports equipment	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾
Medical equipment	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾ +PCT ⁽¹⁵⁷⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾
Monitoring and control instruments	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾
Automatic dispensers	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾
Pv Panels	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾	V ⁽¹⁵⁶⁾

Additionally, its IV Title (*DEL GENERADOR Y OPERADOR DE RESIDUOS DE APARATOS ELÉCTRICOS Y ELECTRÓNICOS*) defines what e-waste generators are (Art. 24) and outlines their obligations (Art. 25) and responsibilities (Art. 26) [134].

Art. 27 defines e-waste operators as a legal person or entity that owns an e-waste valorisation/recovery plant. They must be registered in the Authoritative Registry of

Waste Operating Companies administered by MINAM, and they are duly authorised to carry out the operation of e-waste recovery. Art. 28 establishes their obligations and guidelines on how to present the E-waste Operator Annual Statement (Art. 29). Art. 33 defines what a collection point and an e-waste valorisation/recovery plant (Art. 34) are. Additionally, infractions, sanctions, and definitions on e-waste management and handling are provided [134].

⁽¹⁵⁶⁾ V= Voluntary.

⁽¹⁵⁷⁾ PCT= Plan to develop collection target.

With regard to POPs, Peru adopted the National Plan for the Implementation (NIP) of the Stockholm Convention in 2007.

The NIP identified PCBs as a top priority in managing POPs. It specifically identified the need of a thorough inventory on PCBs and for a gradual phase-out of PCBs-containing equipment. The management of PCBs – from their generation, storage, collection, transportation, and treatment to their final disposal or elimination – is based on the following related regulations:

1. **Legislative Resolution No. 26234 Approves the Basel Convention on the Transboundary Movement of Hazardous Wastes (19.10.93).**
Adopts measures for the adequate exchange of information on TBM of hazardous wastes and the adequate control of such movements. Art. 11, 41, 61 and 131; Annex: I, II, IV [135].
2. **Law N° 28611, General Environmental Law (15.10.2005).**
States that facilities for the manufacture, processing, or storage of hazardous or explosive chemicals must be located in industrial zones, according to the zoning criteria approved by local governments. Art. 23° (23.3). Provisions for the control of chemical substances are also included. Art. 83° (83.1, 83.2) establishes the responsibility of the generator for the management of hazardous waste [136].
3. **Law No. 28256, Law for the Transportation of Hazardous Materials and Waste (19.06.2004).**
Enacts the general provisions for the transportation of hazardous waste and, as such, is applicable to PCB waste [137].
4. **D.S.N° 067-2005-RE (10.08.05), Ratification of the Stockholm Convention by Peru.**
This document establishes Peru's commitment to comply with the provisions of the Stockholm Convention, which becomes a binding legal instrument of supranational character.⁽¹⁵⁸⁾
5. On July 15, 2020 a Ministerial Resolution draft was published approving the '**Methodological Guide for the preparation of the Polychlorinated Biphenyls Environmental Management Plan (PGAPCB)**' and the '**Methodological Guide for the Inventory of Stocks and Residues for the identification of Polychlorinated Biphenyls (PCB)**'.

These guidelines have been approved by Ministerial Resolution N° 002-2021-MINEM/DM. They refer to the management plans that electrical companies must carry out with respect to their equipment (transformers and capacitors that have PCBs). This type of waste is not considered e-waste in Peru [138].

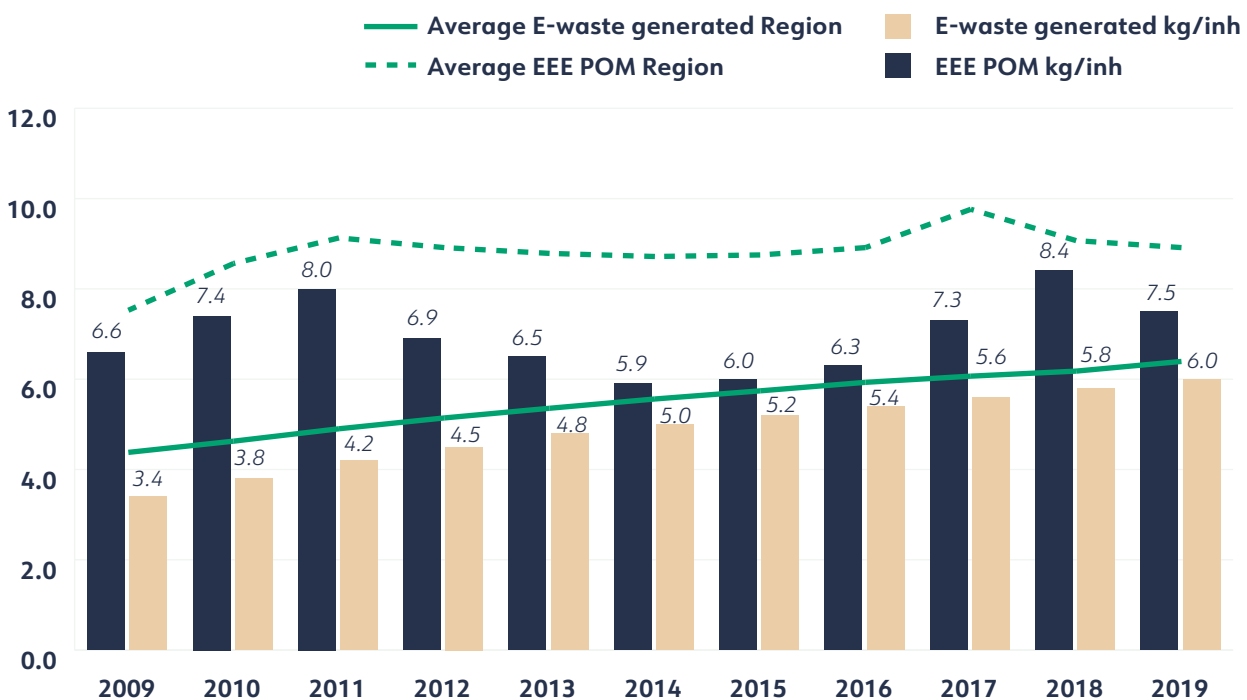
National Statistics on E-waste

Official e-waste statistics are currently being established in Peru by the Ministry of Environment. In 2008, the NGO IPES *Sustainable Development Production* developed a Diagnosis of Electronic Waste Management in Peru [139]. The Diagnostic was updated in 2010 and provided key e-waste indicators (e.g. POM, e-waste generated) and an overview of the e-waste management. Since then, IPES has published different diagnoses of e-waste management for different cities in Peru (e.g. Arequipa [2011] [140], Chiclayo [2012] [141], Cusco [2014] [142], and Piura⁽¹⁵⁹⁾ [2014]) as a means for providing an overview of the e-waste management and estimation of e-waste statistics in Peru's various cities. Furthermore, a 2012 diagnosis of e-waste focused on washing machines, freezers, and television also appeared [143].

Data on EEE placed on the market and e-waste generated was developed by the country following through the methodology developed by UNU/UNITAR for 2012-2017 for all UNU-KEYs and from 2009-2018 for UNU-KEYs 0501-0506 (CAT V-EU10, CAT III and V-EU6).

The analysis of information from 2009-2018 for lamps (CAT V-EU10, CAT III and V-EU6, UNU-KEYs 0501-0506) and from 2012-2017 for all UNU-KEYs was undertaken using information provided by the Ministry of Health and Environment. For 2019, UNU/UNITAR internal data has been used to estimate the main e-waste statistics indicators (i.e. EEE POM and e-waste generated) for the country, as illustrated in Figure 41-Figure 43.

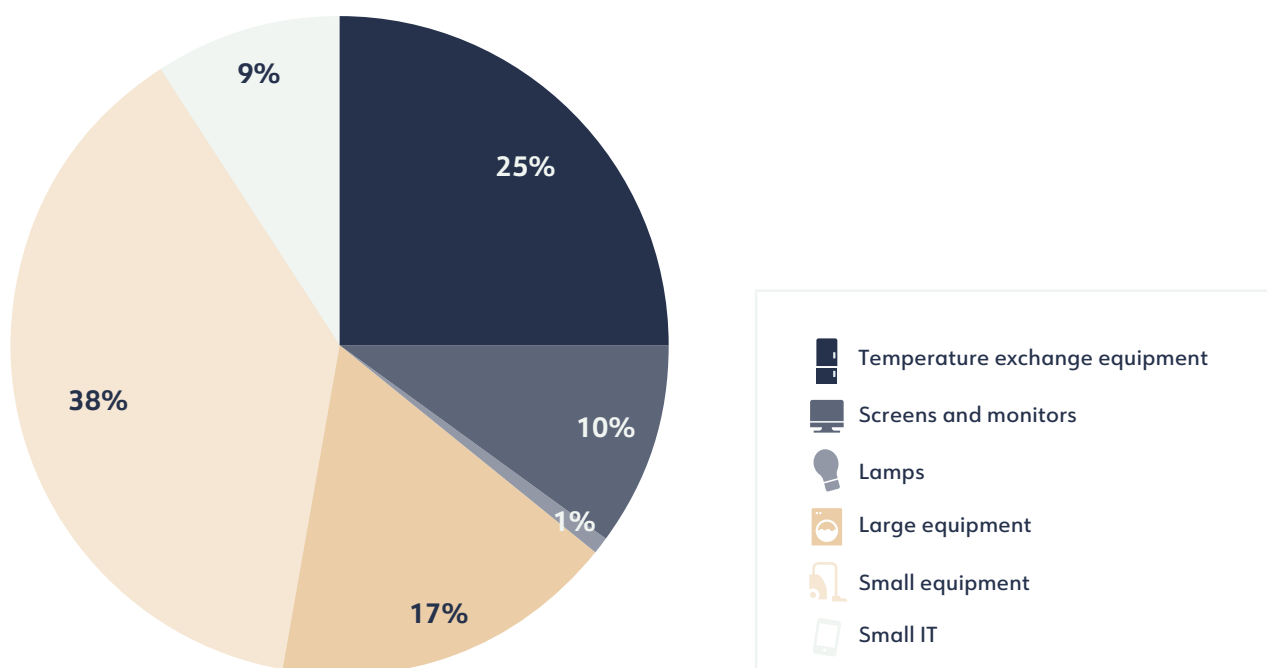
Figure 41. EEE POM and e-waste generated in Peru



Overall, EEE POM has increased from 6.6 kg/inh (193 kt) in 2009 to 7.5 kg/inh (244 kt) in 2019. The annual amount of EEE POM (Figure 41) has fluctuated, but has increased overall during the past decade, from 6.6 kg/inh (193 kt) in 2009 to 8.0 kg/inh (238 kt) in 2011. It then decreased to 5.9 kg/inh (183 kt) in 2014, followed by another increasing trend to 8.4kg/inh (269 kt) in 2018.

⁽¹⁵⁹⁾ http://raee-peru.pe/antiguo/pdf/diagnostico_raee_cusco_2014.pdf.

Figure 42. Share of the EU-6 categories in the EEE (2019)



Small equipment and temperature exchange equipment (Cat. V and I) with, respectively, 2.9 kg/inh and 1.9 kg/inh, account for the highest shares of EEE POM in Peru for 2019 (corresponding to 63 percent of the total). Large equipment (Cat. IV) registered the third highest share of EEE POM for 2019, equal to 17 percent of the total (1.2 kg/inh). The smallest share is lamps (Cat. III) with 0.1 kg/inh, equal to 1 percent of the total (Figure 42).

As of 2018, Peru had 1,215 EEE manufacturers, but most EEE in the country is imported.

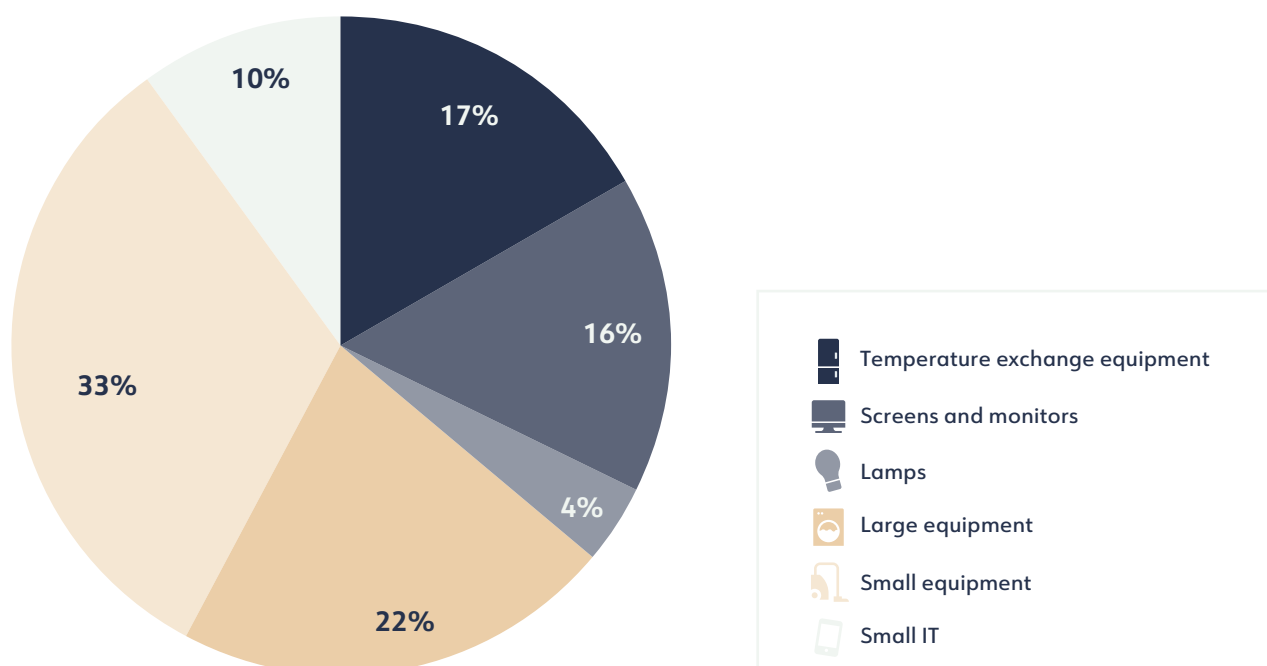
As of 2018, according to the Ministry of Production (PRODUCE) data, there were 1,215 EEE manufacturers covering the 10 categories (EU10), located mainly in the cities of Lima and Callao 714 (68 percent). Most of these manufacturers are micro-enterprises (1,028, or 85 percent), and their contribution to the consumption and generation of e-waste is lower than that of EEE importers. Most EEE-trading companies are importers or retailers in the country. Based on the data provided by the Ministry of Environment, Peru exported 0.7 kt (0.02 kg/inh) of EEE in 2017, but imported 232 kt (7.1 kg/inh).

In 2019, it was analysed that LED lamps, sockets, and Compact Fluorescent Lamps comprised the highest share of lamps being exported and imported, and this trend was also seen for previous years. In analysing data from 2017-2019, the majority of the amount of EEE (by weight) imported and exported included professional IT items, washing machines, and televisions.

E-waste generated increased from 3.4 kg/inh (99.5 kt) in 2009 to 6.0 kg/inh (195.1 kt) in 2019.

The e-waste generated in Peru consistently increased, from 3.4 kg/inh (99.5 kt) in 2009 to 6.0 kg/inh (195.1 kt) in 2019. Figure 43 shows that small equipment (Cat. V) represents the highest share (33 percent) of e-waste generated in 2019, equal to 2.0 kg/inh. It is followed by large equipment (Cat. IV) and temperature exchange equipment (Cat. I) with 1.3 kg/inh and 1.0 kg/inh (22 and 17 percent), respectively. The category of e-waste with the smallest share is lamps (Cat. III), at 4 percent with 0.2 kg/inh.

Figure 43. Share of the EU-6 categories in the e-waste generated (2019)



According to official reporting, the amount of e-waste environmentally soundly collected and recycled in Peru in 2019 was equal to 3.02 kt (0.1 kg/inh).

The statistic of POPs and non-POPs arising from e-waste was unknown as of this report's publication.

E-waste and POP Management System

The formal e-waste management system in Peru relies substantially on the implementation of the EPR principle. MINAM has published several guidelines and standards for proper e-waste management.

Producers are required to design, implement, and administer management systems (which may be individual or collective), collect e-waste from their clients (free of charge), guarantee its adequate environmental management by delivering it to authorised e-waste operators, submit Management Plans to the competent authorities, inform their clients of the need to separate e-waste from other waste, and inform the e-waste operators which components contain hazardous material.

As of 2018, only 98 EEE-importing companies have approved E-waste Management Plans⁽¹⁶⁰⁾. Producers typically contract solid waste-operating companies to collect, transport, recover, and dispose of e-waste, within the framework of the EPR management systems.

Legislative Decree No. 1278 Law on Integral Solid Waste Management and the regulation of the Integral Solid Waste Management Law (LGIRS) establishes that waste operators must be registered in the Authorized Registry of Solid Waste Operating Companies.

Producers must guarantee the adequate environmental management of their wastes through their delivery to e-waste operators registered and with all operational permits. LGIRS establishes that companies that carry out operations related to solid waste management (including e-waste operators) must be registered in the Authorized Registry of Solid Waste Operating Companies.

Peru has an e-waste collection system in place.

Collection activity involves e-waste management systems that install collection points or contract solid waste operators to collect them from places they have made alliances (e.g. businesses) because of EPR, or from collection points, but there are also informal collectors, organisations, and companies that collect donations, some recyclers that are part of associations, and municipal selective collection programs. As of 2018, Peru had 327 e-waste collection points implemented by producers all over the country. Moreover, collection campaigns throughout the country are carried out by municipalities, producers, and e-waste operators with the support from MINAM. On MINAM's website, e-waste generators can find a list of collection points of where to dispose of their e-waste. Furthermore, when supporting and performing collection and awareness campaigns, the government provides brochures with information on the proper management of e-waste and where to dispose of it properly. Currently, due to the COVID-19 pandemic, the number of collection points has been reduced, and a new list has been drawn up.

Six e-waste operators currently carry out the valorisation of e-waste.

Peru has 6 official e-waste operators that provide transportation, collection, and recovery of e-waste in the cities of Lima and Callao Table 12:

Table 11. Authorised e-waste operators (18.05.2021), sources MINAM 2021

E-waste Operator	Scope	Services
Acero Dayana import export S.A.C.	Lima City	Collection, transportation, recovery, purchase, and sale of solid waste with commercial value, which may be sold without prior conditioning or after having been conditioned.
Aceros Gean Import Export Sociedad Comercial de responsabilidad Limitada	Lima City	Collection, transportation, and recovery.
San Antonio Recycling S.A.	Lima City	Collection, transportation, and recovery.
CIA Química Industrial del Pacifico S.A.	Callao	Recovery.
COMMITEL S.A.C.	Lima City	Collection, transportation, and recovery.
Servicios H.F. HNOS. S.A.C.	Lima City	Collection, transportation, and recovery.

The collected e-waste is usually separated as valuable (e.g. printed circuit boards, metals) and non-valuable parts. The valuable parts are either exported or are recovered in the country.

Dismantling of e-waste is performed by solid waste/e-waste operators. Once received and classified, the e-waste is disassembled by the operators who extract and separate the components for valorisation from those that contain hazardous substances or materials.

In the recovery plants, the dismantled recovered valuable components are pressed, packaged, and stored for subsequent sale. According to national rules, common and hazardous wastes are also stored in specially conditioned spaces until their transfer to final disposal. The material separated from e-waste is reinserted into the production processes by domestic recycling, steel companies (scrap), or abroad. Electronic cards are sold for export by operators or to specialised exporters. Formal e-waste operators submit information to MINAM every year.

E-waste material or components that are non-valuable and not hazardous are disposed of in sanitary landfills by the e-waste operators. Hazardous waste is transferred to safety landfills by e-waste operators with recovery plants. E-waste that is disposed of with municipal waste that is neither recovered nor reused is transported and disposed of in landfills or open-air dumps where there are no landfills.

Formal recyclers follow occupational safety and health (OSH) guidelines and have access to the Health System.

Formalised recyclers, who are part of the municipal waste collection programs, follow occupational safety and health (OSH) guidelines, have access to health care through the Integral Health System (SIS), and issue receipts for fees, workdays, and night hours that often exceed 48 hours per week. Informal collectors work in precarious conditions, without access to the aforementioned conditions, and very commonly employ family labor for sorting tasks in which children also participate, with the risk of affecting family health and school attendance rates.

Alliances between the informal sector and e-waste operators have been successful.

Table 11 shows that Peruvian legislation increases the collection target by year, and as a result, some e-waste operators have developed alliances with the informal sector for acquiring products in order to meet their targets. Some e-waste operators build alliances directly with informal collectors, informal association, and intermediaries or with now-formal associations such as Traperos de Emaús. Traperos de Emaús is a nonprofit and self-financed association of previously informal waste collectors with a strong organisational structure that associates with the worldwide association of Emaús waste collectors.

Peru has intermediary retailers and wholesalers generally operating in the informal market. There are no statistics on the number of intermediary businesses in Peru.

Intermediary retailers and wholesalers generally operate in the informal market, commercialising raw e-waste (whole product) and/or post-disassembly e-waste materials (and treatment carried out by formal operators with a recovery plant) to recyclers or waste operators who then sell them to recyclers or exporters.

There are currently no statistics on how many electronic equipment items are disposed of as mixed in with residual waste.**Peru does not have PCB or POP treatment facilities.**

E-waste plastic is separated by colour, and according to the label, they differentiate whether the plastic contains or does not contain hazardous material (e.g. brominated retardants). The e-waste plastic that doesn't contain POPs is usually sold in the local market. The e-waste plastics containing POPs and components with capacitors that are suspected of hazardous material are typically disposed of secure landfills, with no proper treatment provided. The non-hazardous waste is also sent to landfills.

Import & Export of E-waste and POPs Contained in E-waste**Peru is Party to the Basel, Rotterdam, Stockholm, and Minamata Conventions. Peru ratified the Stockholm Convention on POPs in 2005 and prepared the National Implementation Plan (NIP) in 2007.**

Law of Integral Management of Solid Waste, approved by Legislative Decree No. 1278, states that only the import of solid waste destined exclusively for its recovery is allowed (last paragraph of Article 77 of the Regulation of the Solid Waste Management Law approved by Supreme Decree N. °014-2017-MINAM) [144].

Based on the annual reports to the Basel Convention, Peru exported 179 t of mercury compound materials to China in 2019 to provide land treatment (e.g., biodegradation of liquid or sludgy discards in soils, etc.). No hazardous wastes were imported [145].

Stakeholder Mapping

In Peru, the stakeholders involved in the waste sector (that could be identified) and their roles are described below:






Stakeholder	Responsibility
Ministerio del Ambiente (MINAM) Website	<p>The governing entity for solid waste management. Its strategic objective is the efficient management of solid waste, and it has the functional responsibility regarding e-waste of 'regulating and promoting the adequate management of solid waste in the country, including e-waste, as well as coordinating with the sectorial and municipal authorities the due application of the national regulations on solid waste, including e-waste regulations.'</p>
Environmental Evaluation and Fiscalization Agency (OEFA) Website	<p>The governing body of the National System of Environmental Evaluation and Control (SINEFA), whose primary role is to ensure compliance with environmental legislation, supervising and guaranteeing that the functions of evaluation, supervision, control, and sanction in environmental matters are carried out in an independent, impartial, agile, and efficient manner. A complementary aspect is the application of incentives in certain environmental matters. According to the <i>Régimen RAEE</i>, it has the authority to: 1) monitor, supervise, oversee, supervise, control, and sanction environmental matters corresponding to the sectors under its jurisdiction, and 2) submit to MINAM systematised information on the results of monitoring, supervision, oversight, supervision, control, and sanction in environmental matters carried out by the OEFA and the competent sectoral authorities.</p>
Ministry of Health in Peru (MINSA) Website	<p>The Ministry of Health in Peru conducts the National Coordinated and Decentralized Health System based on Integrated Health Networks, the policy for universal health insurance, and intersectoral policies, and actions on social determinants for the benefit of the population's health and well-being.</p>
National Customs Authority (ANA) Website	<p>The National Customs Authority (NCA), attached to the Ministry of Economy and Finance (MEF), is the institution in charge of overseeing and controlling aspects related to the entry and exit of goods through Panama's borders.</p>
General Directorate of Environmental Health (DIGESA) Website	<p>The General Directorate of Environmental Health under the Ministry of Health is the competence authority on POPs.</p>
National Environmental Certification Service for Sustainable Investments (SENACE) Website	<p>The National Environmental Certification Service for Sustainable Investments (SENACE) is an entity attached to the Ministry of Environment. It is responsible for assessing the environmental viability of the most complex investment projects in Peru with technical soundness, as well as promoting effective citizen participation and generating public confidence in the environmental assessment process.</p>
Ministry of Labor and Employment Promotion (MTPE) Website	<p>The main roles of the MTPE are the promotion of decent and productive jobs and the fulfillment of the population's labor and fundamental rights. Through the Directorate of Standardization and Certification of Labor Competencies, the MTPE has developed the Recycling Occupational Profile, which can be applied in evaluation and certification processes.</p>

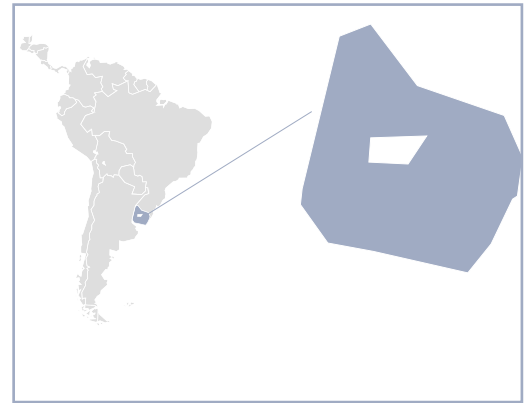
Stakeholder	Responsibility
<p>National Superintendence of Customs and Tax Administration (SUNAT) Website</p>	<p>The National Superintendence of Customs and Tax Administration (SUNAT) plays a role in tax and customs matters in foreign trade and is involved in regulatory and procedural issues regarding the disposal of e-waste assets, export of scrap metal, and donations of e-waste. It represents an important factor in the provision of statistical information.</p> <p>The current investigation has identified that SUNAT plays an important role in the regulation of scrap exports, provision of information on the importation of EEE, and adaptation of a special regime for recyclers who do not have access to the tax credit.</p>
<p>General Directorate of Supplies of the Ministry of Economy and Finance Website</p>	<p>The General Directorate of Supplies of the Ministry of Economy and Finance is the governing body of the National Supply System and the highest technical and regulatory authority on supply matters; as such, it regulates the management procedures for goods classified as e-waste.</p>
<p>Ministry of Transportation and Communications (MTC) Website</p>	<p>Through the General Directorate of Solid Waste Management, MTC exercises sectorial authority and competencies similar to those of PRODUCE. This ministry has not yet transferred supervision and oversight functions to the OEFA.</p>
<p>Municipalities</p>	<p>In Peru, the Municipalities must support the implementation of Management Plans for e-waste generated by the population within its jurisdiction. They promote the producer's REP principles, encouraging and facilitating the implementation of individual e-waste management systems. Furthermore, they support awareness and e-waste collection campaigns in coordination with e-waste management systems which will provide their adequate handling at valorisation facilities. They also promote the separation of e-waste from solid waste at the source of generation.</p>
<p>Entities of the National System of Environmental Evaluation and Control (SINEFA)</p>	<p>The System of Environmental Evaluation and Control is comprised of MINAM, OEFA, and environmental control entities such as ministries and regional and local governments (provincial and district municipalities). These entities are responsible for compliance with environmental legislation, supervision, and guaranteeing the performance of environmental assessment, supervision, oversight, control, and sanctioning functions.</p>
<p>Aceros Dayana Import Export S.A.C. Website</p>	<p>Aceros Dayana Import Export S.A.C. is a solid waste-operating company duly registered before the Ministry of Environment (MINAM).</p> <p>It is dedicated to the collection, transfer, and commercialisation of non-hazardous waste (from industrial facilities, construction, or special activities) and hazardous waste (such as used batteries).</p>
<p>Aceros Gean Import Export Sociedad Comercial de responsabilidad Limitada</p>	<p>Aceros Gean Import Export Sociedad Comercial de responsabilidad Limitada is an operator that collects, transports, and performs recovery of solid waste in the city of Lima, Peru.</p>

Stakeholder	Responsibility
CIA Química Industrial del Pacífico S.A.	CIA Química Industrial del Pacífico S.A. provides valorisation/recovery services of e-waste in the city of Callao, Peru.
COMIMTEL recycling Website	COMIMTEL recycling is a Peruvian company that for 16 years has been carrying out an adequate management through the recovery and final disposal of solid waste and e-waste. They guarantee the traceability of their services, complying with current Peruvian regulations, generating environmental awareness, reducing risks, and promoting corporate social responsibility.
Servicios H.F. HNOS. S.A.C. Website	SERVICIOS HF HNOS S.A.C. is a private company dedicated to the integral management of solid waste whose services include the collection, transportation, segregation, and final disposal of such waste.
San Antonio Recycling Website	San Antonio Recycling is a Peruvian business initiative that was founded in Lima in 2009. SAR is dedicated to closing the cycle of management and handling of e-waste through its environmental treatment handling equipment from the 10 categories of EEE. Currently, the company provides services whose main purpose is to ensure legal compliance and environmental treatment of WEEE with documented traceability of the entire management chain.
Reverse Logistics Group América (RLGA) Website	RLGA provides next-generation return and recycling solutions for customers throughout the entire product life cycle. They provide a complete solution for the obligations and needs of producers and importers of electrical and electronic equipment (EEE) within the framework of each country's national regulations.
Peruvian Association of Actors for Waste Management (ASPAGER) Website	Peruvian association that bring together responsible companies that comply with proper waste management in Peru and that promote proper waste management.
Almi International S.A.C. Website	ALMI International is a company created to support manufacturers, assemblers, and importers of electrical and electronic equipment (EEE) in the implementation of legal compliance with the e-waste Regulations in Peru.
RECOLECC Website	RECOLECC is an e-waste operator that manages e-waste by developing collection campaigns, implementing collection points, executing communication and awareness strategies, and managing the collection and transport through EO-RS RAEE at the national level. It also supervises and monitors the treatment of WEEE and final disposal of hazardous materials or components.
Traperos de Emaús-Perú Website	Traperos de Emaús is a nonprofit and self-financed association of previously informal waste collectors with a strong organisational structure that associates with the worldwide association of Emaús waste collectors.

Country:

Uruguay

-  3.3 million inhabitants [146]
-  176,215 km²
-  **Borders:** Argentina, Brazil, Atlantic Ocean
-  **GDP per capita PPP:** \$24,006 USD [146]
-  **Average household size:** 2.8 members [30]



Map source: United Nations Geospatial Information Section⁽¹⁶¹⁾

E-waste Management:

Legislation: ●●●●●
 Infrastructure: ●●
 Collection Rate: 3%

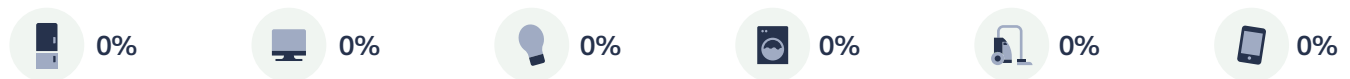
E-waste POP Management:

Legislation: ●●●●●
 Infrastructure: ●●●●●
 Collection Rate: 0%

Legend: ● Advanced ● Transition ● Basic
 Each indicator is one circle.

National legislation on e-waste and POPs:

- Extended Producer Responsibility:** ⚙️ In development. Concept was introduced in the Integrated Waste Management published in September 2019
- National e-waste standards:** ⚙️ In development
- National standards for POPs contained in e-waste:** ⚙️ In development
- E-waste collection target:** ⚙️ In development
- Legislation product coverage in UNU-KEYs:** 0 of 54
- Legislation product coverage in weight (%) on total and per category⁽¹⁶²⁾:** Total: 0% of the e-waste generated in 2019

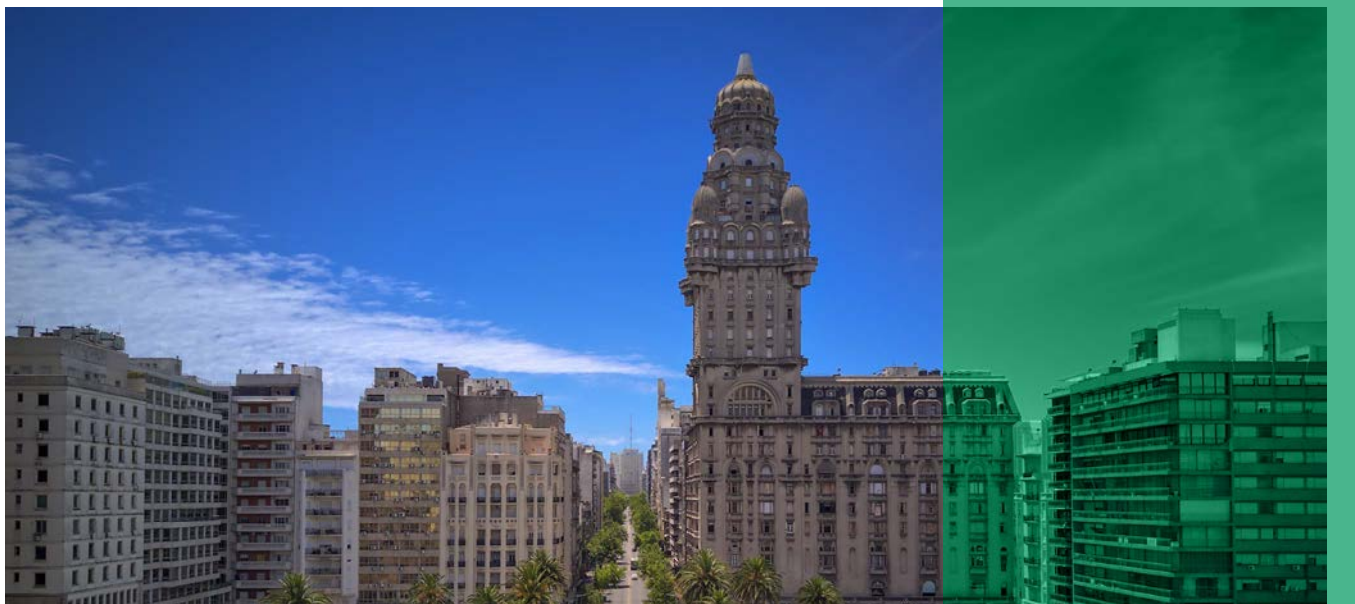





International Conventions:

	Signature	Ratification	Entry into force
Basel Convention [31]	22/03/1989	20/12/1991	05/05/1992
Rotterdam Convention [32]	11/09/1998	04/03/2003	24/02/2004
Stockholm Convention [33]	23/05/2001	09/02/2004	17/05/2004
Minamata Convention [34]	10/10/2013	10/10/2013	24/09/2014

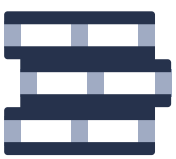

⁽¹⁶¹⁾ <https://www.un.org/Depts/Cartographic/english/htmain.htm>.

⁽¹⁶²⁾ Percentage in weight of e-waste generated equipment covered by the national legislation illustrated per EU-6 collection category for 2019.



EEE Placed on Market (2019):	E-waste generated (2019):	E-waste formally collected (2019):
 <p>49 kt. 14.8 kg/inh.</p>	 <p>39kt. 12.0 kg/inh.</p>	 <p>1 kt. 0.4 kg/inh.</p>

(Source: Ministry of Environment / UNU / UNITAR)

Generated e-waste plastic:	Generated BFRs from e-waste:
 <p>11 kt. 3.2 kg/inh.</p>	 <p>1 kt. 0.2 kg/inh.</p>

(Source: UNDP / UNU / UNITAR)

🔄 Formal/environmentally sound e-waste management system in place:

- ✓ According to the Ministry of Environment, Uruguay has 9 e-waste operators that are authorised or in process of authorisation renewal, of which 2 exclusively provide services of transportation, reception and storage, 1 has authorisation for the incineration of ink and toner cartridges, and 6 carry out processes of transportation, collection, dismantling.
- ✗ At the moment, the facilities (e.g. cement kilns) available in Uruguay do not treat POPs arising from e-waste.

National Legal Framework

The Oriental Republic of Uruguay (hereafter, Uruguay) does not have a specific legal and regulatory framework related to e-waste; these matters fall under the Integrated Waste Management legislation. Uruguay is currently working on a specific e-waste regulation.

Uruguay's most relevant legal instruments around e-waste issues are:

1. Decree 373/003 Regulation of lead acid battery management (under revision), which includes batteries (WEEE) not included in the scope of the regulation being expanded in Uruguay [147];
2. Decree 349/005 Regulation of environmental impact assessment and environmental authorisations [148];
3. Decree 182/013 Regulation for environmentally suitable management of industrial and assimilated solid waste [149];
4. Decree 015/019 Regulation for environmentally suitable management of lamps and other waste containing mercury [150];
5. Law No. 17.283/2000 General Environmental Protection Law [151];
6. Law No. 17.220/1999 Prohibition on the introduction of hazardous waste [152];
7. Law No. 19.829/2019 Integrated Waste Management, September 2019 [153].

Law No. 17.220/1999 Prohibition of Introduction of Hazardous Wastes.

This law establishes that the importation of all types of hazardous waste is prohibited. Although Since Law No. 19,829 considers electronic wastes as special wastes and not hazardous wastes, they are not classified according to hazardousness (according to Law No. 19,829 Integral Waste Management), they can be introduced into the country with a special permit⁽¹⁶³⁾. Hazard classifications are established in the regulatory decree for lead acid batteries and industrial waste and assimilated activities. Currently, WEEE classified as hazardous and lead-acid batteries cannot be imported into the country under this law. The classification will be one of the points to be further developed in the WEEE normative proposal.

Law No. 17.283/2000 General Environmental Protection Law.

The purpose of this general law is to protect the environment, in compliance with the mandate set forth in Article 47 of the Constitution of Uruguay, as well as to establish basic general provisions regarding national environmental policy and environmental management (including the adequate movement of waste, e.g., WEEE) coordinated with the different public and private sectors [154].

Article 20 grants the character of general interest to the protection of the environment against any affection that could derive from the use and handling of chemical substances. It assigns to the Ministry of the Environment (formerly MVOTMA) the responsibility for determining the conditions applicable to the production, import, export, transport, packaging, labeling, storage, distribution, marketing, use and final disposal of these chemical substances [154].

Decree No. 349/005 Regulation on Environmental Impact Assessment and Environmental Authorizations.

The environmental impact assessment (EIA) is a preventive environmental management tool that has been applied in Uruguay since 1994. The EIA regime has existed since the approval of Law No. 16,466 of January 19, 1994 and its Regulatory Decree (originally Decree 435/994 of September 21, 1994). In 2005, Decree 435/994 was replaced by Decree 349/005 of September 21, 2005, which currently regulates environmental authorizations and was developed from a review and participation process carried out through the Technical Advisory Commission for Environmental Protection (COTAMA) in a multidisciplinary and interinstitutional manner [155].

The EIA is a technical and participatory procedure and a management tool for the identification and evaluation of the potential environmental impacts of a project not yet executed, in order to eliminate, mitigate or compensate for its negative environmental impacts. It is subject to a set of authorizations, the most important of which is known as Prior Environmental Authorization (AAP). It also allows enabling or supporting the adoption of a decision by the environmental authority, taking into account the admissibility of the residual impacts of the construction, operation and abandonment of such project⁽¹⁶⁴⁾.

⁽¹⁶³⁾ <https://legislativo.parlamento.gub.uy/temporales/leytemp4601874.htm>.

⁽¹⁶⁴⁾ <https://www.impo.com.uy/bases/decretos-reglamento/349-2005>.

Decree No. 182/013 Regulation of Environmentally Appropriate Management of Industrial and Similar Solid Waste.

The decree regulates the environmentally adequate management of industrial and similar waste generated by the sectors covered. This has served to promote and strengthen the electronic waste management services provided by waste managers.

Law No. 19.829/2019 – Integrated Waste Management

On September 30, 2019, Uruguay published their Integrated Waste Management legislation in accordance with the provisions of Law No. 17.283 of November 28, 2000. The purpose of this law is to protect the environment and promote a sustainable development model by preventing and reducing the negative impacts in the generation, of all stages of waste management. All waste, regardless of its type and origin (with some exceptions), is included within the scope of this regulation. Article 5 of the Law defines special waste as waste that must have a separate management channel (e.g. e-waste, tires, etc.)⁽¹⁶⁵⁾. Special waste management bases the management of waste on the Extended Producer Responsibility (EPR) principle. It makes manufacturers and importers (producers) responsible for financing the recovery of e-waste, but differentiates between them⁽¹⁶⁵⁾.

Its Art. 10 promotes waste management 'as an integral model that contemplates the entire life cycle of the products, including, when appropriate, those associated with the design and use of the products, in order to avoid and minimize the generation of waste and facilitate the recovery of the waste that is generated'⁽¹⁶⁵⁾. It emphasises the prioritisation of minimising waste generation over any alternative by making production processes more efficient and applying best-available technologies and environmental practices.

Article 15 defines competence in that each departmental government is responsible for preparing the respective Departmental Waste Management Plan⁽¹⁶⁵⁾. Its chapter IV is dedicated to waste prevention and recovery. Moreover, Art. 21 establishes that generator and operator are responsible for handling waste streams (including e-waste) in a separated manner to facilitate recovery processes. Per Art. 25, manufacturers and importers of products are obliged to disclose the

necessary information for facilitating recycling and the proper management of waste associated with their respective products⁽¹⁶⁵⁾.

Formalisation of the recycling chain is established.

Most importantly, Art. 27 states that 'authorized and registered individuals or legal entities may permanently or repeatedly carry out the different operations related to the procurement and commercialisation of materials for recycling, as well as the commercialisation and distribution of recycled products'⁽¹⁶⁵⁾. It contemplates the social inclusion of sorters through waste valorisation processes (Chapter IV and VI) and a National Registry of segregators. It also promotes private companies to hire segregators included in this registry, fomenting their formalisation and alliance with the informal sector⁽¹⁶⁵⁾.

Chapter VII, dedicated to special waste, includes e-waste as part of the seven types of special waste it contemplates. Separating manufacturers and importers from traders and intermediaries, it includes the principle of extended responsibility of the manufacturer and importer, who must assume the costs of waste management, including e-waste⁽¹⁶⁵⁾.

Article 48 proposes the creation of the Waste Valorisation Program (PROVAR) within the scope of the Ministry of Industry, Energy and Mining to promote waste valorisation processes at the national level and the development of new products focused on minimising waste generation. This program will be executed in coordination with the Ministries of Housing, Territorial Planning and Environment, Economy and Finance, promoting its integration with other national strategies focused on sustainably productive economic development – with social equity and environmental balance⁽¹⁶⁵⁾.

Uruguay does not have a specific legal and regulatory framework related to e-waste; these fall under the Integrated Waste Management legislation.

⁽¹⁶⁵⁾ <https://legislativo.parlamento.gub.uy/temporales/docu9987996249008.htm>.

Uruguay's most relevant legal instruments regarding POPs are:

1. Law No. 16,112 and Law No. 16,234 of 1990, respectively, created the Ministry of Housing, Land Management and the Environment (MVOTMA), and within the latter, the National Directorate of the Environment. "The Ministry of Housing, Land Management and Environment shall determine, by virtue of the present law and the regulations issued by the Executive Power, the conditions applicable for the protection of the environment, to the production, importation, exportation, transportation, packaging, labeling, storage, distribution, commercialization, use and disposal of those chemical substances that have not been regulated by virtue of the sectorial tasks assigned to the Ministry itself or to other national agencies. Said agencies shall incorporate in their regulations, in coordination with the Ministry of Housing, Land Use Planning and the Environment, provisions that ensure adequate levels of protection of the environment against adverse effects derived from normal use, accidents or waste that may be generated or derive".
2. Constitution of the Republic, 1996, article 47, declared protection of the general interest, establishing the generic duty of persons to refrain from any act that causes deprecation, destruction, or contamination in contravention of the norms of environmental protection.
3. Law No. 16,466 of 1994, Environmental Impact Assessment Law.
4. Law No. 17.220 of 1999, Law on Transboundary Movement of Hazardous Waste.
5. Law No. 17.283 of 2000, General Law on Environmental Protection or LGPA: Article 6, principles of prevention and precaution in all economic and social sectors, information, participation and international cooperation.
6. Law No. 17.283 of 1994, General Law on Environmental Protection. According to its "Article 20. (Chemical Substances). - It is of general interest the protection of the environment against any affectation that could derive from the use and handling of chemical substances, including within the same, the basic elements, compounds, natural complexes and formulations, as well as the goods and articles that contain them, especially those considered toxic or dangerous".
7. Law No. 15.921 of 2001, Law of Free Trade Zones.
8. Law No. 17.732 of 2003, approves the Stockholm Convention on Persistent Organic Pollutants and its annexes.
9. Law No. 17,712 of 2003, MERCOSUR, Framework Agreement on Environment.
10. Law No. 15.691, Uruguay Customs Code, renamed Decree-Law by Law No. 15.738.

Uruguay is working to adopt specific regulations on PCBs and POPs contained in e-waste.

Uruguay plans to carry out activities relating to environmentally friendly management of PCBs, contaminated equipment, and waste, as well as to the strengthening of technical capacity.

National Statistics on E-waste

Official e-waste statistics are currently being established in Uruguay by the Ministry of the Environment.

Before 2019, information on imports and exports of EEE was not carried out systematically in Uruguay. Nonetheless, official information is available at a national level in the Ministry of Industry, Energy and Mining, National Directorate of the Environment through the Ministry of Environment, and the National Directorate for Customs of the Ministry of Economy. Uruguay statistics don't differentiate between new and used equipment being imported or exported.

Data on EEE placed on the market and e-waste generated was developed by Uruguay following the methodology developed by UNU/UNITAR for 2009-2019.

The analysis of information from 2009-2019 was undertaken using the information provided by the Ministry of Environment's DINACEA (formerly the National Directorate of the Environment) to estimate the main e-waste statistics indicators (i.e. EEE POM and e-waste generated) for the country, as illustrated in Figure 44-Figure 46.

Figure 44. EEE POM and e-waste generated in Uruguay

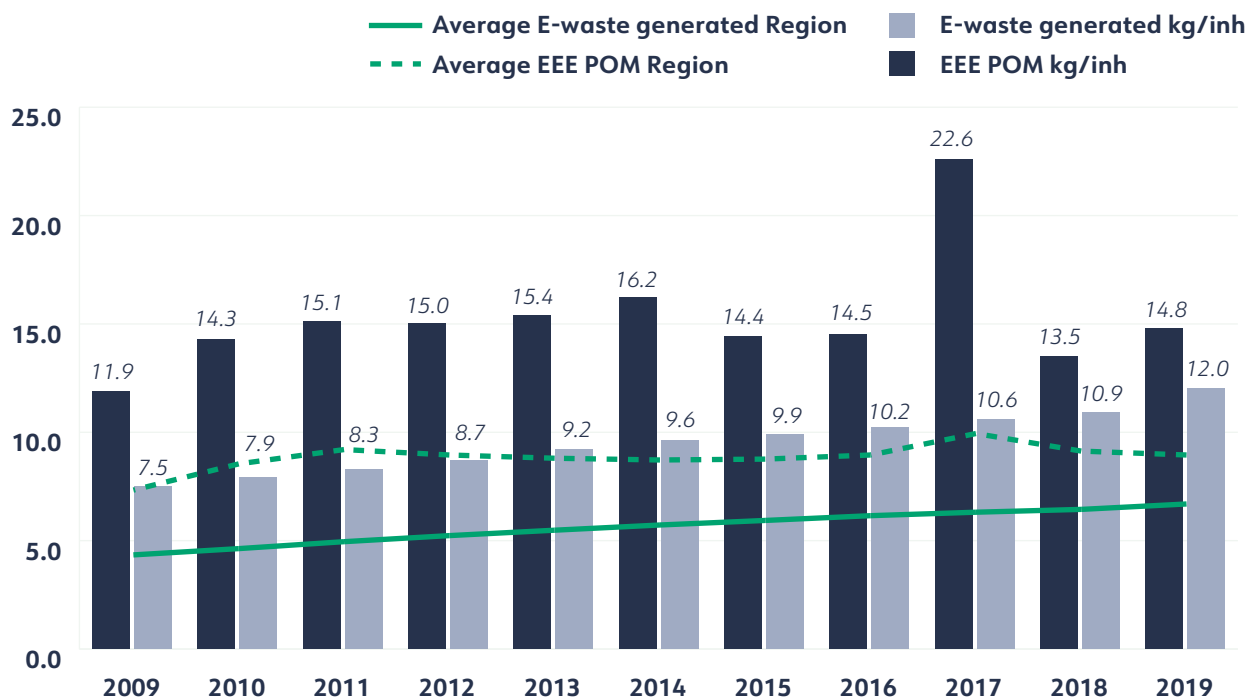
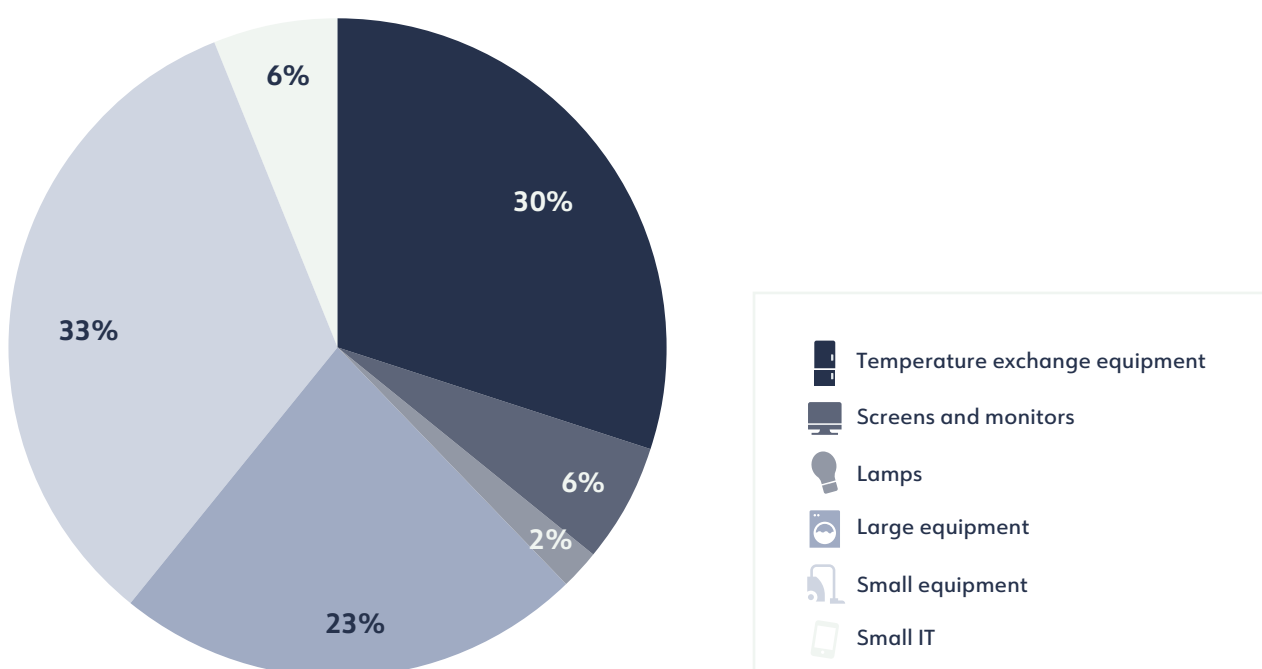


Figure 44 shows that Uruguay's EEE POM and e-waste generated amount have been above the average for the 13 countries analysed.

EEE POM has fluctuated over the years; overall, it has increased, from 11.9 kg/inh (40 kt) in 2009 to 15 kg/inh (48.7 kt) in 2019.

The annual amount of EEE POM has fluctuated but has increased overall over the past decade, from 11.9 kg/inh (40 kt) in 2009 to 14.8 in 2019. A slight decrease is evident from 16.2 kg/inh (55.8 kt) in 2014 to 14.4 kg/inh (49.8 kt) in 2015. The aforementioned was the result of the global financial crisis, which consequently decreased the consumption of EEE [156]. This was followed by another fluctuation, increasing in 2017 from 22.6 kg/inh (78.9 kt), decreasing once more in 2018 with 13.5 kg/inh (47.4 kt), and increasing once more in 2019 with 14.8 kg/inh (48.7 kt). According to the Ministry of Environment, a peak in the introduction of PV panels to the market resulted in 2017 from the development of 11 PV parks, with a total capacity of 150 MW, that were put into operation between 2017 and 2018. This was stimulated by Decree 133/13, where the government motivated companies in generating electricity from large-scale photovoltaic plants [156].

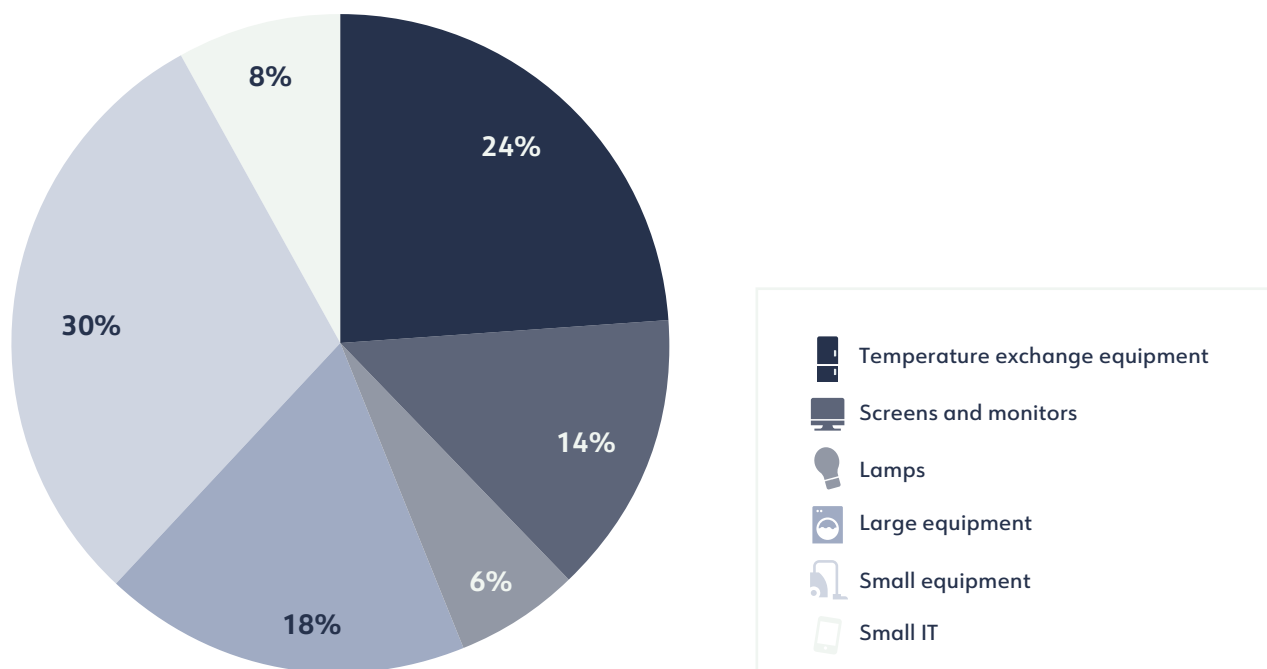
Figure 45. Share of the EU-6 categories in the EEE (2019)



Small equipment (Cat. V) and temperature exchange equipment (Cat. I) with, respectively, 4.9 kg/inh and 4.5 kg/inh, account for the highest shares of EEE POM in Uruguay for 2019 (comprising 63 percent of the total). Large equipment (Cat. I) registers a third-highest share of EEE POM for 2019, with 3.5 kg/inh, or 23 percent of the total. The smallest share is that of lamps (Cat. III) with 0.3 kg/inh, or 2 percent of the total (Figure 45).

Uruguay is an importer country of EEE. Based on the Ministry of Environment's data, Uruguay exported 0.39 kt (0.12 kg/inh) of EEE in 2019, whereas it imported 48.6 kt (14.8 kg/inh). The majority of equipment exported included coffee, water cookers, professional tools (e.g. welding and soldering tools), and temperature exchange equipment. The majority of imported equipment included fridges, washing machines, and air conditioners.

Figure 46. Share of the EU-6 categories in the e-waste generated (2019)



E-waste generated increased steadily over the decade, from 7.5 kg/inh (25.5 kt) in 2009 to 12 kg/inh (39.3 kt) in 2019.

The e-waste generated in Uruguay steadily increased, from 7.5 kg/inh (25.5 kt) in 2009 to 12.0 kg/inh (39.3 kt) in 2019. As Figure 46 shows, small equipment (Cat. V) has the highest share (30 percent) of e-waste generated in 2019, equal to 3.6 kg/inh. Small equipment is followed by temperature exchange equipment (Cat. I) and large equipment (Cat. IV) with 2.8 kg/inh and 2.1 kg/inh (24 and 18 percent), respectively. The category with the smallest share is lamps (Cat. III), at 6 percent with 0.7 kg/inh.

According to official reporting, the amount of e-waste environmentally soundly collected and recycled in Uruguay was equal to 1.21 kt (0.3 kg/inh) in 2019.

POPs statistics are very limited in Uruguay. In 2015, it was estimated that the total amount of POPs-PBDE in EEE imported found in CRT monitors and TVs, LCD monitors and TVs, desktop computers, mobile phones and radios was 45.91 kt. Moreover, a range of POPs-PBDE found in CRT and LCD monitors generated was estimated (at a minimum of 49.41 kt and maximum of 10,459.89 kt) [157].

However, in its 'National Implementation Plan (NIP) of the Stockholm Convention on Persistent Organic Pollutants 2017-2030', Uruguay estimated in 2015 the total polymeric fractions and concentrations of c-OctaBDE for Screens, IT and small equipment (Cat. V and VI). The products analysed included CRT monitors and TVs, LCD monitors and TVs, desktop computers, mobile phones, and radios [157].

E-waste and POP Management System

According to Law No. 19,829/2019 Integral Waste Management, the Ministry of Environment is responsible for e-waste monitoring and management. Municipalities in Uruguay have responsibility for household waste management, but not for special waste (e.g. e-waste).

The Integrated Waste Management legislation No. 19.829 published in 2019 states that the Ministry of Housing, Land Management and Environment through the National Directorate of the Environment is responsible for the management and monitoring of e-waste. As well, Municipalities in Uruguay are responsible for waste management in their jurisdiction, following the approval and publication of Law No. 19,829 – Integrated Waste Management.

Following a 2019 law, the formal e-waste management system in Uruguay relies on the implementation of the EPR principle.

The Law makes manufacturers and importers responsible for financing the recovery of e-waste. Uruguay does not currently have an official e-waste classification; typically, the WEEE Directive 2012/19/EU6 classification is used.

Uruguay currently has 9 e-waste operators specialising in transportation, collection, reception and storage, and dismantling of e-waste in the main cities. Only 3 recyclers perform recovery of materials from e-waste.

The Integrated Waste Management Law (19.829) defines recycling as the use of waste as an input or raw material in a production process, excluding energy recovery (including ferrous and non-ferrous smelters and plastic recyclers)⁽¹⁶⁶⁾. It also defines waste management as all the operational actions to which a waste is subjected for its recovery or final disposal, including (among others) characterisation and classification, initial disposal, collection, transportation, treatment and transformation, commercialisation, and final disposal. Under this concept are waste operators who mainly perform logistical activities, dismantling, and disposal for recovery in the country or abroad⁽¹⁶⁶⁾.

According to the Ministry of Environment, Uruguay has 9 e-waste operators that are authorised or in process of renewal of authorisation, of which 2 exclusively provide services of transportation, reception, and storage; 1 has authorisation for the incineration of ink and toner cartridges; and 6 carry out processes of transportation, collection, dismantling, and export [157]. From information provided by the National Directorate of the Environment, 6 of the 9 recyclers do not recover materials, but instead send the materials resulting from dismantling to other operators or away for exportation. It was estimated that approximately 0.04 kt of CRTs were exported to Belgium in 2018 and that 0.08 kt were exported to Germany in 2019 for treatment.

The informal sector is involved in the informal collection and dismantling of e-waste, but there are no estimates quantifying the amount of e-waste treated by them.

At the moment, there are no statistics regarding the volume of e-waste collected/scavenged/ dismantled by collectors that operate informally. The informal sector usually acquires e-waste by collecting it kerbside, door-to-door, or purchasing e-waste on the street (among other methods). Street (informal) sorters generally dismantle items onsite by taking components that can quickly be converted into cash (e.g. copper windings, copper tanks in water heaters, steel or aluminium parts, etc.).

The most valuable materials (e.g. precious, ferrous, and non-ferrous metals), as well as components that are suitable for reuse as spare parts, are extracted, and the remaining parts, including hazardous substances, usually end up in landfills.

In Uruguay, there is a syndicate organisation for informal classifiers/sorters known as '*Unión de Clasificadores de Residuos Urbanos Sólidos (UCRUS)*', which brings classifiers/sorters together and helps them to defend their rights. There is no record of their degree of specialisation in e-waste.

There are currently no statistics on how many electronic equipment items are repaired, imported, exported as second-hand items, or disposed of as mixed in with residual waste.

Plastics are exported for recycling to Hong Kong, Malaysia, and the Netherlands.

E-waste plastic is separated by colour and value in the market. From information provided by the Ministry of Environment, Uruguay exported approximately 0.03 t of plastics to Hong Kong (0.015 t) and Malaysia (0.016 t) in 2018. In 2019, approximately 0.11 t of plastics were exported to the Netherlands (0.03 t), Hong Kong (0.02 t), and Malaysia (0.07 t, of which 0.05 t are ABS).

Uruguay does not have PCB or POP treatment facilities. Plastics containing POPs are not currently being identified. No separation of brominated and non-brominated plastics from e-waste is being done.

The final destination of e-waste plastics that have not been harnessed and which are suspected of containing hazardous material is usually safety landfills (31 percent for 2018) and landfills (15 percent for 2018), and no proper treatment is provided [159].

Under the framework of the PREAL project, Uruguay is currently evaluating alternatives for the treatment of POPs from e-waste plastics.

Import & Export of E-waste and POPs Contained in E-waste

Uruguay is Party to the Basel, Rotterdam, Stockholm, and Minamata Conventions. Uruguay ratified the Stockholm Convention on POPs on 2004 and prepared the National Implementation Plan (NIP) in 2003, and an update was developed for 2017-2030.

Based on the annual reports to the Basel Convention, **Uruguay exported 12 tons of complete electrical and electronic devices for their recycling/ reclamation of metals and metal compounds and other inorganic materials to the Netherlands in 2017 [159].**

Stakeholder Mapping






In Uruguay, the stakeholders involved in the waste sector (that could be identified) and their roles are described below:

Stakeholder	Responsibility
Ministry of Environment (former MVOTMA) Website	<p>The Ministry of the Environment is responsible for the formulation, execution, supervision, and evaluation of national plans for environmental protection, environmental management, and conservation and use of natural resources, as well as the implementation of national policy in this area.</p>
DINACEA, former National Directorate for Environmental Quality and Evaluation Website	<p>The role of the National Directorate for Environmental Quality and Assessment is to seek to achieve adequate environmental protection by promoting sustainable development through the generation and application of instruments focused on improving the quality of life of the population and the conservation and environmentally responsible use of ecosystems, coordinating the environmental management of public entities, and coordinating with the different social actors.</p> <p>Through the Ministry of the Environment, the National Directorate of Environmental Quality and Evaluation is responsible for the e-waste monitoring and management.</p>
Ministry of Economy – National Customs Directorates Website	<p>The National Customs Directorate has a main function of verifying and controlling the different customs operations of shipment, unloading, and clearance of goods, issuing mandatory classification criteria for the application of the tariff nomenclature collecting the corresponding taxes, and surveying. These tasks must be performed without prejudice to other competencies in order to enforce the conventional obligations resulting from the international treaties signed by the country in customs matters – to exercise, with the means of surveillance, prevention, and repression under its responsibility, the control of the entry, exit, transit, and storage of goods in its territory, in order to avoid and repress the commission of customs offenses.</p>

Stakeholder	Responsibility
ANTEL INTEGRA Website	ANTEL is Uruguay’s state-owned telecommunications company, providing mobile and fixed telephony as well as internet connections. ANTEL INTEGRA, is a project sponsored by Antel, whose aim is to work in partnership with households with lower purchasing power identified by government entities (MIDES, BPS, IMs, MVOTMA, etc.), providing them with a refurbished personal computer, free software, and internet access. Disused computer equipment will be used for this purpose – donated by companies and individuals interested in joining the project.
Farmared/Plateran Website	The company provides logistic services, particularly in the case of WEEE, and is authorized to collect and send CRT monitors and their parts to authorized e-waste managers.
Newlife E-Waste Recycling Website	Authorized e-waste management company for the collection, dismantling and separation of CRT and other monitor components.
Radur S.A. Website	Company authorized to dismantle e-waste with the exception of those containing oils, lubricants, PCB, CFC, HCF. They are also not authorized to receive monitors or printer cartridges.
WERBA S.A. Website	Company authorized to manage a wide range of waste, including electronic waste (all types of electronic waste except photovoltaic panels). It specializes mainly in the disassembly and sorting of computer equipment and small appliances.
Filmetal S.A. Website	Company authorized to manage both metallic waste and e-waste. These include PCB-free transformers, temperature exchange devices, large appliances, lead-acid batteries and small computer equipment.
DEPÓSITO PEDERNAL S.A. Website	Company authorized for the conditioning and subsequent shipment to authorized final destinations of various waste fractions, including common household appliances.
Celuloide S.A. -TRIEX Website	Company authorized collect, provide treatment and disposal services for a wide range of waste, including e-waste.
Marenales Ltda	Company authorized for the conditioning and subsequent shipment to authorized final destinations of various waste fractions, including common household appliances and computer equipment.
Cementos Artigas S.A. (Cement industry) Website	Cement company authorized to co-process different types of waste under certain environmental conditions. As for electronic waste, they are currently only authorized to manage ink cartridges and toners.

Country:

Venezuela (Bolivarian Republic of)

-  28.5 million inhabitants [28]
-  916,445 km²
-  Borders: Caribbean Sea, Guyana, Brazil, Colombia
-  GDP per capita PPP: \$17,527 USD [29]
-  Average household size: 3.3 members [30]



Map source: United Nations Geospatial Information Section⁽¹⁶⁷⁾

E-waste Management:

Legislation: ●●●●●
 Infrastructure: ●●
 Collection Rate: 0.4%

E-waste POP Management:

Legislation: ●●●●●
 Infrastructure: ●●●●●
 Collection Rate: 0%

Legend: ● Advanced ● Transition ● Basic
 Each indicator is one circle.

National legislation on e-waste and POPs:

- Extended Producer Responsibility: ✕
- National e-waste standards: ⚙ In development
- National standards for POPs contained in e-waste: ⚙ In development
- E-waste collection target: ✕
- Legislation product coverage in UNU-KEYs: 0 of 54
- Legislation product coverage in weight (%) on total and per category⁽¹⁶⁸⁾: Total: 0% of the e-waste generated in 2019






International Conventions:

	Signature	Ratification	Entry into force
Basel Convention [31]	22/03/1989	03/03/1998	01/06/1998
Rotterdam Convention [32]	-	19/04/2005 (a)	18/07/2005
Stockholm Convention [33]	23/05/2001	19/04/2005	18/07/2005
Minamata Convention [34]	10/10/2013	-	-



⁽¹⁶⁷⁾ <https://www.un.org/Depts/Cartographic/english/htmain.htm>.

⁽¹⁶⁸⁾ Percentage in weight of e-waste generated equipment covered by the national legislation illustrated per EU-6 collection category for 2019.



EEE Placed on Market (2019):	E-waste generated (2019):	E-waste formally collected (2019):
 <p>277 kt. 9.9 kg/inh.</p>	 <p>267 kt. 9.5 kg/inh.</p>	 <p>1.0 kt. 0.04 kg/inh.</p>

(Source: Ministry of the People's Power for Eco-socialism (MINEC) / UNU / UNITAR)

Generated e-waste plastic:	Generated BFRs from e-waste:
 <p>74 kt. 2.6 kg/inh.</p>	 <p>6 kt. 0.2 kg/inh.</p>

(Source: UNDP / UNU / UNITAR)

Formal/environmentally sound e-waste management system in place:

- ✓ Venezuela (Bolivarian Republic of) has 4 e-waste operators authorised to provide transportation, collection, reception and storage, dismantling, recovery, and recycling of e-waste.
- ✗ Venezuela (Bolivarian Republic of) does not have facilities that process/treat POPs arising from e-waste.

National Legal Framework

The Bolivarian Republic of Venezuela (hereafter, Venezuela - Bolivarian Republic of) regulates e-waste as part of the comprehensive national legislation on hazardous waste management.

The protection of the environment from hazardous wastes and chemicals is enshrined in the Constitution of Venezuela (Bolivarian Republic of), but also in a comprehensive legal and regulatory framework around hazardous wastes and chemicals, summarised as follows:

- Constitution of the Bolivarian Republic of Venezuela (Bolivarian Republic of), of December 15, 1999⁽¹⁶⁹⁾.
- Law No. 55 of November 13, 2001 on Hazardous Substances, Products and Wastes [160].
- Organic Law on the Environment, No. 5.833 of December 22, 2006⁽¹⁷⁰⁾.
- Penal Law on the Environment of May 2, 2012⁽¹⁷¹⁾.
- Law of Integral Waste Management (2010).
- Law on the Plan of the Nation 2019-2025.
- Decree 2.635 of July 22, 1998 on Regulations for the control of the recovery of hazardous materials and the management of hazardous waste [161].
- Resolution 00073 of May 2014 on Requirements for the Authorization of Handlers of Hazardous Substances, Materials or Waste and Registry of Hazardous Waste Generators.

The Constitution establishes an obligation for the State to guarantee a pollution-free environment ensuring the protection of the air, water, soils, coasts, climate, and ozone layer (art. 127). The Constitution also explicitly envisages the adoption of a special law regulating the use, handling, transport, and storage of toxic and dangerous substances.

Law No. 55 of 2001 is focused on regulating the generation, use, collection, storage, transport, treatment, and final disposal of substances, hazardous materials, and waste in order to protect health and the environment (art.1).

The Organic Law on the Environment of 2006 articulates the objectives of environmental management under the coordination of the National Environmental Authority, which, inter alia, includes the prevention, regulation, and control activities capable of degrading the environment; and the reduction or elimination of sources of pollution

(art. 10). Specifically, this law stated that for the purposes of conservation, prevention, control of contamination, and degradation of soil, environmental authorities must ensure the use of appropriate practices for the handling of chemical substances and in the management and final disposal of domestic, industrial, hazardous waste, or of any other nature that may contaminate the soil.

In 2012, Venezuela (Bolivarian Republic of) introduced a specific penal law related to crimes against the environment, including illegal hazardous waste management.

The purpose of the law is to classify as crimes, acts that violate natural resources and the environment, impose criminal sanctions and other precautionary measures, and specify procedural provisions derived from the specificity of environmental matters. The law envisages natural and legal persons' responsibility. The main penalties are those of prison, arrest, and dissolution of the legal person⁽¹⁷²⁾. A number of articles typify conducts that are relevant for e-waste and POPs (such as illegal dumping, toxic landfills, polluting activities and substances, etc.).

A specific legal instrument on the management of waste electrical and electronic equipment, including the establishment of an EPR system, is currently under discussion.

The management of hazardous wastes is currently regulated in Law No. 55, published on November 13, 2001 on Hazardous Substances, Products and Wastes as well as in Decree 2.635 of July 22, 1998 on Regulations for the control of the recovery of hazardous. In August 2020, a draft norm for the comprehensive management of waste electrical and electronic equipment was proposed for discussion. The draft law regulates aspects related to roles and control functions of the institutional framework in Venezuela (Bolivarian Republic of), as well as responsibilities of key actors in the EEE life cycle and management of e-waste, as well of technical elements.

An EPR system is envisaged for producers and importers of e-waste. Differentiated responsibilities are also foreseen for traders, which are expected to become e-waste reception points, and for users and consumers, by establishing a framework of incentives for participating in environmental management programs.

Hazardous wastes are classified according to international classification systems (OECD, EU Waste List).

According to the latest national reporting to the Basel Convention Secretariat, Venezuela (Bolivarian Republic of) refers to the OECD and EU Waste lists [162].

Venezuela (Bolivarian Republic of) foresees EHS standards for hazardous waste management.

EHS standards were introduced in 1998 and 2014 related to the recovery and management of hazardous wastes, as follows:

- Regulations for the control of the recovery of hazardous materials and the management of hazardous waste (Decree 2,635).
- Requirements for the Authorization of Handlers of Hazardous Substances, Materials or Waste and Registry of Hazardous Waste Generators (Resolution 00073).

The draft law on management of waste electrical and electronic equipment, currently under discussion, will introduce specific EHS standards for this specific waste stream.

The management of POPs in Venezuela (Bolivarian Republic of) is carried out in accordance with the regulations for the management of hazardous substances, materials, and wastes.

Venezuela's (Bolivarian Republic of) most relevant POPs legal instruments are:

- Constitution of the Bolivarian Republic of Venezuela (Bolivarian Republic of).
- Law of the Plan of the Homeland 2019-2025.
- Organic Law of the Environment.
- Environmental Criminal Law.
- Law on Hazardous Substances, Materials, and Waste.
- Law on Integral Garbage Management.
- Norms for the control of the recovery of hazardous materials and the management of hazardous waste (Decree 2,635).
- Requirements for the registration and authorisation of handlers of hazardous substances, materials and wastes (Resolution 00073).

Venezuela (Bolivarian Republic of) regulates e-waste as part of a comprehensive national legislation on hazardous waste management.

The management of POPs is carried out in accordance with the regulations for the management of hazardous substances, materials, and wastes.

Venezuela (Bolivarian Republic of) foresees EHS standards for hazardous waste management.

National Statistics on E-waste

Official e-waste statistics are currently being established in Venezuela (Bolivarian Republic of) by the Ministry of the People’s Power for Eco-socialism (MINEC).

Before 2019, information on imports and exports of EEE was not carried out systematically in the country. Nonetheless, official information is available at the national level in the Ministry of People’s Power for National Commerce, the Ministry of the People’s Power for Eco-socialism, and the National Integrated Service of Customs and Tax Administration. Venezuela (Bolivarian Republic of) statistics don’t make differentiation on new or used equipment being imported or exported.

Data on EEE placed on the market and e-waste generated were developed by the country following the methodology developed by UNU/UNITAR for 2018 and 2019.

Analysis of information from 2010-2019 was undertaken using the information provided by the National Directorate of the Environment to estimate the main e-waste statistics indicators (i.e. EEE POM and e-waste generated) for the country, as illustrated in Figure 47-Figure 49.

Figure 47. EEE POM and e-waste generated in Venezuela (Bolivarian Republic of)

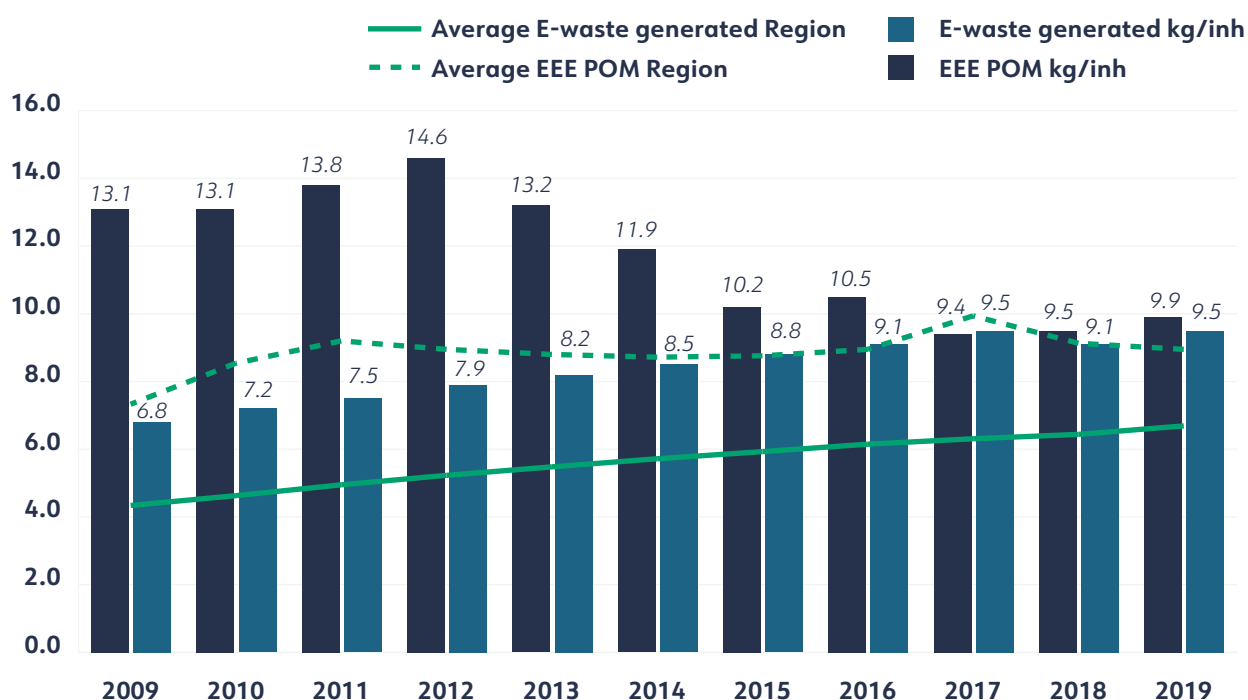
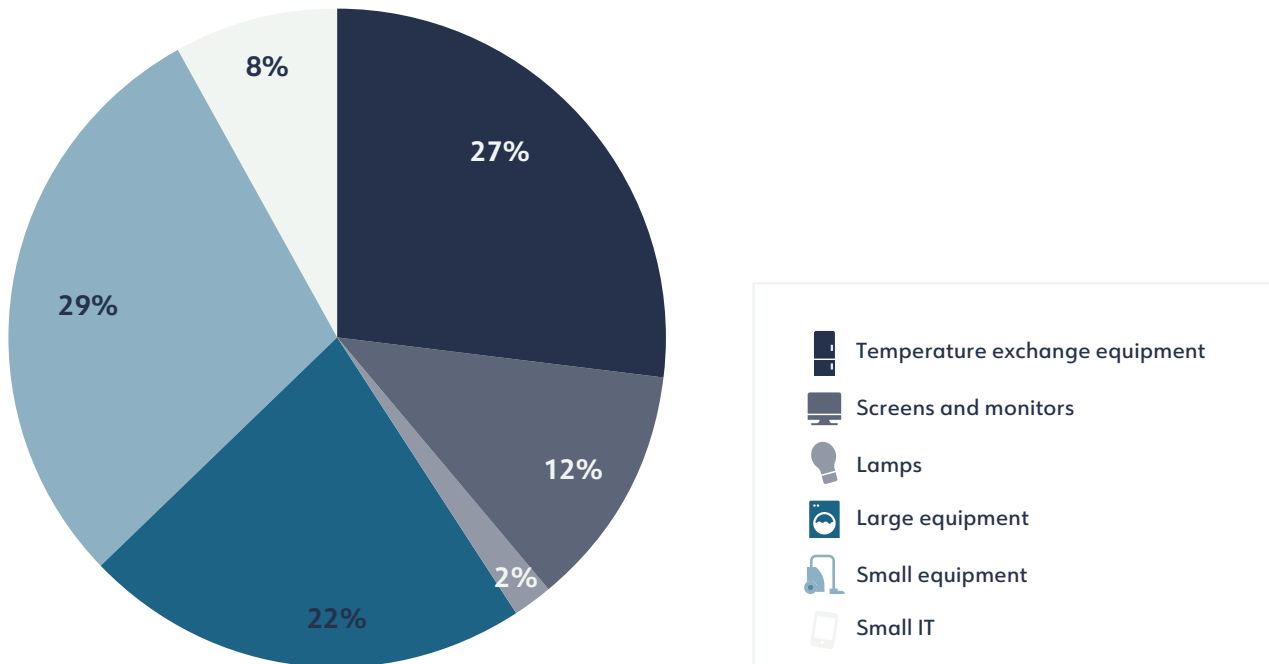


Figure 47 shows that Venezuela’s (Bolivarian Republic of) EEE POM and e-waste generated amounts have been above the average number for the 13 countries analysed.

EEE POM has fluctuated over the years, but overall it has decreased, from 13.1 kg/inh (368 kt) in 2009 to 9.9 kg/inh (277 kt) in 2019.

The annual amount of EEE POM has fluctuated but has decreased over the past decade, but from 13.1 kg/inh (368 kt) in 2009 to 14.6 kg/inh (428 kt) in 2012, an increasing trend is present. However, it decreased in 2013 from 13.2 (394 kt) to 9.9 kg/inh (277 kt) in 2019. This trend can be attributed to many factors (e.g. natural disasters, economic factors, decrease in internal production, etc.).

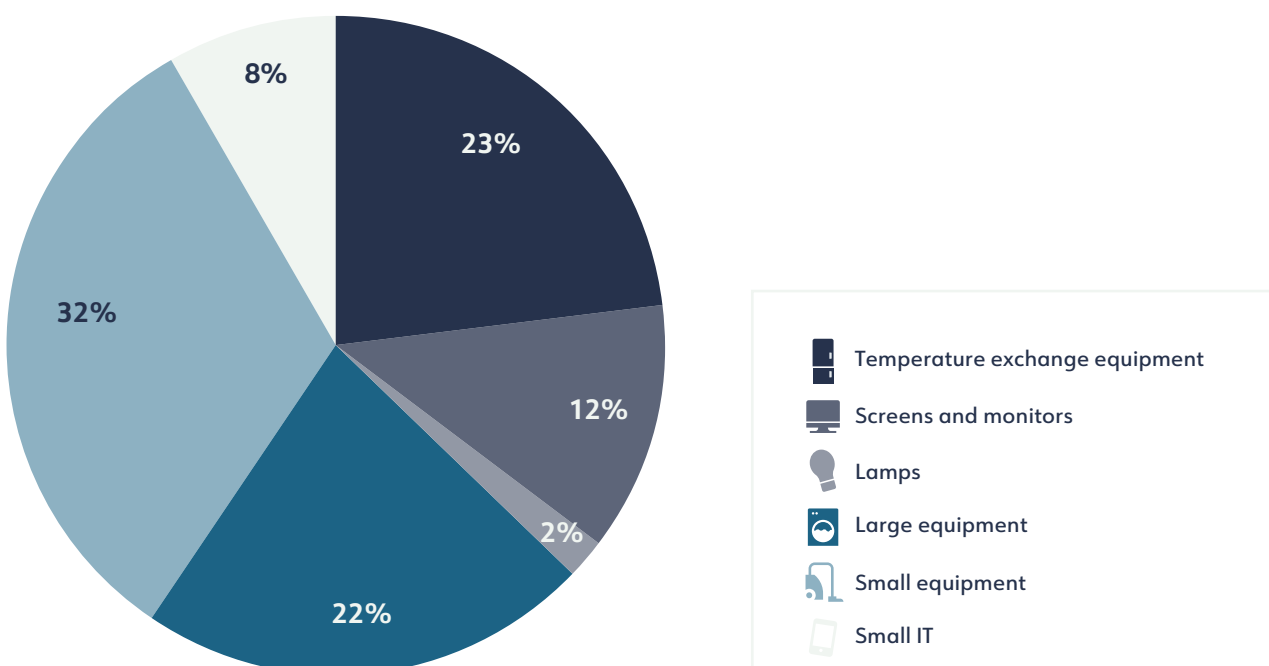
Figure 48. Share of the EU-6 categories in the EEE (2019)



Small equipment (Cat. V) and temperature exchange equipment (Cat. I), with 2.9 kg/inh and 2.6 kg/inh, respectively, account for the highest shares of EEE POM in Venezuela (Bolivarian Republic of) for 2019 (corresponding to 56 percent of the total) (Figure 48). Large equipment (Cat. IV) registers the third- highest share of EEE POM for 2019 with 2.2 kg/inh, representing 22 percent of the total share. The smallest share is that of lamps (Cat. III) with 0.2 kg/inh, equal to 2 percent of the total.

There are currently no statistics on how many electronic equipment items are imported and exported as second-hand.

Figure 49. Share of the EU-6 categories in the e-waste generated (2019)



E-waste generated increased steadily through the years, from 6.8 kg/inh (191.4 kt) in 2009 to 9.5 kg/inh (267 kt) in 2019.

The e-waste generated in Venezuela (Bolivarian Republic of) showed a consistent increase from 6.8 kg/inh (191.4 kt) in 2009 to 9.5 kg/inh (267 kt) in 2019. As Figure 49 shows, small equipment (Cat. V) has the highest share (32 percent) of e-waste generated in 2019, equal to 3.1 kg/inh (86.8 kt). It is followed by temperature exchange equipment (Cat. I) and large equipment (Cat. IV) with 2.2 kg/inh and 2.1 kg/inh (24 and 22 percent), respectively. The category of e-waste with the smallest share is lamps (Cat. III), at 2 percent with 0.2 kg/inh.

In 2019, Venezuela (Bolivarian Republic of) exported 1.0 kt (0.04 kg/inh) of e-waste to Japan for their ESM, according to official reporting.

The statistic of POPs and non-POPs arising from e-waste were unknown as of this report's publication.

E-waste and POP Management System

The Ministry of the People's Power for Eco-socialism is responsible for the e-waste and POPs monitoring and management.

As established in the legislation, the Ministry of the People's Power for Eco-socialism is responsible for e-waste and POPs monitoring and management.

Venezuela (Bolivarian Republic of) does not yet have an official system for collection of e-waste, but such a system is currently being evaluated.

Under the framework of the PREAL project, Ministry of the People's Power for Eco-socialism has designed an e-waste collection plan which includes creation of collection points in recreational parks. Furthermore, the Ministry of the People's Power for Eco-socialism has disseminated information on the proper e-waste management and provided formal training. Discussions with producers and distributors of e-waste on their proper management, regulations, and technical standards for EPR have also been done.

E-waste collection campaigns in Venezuela (Bolivarian Republic of) have been administered by e-waste operators, environmental NGOs, and producers.

E-waste operators in Venezuela (Bolivarian Republic of) implement standards such as ISO 14001 and national health and safety standards voluntarily in their companies.

E-waste operators in Venezuela (Bolivarian Republic of), are obliged to follow official standards provided by a legal decree, such as:

- Standards for the control of hazardous material recovery and hazardous waste management (Decree 2,635).
- Requirements for the registration and authorisation of handlers of hazardous substances, materials and wastes (Resolution 00073).

Some e-waste operators are currently voluntarily applying ISO 14001 and health and safety standards.

Venezuela (Bolivarian Republic of) has 4 companies that specialise in the transportation, collection, reception and storage, dismantling, recovery, and recycling of e-waste.

Venezuela (Bolivarian Republic of) has 4 companies that provide management of e-waste. These companies carry out the processes of collection, storage, treatment, and dismantling of all types of e-waste and reuse of recoverable materials, scrap metal, glass, plastics, etc.

The informal sector is involved in the informal collection and dismantling of e-waste, but no estimates quantifying the amount of e-waste treated by the informal sector have been made.

The vast majority of recyclable material is collected/scavenged/purchased by collectors that operate informally. The informal sector typically acquires e-waste by collecting it kerbside or in the streets, among other methods. They dismantle the equipment using rudimentary technology and extract the valuable parts (e.g. printed circuit boards) to sell them locally and/or to repair shops. The less-valuable parts are disposed of in landfills. According to the Ministry of the People's Power for Eco-socialism, they provided training and capacity-building to members in the informal sector regarding health and safety standards and proper management of e-waste. No association or cooperatives have been identified by the Ministry of the People's Power for Eco-socialism.

There are currently no statistics on how many electronic equipment items are repaired or disposed of as mixed in with residual waste.

Under the framework of the PREAL project, the Ministry of the People's Power for Eco-socialism will be performing studies on the number of companies and electronics that are being repaired and disposed of as mixed in with residual waste.

Plastic that is profitable in Venezuela (Bolivarian Republic of) is usually recycled domestically or exported.

Plastics in Venezuela (Bolivarian Republic of) are managed by both formal and informal recyclers. Valuable plastic (e.g. PET) is recycled or exported, and those that are not considered valuable are typically disposed of in landfills.

Venezuela (Bolivarian Republic of) does not have PCBs or POPs treatment facilities. Plastics containing POPs are not currently being identified. No separation of BFR and non-BFR e-waste plastic is being done.

The e-waste plastics that contain POPs are typically disposed of in landfills, and no proper treatment is provided. PCB capacitors are exported for treatment under the requirements of the Basel Convention.

Under the framework of the PREAL project, Venezuela (Bolivarian Republic of) is currently evaluating alternatives for the treatment of POPs from e-waste plastic.

Import & Export of E-waste and POPs Contained in E-waste

Venezuela (Bolivarian Republic of) is Party to the Basel, Rotterdam, and Stockholm Conventions and signed the Minamata Convention on mercury in 2013. Imports of hazardous wastes are prohibited.

The Constitution of the Bolivarian Republic of Venezuela (Bolivarian Republic of) prohibits the importation of toxic and hazardous waste (art. 129). As well, according to the Law on Hazardous Substances, Materials and Waste, 'The introduction of pathological and dangerous wastes into the country is prohibited' (Article 5). According to this law, illegal traffic of hazardous and other wastes constitutes a crime.

Law No. 55 of 2001 foresees the responsibility and obligation of importers to return to their cost to the country of origin, products, and substances subject to control and regulation of this Law, when they are expired or in poor condition and cannot be disposed of in the country safely.

Asbestos, PCB residues, Chlorinated fluorocarbons and sediments from the recovery of these solvents are included in the list of wastes in need of special consideration in case of TBM⁽¹⁷³⁾.

No restrictions on the export or transit of hazardous wastes and other wastes for final disposal or recovery are envisaged [163].

According to the Ministry of the People's Power for Eco-socialism, approximately 2,100 tons (obsolete pesticides and PCBs) were exported to European countries (France and Holland, among others) for their treatment and final disposal.

Based on the annual reports to the Basel Convention in 2019, Venezuela (Bolivarian Republic of) exported 37,852 printed circuit boards to Japan for recycling/reclamation of metals and metal compounds.

Stakeholder Mapping

In Venezuela (Bolivarian Republic of), the stakeholders involved in the waste sector (that could be identified) and their roles are described below:

Stakeholder	Responsibility
Ministry of the People's Power for Eco-socialism Website	The Ministry of People's Power for Eco-socialism is the entity of the National Executive branch in charge of protecting and conserving the environment, through the construction of the new Eco-socialist model and based on a harmonic relationship between humans and the environment. The model guarantees the rational, optimal, and sustainable use and exploitation of natural resources, respecting the processes and cycles of nature. They are in charge of overseeing the management and monitoring of e-waste.
Ministry of the People's Power for Economy, Finance and Foreign Trade (MPPEF) Website	The Ministry of the People's Power for Economy, Finance and Foreign Trade is an organ of the Executive Branch whose mission is to exercise the steering role of the economic and fiscal policy and to coordinate the Financial Administration of the National Public Sector.

Stakeholder	Responsibility
	They are also responsible for coordinating the Financial Administration of the National Public Sector and directing and supervising the implementation and maintenance of the systems that comprise it, within the framework of the legal system, with a clear focus on quality, efficiency, and ethics, in order to contribute decisively to the economic and social welfare of the country.
National Integrated Service of Customs and Tax Administration Website	National Integrated Service of Customs and Tax Administration is an executing body of the National Tax Administration of Finance, which is focused on improving national tax collection. Among its main functions are the collection and control of all taxes, as well as reducing tax evasion and tax delinquency.
Ministry of People’s Power for National Commerce Website	As stated on their website, the Ministry of People’s Power for National Commerce promote and guarantee the management of the commercial approach for developing the activities of negotiation of import, export, distribution, marketing, and productive investment with national and international commercial strategic alliances. They contribute to satisfying the social needs of the nation. They also strive to be the nationally recognised body, valued for its efficiency, efficacy, and effectiveness in the commercial development of goods and services within the framework of the body’s competencies and attributions.
Corporación Devesa de Venezuela C.A. – Vitaambiente Website	<p>The Company provides integrated management for the collection, transportation, temporary safe storage, and processing (recycling, reuse, recovery) and final disposal of what cannot be valorised, recycled, or reused from hazardous materials and wastes. They offer communities with the alternative of giving an environmentally and economically sustainable destination to the wastes that are regularly produced, both in state institutions and in the private sector.</p> <p>They mainly provide services to manage energy-saving light bulbs and fluorescent luminaires that contain mercury, as well as batteries and e-waste.</p>
Recuperadora e Inversiones Canaima C.A.	The company manages non-hazardous recyclable materials as well as hazardous materials requiring authorisation for the handling of hazardous substances, materials, or wastes and inscriptions in the registry of activities capable of degrading the environment (RACDA). They provide services of transportation, collection, storage, treatment, and final disposal of hazardous materials and wastes.
Ecoreciclaje Integral 2008, C.A. Website	EcoReciclaje focuses its activities on providing environmental services to industries, institutions, and individuals with the recycling and final disposal of electrical and electronic equipment as well as industrial waste in an ecologically correct and responsible manner.
Cesven S.A. Website	Company dedicated to providing efficient environmental solutions and complying with all current legislative and safety regulations in an efficient manner, first implementing a recovery and recycling policy. They provide transportation, collection, dismantling, treatment, and final disposal of fluorescent lamps, energy-saving bulbs, and monitors, as well as recovery of materials.

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11. ANNEXES

A. UNU-KEYs and Six E-waste Categories

UNU-KEY	Full Name	Six Categories
0001	Central Heating (household-installed)	IV
0002	Photovoltaic Panels	IV
0101	Professional Heating & Ventilation (excl. cooling equipment)	IV
0102	Dishwashers	IV
0103	Kitchen (e.g. large furnaces, ovens, cooking equipment)	IV
0104	Washing Machines (incl. combined dryers)	IV
0105	Dryers (wash dryers, centrifuges)	IV
0106	Household Heating & Ventilation (e.g. hoods, ventilators, space heaters)	IV
0108	Fridges (incl. combi-fridges)	I
0109	Freezers	I
0111	Air Conditioners (household-installed and portable)	I
0112	Other Cooling (e.g. dehumidifiers, heat pump dryers)	I
0113	Professional Cooling (e.g. large air conditioners, cooling displays)	I
0114	Microwaves (incl. combined, excl. grills)	V
0201	Other Small Household (e.g. small ventilators, irons, clocks, adapters)	V
0202	Food (e.g. toaster, grills, food processing, frying pans)	V
0203	Hot Water (e.g. coffee, tea, water cookers)	V
0204	Vacuum Cleaners (excl. professional)	V
0205	Personal Care (e.g. tooth brushes, hair dryers, razors)	V
0301	Small IT (e.g. routers, mice, keyboards, external drives & accessories)	VI
0302	Desktop personal computers (excl. monitors, accessories)	VI
0303	Laptops (incl. tablets)	II
0304	Printers (e.g. scanners, multi-functionals, faxes)	VI
0305	Telecom (e.g. [cordless] phones, answering machines)	VI
0306	Mobile Phones (incl. smartphones, pagers)	VI
0307	Professional IT (e.g. servers, routers, data storage, copiers)	IV
0308	Cathode Ray Tube Monitors	II
0309	Flat Display Panel Monitors (LCD, LED)	II
0401	Small Consumer Electronics (e.g. headphones, remote controls)	V

UNU-KEY	Full Name	Six Categories
0402	Portable Audio & Video (e.g. MP3, e-readers, car navigation)	V
0403	Music Instruments, Radio, Hi-Fi (incl. audio sets)	V
0404	Video (e.g. video recorders, DVD, Blu-ray, set-top boxes)	V
0405	Speakers	V
0406	Cameras (e.g. camcorders, photo, and digital still cameras)	V
0407	Cathode Ray Tube TVs	II
0408	Flat Display Panel TVs (LCD, LED, Plasma)	II
0501	Lamps (e.g. pocket, Christmas, excl. LED and incandescent)	V
0502	Compact Fluorescent Lamps (incl. retrofit and non-retrofit)	III
0503	Straight Tube Fluorescent Lamps	III
0504	Special Lamps (e.g. professional mercury, high & low pressure sodium)	III
0505	LED Lamps (incl. retrofit LED lamps and household LED luminaires)	III
0506	Household Luminaires (incl. household incandescent fittings)	V
0507	Professional Luminaires (offices, public space, industry)	V
0601	Household Tools (e.g. drills, saws, high-pressure cleaners, lawnmowers)	V
0602	Professional Tools (e.g. for welding, soldering, milling)	IV
0701	Toys (e.g. car racing sets, electric trains, music toys, biking computers)	V
0702	Game Consoles	VI
0703	Leisure (e.g. large exercise, sports equipment)	IV
0801	Household Medical (e.g. thermometers, blood pressure meters)	V
0802	Professional Medical (e.g. hospital, dentist, diagnostics)	IV
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	V
0902	Professional Monitoring & Control (e.g. laboratory, control panels and invertors)	IV
1001	Non-Cooled Dispensers (e.g. for vending, hot drinks, tickets, money)	IV
1002	Cooled Dispensers (e.g. for vending, cold drinks)	I

B. Mathematical Equations

The mathematical description of 'e-waste generated' is a function of the lifespans and EEE POM of the previous years. In particular:

- *E-waste Generated* (n) is the quantity of e-waste generated in evolution year n
- *POM* (t) is the product sales (POM) in any historical years t prior to year n
- t_0 is the initial year that a product was sold
- $L^{(p)}(t, n)$ is the discard-based, lifetime profile for the batch of products sold in historical year t

$$E \text{ waste generated } (n) = \sum_{t=t_0}^n POM(t) * L^{(p)}(t, n)$$

The lifespan, $L^{(p)}(t, n)$ is the lifespan profile of an EEE sold in year t , which reflects its probable obsolescence rate in evaluation year n . The discard-based lifespan profile for a product could be modelled using several probability functions. The Weibull distribution function is considered most suitable for describing discard behavior for EEE and has been applied in the European Union and in scientific literature.

Due to social and technical developments, a product's lifespan could be time-dependent. For instance, the CRT monitor rapidly grew outdated, due to the technological developments of flat-screen monitors. In that case, lifespan distributions should ideally be modelled for each historical sales year. The Weibull function is defined by a time-varying shape parameter $\alpha(t)$ and a scale parameter $\beta(t)$ as described in the equation below:

$$L^{(p)}(t, n) = \frac{\alpha(t)}{\beta(t)^{\alpha(t)}} (n-t)^{\alpha(t)-1} e^{-[(n-t)/\beta(t)]^{\alpha(t)}}$$

For other, more stable products, time-independent lifespans sufficiently describe actual behavior. In those cases, the variations of the shape and scale parameter over time are minor, and variations can be disregarded. The distribution of product lifespans can then be simplified as follows:


$$L^{(p)}(t, n) = \frac{\alpha}{\beta^\alpha} (n-t)^{\alpha-1} e^{-[(n-t)/\beta]^\alpha}$$

C. List of Waste and Substances Under the Basel Convention That Are Relevant for E-waste

A,B Code	Description	Type of E-waste or Component Containing Hazardous Substances	Y code
A1180	Waste electrical and electronic assemblies or scrap containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes, and other activated glass and PCB-capacitors, or contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Annex III (note the related entry on list BB1110).	Any e-waste containing hazardous substances.	e.g. Printed circuit boards categorised as A1180 can also be categorised according to Annex I constituents: Y31 ('Lead; lead compounds'), Y20 ('Beryllium, beryllium compounds'), Y27 ('Antimony, antimony compounds'), Y45 ('organohalogen compounds other than substances referred to' elsewhere in Annex I).
B1110	Electrical and electronic assemblies: <ul style="list-style-type: none"> • Electronic assemblies consisting only of metals or alloys. • Waste electrical and electronic assemblies or scrap (including printed circuit boards) not containing components such as accumulators and other batteries included on list A, mercury switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or not contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) or from which these have been removed, to an extent that they do not possess any of the characteristics contained in Annex III (note the related entry on list A A1180). • Electrical and electronic assemblies (including printed circuit boards, electronic components, and wires) destined for direct reuse, and not for recycling or final disposal. 	Any e-waste containing hazardous substances.	
B4030	Used single-use cameras, with batteries not included on list A.	UNU-KEY 0406.	

A,B Code	Description	Type of E-waste or Component Containing Hazardous Substances	Y code
A1170	Unsorted waste batteries excluding mixtures of only list B batteries. Waste batteries not specified on list B containing Annex I constituents to an extent to render them hazardous.	Most likely batteries from e-waste.	
B1090	Waste batteries conforming to a specification, excluding those made with lead, cadmium, or mercury.	Most likely batteries from e-waste.	All.
A1010	Metal wastes and waste consisting of alloys of any of the following: antimony - arsenic - beryllium - cadmium - lead - mercury - selenium - tellurium - thallium.	Mercury in switches, contacts, and thermometers.	Y31 (lead; lead compounds), Y29 (mercury; mercury compounds), Y25 (selenium; selenium compounds), Y27 (antimony; antimony compounds).
A1020	Waste having as constituents or contaminants, excluding metal waste in massive form, any of the following: - Antimony; antimony compounds - Beryllium; beryllium compounds - Cadmium; cadmium compounds - Lead; lead compounds - Selenium; selenium compounds - Tellurium; tellurium compounds.	Could also be PCB (next to A1180) or antimony as flame retardants, lead compounds.	Y25 (selenium; selenium compounds), Y27 (antimony; antimony compounds), Y31 (lead; lead compounds).
A1030	Waste having as constituents or contaminants any of the following, - Arsenic; arsenic compounds - Mercury; mercury compounds. - Thallium; thallium compounds.	Mercury and arsenic are found in fluorescent and backlight lamps + mercury-added waste.	Y29 (mercury; mercury compounds).
A2010	Glass waste from cathode ray tubes and other activated glass.	Screens of cathode ray tubes.	Y31 (lead; lead compounds).
A3180	Wastes, substances and articles containing, consisting of or contaminated with PCB, polychlorinated terphenyl, polychlorinated naphthalene or polybrominated biphenyl, or any other polybrominated analogues of these compounds, at a concentration level of 50 mg/kg or more.	Can contain brominated flame retardants (in plastics) and persistent organic pollutants fractions of e-waste.	Y10 Waste substances containing or contaminated with PCBs, polychlorinated terphenyl, polybrominated biphenyls Y27 (antimony; antimony compounds).

D. E-waste Statistics and Management Assessment Scores per Countries

Country 	Legislation 					Infrastructure 	
	1.1 Existence of e-waste-specific legislation	1.2 Enforced products in national e-waste legislation (% of e-waste generated mass)	1.3 Is there an e-waste collection target?	1.4 Are there minimum standards of e-waste management?	1.5 Number of MEAs ratified or signed	2.1 Are there collection points in each municipality?	2.2 Are there treatment facilities in the country for ESM of e-waste? ⁽¹⁷⁴⁾
Argentina	no	0	in development	voluntary	4 ratified	main cities	yes
Bolivia (Plurinational State of)	yes	0	in development	voluntary	4 ratified	no	no
Chile	yes	0	in development	voluntary	4 ratified	main cities	yes
Costa Rica	yes	0	in development	yes	4 ratified	yes	yes
Ecuador	yes	0.002 ⁽¹⁷⁵⁾	yes	yes	4 ratified	main cities	yes
El Salvador	in development	0	no	yes	4 ratified	no	no
Guatemala	no	0	no	no	3 ratified	no	no
Honduras	no	0	no	voluntary	4 ratified	no	no
Nicaragua	no	0	no	in development	4 ratified	no	no
Panama	in development	0	in development	voluntary	4 ratified	no	yes
Peru	yes	1	yes	yes	4 ratified	main cities	yes
Uruguay	in development	0	in development	in development	4 ratified	no	no
Venezuela (Bolivarian Republic of)	no	0	no	voluntary	3 ratified	no	yes

⁽¹⁷⁴⁾ In some countries, this may apply only for some products- For more information, see Chapter 9 'Country Profiles'.

⁽¹⁷⁵⁾ Corresponding to mobile phones.

E-waste Statistics per Countries

Country	Year	EEE POM		E-waste generated		E-waste collected for ESM		Collection rate
		kg/inh	t	kg/inh	t	kg/inh	t	%
Argentina	2019	7.0	313,370	7.3	327,676	0.3	13,150	4.0
Bolivia (Plurinational State of)	2019	7.5	85,965	4.7	53,293	0.2	2,132	4.0
Chile	2019	13.4	251,116	7.9	148,832	0.4	6,840	5.0
Costa Rica	2015	15.5	78,238	13.2	66,948	1.0	5,100	8.0
Ecuador	2019	7.5	129,902	5.1	87,575	0.2	3,000	4.0
El Salvador	2019	7.5	50,437	5.0	33,350	0.1	435	1.0
Guatemala	2019	4.7	83,314	2.9	51,406	Not available	Not available	Not available
Honduras	2019	2.9	27,714	2.6	24,823	0.01	120	1.0
Nicaragua	2019	3.2	20,180	2.5	15,655	0.01	60	0.4
Panama	2019	15.2	64,086	8.6	36,191	0.02	84	0.2
Peru	2019	7.5	244,347	6.0	195,108	0.1	3,017	1.5
Uruguay	2019	14.8	48,709	12.0	39,272	0.4	1,210	3.0
Venezuela (Bolivarian Republic of)	2019	9.9	276,968	9.5	267,024	0.04	1,000	0.4
Average		9.0	128,796	6.7	103,627	0.22 ⁽¹⁷⁶⁾	3,270 ⁽¹⁷⁶⁾	2.7
Total			1,674,345		1,347,154		35,968	

E. EEE and E-waste Plastic BFR Statistics and Management Assessment Scores per Countries

Country 	Legislation 			Infrastructure 			
	Existence of POP norms/ legislation	Existence of POP legislation specifically on e-waste	Are there a minimum standard for POPs from e-waste management?	Collection of plastics	How is the plastic contained in e-waste separated?	Treatment of POPs contained in e-waste plastic.	Are there treatment facilities in the country for POPs contained in e-waste plastic?
Argentina	yes	no	in development	formal + informal sector	colour and through experience	landfilled and exported	no
Bolivia (Plurinational State of)	yes	no	in development	formal + informal sector	colour and through experience	landfilled and exported	no
Chile	yes	in development	no	formal + informal sector	colour and through experience	landfilled and exported	no
Costa Rica	yes	in development	in development	formal + informal sector	colour and through experience	co-processing (cement furnace)	no
Ecuador	yes	no	in development	formal + informal sector	colour and through experience	landfilled and exported	no
El Salvador	yes	no	in development	formal + informal sector	colour and through experience	co-processing (cement furnace)	no
Guatemala	yes	no	no	formal + informal sector	colour and through experience	landfilled and exported	no

Country 	Legislation 			Infrastructure 			
	Existence of POP norms/ legislation	Existence of POP legislation specifically on e-waste	Are there a minimum standard for POPs from e-waste management?	Collection of plastics	How is the plastic contained in e-waste separated?	Treatment of POPs contained in e-waste plastic.	Are there treatment facilities in the country for POPs contained in e-waste plastic?
Honduras	yes	no	in development	formal + informal sector	colour and through experience	landfilled and exported	no
Nicaragua	yes	no	no	formal + informal sector	colour and through experience	landfilled and exported	no
Panama	yes	no	in development	formal + informal sector	colour and through experience	landfilled and exported	no
Peru	yes	no	in development	formal + informal sector	colour and through experience	landfilled and exported	no
Uruguay	yes	no	in development	formal + informal sector	colour and through experience	landfilled and exported	no
Venezuela (Bolivarian Republic of)	yes	no	in development	formal + informal sector	colour and through experience	landfilled and exported	no

EEE and E-waste Plastic BFR Statistics per Countries

Country	Year	EEE Plastic POM		E-waste generated plastic		EEE Plastic-BFR POM		E-waste generated plastic-BFR	
		kg/inh	kt	kg/inh	kt	kg/inh	kt	kg/inh	kt
Argentina	2019	1.72	77.54	1.94	87.56	0.11	4.93	0.15	6.83
Bolivia (Plurinational State of)	2019	1.80	20.55	1.22	13.89	0.15	1.67	0.11	1.26
Chile	2019	3.50	65.53	2.15	40.23	0.23	4.31	0.17	3.19
Costa Rica	2019	4.57	23.11	4.11	20.81	0.37	1.88	0.36	1.82
Ecuador	2019	2.41	41.67	1.75	30.15	0.20	3.47	0.16	2.69
El Salvador	2019	1.79	11.97	1.46	9.76	0.14	0.91	0.13	0.86
Guatemala	2019	1.43	25.18	0.89	15.66	0.12	2.12	0.08	1.43
Honduras	2019	0.92	8.80	0.80	7.70	0.07	0.70	0.06	0.60
Nicaragua	2019	0.99	6.32	0.77	4.88	0.07	0.48	0.06	0.41
Panama	2019	3.59	15.15	2.46	10.39	0.25	1.05	0.20	0.85
Peru	2019	2.46	80.08	1.73	56.07	0.22	7.04	0.15	4.96
Uruguay	2019	3.58	11.75	3.19	10.47	0.26	0.84	0.25	0.83
Venezuela (Bolivarian Republic of)	2019	2.50	70.06	2.64	74.00	0.20	5.56	0.22	6.16
Average		2.22	35.21	1.85	29.35	0.2	2.69	0.15	2.45
Total			457.70		351.58		34.96		31.90

12. ABOUT THE AUTHORS

Michelle Wagner



Michelle Wagner is a Research Associate at the Sustainable Cycles Programme, co-hosted by United Nations University and the United Nations Institute for Training and Research. Michelle graduated Magna Cum Laude as an environmental engineer in the Universidad Católica de Honduras and has a Master's degree in Material Science applied for Environmental Technologies from the Royal Institute of Technology (KTH) in Sweden. Her working experience and research focuses on waste management, circular economy resource efficiency and environmental assessment. She has also contributed and led tasks in various projects focused on mapping and quantifying critical raw materials stocks and flows at national and regional levels across Europe and Latin America. She has expertise developing methodologies, modelling, and reporting on waste statistics (e-waste, batteries, plastics etc.). Additionally, she has co-developed EEE Placed on Market, e-waste generated, and plastic tools and has authored their corresponding manuals with the intent of assisting countries in estimating key indicators. Moreover, Michelle is also author and co-author of various publications that focus on quantifying e-waste amounts, such as the recently published in-depth review of the E-waste Collection Rates and Targets. She is highly skilled in organizing and conducting institutional capacity-building in the EU and in developing countries through statistical workshops and e-waste academies that strengthen e-waste management, statistics, and policies. She previously worked as Project Manager in the Ministry of Environment in Honduras, where she certified, audited, and granted environmental licenses, evaluated the environmental impact of projects, and promoted environmental policies.

Dr. Cornelis Peter Baldé



Dr. Cornelis Peter Baldé is a Senior Programme Officer at the Sustainable Cycles Programme, which is co-hosted by United Nations University and the United Nations Institute for Training and Research. He received his PhD in hydrogen storage at Utrecht University. Kees is the initiator of the Global E-waste Monitor series and is a researcher holding an H-factor of 17; he is also co-founder of the Global E-waste Statistics Partnership, author of various national e-waste and battery studies, and manager of research projects. Furthermore, he is a member of global expert groups on circular economy, waste, and sustainable development goals. He frequently provides policy advice to governments and is chair of the board of the Dutch National (W)EEE Register. Previously, he was the deputy team manager for environment statistics at Statistics Netherlands and was responsible for several ground-breaking publications on green growth and circular economy, as well as for various official statistics of the Netherlands.

Vittoria Luda di Cortemiglia



Vittoria Luda di Cortemiglia works as a consultant for the Sustainable Cycles Program of UNITAR. She graduated in law at the University of Turin and completed a Master of Arts (MA) in International Relations at St. John's University in New York. Vittoria leads analysis and training programs related to waste crime, transboundary waste shipments, and environmentally sound management of waste.

Dr. Innocent Nnorom



Dr. Innocent Nnorom works at Abia State University in Nigeria. He received his PhD in Analytical/Environmental Chemistry from the University of Ibadan, having studied pollution from e-waste management in Southern Nigeria. He was part of the 2009 E-waste Summer School. He has participated in several e-waste projects, including the E-waste Africa Project and the Person in Port (PiP) Project. He is a Senior Research Fellow at the Basel Convention Coordinating Centre for Africa (BCCC-A) in Nigeria. In 2019, he was a Visiting Research Fellow at the University of Manchester. He has contributed to the Global E-waste Monitor in recent years.

Dr. Ruediger Kuehr



Dr. Ruediger Kuehr is the Director of UNU's Sustainable Cycles (SCYCLE) Programme and Head of the recently established UNITAR Bonn Office. He also serves as Head and Senior Manager of the SCYCLE Programme under UNITAR. As a political and social scientist by education, Ruediger has worked for more than twenty years on the e-waste challenge. He co-founded the StEP Initiative, co-initiated the development of an e-waste coalition among the various UN organisations and the SCYCLE Programme, and initiated the permanent E-waste Academies and E-waste Monitors at the global, regional, and national levels. But the foundation of Ruediger's work is in establishing strategic approaches to sustainability, which renders life-cycle thinking indispensable in his activities; as such, he is also a frequent speaker for forward-thinking solutions at conferences and in media appearances.

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Giulia Iattoni is a Programme Associate at the Sustainable Cycles Programme, co-hosted by UNU and UNITAR. Giulia graduated cum laude in Environmental Engineering at the University of Bologna and spent a research period at the Technical University of Vienna, focusing on water quality and resources sustainability. Since 2019, Giulia has been involved on various projects focused on e-waste data collection and quantification, as well as on projects concerning the analysis of e-waste management models and related environmental impacts at the national and regional level. She is also designing and conducting workshops to build institutional capacity on e-waste statistics and legislation for several countries worldwide.



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