Guidelines for the development of national systems for integral management of waste electrical and electronic equipment in Latin America

In partnership with:

UNIDO UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

gef global environment facility INVESTING IN OUR PLANET

PROYECTO RESIDUOS ELECTRÓNICOS AMÉRICA LATINA-PREAL ONUDI - FMAM

ITU

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Table of contents

List of figures and tables

Figures

Tables

Abbreviations and acronyms

AI	Artificial Intelligence
ABS	Acrylonitrile butadiene styrene
ABS-PC	Acrylonitrile butadiene styrene-polycarbonate
BFR	Brominated flame retardants
EEE	Electrical and electronic equipment
EPR	Extended Producer Responsibility
ESM	Environmentally Sound Management
EU	European Union
EU-6	It refers to the six categories of WEEE defined by the EU
HIPS	High-impact polystyrene,
HS	Harmonized System refers to the Harmonized Commodity Description and Coding Systems.
IMS	Integral Management System
IoT	Internet of Things
ISWA	International Solid Waste Association
KPI	Key Performance Indicator
PC	Policarbonato
POM	Put on the market
POP	Persistent organic pollutants
PREAL	E-Waste Project in Latin America
PRO	Producer Responsibility Organizations
SCYCLE	Sustainable Cyclesprogramme of UNITAR
SDO	Sustainable Development Objectives
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
UNU	United Nations University
WCO	World Customs Organization
WEEE	Waste Electrical and Electronic Equipment
XRF	X-ray Fluorescence Spectrometry/Spectrometer

Glossary

Term	Description
Electrical and electronic equipment (EEE)	Equipment which is dependent on electric currents or electromagnetic fields to work properly, and equipment for the generation, transfer and measurement of such currents and fields and designed for use with a voltage not exceeding 1 000 V for alternating current and 1 500 V for direct current. (ITU-T L.1030)
Harmonized System tariff codes (HS)	International nomenclature established by the World Customs Organization, based on a classification of goods according to a six-digit code system accepted by all participating countries. These countries may establish their own subclassifications of more than six digits for tariff or other purposes. (World Customs Organization, s.f.)
Component	Element with electrical or electronic functionality connected together with other components, usually by soldering to a printed wiring board, to create an electronic circuit with a particular function (for example, an amplifier, radio receiver or oscillator). For a given component, or part of the component, waste handling requirements apply to the original equipment or part of the equipment to which it belongs. (ITU-T L.1036) (United Nations Environment Programme, 2011)
Disposition	Any operation specified in Annex IV of the Basel Convention. (Basel Convention Secretariat, 2017)
Final Disposition	The term is commonly used to refer to operations specified in Annex IV A of the Basel Convention. (Basel Convention Secretariat, 2017)
Distributor	Any natural or legal person in the supply chain, who makes an EEE available on the market. A distributor may also be a producer. (ITU-T L.1036)
Generation of WEEE	Quantity or weight of disposed products (waste) due to national consumption from a national territory in a given reporting year prior to any activity (collection, reuse, treatment, or export). (ITU-T L.1036)
Generator	The unit, individual or organization that owns and generates scheduled waste (SW) or waste electrical and electronic equipment, at the time and venue of its generation. (ITU-T L-1036)
Manager	Any natural or legal person, public or private, authorized to carry out one or more waste management operations, including collection, transport, storage, treatment, recovery, or disposal, in accordance with current environmental regulations and under the principles of traceability, safety, and sustainability. (International Telecommunication Union et al., 2015)
Importer	Any person who, under the jurisdiction of the importing state, organizes the import of hazardous waste or other waste. (International Telecommunication Union and Wolrd Economic Forum, 2021)

(continued)

Term	Description
Waste hierarchy	The waste hierarchy ranks waste and material management options, from prevention, minimization, and reuse (including remanufacturing) to recovery (including recycling and energy recovery) and disposal. In the hierarchy, prevention is the preferred option, and disposal is the least desirable. The preference is based on the environmental impact of the selected option, the consumption of material resources, and its ability to promote efficient use of resources. (United Nations, s.f.)
Environmentally sound management of waste	Adopting all possible measures to ensure that waste, whether hazardous or not, is managed in a way that protects human health and the environment from any adverse effects that may arise from it. (United Nations, s.f.) (United Nations Environment Program, 1992).
Special waste[1]	Solid waste that, due to its composition, volume, or weight, may be hazardous and therefore requires special handling. This includes solid waste from healthcare facilities, expired chemicals and pharmaceuticals, expired food, waste from facilities that use hazardous substances, sludge, and bulky or heavy waste that, with authorization or illegally, is handled together with municipal solid waste. (United Nations Industrial Development Organization, 2007). In some countries, WEEE are considered within this category.
Producer	Any natural or legal person, established in a state, who manufactures or markets or resells electrical and electronic equipment (EEE) under his own name or trademark; put on the market of that state, on a professional basis, EEE from a third country or from another state; or sells EEE by means of distance communication directly to private households or to users other than private households in a state, and is established in another state or in a third country. (ITU-T L.1036)
Waste	Materials that are not primary products (i.e., products produced for the market) for which the generator has no further use in terms of its own production, processing, or consumption purposes, and which it wishes to dispose of. (United Nations Statistics Division, 2025)
Hazardous Waste	Waste that, due to its chemical reactivity or its toxic, explosive, corrosive, or other properties, poses a danger to health or the environment. This includes waste that causes hazards when combined with other waste but excludes radioactive waste. (United Nations, s.f.) (United Nations Environment Program, 1992)
Waste Electrical and Electronic Equipment (WEEE)	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. (ITU-T L.1031)
Extended producer responsibility (EPR)[2]	A policy principle to promote total life cycle environmental improvements of product systems by extending the responsibility of the manufacturers of the product to various parts of the entire life cycle of the product, and especially to the take-back, recycling and final disposal of the product. (ITU-T L.1021)
Formal Sector	Those regulated by environmental protection laws specifically designed for e-waste. (ITU-T L.1030)

(continued)

Term	Description
Collection system[3]	It is an operational structure made up of EEE producers to implement the principle of extended producer responsibility (EPR) and achieve the collection targets set by the country. They assume responsibility for the environmentally safe management of WEEE throughout the management chain and may consist of a single producer (individual recovery system) or a group of producers (collective recovery system). (Sustainable Recycling Industries, 2017) (UIT-T. L.1021) In countries where EPR has not yet been implemented, the WEEE collection system may be managed by private companies (operators), NGOs, or government entities.
Treatment	Recovery or disposal operations, including preparation prior to recovery or disposal. (ITU-T L.1030)
Valorization	Any operation whose main result is that the waste serves a useful purpose by replacing other materials that would otherwise have been used to fulfill a particular function, or that the waste is prepared to fulfill that function, in the facility or in the economy in general. (European Parliament and Council of the European Union, 2008)

[1] They are also known as special handling waste or differentiated handling waste.
[2] This footnote does not apply to the English version.
[3] In Latin American countries, they are also known as compliance units, management systems, post-consumer plans, EPR programmes, or collection and management systems.

Executive Summary

Within the framework of the UNIDO-GEF project, *Strengthening national initiatives and improving regional cooperation for the environmentally sound management of POPs in waste electrical and electronic equipment (WEEE)*, hereinafter referred to as the PREAL Project, thirteen Latin American countries strengthened their legislation and public policy or made significant progress in the sustainable management of WEEE. However, one of the important conclusions of the project concerns the heterogeneity that exists regarding key concepts that lead to the implementation of a WEEE management system with integral management and the approach to managing this waste. Although some countries have made significant progress in implementing a comprehensive management system (CMS), others are still in the early stages of development and, thanks to PREAL, have laid the foundations for the near future.

The purpose of this document is to propose minimum guidelines for Latin American countries and other regions to structure their national systems for the integral management of Waste Electrical and Electronic Equipment (WEEE). The document addresses various aspects relevant to the planning and implementation of a national WEEE management system based on Extended Producer Responsibility (EPR) and includes experiences and results from the PREAL project, which has contributed significantly to establishing adequate WEEE management in the region. To this end, it details the basic elements of a national WEEE management system, including the legal and policy framework, collection systems, financing, control and monitoring, and training and awareness-raising for the actors involved. In addition, it presents technical and informational guides developed within the framework of PREAL to support the implementation of these systems.

The implementation of these guidelines is expected to enable countries to move towards more efficient and sustainable management of WEEE, contributing to the protection of the environment and public health, and promoting a circular economy that maximizes the use of resources.

Introduction

Technological development and innovation seem to be growing exponentially over the years. Looking at the services or products that were purchased just a decade ago, it feels like humanity has taken a leap forward in time. Today, technology is present in every facet of the average person's daily life. The Internet of Things (IoT) and artificial intelligence (AI) are generating significant transformations in everyday life, enabling device connectivity and real-time analysis. This integration promotes automation in the residential sector; it also has relevant applications in industrial, agricultural, and healthcare sectors, to name a few. As a result, an increase in the use of electrical and electronic equipment has been registered due to current demands. It is to be expected that, due to the increase in consumption, the generation of Electrical and Electronic Equipment Waste (WEEE) will also increase.

Baldé et al (2024) indicates that 82 of 193 United Nations member countries have laws or regulations on WEEE management, representing 42% of the total. Of these, only 67 countries apply extended producer responsibility (EPR).

In 2022, 62 million tonnes of electronic waste were generated worldwide, with an average of 7.8 kg per person. Only 13.8 million tonnes (22.2%) were reported as collected by official channels and presumably treated in an environmentally sound manner. In high- and upper-middle-income countries, 16.0 million tonnes (25.8%) were collected by informal systems, while in low- and lower-middle-income countries, 18.0 million tonnes (29%) were reported. The remaining 14.0 million tonnes (22.5%) ended up in landfills or were disposed of improperly. (Baldé et al, 2024)

According to the *Global E-Waste Monitor 2024* (Baldé et al, 2024) in 2022, the Americas generated 14 million tonnes of WEEE, with an average of 14.1 kg per inhabitant, but only 30% was collected and recycled. The report indicates that, of the 36 countries on this continent analyzed, 12 have legislation on WEEE, only nine incorporate EPR, and only four have targets for WEEE collection. The countries with the highest generation of WEEE in the Americas are the United States (7.2 billion kg), Brazil (2.4 billion kg), and Mexico (1.5 billion kg). However, the United States and Aruba are the countries with the highest per capita generation (21 kg/capita), followed by Canada and Puerto Rico (20 kg/capita). The results presented in this study reveal significant regional inequalities, highlighting the urgent need to improve the environmental management of this waste.

WEEE contains a variety of materials, with up to 69 elements from the periodic table identified, including precious, non-critical, and critical metals (Forti, Baldé, Kuerh, & Bel, 2020). Up to 15 types of plastics have also been identified in this waste. On average, plastics account for 25% - 30% of total WEEE. In addition, they contain hazardous substances that can be released into the environment if they are handled, disassembled, or disposed of improperly (Wagner et al., 2022).

This is one of the largest waste streams worldwide and one of the most concerning, due to low collection rates through formal management systems, mainly in developing countries, which increases the risks they pose to health and the environment. As a result, countries must make efforts to develop national WEEE management systems to ensure the environmentally safe management of this waste. The PREAL project strengthened WEEE management through policies, regulation, technology, business models, training, and awareness-raising in 13 Latin American countries. This information can be found in the document *Management of Waste Electrical and Electronic Equipment in Latin America: Current Situation and Outlook*.

This document addresses various aspects considered relevant for the planning and implementation of a national system for the integral management of WEEE based on EPR, providing governments and stakeholders with a guide based on the recommendations of various international organizations. It also draws on the experience of the 13 countries that participated in the PREAL project.

Chapter 1 – Management of Waste Electrical and Electronic Equipment (WEEE) in the countries participating in the PREAL project

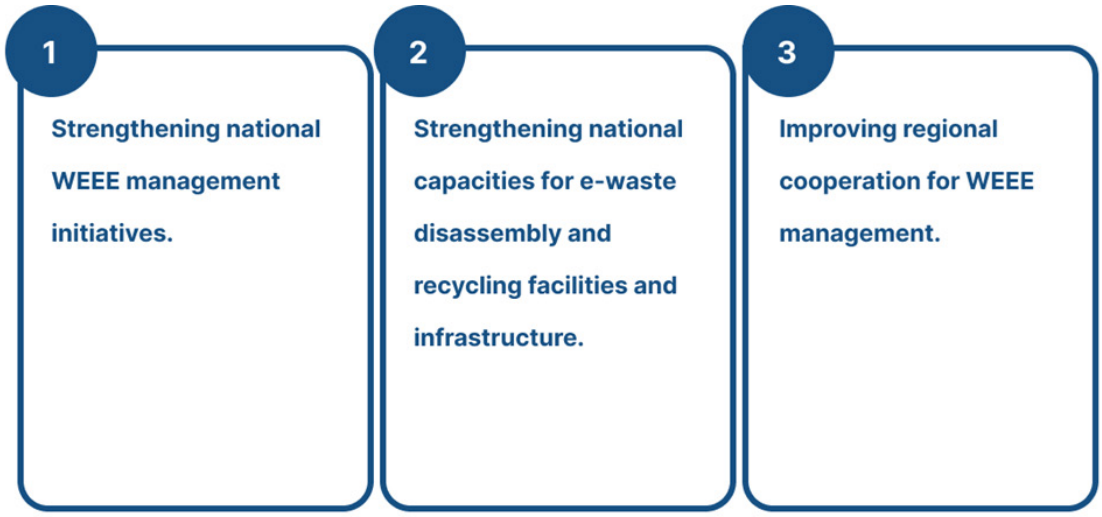
In Latin America, managing Waste Electrical and Electronic Equipment (WEEE) presents significant challenges due to the rapid increase in the production of this waste, the limited availability of recycling infrastructure, and the informal nature of the actors involved in the management chain. While some countries have specific legislation and have made progress in implementing Extended Producer Responsibility (EPR) systems, the region as a whole exhibits high levels of informality, low rates of formal collection and limited utilization of materials contained within WEEE. These conditions pose environmental and public health risks while wasting the economic potential of the circular economy.

Between 2019 and 2024, the *Latin American Electronic Waste Project (PREAL)* was implemented under the leadership of the United Nations Industrial Development Organization (UNIDO) and with support from the Global Environment Facility (GEF). The project involved 13 countries in the region. The project was instrumental in strengthening legislation, technical capacities, and regional cooperation in WEEE management. The results achieved serve as a practical reference for Latin American countries seeking to establish or enhance their national WEEE management systems

For a broader understanding of the current situation regarding the management of Waste Electrical and Electronic Equipment (WEEE) in Latin America, we suggest consulting, in addition to this document, the report *Management of Waste Electrical and Electronic Equipment in Latin America: Current Situation and Outlook*. (UNIDO-ITU, 2025). This report presents detailed fact sheets on the progress made in the 13 countries that participated in the PREAL Project, as well as summaries of Brazil, Colombia, and Mexico as additional references in the region, and Japan and France as global references. Based on this regional diagnosis, this document develops practical guidelines and KPIs aimed at strengthening WEEE management in Latin America, using the PREAL Project as a central learning experience.

The PREAL project began implementation in 2019 and concluded its activities in December 2024, under the coordination of the United Nations Industrial Development Organization (UNIDO) as the implementing agency, with national execution carried out by various entities designated in each participating country. The project achieved significant results in its three components, as shown in Figure 1.

Figure 1: Components of the PREAL project



Source: Own elaboration (2025)

The first two components formed the core of the work and were developed with technical teams in each participating country. The third component focused on harmonizing activities at the regional level and on UNIDO's cooperation with international and regional partners – such as ILO, WHO/PAHO, UNITAR, the WEEE Forum, EMPA, and ITU – to ensure that the practices promoted would have greater scope and continuity beyond the end of the project.

During implementation, multiple activities were carried out, and important results were achieved, among which the following stand out.

1.1 PREAL project support for strengthening national WEEE management initiatives

During the implementation of the PREAL project, one of the most significant progresses focused on strengthening the regulatory framework for WEEE management in the participating countries. The review and creation of policies allowed a more solid foundation for the formalization of collection systems, incorporating EPR, and updating regulations that had become outdated considering the growth of this waste stream.

In general terms, two groups of countries can be distinguished: those that already had previous regulations and managed to strengthen them through updates or specific regulations, and those that lacked legal provisions and developed their regulatory frameworks for WEEE for the first time. In both cases, the progress made has contributed to greater legal clarity, improved inter-institutional coordination, and paved the way for the implementation of more effective EPR systems.

For detailed information on the regulatory changes achieved in each country, readers can refer to the supplementary document *Management of Waste Electrical and Electronic Equipment in Latin America: Current Situation and Outlook*, which includes fact sheets on the 13 countries participating in the PREAL Project. This document presents only a general summary, and the specific results are summarized in Figure 2.

Figure 2: Current situation of the regulatory framework in the countries participating in the PREAL project

Country	Are there specific regulations for WEEE management and the application of the REP at the national level?	Current situation
Argentina 	No	Argentina maintains Decree 779/2022, which regulates Law Nr. 25.916, identifying WEEE as a special category household waste, although Law Nr. 24,051 may also classify them as hazardous waste depending on its composition or the level of risk it poses. During the implementation of the PREAL project, the "Manual of Integral WEEE Management" (2020) was published, with an update to 2024. Currently, work is underway on national legislation to establish EPR and other actions related to WEEE management.
Bolivia 	No	In 2015, Bolivia enacted Law Nr. 755, which establishes integral waste management at the national level, and subsequently its implementing regulations in 2016. Since 2012, the Bolivian Institute of Standardization (IBNORCA) has applied Bolivian Standard NB 69019, which sets requirements for the environmentally safe management of WEEE. Since 2024, Ministerial Resolution MMAyA Nr. 334/2024 has been in force, approving the "General Regulations on Extended Producer Responsibility," which also addresses the management of WEEE. With the support of the PREAL project, a proposal for regulations on "Integral environmental management of waste electrical and electronic equipment (WEEE)" has been developed and is currently under review prior to approval. A manual has also been developed for the management of plastics containing brominated flame retardants (BFRs) from WEEE, and a guide for the co-processing of WEEE plastics in cement kilns.

Country	Are there specific regulations for WEEE management and the application of the REP at the national level?	Current situation
Chile 	Yes	Since 2016, Chile has maintains the Framework Law 20.920 for Waste Management, EPR, and Recycling Promotion, which introduced the EPR scheme for six product streams, including EEE. Exempt Resolution Nr. 03413/2025 was issued in May 2025. The purpose of this resolution is to establish collection and recovery targets, as well as other obligations, associated with priority products, including EEE. The resolution is currently under review prior to publication.
Costa Rica 	Yes	In May 2010, Decree Nr. 35993-S was issued regarding the Regulations for the Integral Management of Electronic Waste, which addresses the guidelines for the proper management of this type of waste. Pursuant ministerial directive DM-CB-8016-2016, the Technical Guide for the integral management of WEEE was published, which was updated with the support of the PREAL project. With the support of the PREAL project, a document has been drawn up to update the current regulations, which has been submitted for a public consultation and will be published in a new decree once it has been approved.

Country	Are there specific regulations for WEEE management and the application of the REP at the national level?	Current situation
Ecuador 	Yes	Since 2013, Ecuador has had a national policy for managing WEEE. With the support of the PREAL project, the policy has been updated and made public. It will soon be published. In 2022, with the support of the PREAL project, Ministerial Agreement 067 was published, addressing for the first time the application of EPR in the management of WEEE from domestic sources. The project also supported the drafting of Ministerial Agreement 097, which addresses the application of EPR in the management of discharge lamps and LED lamps. Since 2024, an Informative Guide on WEEE management has been available to the general public, and a technical guide is about to be published, aimed at WEEE managers, so that they can carry out their work and management in an environmentally appropriate manner.
El Salvador 	No	El Salvador has in force the Integral Management of Waste and Recycling Promotion Act (2020) and the Special Act on Waste Collection, Use, and Final Disposal (2024), which represent the highest-level regulatory framework establishing guidelines for waste management. Since January 2025, waste management in the country has taken a new direction, with responsibilities being transferred from the Ministry of Environment and Natural Resources (MARN) to a newly created entity called the National Solid Waste Authority (ANDRES), which will be responsible onward for waste management, including WEEE. With the support of the PREAL project, a set of regulations addressing WEEE management was developed, which was transferred to ANDRES and is expected to be reviewed and accepted prior to its official publication. The Technical Guide for the Integral Management of WEEE has been published, as well as the Citizen's Guide for the Responsible Management of WEEE and the Guide for WEEE Generators.

Country	Are there specific regulations for WEEE management and the application of the REP at the national level?	Current situation
Guatemala 	No	The Ministry of Environment and Natural Resources (MARN), with the support of PREAL, has drafted a proposal for regulations addressing the management and disposal of WEEE, incorporating EPR into this management. It is currently under review prior to its publication and national implementation.
Honduras 	No	With the support of the PREAL project, a national regulatory proposal was drafted to regulate the management of EEE and WEEE, establishing differentiated procedures for collection, treatment, and final disposal, and incorporating EPR. Its approval and subsequent publication are pending.
Nicaragua 	Yes	In April 2024, Nicaragua enacted Mandatory Technical Standard NTON 05002:2022 on WEEE management, which regulates generators and managers and incorporates technical provisions to prevent and reduce associated environmental impacts, thanks to the support and contribution of the PREAL project.
Panama 	No	In Panama, a draft regulation is being prepared to implement EPR in WEEE management. This process has included participatory spaces for dissemination and exchange with various cross-sectoral actors involved in the different stages of WEEE management in the country.

Country	Are there specific regulations for WEEE management and the application of the REP at the national level?	Current situation
Peru 	Yes	In November 2019, Supreme Decree Nr. 009-2019-MINAM was enacted, establishing the Special Regime for the Management and Handling of WEEE, incorporating EPR and collection targets for certain categories of EEE. In addition, Decree No. 035-2021-MINAM was issued, extending collection targets to other categories of EEE. Likewise, regulations have been established that define penalties and administrative offenses for those who fail to comply with WEEE management obligations, as well as specific procedures for the management of WEEE belonging to state-owned movable goods. The implementation of the PREAL project contributed to the updating of Supreme Decree Nr. 009-2019-MINAM, as well as to the production of several guides of interest aimed at different target publics, both for the general public and for key managers and generators.
Uruguay 	Yes	In November 2024, Uruguay's Ministry of Environment enacted the Regulation for the Integral Management of Waste Electrical and Electronic Equipment (WEEE). The regulation applies to EEE, whether manufactured or imported in any form or under any regime in areas under national jurisdiction, as well as to its waste.
Venezuela 	Yes	In May 2024, Resolution 022 was enacted, establishing standards for the integral management of Electrical and Electronic Equipment Waste (WEEE). This regulation applies to all individuals and entities that manage WEEE within the national territory. It includes the categories listed in its annexes and excludes waste that does not present hazardous conditions in accordance with current legislation.

Source: Own elaboration based on the data provided by each country (2025)

Table 1 shows the achievements of the PREAL project in different areas addressed during its implementation.

Table 1: Achievements in management and communication strategies, dissemination material, links with academia, and capacity building in the PREAL Project

Aspect	Achievement	Metrics
Strategies and frameworks for public policy	Several countries developed or updated national strategies to improve WEEE management, prioritizing public awareness, communication, and strengthening formal collection. Financing guidelines were also promoted, combining EPR with complementary mechanisms in eight countries in the region.	**18** national strategies to improve WEEE management developed **10** financial strategies defined
Technical tools and operational guides	During the implementation of the project, guides and technical documents were developed, including guides for managers and operators of treatment facilities, informational materials for citizens, as well as specialized manuals on brominated flame retardant plastics and their co-processing. These tools facilitated the adoption of good practices in the WEEE management chain.	**26** guides, technical documents, and informational materials for citizens
Training and capacity building	Training was a cross-cutting issue, so training events were developed for officials, managers, and other key actors.	**227** training events **16500** people **7801** men (47%) **8749** women (53%)
	Communicators and journalists were trained. News items in different formats (visual, written, spoken) were generated in the media.	**2127** journalists **26** events **2840** news items in different formats

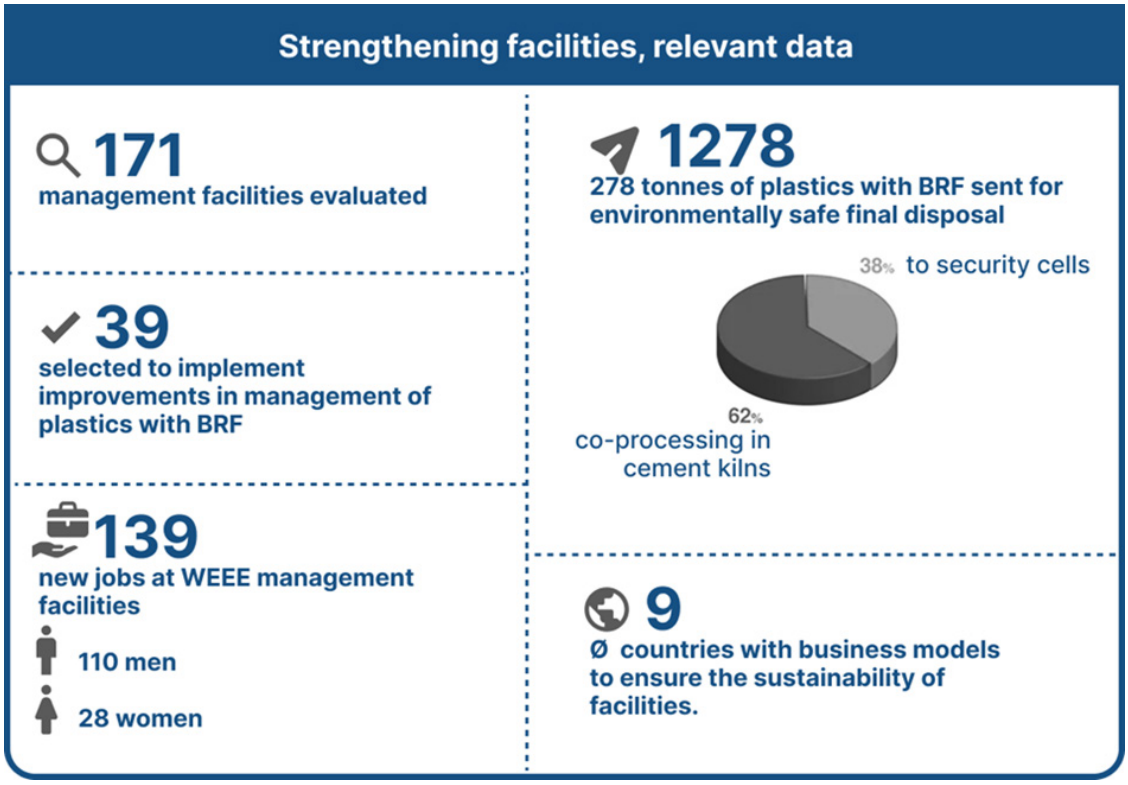
Aspect	Achievement	Metrics
Engagement with academia and knowledge generation	The project established links with universities and the academia, promoting the inclusion of WEEE content in curricula and encouraging applied research. In addition, national knowledge and information systems were developed, to ebable 11 countries to have platforms for registration and analysis of key data on imports, handling plans, and WEEE management.	Liaison with **51** **higher education institutions** **13** **national knowledge and/or information systems** **11** **countries with platforms for registering and analyzing key data**
Communicat ion and public outreach	Social media and the mass media became key tools for disseminating information on WEEE. Infographics, posters, videos, and publications were produced and used in awareness-raising and training events for the general public.	**1730** **materials produced** and used in 244 events **43245** people trained **Reach on social media and in the media** 20814 men . 22641 women **10020** people trained **in 45 specific campaigns** 4808 men 5212 women

Source: Own elaboration based on the data from the final report of the PREAL project (2025)

1.2 Support for strengthening of WEEE dismantling and recycling facilities

The project enabled the development of a methodology for evaluating WEEE management facilities in the 13 participating countries, through which 171 facilities were evaluated and 39 were selected for the development of actions aimed at improving WEEE management. In particular, the project focused its efforts on the identification and environmentally sound management of plastics containing brominated flame retardants (BFRs) (see Figure 3).

Figure 3: Data on the strenghtening the facilities



Source: Own elaboration based on PREAL project data (2025)

The 39 facilities selected to work with the project were, for the most part, the largest in their respective countries and manage between 50% and 90% of the WEEE generated nationally. In turn, all technical staff at these facilities received training and support from national and regional teams on the identification and separation of brominated flame retardant (BFR) plastics and their environmentally sound management.

During the PREAL implementation, 1 278 tonnes of plastic were sent for environmentally safe final disposal. This plastic had been previously identified and separated because it contained BFRs, which were verified by bromine measurements using X-ray fluorescence (XRF) spectrometry equipment. Approximately 62% were sent for co-processing in cement kilns and 38% to secure cells. At the end of the project, more than 550 000 pieces of equipment were analyzed, representing nearly 4 000 tonnes at the selected WEEE facilities.

During project implementation, 139 new jobs were reported at the selected WEEE facilities (110 men and 29 women). Meanwhile, PREAL promoted business models that focused on making better use of BFR-free plastics to offset management companies' economic efforts involved in identifying and separating plastics with brominated flame retardants.

In July 2023, the project organized capacity building activities addressed to participating management companies, with the aim of presenting the economic opportunities that exist in the commercialization of BFR-free fractions in materials such as ABS, ABS-PC, HIPS, and PC, among others. The event was attended by 30 representatives from 23 WEEE recycling companies from PREAL member countries. In addition, at least nine countries developed business models to ensure the long-term sustainability of WEEE management facilities.

Chapter 2 – Elements of a national system for the integral management of Waste Electrical and Electronic Equipment (WEEE) based on Extended Producer Responsibility (EPR)

In order to make more efficient use of resources and contribute to achieving common regional and global objectives, governments must establish national WEEE integral management systems that allow for the prevention and reduction of waste generation, the increase of collection and recycling rates, and the incorporation of recycled materials into production processes.

An **integral WEEE management system** is understood to be a coordinated set of regulatory, operational, financial, administrative, educational, and evaluation actions and structures that ensure that this waste is collected, transported, disassembled, reused, treated, and disposed of in an environmentally safe manner. The main purpose is to protect human health and the environment by promoting the collection and extension of the useful life of electrical and electronic equipment (EEE), the reuse of its parts and materials, and the proper handling of hazardous fractions that cannot be recovered.

This chapter provides practical information to help countries design and develop their national WEEE management systems. It defines key concepts, such as extended producer responsibility (EPR), and outlines the fundamental components of these systems, emphasizing critical considerations for regulatory frameworks.

2.1 Extended Producer Responsibility (EPR)

National WEEE management systems require the establishment of policies and strategies that assign differentiated responsibilities to all parties involved in the value chain according to their functions, which includes, as a fundamental element, the participation of producers through **EPR**. This principle, first mentioned by Thomas Lindhqvist, has been successfully applied internationally since the early 1990s and requires those who place EEE on the national market to be accountable for their products from design and manufacture to the end of their useful life, including post-consumption management.

Extended Producer Responsibility (EPR)

Policy principle aimed at promoting environmental improvements throughout the entire life cycle of product systems, which consists of extending the responsibility of product manufacturers to various stages of the product's entire life cycle, particularly recovery, recycling, and final disposal.

(International Telecommunication Union and Wolrd Economic Forum, 2021)

This approach has two important characteristics:

- Encourage the incorporation of environmental considerations into product design.
- Transfer to the producer the physical and economic responsibility for the collection, treatment, and reuse or recycling of the products they put on the market.

EPR seeks to integrate environmental characteristics into products and production processes throughout their value chain. This scheme effectively allows manufacturers, importers, consumers, and governments to assume responsibilities within WEEE collection systems in a balanced manner, where producers are involved up to the post-consumer stage. (OECD, 2001).

In general, producers internalize the costs associated with collection, treatment, reuse, recycling, and the environmental externalities caused by the final disposal of hazardous materials. As a result, objectives such as waste prevention and reduction, increased use of recycled materials in production processes, and efficient resource use will be achieved. (OECD, 2001).

In the post-consumption stage, the EPR approach seeks to increase recovery rates and reduce waste generation and leakage by shifting responsibility from the general population and local or municipal governments to specific producers and consumers. (Brown, Laubinger, & Börkey, 2023). Figure 4 presents a list of benefits that the implementation of EPR may have.

Figure 4: Benefits of implementing the PER

Benefits of implementing the EPR

- Shift financial responsibility from national and local governments to consumers and producers, to allow cost recovery.
- Improve separate collection of waste by removing them from the normal stream of ordinary waste.
- Increase collection and recycling rates, to allow material recovery.
- Encourage producers to design products that reduce environmental impacts throughout their life cycle.
- Reuse and refurbishment of used products.
- Use of recovered materials.
- Use of hazardous and non-recyclable materials.
- Innovation for a more efficient design and production. Promotes cleaner production chains and products. Creation of business opportunities.
- Contribution to the circular economy.

Source: (Brown, Laubinger, & Börkey, 2023)

In addition, three additional types of liability can be established, as characterized by Lindhqvist & Ryden (2018):

- **Information responsibility**: The producer must provide information about the product and its effects during the different stages of its life cycle (e.g., eco-labeling, energy or noise information).
- **Liability for damage**: This refers to specific liability for environmental, or safety damage caused by a product.

- **Liability for product ownership**: In this case, the producer retains ownership of the product throughout its life cycle.

Figure 5 illustrates Latin American countries that have adopted EPR into their legislation.

Figure 5: Incorporation of the EPR for WEEE management in Latin American countries

Source: Own elaboration, 2025

In general, the definition of producer is not limited solely to those who manufacture the EEE but also applies to the natural or legal person who put the EEE on the market. These may be manufacturers, importers, distributors, marketers, and resellers. They are important actors in the product life cycle, and their responsibilities within the national system must be clearly defined.

Producer

Any natural or legal person established in a state who manufactures, commercializes, or resells electrical and electronic equipment (EEE) under their own name or trade name; places EEE from a third country or another state on the market of that state on a professional basis; or sells EEE by means of distance communication, directly to private households or users other than private households in a state and is established in another state or in a third country (ITU-T L.1036).

Actors involved in the production process agree that producers should be responsible for environmental issues related to their products because they have unique knowledge that other participants in the process lack (OECD, 2001). For instance, EEE producers typically have the most access to technological expertise, proprietary information, and product knowledge. Based on this knowledge, producers are better positioned than other actors to modify products and assume physical and/or financial responsibility for treating post-consumption waste from their products.

Therefore, producers are best placed to make changes to their products so that they comply with the objectives of the EPR program, to stimulate innovation and product redesign, to promote more durable products (i.e., products that generate less waste) or products that are easier to reuse or recycle. An EPR scheme is most effective when the producer is designated as the entity with the greatest control over decisions related to material selection and product design (OECD, 2001).

In the case of Latin America, most of the EEE market comes from imports, either as complete equipment or as parts and components to be assembled, and to a lesser extent, manufacturing in countries such as Argentina, Brazil, Colombia, and Mexico. The producer, who would be identified as the manufacturer, importer, or assembler, is the one who must have full knowledge of the product being manufactured, imported, or assembled, both in terms of its functionality, the characteristics of its parts, and the proper way to dispose of it in the post-consumption phase.

2.1.1 Other Liability Combinations: Shared Responsibilities

While close coordination with all actors involved in the value chain is an inherent part of EPR, responsibility can also be shared, more formally, between the producer and the government, or between one or more actors in the product chain, as explained below.

a) Shared Responsibility between the Municipal Government and the Producer

Under this model, producers pay a fee to finance the physical management of the product in its post-consumption phase, although the municipality retains physical responsibility for part of the waste management. The countries of the Organization for Economic Cooperation and Development (OECD) have used two options for its implementation. One option is for the municipality to assume physical responsibility (totally or partially) for the collection and sorting of post-consumption waste, while the producer (totally or partially) finances this activity and then takes charge of managing the sorted waste for treatment. The other option is for the municipality to continue operating as before, but with the producer pays the additional costs associated with the treatment and disposal of its product.

This shared model provides partial internalization of costs for the financial management of post-consumption products. Figure 6 presents one example of this type of responsibility.

Figure 6: Examples of shared responsibility between the Municipal Government and the Producer

CEW Recycling Program in California [1]

CalRecycle is a state agency responsible for managing waste covered by EPR in California. This agency implements the CEW recycling program. Consumers pay a fee for the management of their WEEE to the retailer when they purchase their EEE.

CalRecycle

The retailer transfers the money to the California Department of Tax and Fee Administration. This fee is used to fund the collection and recycling system.

[1] For more information see: https://calrecycle.ca.gov/Electronics/CEW/

Source: Own elaboration, 2025

b) Proportional Liability

Another form of shared responsibility is distributing responsibility among the actors in the product chain. With this approach, the role and degree of responsibility of each actor for a specific product, product group, or sector is defined. Responsibilities are distributed based on each actor's role in the product chain. This concept is common in industry-led initiatives. One advantage of this method is that it increases the amount of information about the EPR program disseminated among actors in the product chain (OECD, 2001).

Determining and ensuring a fair and equitable distribution of responsibilities can be more complex than simply reaching agreement on the specific roles of the actors. In a proportional responsibility scheme, it is essential that all parties participate equally in the program to prevent one or two actors from shouldering the burden of their responsibilities. Incentives or rewards can be established to encourage participation, while penalties could be applied in the event of non-compliance.

Given that some product chains are highly complex, this method may be more suitable in contexts where the chain is relatively short, with few actors involved and a limited number of producers.

c) Partnerships between producers and other actors in the product chain

Examples of this model

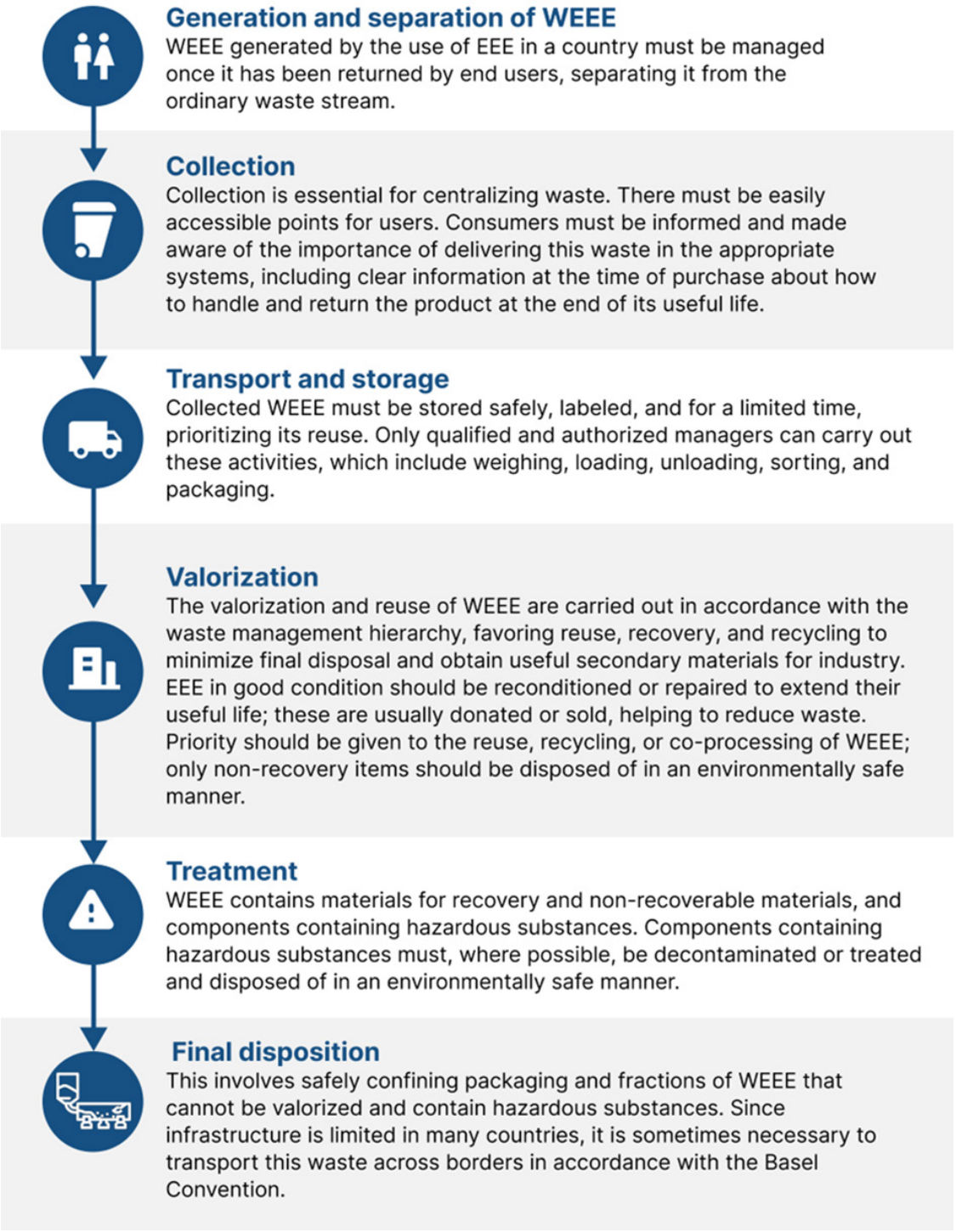
These include agreements between the producer and a recycling company to collect products, or between the producer and a retailer to collect deposits and issue refunds. Sometimes distributors and retailers are enlisted to collect the products and return them to the producer.

This model involves an agreement (formal or informal) between the producer and one or more actors in the product chain. The producer has the ultimate responsibility and leadership within the EPR program. The specific combinations of responsibilities will depend on the policy instrument, product, distribution chain, and other factors.

2.2 Minimum elements of a national waste electrical and electronic equipment management system (WEEE)

A WEEE management system is defined as an integrated set of regulatory, administrative, operational, and financial elements that ensure the collection, transportation, storage, valorization, treatment, and environmentally safe disposal of this waste. Figure 7 illustrates the operational stages of a management system. The purpose of implementing a national WEEE management system is to mitigate health and environmental risks, encourage the reuse of EEE, promote WEEE collection, and efficiently use materials obtained through disassembly. The system also ensures the proper treatment of non-recoverable hazardous fractions or components to reduce or eliminate their hazardousness and the environmentally safe disposal of non-recoverable waste generated during the various stages of waste re-utilization.

Figure 7: Operational stages in a national WEEE management system



Source: Own elaboration, (2025)

A management system based on the principle of Extended Producer Responsibility (EPR) has basic elements that are interrelated, providing sustainability to national systems. These elements are presented in Figure 8 and explained in later sections of the document.

Figure 8: Outline of the basic elements that make up a national WEEE management system with integral management

Source: Adapted from (Ministry of Environment and Sustainable Development of Colombia, 2023) and (United Nations University, 2018)

To develop and consolidate a national management system, it is important to carry out a situation assessment that allows one to know the country's status in terms of quantities of imported EEE, quantities of WEEE generated, existing legislation related to WEEE management, actors and stakeholders that may be involved in the national system, among other factors. The document *Policy Practices for e-Waste Management* explains the beginning of the process to implement EPR in African countries.

The national WEEE management system must have public policies and legislation that includes key definitions harmonized with international definitions. This is essential for all stakeholders to understand the purpose of the legislation (United Nations University, 2018). Section *2.2.1. Legal and policy framework* explains this element in detail.

Likewise, efficient collection systems (or system) need to be designed, as explained in Section *2.2.2. Collection systems for the application of EPR.*

Another important element is financing to ensure the effective and sustainable operation of WEEE management (see Section *2.2.3, Financing Mechanisms for the Collection System*). It is crucial to monitor and control the national system to assess its effectiveness and make the necessary adjustments to achieve the country's defined objectives. Section *2.2.4. Monitoring and Control of the National WEEE Management System* explains the activities required to implement this element.

Chapter 4. Setting WEEE Collection Targets, explains how to set collection targets within the national management system. This is an important aspect for evaluating the performance and compliance of producers through their collection systems.

Other important elements within a national system are education and training, and awareness raising, which are discussed in *Chapter 3. Support elements for national systems for the integral management of WEEE.*

Finally, it is important to have infrastructure in place for all the operational activities that mustto be carried out to manage WEEE, as explained in *Chapter 5. Infrastructure for WEEE management.*

2.2.1 Legal and policy framework

This framework refers to the set of policies, laws, regulations, and standards that must be in place for an effective national WEEE management system.

Having a law, regulations, or general waste standard that includes WEEE provides legal certainty to the system and frames its management. However, this general approach may leave out some key elements necessary for adequate regulation.

Legal and policy framework

A specific legal framework can better support WEEE management because it allows covering all the regulatory issues necessary to design, implement, and monitor WEEE management.

On the other hand, having a specific regulatory instrument for WEEE enables more focused management and deeper consideration of the relevant issues. The most relevant points are presented below.

a) Clear objectives

Legislation based on EPR must have clear objectives. The main objective is to protect the environment and human health by preventing or reducing the adverse impacts of the generation and improper management of electronic waste. Other important objectives are:

- Establish the waste hierarchy as a guiding principle to prevent and reduce the generation of WEEE.
- Establish producer responsibility for the end-of-life management of products they put on the market.
- Promote sustainable practices by all the actors in the EEE chain, aimed at reducing pollution, optimizing the use of materials and energy, and encouraging reuse and recycling.
- Ensure the selective collection and proper treatment of WEEE. (United Nations University, 2018)

b) Basic definitions

The standardization of terms and definitions used in national regulations allows for a clear and accurate understanding of their purpose. Key definitions related to stakeholders and the main elements of management systems and stages can be incorporated into the regulations as appropriate (United Nations University, 2018).

Recommendation

Some sites where existing definitions can be consulted are the following:

ITU Terms and Definitions: https://www.itu.int/myworkspace/#/terminology

Glossary of terms of the Basel Convention http://www.basel.int/portals/4/download.aspx?d=UNEP-CHW-PUB-GUID-GlossaryTerms.Spanish.pdf

UNterms https://unterm.un.org/unterm2/en/view/72c7364d-a5e7-46b5-8f03-f48ca5d44402

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their disposal http://www.basel.int/portals/4/basel%20convention/docs/text/baselconventiontext-s.pdf

UNdata A world of information https://data.un.org/Glossary.aspx?q=waste

The PREAL Project found that there are differences in the definitions and concepts of the regulations of the participating countries. International organizations such as the International Telecommunication Union (ITU), the United Nations Industrial Development Organization (UNIDO), the United Nations University (UNU), the United Nations Environment Programme (UNEP), and the European Union (EU), to name a few, have already agreed on definitions and concepts used by countries in other parts of the world.

The Glossary section of this document specifies the terms and definitions used for a better understanding of the document. These can be used as a basis for incorporation into the legislation of each country.

It is advisable to use them to establish a common basis at the regional level and achieve the standardization of national management systems with international systems, which facilitates their integration into the global set of indicators. There may be other terms that countries identify and that needto be incorporated into the regulations.

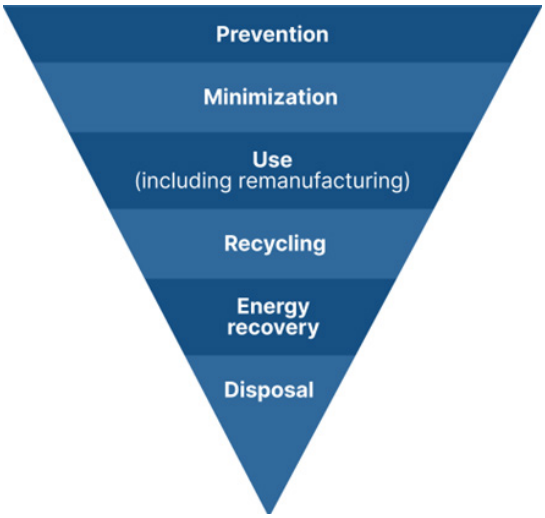
Important consideration

Governments must clearly define the concept of waste and WEEE in their regulations. They can use the definitions presented in the glossary of this document as a basis.

Integral waste management begins with the definition of waste itself. Waste is material that the owner or possessor wants or needs to discard because it has no value to them. However, that material may have value to someone else or for other processes; in other words, it remains a valuable resource depending on the possessor and their interests. The difference between waste and refuse lies in the value that the former has within WEEE management as part of the circular economy.

The operational stages are related to the management of WEEE flows, from generation to final disposal, considering the waste management chain, parts, and materials obtained. This includes treatment and final disposal (WASTE, 2001). Within these elements, the initial stages of the waste hierarchy must also be considered: prevention and minimization (Figure 9). These two elements do not strictly correspond to operational elements; however, as indicated above, integral waste management does not only include technical and financial aspects. Establishing the waste hierarchy within the legal and policy framework strengthens the circular economy model and a conscious and responsible consumption.

Figure 9: Waste hierarchy



Source: Elaborated base on (United Nations, s.f.)

Waste prevention and minimization are actions that depend on consumers, so sociocultural aspects must be considered and communication and awareness strategies for conscious and informed consumption must be developed. Likewise, consumer actions are imperative for the flow of WEEE in the national WEEE management system. These points are addressed in Section *3.1. Training, communication, awarenes*.

c) Declaration of WEEE as special handling waste

It is essential to differentiate WEEE from other waste streams, so it is advisable to identify them as special, requiring special handling, or differentiated in the regulations. This allows for the optimization of the national system, as this waste would enter a controlled management system, thus preventing it from being sent to landfills or handled and disposed of informally. Likewise, it should be indicated whether The WEEE or its components or fractions are classified as hazardous waste.

Important

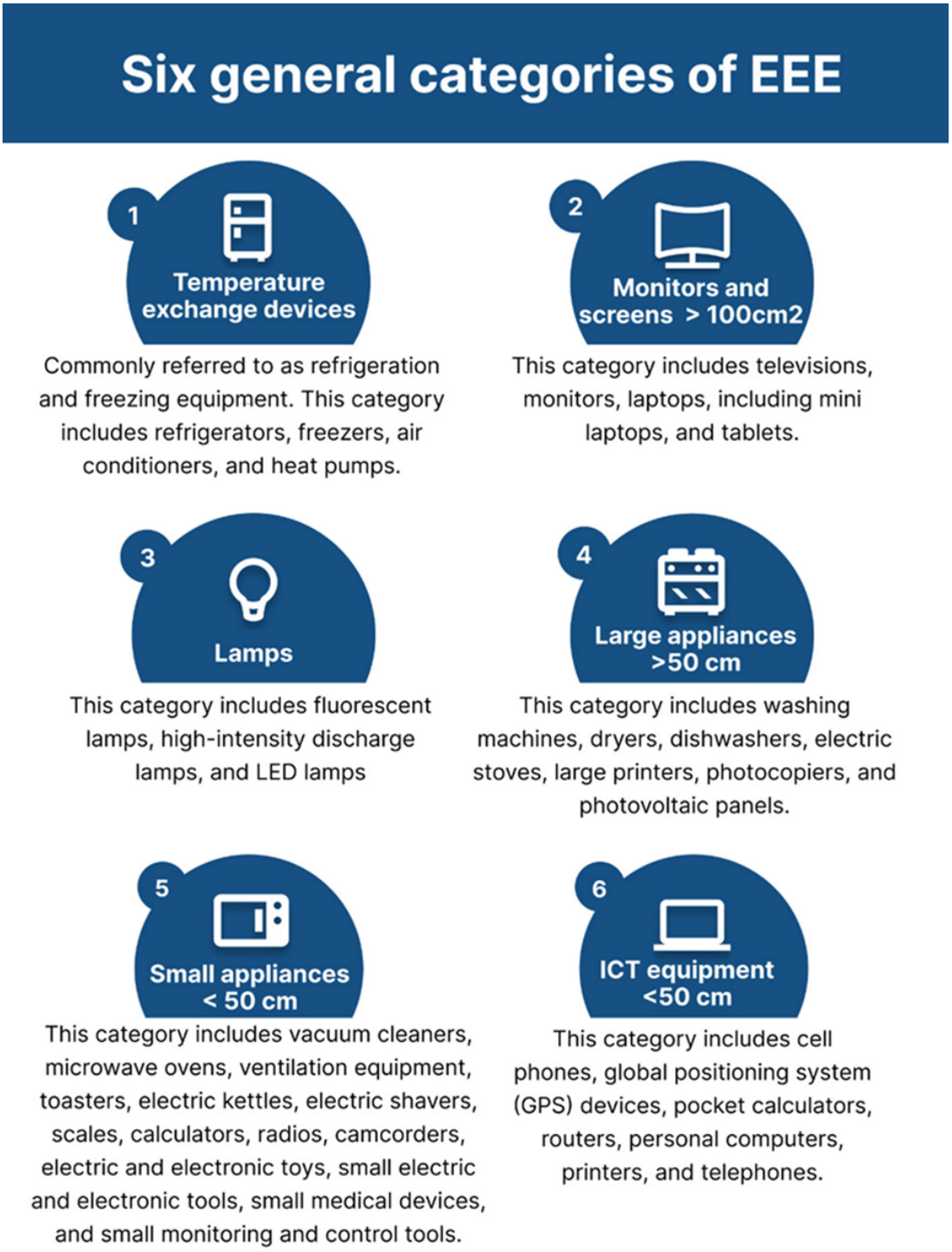
WEEE are non hazardous; however, they contain both valuable and hazardous materials. The national WEEE management system must ensure that the recovery of materials from WEEE is carried out in a controlled manner (separate or special handling) and that hazardous materials are handled in an environmentally sound manner (Baldé et al., 2024).

d) Definition of categories of EEE/WEEE

Another important aspect to define is the categories of EEE. Many countries have adopted the six categories defined in *European Directive 2012/19/EU on waste electrical and electronic equipment (WEEE),* which are used in the international framework for WEEE statistics (Baldé et al, 2024). These categories are shown in Figure 10. One advantage of using these categories is that they cover most EEE and are closely related to WEEE characteristics. While this document

recommends using these categories, countries may define their own according to their needs and circumstances.

Figure 10: Categories of EEE based on European Directive 2012/19/EU



Source: Adapted from (Baldé et al, 2024)

The United Nations University (UNU) has classified EEE into 54 categories, known as UNU-KEYS, grouping them according to similar functions, comparable material compositions, average weights, and similar end-of-life attributes. These 54 categories are in turn related to the six general categories established by the European Union (EU-6). The document can be found at: *E-waste statistics: guidelines on classifications, reporting, and indicators (Forti, Baldé, & Kuehr, 2018)*.

UNU-Keys classification

The UNU-KEYs classification was created by the United Nations University (UNU). This system is structured around three key aspects:

- the type of product
- waste management, and
- legislative relevance

The classification list contains 54 categories that correspond to approximately 660 types of WEEE with different conventional classifications (European Commission, 2015). This categorization enables consistent performance comparisons between regions and regulatory compliance schemes.

Annex 1 of the document E-waste Statistics: Guidelines on Classifications, Reporting, and Indicators (Forti, Baldé, & Kuehr, 2018), presents the relationship between UNU and Harmonized System codes.
Annex 1 of the aforementioned document provides the list of the 54 categories and their relationship to EU-6.

It is very important to clearly define in national regulations the types of EEE subject to EPR to prevent misinterpretation by the responsible authorities and regulated actors. For instance, a producer importing refrigeration and air conditioning equipment may do so under at least 35 Harmonized System (HS) tariff subheadings and must know if the equipment is subject to EPR. To eliminate any ambiguity, countries should define the EEE to be controlled using the Harmonized System (HS) tariff classification, as Colombia has done. Alternatively, they can rely on the categories of the United Nations University (UNU Keys). The latter allow countries to identify the types of EEE put on the market and have been used to estimate the amount of WEEE generated in a study by the International Observatory on WEEE (https://globalewaste.org/), a project of the International Telecommunication Union (ITU), the United Nations University – Sustainable Cycles (UNU-SCYCLE), and the International Solid Waste Association (ISWA).

e) Roles and responsibilities of key players

The players involved in the integral management of WEEE can be institutions, companies, organizations, or individuals, either because they have direct responsibilities in the system or because they have interests in the issue. These actors may belong to the public or private sector (WASTE, 2001). It is also important to include consumers and detail their roles and responsibilities within the national system. Furthermore, once responsibilities have been determined, a decision must be made on the degree of physical and financial responsibility to be assigned to the producer (and other actors).

The EPR approach covers the entire product life cycle, from design to end of life. In countries where EEE is manufactured, regulations must also include this design and production stage, and not be limited solely to commercialization, use, and end-of-life management. The identification of other actors, along with their roles and responsibilities, as well as the operational and sustainability elements of the national system, must be defined and guided to ensure the implementation of EPR in each territory.

Figure 11 shows a list of potential key actors based on the experience of the countries that participated in the PREAL Project.

Figure 11: Key players in national WEEE management systems, based on the experience of countries participating in the PREAL Project

Source: Own elaboration (2025)

Players identified in the countries that participated in the PREAL project are presented, along with a non-exhaustive proposal of roles and responsibilities for each player. These roles and responsibilities may vary depending on the reality of each country, so it is important to identify them in the context of each nation according to its needs and circumstances.

It is also important to bear in mind that there are several options and combinations of physical and financial responsibility that can be implemented. Policy makers should review the range of possibilities for distributing responsibilities in relation to policy objectives and the feasibility of implementation.

The national government plays a fundamental role in creating the legal and political framework for EPR, through laws or agreements, and in defining parameters for special agreements or voluntary programs.

Its responsibilities include:

- Develop and enforce legislation for waste management.
- Promote awareness of EPR programs and their requirements.
- Support initiatives and provide facilities where possible for awareness campaigns created in collection systems led by producers.
- Implement support policies, such as green government procurement or unit fees for the treatment of household waste.
- The central government, through its competent authority, will exercise the role of supervisor, especially of the Producer Responsibility Organizations (PROs) that have been established, verifying the nature and performance of their activities.
- Provide the necessary resources to carry out the plans outlined in the legislation and ensure that those who are regulated are monitored and overseen.

As a large producer of WEEE, Peru must promote policies that ensure state-generated WEEE is delivered to authorized PROs. Figure 12 illustrates how Peru has legislated regarding WEEE generated by the state.

They participate in quantifying imported EEE, which is important given the boom in online and app-based sales. Close collaboration between the competent authorities and the private sector, particularly collection systems, has significantly reduced the evasion rate for online purchases in some states. Another important measure is controlling the illegal export of WEEE and its components, which mainly occurs through unauthorized managers. Customs authorities must:

- Account for imported and exported EEE and WEEE to enable the compilation of statistics on the national consumption rate of EEE and the amount of WEEE exported for recycling.
- Participate in measures that aim to ensure the clear reporting and quantification of exports for reuse of both domestic and professional WEEE (WEEE FORUM, 2020)

National Customs Authorities

Producers, whether manufacturers, importers, or assemblers, are responsible for the environmentally sound collection and management of their products at the end of their useful life. This responsibility is based on their market share and includes the corresponding financial arrangements.

Producers must:

- Register as an EEE producer and register their products in national registries.
- Submit management plans to the competent authority for approval, as well as annual compliance reports.
- Manage the return and treatment of waste, complying with established environmental requirements.
- Lead management programs created since the application of the EPR principle.
- Finance collection and management systems to cover the costs of recycling and treating their products.
- Internalize the environmental costs of the entire EEE life cycle.
- Incorporate the cost of product disposal into the price.
- Adopt eco-design criteria in the manufacture of EEE.[1]
- Minimize waste and environmental impacts during the design and manufacture of their products.

Producers (manufacturers or importers)

[1] If countries have EEE manufacturers, the design and production stage must be considered.

Collection systems

Producer Responsibility Organizations (PROs), also known as collection systems, management systems, post-consumption management plans, or compliance units in Latin America, are authorized or developed by producers. PROs act on behalf of their members to ensure compliance with responsibilities related to collection, recycling, and financial commitments.

PROs must:

- Collectively manage the collection and recycling of post-consumption products.
- Charge producers' fees to cover the costs of collection and recycling.
- Conduct awareness and education programs for both producers and consumers.

Marketers and distributors play a strategic role in the return of WEEE and must fulfill specific responsibilities to support the EPR system. In most European countries, they are required to accept used EEE when a new one with similar characteristics is purchased (the 1-to-1 mechanism). Similarly, they only permit collection points to be established within authorized collection systems. Their responsibilities include:

- Sell only products from registered producers and importers.
- Allow the installation of drop-off points that belong only to collection systems officially registered with the competent authority.
- Inform consumers at the point of sale about possible return systems and collection points so that they can return their used EEE (Sustainable Recycling Industries (SRI), 2017).
- Accept the return of used EEE, regardless of whether they sold the products or whether consumers purchase a new product as a replacement.
- Follow the guidelines established by the producer(s) for the return and proper management of the dropped-off WEEE.

Marketers

Retailers

Local governments/ municipalities

Local governments play a supporting role in WEEE management, especially when producers require their involvement in collection, storage, or other activities defined within the collection systems established by the producers. Additionally, local governments can promote collection and awareness campaigns driven by Integrated Management Systems (IMS) or Producer Responsibility Organizations (PROs) that are duly registered.

Civil society organisations, which are primarily made up of people united by a common goal, can support producers and the systems created for WEEE management. As they directly impact the population, they can play a key role in disseminating management plans created by producers and, above all, conveying the importance of safely managing WEEE. As part of the policy and regulatory development process, governments must consult with civil society organisations to obtain relevant feedback prior to approval.

Although the informal sector refers to organizations that are often not registered in the registry of the competent authority, it has a significant impact on waste collection systems in Latin American countries. It is suggested:

- Integrate them into the formal collection systems of the PROs or formalize their operations so that they comply with the environmental requirements established for their operation.
- Limit their activities exclusively to collection and not allow the disassembly of equipment or the extraction of components, in the event that they are not formalized.

Figure 13 describes the situation of this sector in Larin America.

Consumers play an important role in WEEE management, as their decisions about which products to buy and how to dispose of them directly affect the success of EPR programs.

Consumers should:

- Separate WEEE from household waste and use the collection infrastructure provided by the PROs.
- Understand their role in the EPR program and participate actively in the proper disposal of waste.
- Stay informed through communication plans developed by producers or collection systems.
- Destroy the data contained in the EEE.

WEEE managers must comply with the environmental requirements established for the collection, transport, reuse, disassembly, recycling, and treatment of WEEE.

Their responsibilities include:

- Have all the authorizations required by national regulations.
- Ensure that WEEE management operations are environmentally safe and comply with BAT (Best Available Techniques)/BEP (Best Environmental Practices) and local regulations.
- Work closely with duly registered collection systems.
- Issue WEEE management certificates to feed into the traceability system.

These are entities or individuals that produce a significant amount of WEEE. The classification between small and large generators is based on the amount of WEEE discarded, and it is the competent authority in each country that determines the specific threshold for this classification. This group mainly includes corporations, large commercial and service companies, state entities, and basic and higher education institutions. As they produce large quantities of WEEE as part of their inventories and innovation, they must maintain close communication with local producers, whoever their supplier may be, or, failing that, with the marketers or distributors of the brands of equipment they use. It is very important that they adhere to the collection systems set up in each country.

Large generators

Academia

Universities and research centers are key players in WEEE management, both because of their capacity to generate knowledge and their proximity to the community. Many higher education institutions participate in international initiatives and networks aimed at addressing the challenges posed by WEEE.

The role of the academic institutions in this area is fundamental and is reflected in various activities, such as:

- **Research and innovation**: promote studies that allow processes to be optimized, products to be improved, and their useful life to be extended.
- **Generate data and statistics**: provide information on the generation and management of WEEE, which is valuable to national and, in some cases, local governments in the formulation of policies and regulations.
- **Train professionals**: incorporate the topic of WEEE into study plans and curricula.
- **Develop outreach projects**: create online training spaces on WEEE management, extending their scope beyond university campuses.

See also: Recommendation ITU-T L.1033 *Guidance for institutions of higher learning to contribute to the effective life cycle management of e-equipment and e-waste*.

Other organizations can contribute to the broad and complex task of properly managing WEEE. Neighborhood organizations, schools, rural councils, religious groups, and non-profit entities can participate in the management process and should support management efforts. Each jurisdiction will be responsible for identifying these groups and involving them in the management chain where appropriate.

Other organizations

Non-governmental organizations

Non-governmental organizations play a key role in WEEE management, providing support especially to developing countries and emerging economies. Some of them establish certification standards for waste managers, which helps to ensure environmentally responsible practices.

Among its main functions, the following stand out:

- **Raise awareness and educate**: they carry out campaigns to inform society about the environmental and health risks associated with the improper disposal of WEEE, promoting responsible management practices.
- **Collaborate with communities**: they work with local communities to promote sustainable practices and strengthen a culture of environmental responsibility.
- **Mobilize resources**: they manage funds and develop projects that support countries in need, contributing to the strengthening of environmental management and the proper handling of WEEE.
- **Research and advocacy**: they produce studies on the magnitude and impact of WEEE and advocate for the implementation of effective public programs and public policies, in collaboration with governments and industry stakeholders (It Recycle, 2023).

Source: Based on the STEP White Paper (STEP, 2018)

Figure 12: Case of the state as a large generator

The state as a large generator of WEE: the case of Peru

The state, through its public institutions, ministries, educational centers, and decentralized entities, is one of the main generators of WEEE. Its role as a massive consumer of technology requires differentiated, traceable, and environmentally safe management. Several Latin American countries have incorporated the principle of extended producer responsibility into their legal frameworks, recognizing the state as a promoter of public policies and environmental regulations, and as a coordinator between the private sector, citizens, and international organizations.

It is important to bear in mind that, in addition to regulating WEEE management in the country, the state must comply, as a generator or institution, with traceability, delivery to authorized managers, and recovery targets. Therefore, specific regulations and mechanisms should be in place for state assets.

Peru has been a pioneer in Latin America in establishing a special regime for the management of WEEE, recognizing the state as the primary generator of this waste. Peru has developed specific regulations:

- Supreme Decree Nr 009-2019-MINAM. Establishes the special regime for the management and handling of WEEE, defining obligations for producers, marketers, operators, and generators, including state entities.
- Directive Nr. 001-2020-EF/54.0. This directive, issued by the Ministry of Economy and Finance, regulates the procedure for the disposal, classification and delivery of state-owned movable assets that are classified as WEEE.

In operational terms, the Ministry of the Environment (MINAM) has collaborated with public entities to provide training to officials on the institutional management of WEEE, including segregation, inventory, traceability and delivery of waste to authorised systems. MINAM has approved the management plans of nine WEEE management systems, which are authorised to receive waste generated by the state. Awareness campaigns and technical guides have also been developed to encourage regulatory compliance within public institutions.

Source: https://www.gob.pe/institucion/minam/informes-publicaciones/1503643-regimen-especial-de-gestion-y-manejo-de-residuos-de-aparatos-electricos-y-electronicos

Figure 13: The informal sector in Latin America

Informal sector in Latin America

The informal sector plays a crucial role in WEEE management in many countries, especially those where the formal collection and recycling infrastructure is not fully developed. This sector usually collects WEEE by searching for waste in garbage dumps, landfills, and sometimes even in homes or businesses. They often do so individually or in informal groups, without being regulated or having an organized infrastructure. Once collected, they separate the waste into usable and unusable components. This includes materials such as metals, plastics, and electronic parts, which can be recycled or sold to intermediaries for further treatment (STEP, 2020).

Collectors have practical knowledge about which parts of WEEE are valuable for recycling or resale. This allows them to generate income from the waste they collect. The lack of technical training, adequate equipment, and safety standards leads to the improper handling of hazardous substances present in WEEE, such as mercury, lead, or chemical materials, which pose a threat to health and the environment.

Despite operating in informal conditions, this sector contributes to the recovery of valuable materials and reduces the amount of waste that would otherwise end up in landfills. However, their work is often carried out without institutional support and without complying with environmental regulations, which can create risks. The informal sector faces multiple challenges, such as lack of access to training, job security, and legal protection. However, its inclusion in formal collection systems or recycling associations could improve the efficiency of WEEE management and reduce the risks associated with improper waste handling (Sustainable Recycling Industries (SRI), 2017).

It is proposed that the governments, in collaboration with relevant stakeholders such as the academia and producers, should create training opportunities to develop this sector's capabilities and enhance its operational efficiency. This will ensure that

Source: Own elaboration, 2025

2.2.2 Collection systems for EPR implementation

Legislation must promote an efficient system for collecting, reusing, and valorizing WEEE, while ensuring the environmentally sound management of hazardous and non-recoverable fractions derived from the management. To direct WEEE to authorized managers, effective selective collection is required, which the legislation must guarantee (United Nations University, 2018). One way to structure selective collection is through take-back systems, which can be individual or collective (International Telecommunication Union, 2018).

While in individual models each producer is responsible for the products or product categories it put on the market and develops its own EPR plan, in collective models several producers join forces and a single EPR plan is generated for all the companies that make up the collective. (Sustainable Recycling Industries (SRI), 2017).

Important

Governments must define in their legislation:

✓ whether individual or collective management models will be used

✓ the legal, administrative, and organizational requirements of producer responsibility organizations (PROs). The tools for implementing the EPR.

Collective models are normally established as producer responsibility organizations (PROs) and are responsible for organizing and managing the collection and recycling of WEEE on behalf of producers, for which they subcontract management companies. These organizations must be formally established in accordance with the requirements set by each country. Normally, each producer pays a fee for the services provided by the PRO, based on their market share, which must cover administrative and operational costs, such as the collection and treatment of WEEE. (International Telecommunication Union, 2018). In Latin American countries, PROs are known by different names, such as compliance units, management systems, post-consumption plans, EPR plans, or collection and management systems.

Establishing collective management models increases producers' competitiveness, allows them the opportunity to engage in collective bargaining with stakeholders, and generates economies of scale and cost reductions for participants. The most widely used model worldwide in the WEEE sector is the collective model, implemented through PROs (International Telecommunication Union, 2018). It also offers advantages for governments, as it facilitates control and monitoring and reduces the administrative burden.

The take-back collection system assigns physical and financial responsibility for WEEE management to producers or to the PRO. Figure 14 shows the collection methods.

Figure 14: Examples of collection methods that producers or PROs can implement

Source: Own elaboration (2025)

It is important for collection systems to gradually expand to different geographical areas instead of focusing solely on large urban centers. Additionally, collection systems can contribute to the fulfillment of the country's circular economy objectives by promoting the extension of the useful life of collected devices, the recovery of raw materials, and supporting technology and innovation programs.

Figure 15 shows the WEEE collection points in the countries that participated in the PREAL project and had the information available.

Figure 15: Information on the regional map of WEEE collection points developed by the PREAL project

WEEE collection points in PREAL project countries

Several countries participating in the PREAL project compiled information on WEEE collection points as part of their efforts to create national regulations.

The PROs have set up these collection points to strengthen environmental and waste management. Collections were also coordinated with authorized waste management companies.

Location of WEEE collection points:

Costa Rica, El Salvador, Honduras and Panama | **Ecuador and Peru** | **Argentina and Chile**

The designations employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of the ITU and UNIDO and the ITU and UNIDO Secretariat concerning the legal status of the country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries

Source: Adapted from https://residuoselectronicosal.org, 2025

2.2.3 Financing mechanisms for the collection system

A common question regarding EPR is who pays for the waste collection and management system, in this case for WEEE. Traditionally, municipalities, financed by taxpayers, have been responsible for the treatment of municipal solid waste. Over time, the volume of municipal waste per capita has increased substantially and its composition has become more complex.

Who finances the EPR?

Producers finance the EPR, either through producer fees or through the PRO.
The final cost is passed on to the consumer.

Social and environmental costs
can be internalized by incorporating
management costs into product prices.

The EPR recognizes that producers are in the best position to modify products to prevent waste, minimize waste management costs, and reduce the environmental impact of a product in its post-consumption phase. Therefore, it is desirable that WEEE be declared special waste[1] to remove it from municipal waste streams and ensure that producers manage it through collection systems. The legal and policy framework incorporated by the EPR should therefore be designed to provide incentives that encourage producers to finance the social and environmental costs of managing their EEE. Any unavoidable costs could be incorporated into the product's price, ensuring that producers and consumers, rather than taxpayers, pay for the social costs (externalities).

The internalization of social and environmental costs (or externalities) is possible when the financial responsibility is fully transferred to producers and consumers. Producers incorporate the additional costs of post-consumption management into the price of the EEE (in proportion to the elasticity of demand). Cost internalization provides incentives for producers to change product design and reduce the costs associated with the treatment and disposal of post-consumption products.

The internalization of social and environmental costs (or externalities) is possible when the financial responsibility is fully transferred to producers who, in turn, incorporate management costs into the price of the EEE the costs of post-consumption management (in a proportion as low as possible to avoid losing competitivines). The cost internalization incentives producers to change product design and reduce the costs associated with the treatment and disposal of post-consumption products.

In the case of partial cost internalization, producers partially pay for the costs of treating post-consumption products and they contribute financially to the operation of the local waste collection system, although the municipality may bear some of the costs of collecting, sorting, or treating post-consumption products.

The type of cost internalization and its applicability in the country must be defined in the legal and policy framework. In Figure 16, other mechanisms that can be used to implement the EPR are explained.

[1] Other terms used include special management or differentiated management.

Figure 16: Mechanisms for financing the EPR

Other mechanisms used in the application of EPR

Other mechanisms that can be used in the implementation of EPR and that pursue the same objective as take-back systems are deposit/refund schemes, advance disposal fees, final disposal fees, and recycling fees. These mechanisms have not been widely developed for WEEE management. (OECD (2001); Sustainable Recycling Industries (2017)).

Deposit and refund:
The user makes a payment (deposit) when purchasing the product, and that payment is refunded in full or in part when the product is returned to the marketer or a manager. This system is widely known for beverage containers, but has been extended to categories such as batteries, light bulbs, and tires.

Advance disposal and recycling fee:
This is usually collected at the point of sale or by the marketer, and is paid by the consumer as part of the final price (invisible fee) or as an additional charge (visible fee). The fee is paid to the collection system in exchange for collection and recycling, while also financing the administration of the system. This scheme is normally used for products with a long useful life, such as refrigerators.

Final disposal and recycling fees:
Although the advance fee is more widely used, fees are also used when WEEE is delivered to PRO or waste managers. Disposal and recycling fees can be fixed for all categories or flexible, based on product components and recycling costs according to brand, model, and related technical specifications.

Mechanisms for Implementing EPR Upstream

There are mechanisms for implementing EPR upstream, such as:

Taxes on raw materials:
This is an indirect instrument that promotes the adoption of EPR schemes by taxing raw materials for manufacturing, thereby allowing the use of secondary (recycled) raw materials or less hazardous materials.

Design for sustainability:
EPR promotes the development of products designed to be more durable, repairable, reusable, and recyclable, reducing the need for new resources and the generation of waste.

Leasing or renting:
The producers own the EEE, so they may decide to rent the products to maintain control over them throughout their life cycle, which allows them to repair and reuse components. It may be impractical to use this mechanism for short-life EEE. More and more users are opting for leasing or renting EEE.

Recycling subsidies: These are used to stimulate recycling markets. They can be subsidies for the collection of materials for recycling, subsidies for reprocessing companies, or subsidies for users of recycled materials.

Source: Own elaboration based on (OECD, 2001) and (Sustainable Recycling Industries (SRI), 2017), 2025

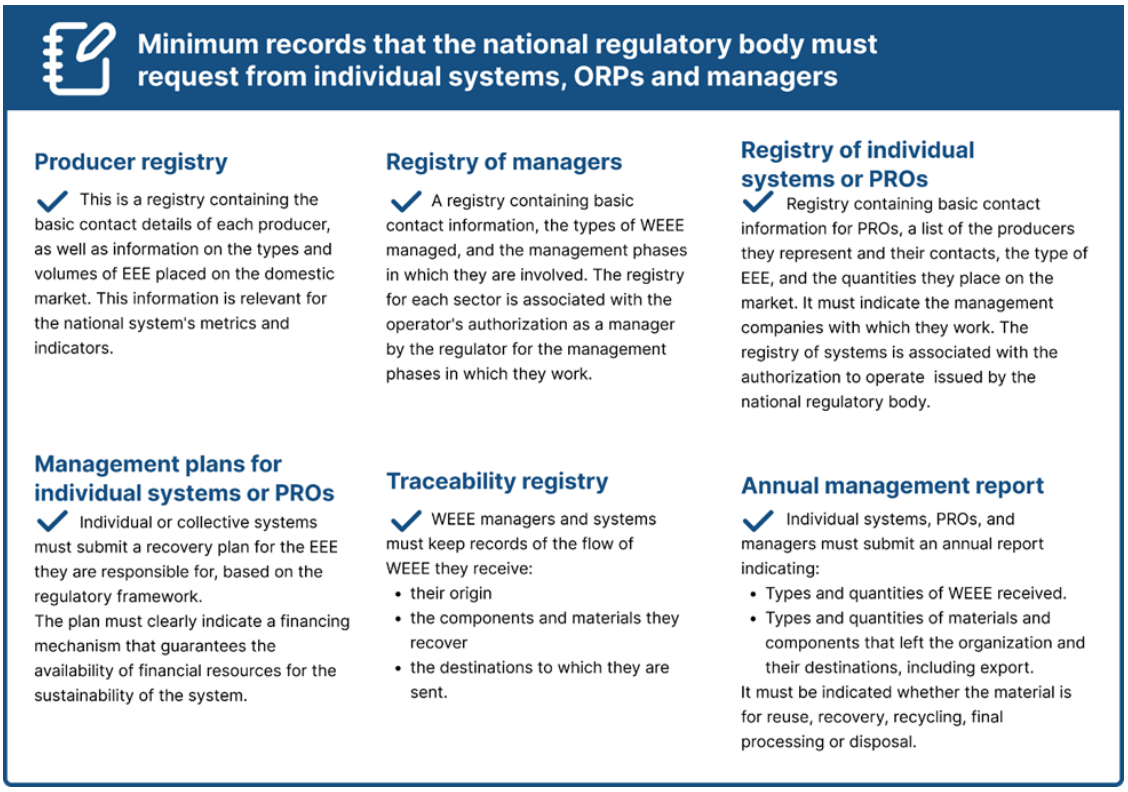
2.2.4 Monitoring and controlling the national WEEE management system

What gets measured gets controlled, what doesn't get controlled can't be managed, and what can't be managed can't be improved.
Peter Drucker

Information is key in a national management system, as it allows for measuring the progress achieved and the compliance with the EPR. There is a variety of information that must be systematized in the EPR models, which can be collected through registries, reports, or statements.

Systematizing the information obtained from the registry and reports enables the development of metrics for the national management system and the estimation of indicators. In terms of transparency and accountability, it is good practice for information on producers, managers, and collection systems to be public, and for national indicators to be published. This also serves to report to international regulatory bodies. Figures 17 and 18 show, respectively, the minimum registries that the regulatory body should require and the links where registries implemented in Colombia and Costa Rica can be found.

Figure 17: Minimum registries that the national regulatory body must require of individual systems, PROs, and managers



Source: Own elaboration, 2025

Figure 18: Links where you can find records implemented in Colombia and Costa Rica

Examples from Colombia and Costa Rica

Colombia

The following links can be accessed to get information from Colombia:

- Registry of Producers and Marketers of Electrical and Electronic Equipment – RPCAEE. | One-stop shopping for foreign trade
- Search for Management Offices
- Registry of collection systems

Costa Rica

The following links can be accessed to get information from Costa Rica:

- List of Compliance Units in Registry
- General list of managers
- Video tutorial on reporting waste management. Managers without access to the digital platform and Compliance Units
- Map of collection points

Source: Own elaboration, 2025

As monitoring and surveillance mechanisms, national or local regulatory bodies must periodically inspect the facilities of WEEE managers to verify that they comply with the technical requirements that enable environmentally safe and occupational safety-conscious operation.

Chapter 3 – Support elements for national WEEE integral management systems

Section 2.2. addresses the fundamental components of a national system for the integral management of WEEE, but as mentioned therein, such a system also requires educational tools and communication and awareness-raising actions aimed at all stakeholders to achieve the objectives set by the country. This chapter presents some of these elements, which will contribute to the development and implementation of the national system.

3.1 Training, communication, awareness-raising, and education

Training, communication, awareness-raising, and education are fundamental pillars for the national WEEE management systems. As previously mentioned, consumers play a pivotal role in Extended Producer Responsibility (EPR) programs because they decide whether to deliver waste to the formal collection channels established by producers. Therefore, it is essential that all stakeholders, both public and private, join forces to actively participate in raising public awareness and educating the public about the importance of environmentally friendly WEEE management.

3.1.1 Training

It is important to provide training to the following actors:

Capacity building

It is necessary to strengthen the capacities of different actors within the national WEEE system, starting with **public officials** as those responsible for making decisions and developing the country's policies on this matter.

The capacity building strategy should reach other actors such as **communicators and managers,** so that they can carry out their activities in a more informed manner and ensure the environmentally safe management of WEEE.

Academia and **NGOs** are actors that can support the development of capacity building programs.

a. Public Officials: Government entities that guide and oversee the implementation of the national system must have qualified personnel for these purposes. Public officials in charge must be sufficiently trained in the application of the EPR and the national WEEE management system. They must also have the technical knowledge to effectively monitor and control bound parties.

b. Media: The media plays a very important role in education and awareness-raising. It must clearly and concisely convey messages to the population. First, a national communication and education strategy must raise awareness among the media and inform them of the basic concepts of WEEE management and of the country's progress.

c. Managers: Many management companies are small- to medium-sized enterprises that lack qualified personnel. Instead, they have staff who have acquired empirical knowledge about the collection, disassembly, and recovery of materials. Therefore, it is essential to have a training program that allows managers to acquire technical knowledge and perform their tasks safely, ensuring their well-being and protecting the environment.

3.1.2 Communication, awareness-raising, and education

Developing a national communication and awareness strategy aimed at **specific interest groups** and the **general public** is important for raising awareness of how the national WEEE management system works, its scope and achievements, and, more importantly, how people can participate.

Implementing a national communication and awareness strategy is often a lengthy and costly process. In addition to reaching as many people as possible, the strategy must be sustained over time to have a lasting effect on the population. Although collective and individual collection systems are the first to implement the strategy, its magnitude requires decisive participation from government and local authorities. Support from national and local authorities responsible for WEEE management, as well as municipalities, is essential to achieving the desired effect. It is important to utilize all available mechanisms and tools to enable these possibilities through policy. Additionally, the media, academia, non-governmental organizations (NGOs), and managers can be involved in the communication and awareness strategy aimed at the population.

National communication and awareness strategy

The **decisions** consumers make about the EEE they buy and how to dispose of it at the end of its useful life are **critical** to the proper **functioning** of the **national system.**

A national communication and awareness strategy should consider:

- Provide information about the EPR, its role, and its responsibilities within the national system.
- Raise awareness about conscious and informed purchasing of EEE, so that people buy what they need, looking for products that offer durability and repairability.
- Raise awareness about the environmental and social impacts of environmentally safe management of WEEE.
- Report on the EPR management models that have been adopted (take-back recovery system, deposit and refund, among others)..
- Provide information on collection points and how WEEE should be delivered.
- Disseminate data on the progress of the national management system.

Important

Involving ministries of education and academia is essential to incorporating WEEE management into general education programs and university curricula as a cross-cutting matter. This is also crucial for training professionals with technical knowledge.

Another important element is education. Involving Ministries of Education in incorporating WEEE management as a cross-cutting subject in primary and secondary school curricula allows raising awareness of the issue from early childhood and throughout the entire basic education cycle.

Finally, technical and professional staff involved in WEEE management must be trained. It is essential to involve the academia and technical training institutions. Academic programs must include topics related to EEE and WEEE, and the development of science, technology, and innovation applied to the sector must be promoted.

3.1.3 Technical guides and informational guides

The development and dissemination of guides is a key tool for supporting the implementation of EPR policies and promoting the proper management of WEEE. In Figure 19 two types of guides that countries can develop are explained.

Figure 19: Types of technical guides that can be developed for different actors in the national management system

Technical Guides

These are aimed primarily at managers and personnel involved in the disassembly, valorization, and treatment of WEEE. The guides should include the best environmental practices for transportation, disassembly procedures, the safe storage of components, the use of personal protective equipment, the handling of higher-risk waste, the traceability of flows, and minimum operating standards.

The guides encourage the continuous evaluation and control of operations to prevent risks to health and the environment.

Informative Guides

These are aimed at consumers, generators, producers, households, and other groups.

Its purpose is to educate and raise awareness about the proper management of WEEE, its basic concepts, and how the national system functions..

Source: Own elaboration, 2025

The countries participating in the PREAL project have developed technical and informative guides that can be consulted for reference.

Figure 20: Examples of technical and information guides developed under the PREAL project

Technical Guides

Colombia

- Technical Guide for the integral management of WEEE.
- Technical Guide for the consideration of chemicals of concern in the sustainable public procurement process for electrical and electronic equipment.
- Technical Guide for the integral management of WEEE.
- Consideration of chemicals of concern in the sustainable procurement process for EEE.
- Booklet on WEEE management aimed at children.

El Salvador

- Technical guide for integral management of WEEE in El Salvador.

Peru

- Guide to the management and handling of waste electrical and electronic equipment.
- Technical guide for the management and handling of WEEE Category 3: IT and telecommunications equipment.

Information guides

Ecuador

- Information guide on the management of WEEE in Ecuador.

El Salvador

- Technical guide for generators of WEEE in El Salvador.

Peru

- Management and handling of WEEE.
- Generation of WEEE in private entities.
- Management and handling of WEEE, Household generators.

Note: Links of interest can be found in Annex 4.

Source: Adapted from information of the PREAL project, 2025

3.2 International technical standards for the management of WEEE

International standards, such as R2 (Responsible Recycling), e-Stewards, and CENELEC, which establish administrative, technical, and operational procedures for WEEE management companies to follow to receive certification. Colombia and Peru developed national technical standards based on these international standards, allowing these principles to be adapted to the local context and strengthening the environmentally safe management of WEEE in the

country. Combining global and national standards is key to ensuring compliance, operational efficiency, and alignment with the circular economy principles. (See Table 2)

Table 2: International technical standards and national technical norms for the management of WEEE

Standard	Description
R2v3 (Responsible Recycling)	It is one of the most globally recognized standards for certifying WEEE managers. The standard's approach includes material traceability, data protection, a management hierarchy that prioritizes reuse over recycling, and occupational safety. Version v3 emphasizes export control and risk assessment and has been widely adopted by companies operating in international markets. https://sustainableelectronics.org/
e-Stewards	Promoted by BAN, it stands out for its ethical approach. It prohibits the export of hazardous waste to developing countries and demands fair working conditions, data protection, and integration with ISO 14001. It is ideal for organizations with sustainability and social responsibility policies. https://e-stewards.org/
CENELEC EN 50625 series	It brings together the harmonized technical standards in Europe for the treatment of WEEE. They are directly linked to Directive 2012/19/EU and establish detailed requirements for all stages of the process (collection, transport, storage, treatment, and decontamination). They are mandatory in states and applicable to operators seeking to align themselves with European standards. https://www.cencenelec.eu/european-standardization/cen-and-cenelec/
UIT-T L.1037: Requirements for the collection, transportation, storage, dismantling, valorization and final disposal of WEEE	It establishes a framework for managing WEEE safely and sustainably. It includes processes such as collection, transport, valorization, and final disposal. Its objective is to improve recycling and resource recovery, especially in developing countries. In addition, it promotes traceability and classification for a more efficient management. https://www.itu.int/rec/T-REC-L.1037/en
ISO 59000 series of standards: Circular economy **ISO 59014:2024 Environmental management and circular economy – Sustainability and traceability of the recovery of secondary materials**	Set of international standards designed to harmonize the understanding and practice of the circular economy across all types of organizations. This standard provides principles, requirements, and guidance for organizations seeking to promote sustainability in their secondary material recovery processes. https://www.iso.org/obp/ui/#iso:std:iso:59014:ed-1:v1:en

Table 2: International technical standards and national technical norms for the management of WEEE (continued)

Standard	Description
NTC 6352-1 y 6352-2 (Colombia)	These are national technical standards for WEEE management in Colombia. They include requirements for logistics, storage, treatment, and decontamination, and require third party audits to validate complete operations. They represent a regional model of regulatory adaptation. https://tienda.icontec.org/
NTP 900.066-1 y NTP 900.064 (Perú)	Issued by Peru's National Institute of Quality (INACAL), they establish the technical requirements for WEEE management in the country. The first establishes procedures for the collection, storage, transportation, treatment, and final disposal of electronic waste, in accordance with Supreme Decree No. 009-2019-MINAM. It serves as a reference for operators, inspectors, and public entities that manage electronic waste under the Special Regime. The second standard complements the first by establishing criteria for the safe handling of electrical and electronic equipment, including classification, handling, and risk prevention aspects. It is useful for designing internal protocols in public and private institutions and for training technical personnel. https://biblioteca.upc.edu.pe/c.php?g=1128559&p=8236306

Source: Own elaboration, 2025

As a complement to national and international technical standards, it is also recommended to implement certifiable business management systems. Among the most widely used are the following:

a) **RIOS™ (Recycling Industry Operating Standard)**: it is an integrated management system that combines quality, environment, health, and safety. Although it is not specific to WEEE, it is useful for management companies that handle multiple types of waste. Its strength lies in continuous improvement and the possibility of integration with other certifications such as ISO 9001 or ISO 14001. (RIOS™ Recycling Industry Operating Standard, 2024)

b) **ISO 14001**: it is a global standard for environmental management systems. Although it does not focus exclusively on WEEE, it establishes a solid basis for identifying impacts, complying with environmental legislation, and promoting continuous improvement. It is often required as a complement to certifications such as those developed by R2 and e-Stewards. This standard can also be incorporated into an integral management system (IMS) with the ISO 9001 (quality) and ISO 45001 (occupational health and safety) standards, allowing organizations to optimize resources, avoid duplication, strengthen traceability, and comply with multiple regulatory requirements in a coordinated manner. (International Standardization Organization, 2025)

Chapter 4 – Setting WEEE collection targets

To implement an effective WEEE management system, it is essential to define clear collection targets that allow for the evaluation of producers' performance and compliance through their collection systems, whether they are individual or collective. The government is responsible for leading the process of setting targets, negotiating them with EEE producers, and engaging other relevant stakeholders. It is important to bear in mind that the targets must be (OCDE, 2024). It is important to bear in mind that the targets must be:

- **Mandatory**: this drives the growth of recovery rates.
- **Ambitious but achievable**: these will depend on the analysis that each country makes according to its national circumstances.

Below is the methodology for estimating collection targets most used by the countries that participated in the PREAL project due to its simplicity.

4.1 Estimated number of EEE put on the market (POM)

Estimating the quantity of EEE put on the market (POM) and the quantity of WEEE generated is the starting point for calculating collection targets. These estimates allow to know the magnitude of the WEEE situation that the country must face. There are several methodologies for estimating POM, with apparent consumption being the most widely used due to its simplicity (Figure 21). (Forti, Baldé, Kuerh, & Bel, 2020)

Recommendation

It is recommended that the categories defined at the national level be linked to the 54 categories of the UNU codes for reporting statistics to the Global E-Waste Monitor.

Figure 21: Estimated number of EEE put on the market

Estimation of the quantity of EEE placed on the market

This is based on key data such as the volume of imports of new and second-hand equipment, exports, and domestic production.

EEE placed on the market = Domestic production + Imports of new equipment + Imports of second-hand equipment - Exports.

Data sources:

- Domestic production: generally available through national statistical activities such as those prepared by Ministries of Industry, Trade, and Finance, as well as other national offices.
- Imports and exports: The most widely used database is UN COMTRADE.
- Second-hand imports: Since these types of imports are often not officially registered, data can be obtained through surveys or interviews with importers and port authorities.

Source: (International Telecommunication Union, 2024)

Source: Own elaboration, 2025

The EEE POM is calculated for each EEE category. If the information is available, it can also be calculated for the 54 UNU-Keys. However, the methodology requires statistical information that is not always available in some countries in the region, such as, for example, national production data, annual exports and imports of EEE, and projections of EEE imports, can be used. The main sources of information on imports and exports are national customs agency data. Therefore, it is important for countries to work with the tariff codes of the Harmonized System (HS).

Figure 22: Importance of using the Harmonized System (HS) tariff codes

Harmonized System (HS) tariff codes of the World Customs Organization

The use of codes from the World Customs Organization's harmonized system facilitates the accurate identification of products and their weight. Although designed for customs purposes, these codes are useful for WEEE management to identify the flow of EEE by country. Since 2022, there has been a specific code for the movement of WEEE.

The use of these codes allows:

- Knowing the mass in kilograms of imported and exported WEEE, which is essential for traceability in the national management system.
- Estimating the EEE placed on the market, WEEE generated, and setting collection targets.

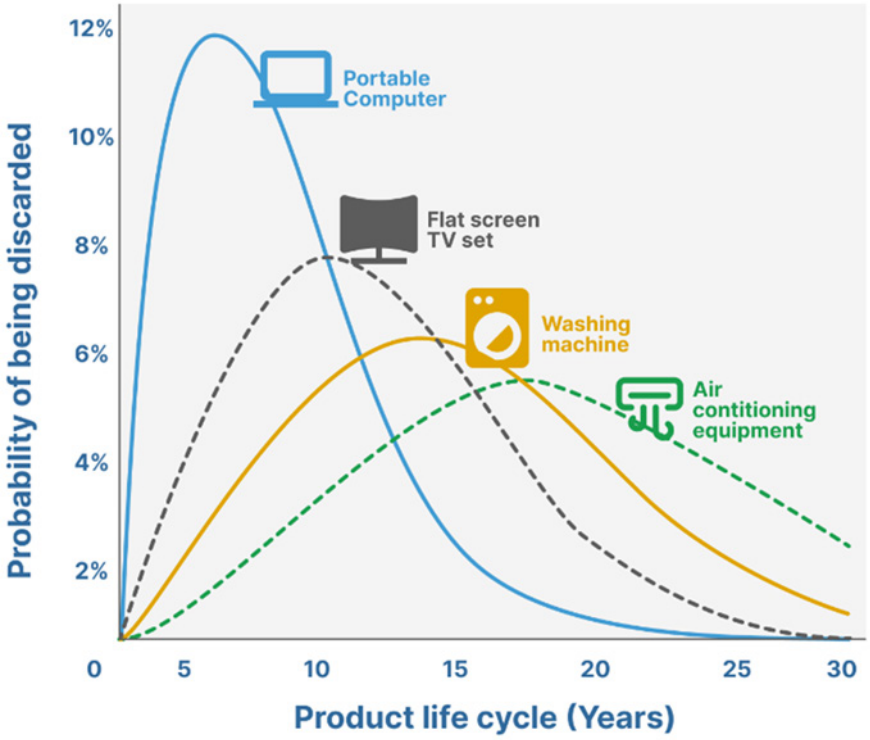
As part of the process, it is important to define the reporting frequency by EEE category and link these codes to UNU-KEYS codes in order to report country data, contributing to the global statistics. It is also necessary to integrate customs agencies and the national EEE management system as key players.

Source: Own elaboration, 2025

4.2 Estimation of WEEE generated

Once the EEE put on the market is known, the WEEE generated is estimated. The generation of electronic waste is calculated using the POM EEE and the useful life of each type of WEEE. The WEEE generated is the total mass of electronic waste, before any management activity. The useful life of the EEE is expressed by a probabilistic function (Weibull function) and varies by UNU-KEY, with the shape and scale parameters associated with the average useful life for each UNU-KEY individually. (Forti, Baldé, Kuerh, & Bel, 2020)

Figure 23: Example of life cycles of EEE



Source: Own elaboration based on Forti, Baldé, Kuerh, & Bel, 2020

4.3 Estimation of collection targets

The most common methodology for calculating collection targets is based on the EEE POM methodology, which constitutes the baseline. In this methodology, annual collection targets are calculated as a percentage of the average EEE POM for the previous three years. However, it should be noted that this methodology may be prone to error when applied to the EEE of new technologies with a long service life, such as photovoltaic panels. This is because, even though they have recently been placed on the market, it is possible that no WEEE has been generated yet.

Once the baseline has been established, each country must set the collection rates applicable to each category or subcategory of EEE, preferably specifying the codes or tariff lines that will be mandatory. While it is desirable to set targets for each category of EEE, this depends on the context and management capacity of each country. Although a general collection percentage can also be established, this is not recommended for Latin American countries because, as mentioned above, the targets are based on the EEE POM methodology, which has limitations for long-life equipment such as large appliances or solar panels. These percentages should increase progressively over time, to allow for a gradual increase in collection levels.

Recommendation

It is recommended to act **gradually** both in incorporating WEEE categories and in setting collection targets.

Covering all categories of WEEE when the national WEEE management system is just starting out can be a considerable challenge and could make it difficult to meet the targets set by countries.

The following are important considerations for defining the baseline used in estimating collection targets:

a) It can be calculated individually per producer or as the sum of all producers that make up a collective system.

b) If the producer has been operating in the market for the last three (3) years, the annual average of units or weight of EEE introduced during that period is calculated.

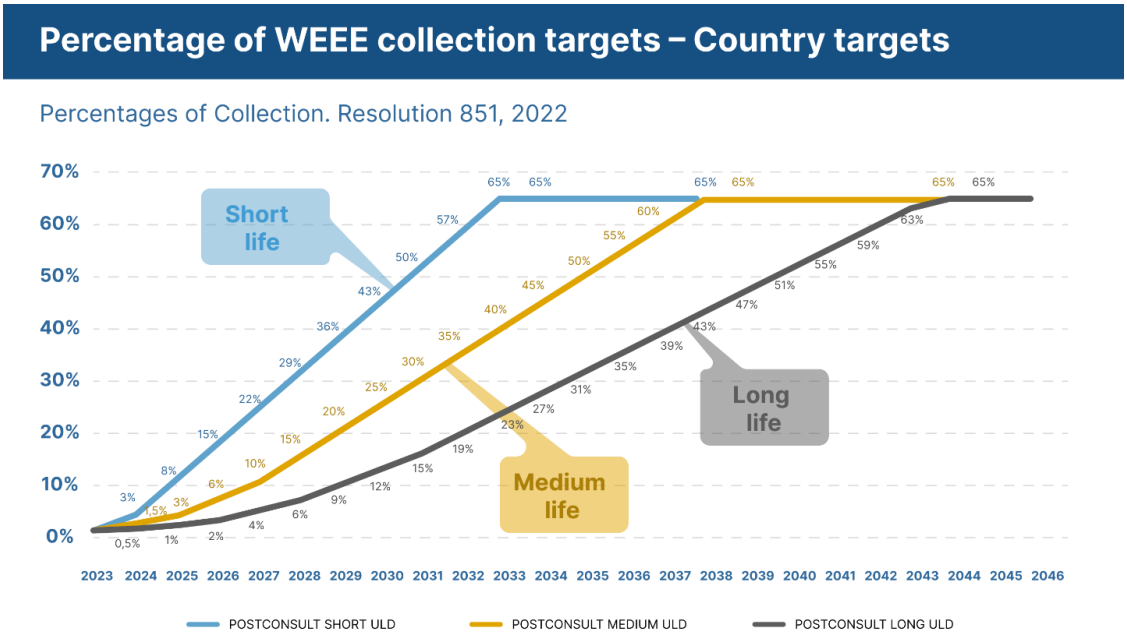
c) If the producer has been operating for less than three years, the average of the available years will be used.

d) If the producer is new to the market, the baseline will be determined based on import, manufacturing, or sales projections for the first year of operation.

e) In all cases, it is recommended to use the net weight of the product, excluding packaging, year-end inventories, and exports.

Figure 24 illustrates Colombia's collection targets for EEE with short, medium, and long useful lives. The targets are also applied gradually by year.

Figure 24: Example of collection targets in Colombia



Note: ULD, Useful Life Distribution

Source: Own elaboration based on the: (Ministry of Environment and Sustainable Development of Colombia, 2022)

It is important to note that percentages may vary depending on the following:

a) The type of EEE (e.g., large appliances, small appliances, IT and telecommunications equipment, among others).

b) Year of compliance (with staggered targets), identifying a target year and a goal to be achieved that year and thereafter.

c) National policies and installed capacity for EEE management.

Collection targets should consider gradual growth over the years, not only in terms of annual collection rates, but also in terms of coverage of the EEE that are to be regulated. It is recommended to start first with the categories of EEE that the country considers to be the highest priority, both in terms of generation volume and potential for harm and then expand the obligation to other categories or tariff items.

Experience in Latin America has shown that initial estimates are a fundamental technical tool for setting collection targets. These targets are typically finalized through negotiations with the government, producers (both individual and collective systems), and industry associations.

It is recommended that initial targets be realistic and gradual to allow for the consolidation of collection systems and ensure producer compliance. Subsequently, based on the experience and results of the first few years, authorities can increase recovery rates to advance toward circular economy and environmental impact reduction targets.

4.4 Setting thresholds

An important aspect to consider is that regulating all producers or all EEE circulating in a country can easily exceed the monitoring and control capacity of the responsible authorities and prove counterproductive. Although it would be desirable to regulate 100% of the country's producers, it is advisable to define minimum thresholds based on institutional capacity and the national WEEE management infrastructure. A hypothetical example could be that by regulating only 30% of producers, 95% of EEE put on the market can be controlled.

The definition of thresholds enables the authorities to concentrate their efforts on players with the largest market share – those who introduce significant volumes of EEE. This prevents administrative and operational overload, allowing authorities to concentrate their efforts where greater environmental efficiency can be achieved.

To set these thresholds, it is recommended to evaluate the following:

a) **Customs control capacity** to verify imports and exports of EEE and WEEE.

b) **Surveillance capacity of the competent ministry or authority**, including monitoring of registries, reports, and management plans of producers and managers.

c) **National management capacity in place**, considering the infrastructure and authorized operators for the collection, treatment, and disposal of WEEE.

d) **Opportunities for valorization**, including the reuse of components and the export of recovered fractions.

A useful tool for establishing these thresholds is the Pareto principle or 80/20 rule. This principle also allows for prioritizing the categories of WEEE to be regulated. For example, it could be the case that a small percentage of EEE categories (such as ICT equipment, mobile phones, televisions, or refrigerators) account for most of the total volume commercialized and, therefore, of the potential for WEEE generation.

By applying this principle, countries can define thresholds to determine which products should be included in EPR systems based on tonnes per year or units commercialized, which producers should report, and which streams require traceability and collection targets. This strategy facilitates regulatory and technical targeting, avoiding the dispersion of efforts in low-impact categories and strengthening the efficiency of the collection system.

Finally, it is recommended that governments schedule periodic reviews to assess progress toward the targets, analyze together with producers the successes and difficulties in achieving the objectives, and make any necessary adjustments and corrections to align them with local needs and conditions.

Chapter 5 – Infrastructure for WEEE management

To implement an integral management system for WEEE, it is essential to have an infrastructure that can respond to the challenges posed. Once the collection systems of producers (individual or collective) are set up and the collection and management targets are established, a network must be in place to collect WEEE and an industry capable of responding to these requirements.

In this context, the national government, in conjunction with the private sector, must promote the development of a WEEE management industry that covers all operational stages of management, which were explained in section *2.2. Minimum elements of a national waste electrical and electronic equipment management system (WEEE).*

Once users deliver their waste to a collection point, it enters a management process. Through a series of activities, WEEE can be remanufactured or disassembled to recover materials and treat or dispose of hazardous components. Figure 19 illustrates the various WEEE management activities. Countries must have the appropriate infrastructure for each management activity.

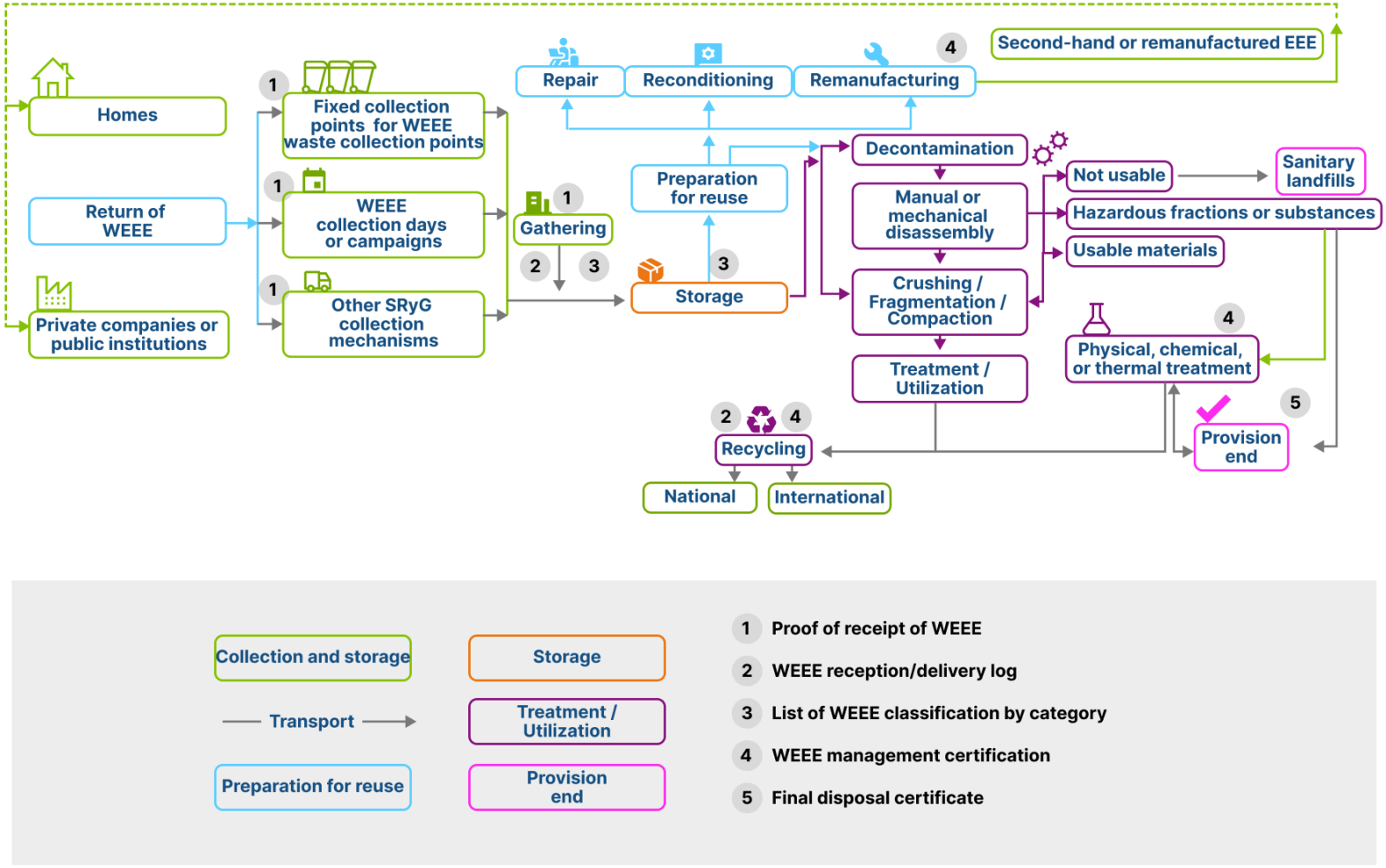
Once users deliver their waste to a collection point, it enters a management process. Through a series of activities, WEEE can be remanufactured or disassembled to recover materials and treat or dispose of hazardous components. Figure 25 illustrates the various WEEE management activities. Countries must have infrastructure for each management activity, which must be appropriate for the type of activity being carried out.

Authorized managers

A WEEE **manager** is considered to be any natural or legal person, public, private or mixed, national or foreign, who carries out **one or more activities** within the management chain. (International Telecommunications Union et al. 2015).

Managers must be **authorized** by the regulatory body for each of the management activities they perform.

Figure 25: WEEE management activities that a national system must have



Source: Own elaboration based on the (Ministry of Environment and Sustainable Development of Colombia, 2023)

Facilities must undergo regular inspections

Facilities that manage WEEE must undergo **regular inspections** to ensure compliance with national regulations, protect the health of workers, and prevent environmental impact. These inspections ensure that **processes** are carried out **safely and under control.**

They also help to detect illegal WEEE handling practices by scrap dealers or unauthorised companies.

Managers must bear in mind the following general aspects during all handling activities:

- Comply with current rules and regulations.
- Obtain environmental licenses and other administrative permits as required by national legislation.
- Have civil liability insurance to cover possible environmental impact or damage risks.
- Develop an occupational safety program for its workers that considers the necessary measures to ensure occupational safety and environmental protection.
- Only accept WEEE for which you are authorized and have storage and processing capacity.
- Do not accept WEEE of dubious origin, whether due to suspicion of theft or tampering, nor accept parts or components removed from WEEE unless they come from an authorized waste manager.
- Handle WEEE in a way that preserves its physical integrity, taking care to avoid damage or breakage that could release hazardous substances into the air, water, soil, or harm people.
- Store WEEE in areas where it is not exposed to sunlight, water, or rain.
- Have a documentation system that allows for the traceability of the waste it receives.
- Have trained personnel, depending on the activities they carry out and the type of WEEE they receive.
- Encourage managers to seek continuous improvement in their processes to optimize the effectiveness and efficiency of their operations, in accordance with national or international technical standards.

Table 3 presents the minimum infrastructure requirements for waste managers. As explained in section 3.1.3, is recommended that each country develop its own technical guides that elaborate on the aspects mentioned in the table and are adapted to the country's needs and realities.

Table 3: Minimum conditions for the infrastructure of each stage of the WEEE management process

Stage	Minimum conditions for the infrastructure
Collection	End users must deliver WEEE to collection points established by producers or through collection systems. These points must be **easily accessible to users** and have security and control measures in place. – Post signs to guide users to the designated WEEE area and explain the conditions for handing it over. – Have specific areas for WEEE to reduce the risk of deterioration and release of hazardous substance. – Have containers with the appropriate characteristics and capacities for the WEEE to be received and ensure they are labeled correctly. After collection, WEEE can be stored temporarily (stockpiled) in designated areas or sent directly to a WEEE manager's facilities.
Transport and storage	Transport to management companies must preserve the integrity of WEEE and be carried out in accordance with the risks posed by the equipment being transported, always complying with the legal regulations indicated by the competent authority. – Have the necessary permits to travel on national roads, in accordance with the legislation of each country. – Transport waste in special containers to prevent movement in the vehicle that could cause breakage or damage to the WEEE. Containers can be bags, rigid boxes (known as gaylor), baskets, among others. These containers must have means of securing them to prevent movement in the vehicle. – Pack fragile appliances that are prone to breakage. In the case of temporary storage or collection, the following conditions must be met: – Areas under roof or properly protected so that WEEE is not exposed to direct sunlight, water, or rain. – Concrete surfaces, preferably impermeable depending on the type of WEEE. – Lighting and ventilation appropriate to the activities carried out. – Be located away from sources of combustion or heat.

Table 3: Minimum conditions for the infrastructure of each stage of the WEEE management process (continued)

Stage	Minimum conditions for the infrastructure
Valorization	Activities involving preparation for reuse (repair, reconditioning, and remanufacturing) (see Figure 25) as well as treatment for valorization must: – Design and establish the space for the activities to be carried out: • Roofed areas with concrete surfaces, preferably waterproof and non-slip, away from sources of heat, combustion, or ignition. • Safe access and exits. • Fire protection system that includes at least smoke detectors and fire extinguishers or another system, as indicated by the respective risk assessment. – Have at least the following areas: • For incoming WEEE. • For materials awaiting disassembly. • For each category of WEEE being prepared for reuse or treatment for valorization. • Storage of parts that can be used later as spare parts. • Storage of fractions containing hazardous substances. • Storage of parts adeemed unsuitable for reuse and any associated waste material. – Label areas according to the type of process being performed. – Restrict access to areas where valuable or hazardous materials are stored to prevent unauthorized personnel from entering and posing health risks. – Separate hazardous substances and components to be sent for treatment or final disposal. – Obtain authorization from the competent authorities to transfer waste, components, or fractions if they need to be decontaminated, treated, eliminated, or disposed of at external facilities, either within or outside the country. These materials must be accompanied by a form detailing the process they have undergone. – Have effective methods for destroying data contained in WEEE storage devices to ensure the confidentiality of the generator. – Have clear procedures for each process that include prevention and mitigation measures for handling hazardous components, fractions, or substances, in accordance with the approved environmental management plan.
Treatment	WEEE contains materials for recovery, unusable materials, and components containing hazardous substances. Components containing hazardous substances must, where possible, be decontaminated or treated and disposed of in an environmentally safe manner. The treatment of hazardous waste is preferably carried out by companies located within the national territory. Operators carrying out treatment activities must: – Be authorized by regulatory bodies to treat hazardous waste, components, or fractions. – Establish an efficient and measurable decontamination procedure that allows for evaluation and control, using a recognized methodology. – These materials must be accompanied by a form detailing the process they have undergone, if applicable.

Table 3: Minimum conditions for the infrastructure of each stage of the WEEE management process (continued)

Stage	Minimum conditions for the infrastructure
Final disposition	Non-recoverable ordinary waste can be disposed of in landfills. Regulatory bodies must clearly establish in the national regulations relating to the disposal of WEEE that hazardous components and parts are prohibited. – Consider co-processing as an alternative to final disposal for hazardous substances or contaminated fractions that cannot be recovered in the country. – Dispose of waste in secure landfills or secure cells and in special incinerators for hazardous materials. Co-processing in cement kilns may be considered. – Ensure that the final disposal of hazardous waste is carried out as a first option in companies located in the national territory. – Export hazardous waste for treatment and final disposal if the country does not have the necessary infrastructure, as established in the Basel Convention.

Source: Own elaboration based on (International Telecomunication Union, 2025)

Chapter 6 – Tools for verifying the progress and effectiveness of the national WEEE management system

The effectiveness of the national WEEE management system, i.e., compliance with all or at least most of the requirements indicated in the document, should result in the consolidation of collection systems that must capture ever-increasing volumes of WEEE and manage them in an environmentally safe manner, thereby reducing negative effects on health and the environment.

Below are shown two recommended tools for countries to be used to verify the progress and effectiveness of their national WEEE management systems. One tool is a checklist that can help countries to plan and monitor their systems. The other is a set of key performance indicators (KPIs). KPIs are essential for evaluating and monitoring the effectiveness of a national WEEE management system's implementation, as they provide metrics for assessing progress.

6.1 Tool for verifying the degree of progress of the national management system

Table 4 presents a checklist to help countries begin implementing the national system and verify their progress. The purpose of the checklist is to facilitate the identification of progress made and gaps that still exist in key areas so that each country can prioritize improvement actions. It is important to note that this list is a recommendation, not an exhaustive compilation of all possible requirements, but rather it is a practical resource to guide the progressive strengthening of WEEE management.

Table 4: Tool for verifying progress in the implementation of the national management system

Aspect	Activity/Description	State		
Public policies	There is a public policy that incorporates WEEE management.	Yes	In process	No
Regulatory framework	There is a specific regulatory tool for WEEE.	Yes	In process	No
	There is a regulatory tool based on EPR.	Yes	In process	No
	The regulatory tool has clear objectives for the national WEEE management system.	Yes	In process	No
	The regulatory instrument contains key definitions for a proper understanding of the legislation on WEEE management.	Yes	In process	No
	The regulatory instrument defines the WEEE that constitutes special waste (requiring special or differentiated handling).	Yes	In process	No
	The regulatory instrument defines the categories of EEE/WEEE.	Yes	In process	No
	The regulatory tool clearly defines all actors involved in WEEE management, as well as their roles and responsibilities.	Yes	In process	No
	The regulatory tool defines collection targets.	Yes	In process	No
	Technical guides have been formalized by the competent authority.	Yes	In process	No
Infrastructure	A system covering all stages of management has been consolidated.	Yes	In process	No
	Formally registered individual or collective collection systems are in place.	Yes	In process	No
	Formally registered WEEE managers are in place to handle the different stages of management.	Yes	In process	No
	The installed capacity for WEEE processing at the national level is known.	Yes	In process	No

Table 4: Tool for verifying progress in the implementation of the national management system (continued)

Aspect	Activity/Description	State		
Control and monitoring	There is a registry of producers containing relevant information.	Yes	In process	No
	There is an up-to-date registry of managers containing relevant information.	Yes	In process	No
	There is an up-to-date registry of individual and collective collection systems containing relevant information.	Yes	In process	No
	A tool has been formalized for the reporting of WEEE production by each producer.	Yes	In process	No
	A tool has been formalized for the reporting of WEEE managed by each manager.	Yes	In process	No
	A tool has been formalized for the annual reporting of the management carried out by the collection systems, including the percentage of compliance with the targets.	Yes	In process	No

6.2 Key performance indicators (KPI)

Organizations such as the United Nations and its specialized agencies, such as the ITU, have indicators aimed at significantly reducing waste generation through prevention, reduction, recycling, and reuse, and are aligned with the fulfillment of Sustainable Development Goals (SDGs) 11 and 12.

KPIs help identify areas for improvement, ensure transparency, and promote more sustainable and responsible management practices throughout the WEEE management chain.

An important point that cannot be overlooked is establishing the baseline against which the indicator and target will be compared over time, as this allows the indicator to be measured and the degree of progress on the issue of interest to be determined. The baseline establishes the initial situation of the indicator of interest, i.e., the initial figure from which future values (targets) will be established.

The baseline data used is that of EEE put on the market and WEEE generated, which forms part of the information that allows establishing the diagnosis when initiating the national WEEE management system. Table 5 presents the formulas for estimating these two variables.

Table 5: Formulas for estimating EEE put on the market (POM) and WEEE generated

Variable	Formula
EEE put on the market	Total EEE put on the market (kg) = National production of EEE (kg) + EEE imported (kg) – EEE exported (kg)
WEEE generated	Total WEEE generated (kg) = WEEE collected by the formal sector (kg) + WEEE dispuestos con otros residuos (kg) + WEEE collected by the informal sector (kg) + WEEE with unknown dstination (kg) Where WEEE collected by the formal sector is WEEE nationally managed (kg)+WEEE exported (kg)

Source: (Baldé, et al, 2024) and (International Telecommunications Union, 2024)

The set of indicators suggested below (Table 6 and Table 7) will allow countries to assess the performance of such systems and their contribution to the SDGs, both in maturity and effectiveness. This set of indicators aims to standardize information and provide Latin American countries with a practical tool for measuring progress in key aspects of WEEE management. Its purpose is to support national systems by proposing suggested targets and assessment scales that can be adapted to the reality and capacities of each country. The suggested indicators should be periodically assessed, according to the needs of the country, for monitoring, evaluating, and improving the national system. Annex 3 presents a list of other indicators that governments can use to verify the performance of their systems.

Table 6: List of proposed key performance indicators for measuring the maturity of national WEEE management systems

Category: Maturity		
Indicator: Number of collection points per inhabitant (points/inhabitant)		
Description	Evaluate the availability and accessibility of the collection system.	
Formula	$\text{Number of collection points (points/inhab)} = \frac{\text{Total collection WEEE points}}{\text{Total inhabitants}}$	
Target		**Evaluation scale**
At least 1 collection point per 1 000 inhabitants, including municipal and commercial collection points.		Low: < 1 point/1 000 inhab Medium: 1-3 points/1 000 inhab High: > 3 point/1 000 inhab
Indicator: Number of collection methods implemented		
Description	Reflects the diversity of collection methods used in the management system.	
Formula	$\text{Number of collection methods implemented (dimensionless)} = \sum_{i=1}^{n} \text{Collectin method}_i$	
Target		**Evaluation scale**

Table 6: List of proposed key performance indicators for measuring the maturity of national WEEE management systems (continued)

Implement at least three different collection methods (CAM, mobile points, collection in stores).	Low: 1 mode Medium: 2-3 modes High: > 3 modes
Indicator: Number of categories of WEEE collected at MCC points	
Description	Indicates the level of separation and specialization of the system.
Formula	$$\text{Number of WEEE categories collected in MCC points (dimensionless)} = \sum_{i=1}^{n} \text{Categories of WEEE collected in MCC points}_i$$
Target	**Evaluation scale**
Collect at least four different categories of WEEE at MCC collection points.	Low: < 3 categories Medium: 3-5 High: > 5
Indicator: Number of active citizen feedback mechanisms	
Description	It reflects the level of social engagement and commitment.
Formula	$$\text{Number of active citizen feedback mechanism} = \sum_{i=1}^{n} \text{Active mechanisms for citizen's feedback}_i$$
Target	**Evaluation scale**
Establish at least one active feedback channel (annual survey, telephone line, app).	Low: Without mechanisms or inactive mechanism Medium: 1 active mechanism High: > 1 active mechanism
Indicator: Percentage of population with a collection point less than 1 km away (%)	
Description	It allows for the evaluation of the system's fairness and territorial scope.
Formula	$$\text{Percentage of population with one collection points less than 1 km away} = \frac{\text{\# of inhabitants with on collection points less than 1 km away}}{\text{Total onhabitants}} * 100$$
Target	**Evaluation scale**
Minimum coverage of 80% of the urban population with access to a collection point less than 1 km away	Low: < 60% of the population with one collection point less than 1 km away Medium: 60 – 80% of the population with one collection point less than 1 km away High: > 80% of the population with one collection point less than 1 km away

MCC: Municipal Collection Centers, also known as Clean Points, Eco-Parks, or Recycling Centers
[1] Estimates based on the total costs of collection systems in Colombia.

Source: (Forti, Baldé, & Kuehr, E-waste Statistics: Guidelines on Classifications, Reporting and Indicators, 2018)

Table 7: List of proposed key performance indicators for measuring the effectiveness of national WEEE management systems

Category: Effectiveness		
Indicator: Percentage of WEEE formally collected (%)		
Description	Proportion of WEEE collected compared to estimated generation.	
Formula	$\text{Percentage of WEEE formally collected} = \left(\frac{\text{Total WEEE collected by the formal sector (kg)}}{\text{Total WEE generated (kg)}}\right) x100$	
Target		**Evaluation scale**
Capture at least 40% of the estimated WEEE generated		Low: < 30% Medium: 30-60% High: > 60%
Indicator: Percentage of WEEE disposed of with other waste (%)		
Description	Indicates the effectiveness of the system in preventing incorrect discarding.	
Formula	$\text{Percentage of WEEE disposed of with other waste} = \left(\frac{\text{Total WEEE disposed of with other waste (kg)}}{\text{Total WEEE generated (kg)}}\right) \times 100$	
Target		**Evaluation scale**
Reduce WEEE in mixed waste to less than 20%		Low: > 10% Medium: 5-10% High: < 5%
Indicator: Percentage of WEEE collected in good condition (%)		
Description	Reflects the quality of the material collected for recycling or reuse.	
Formula	$\text{Percentage of WEEE collected in good condition (\%)} = \frac{\text{Total WEEE collected in conditions suitable for reuse or recycling (ton)}}{\text{Total WEEE collected (ton)}} * 100$	
Target		**Evaluation scale**
At least 60% of the WEEE collected must be in reusable or recyclable condition		Low: < 50% Medium: 50-80% High: > 80%
Indicator: Amount of e-waste collected per inhabitant (kg per capita)		
Description	Direct metric of performance in volume per inhabitant.	
Formula	$\text{Amount of WEEE collected per inhabitant (kg/capita)} = \left(\frac{\text{Total collected WEEE by the formal sector (kg)}}{\text{Total inhabitants}}\right)$	
Target		**Evaluation scale**

Table 7: List of proposed key performance indicators for measuring the effectiveness of national WEEE management systems (continued)

Collect at least 3 kg per capita per year	Low: < 2 kg Medium: 2-5 kg High: > 5 kg
Indicator: Total cost of WEEE management (USD/tonne)	
Description	Allows the economic efficiency of the system to be evaluated.
Formula	$$\text{Total WEEE management cost RAEE per weight (USD/tonne)} = \frac{\text{Total collection cost (USD)}}{\text{Total collected WEEE (tonne)}}$$
Target	**Evaluation scale***
Keep management costs below $300 per tonne	Low: > 500 USD/tonne Medium: 300-500 USD/tonne High: 300 USD/tonne

MCC: Municipal Collection Centers, also known as Clean Points, Eco-Parks, or Recycling Centers

* Estimates based on the total costs of collection systems in Colombia.

Source: (Forti, Baldé, & Kuehr, E-waste Statistics: Guidelines on Classifications, Reporting and Indicators, 2018)

Annex 1: Complete list of UNU-KEYS

UNU-KEY	Full Name	EU-6
0001	Central Heating (household-installed)	4
0002	Photovoltaic Panels	4
0101	Professional Heating & Ventilation (excl. cooling equipment)	4
0102	Dishwashers	4
0103	Kitchen (e.g. large furnaces, ovens, cooking equipment)	4
0104	Washing Machines (incl. combined dryers)	4
0105	Dryers (wash dryers, centrifuges)	4
0106	Household Heating & Ventilation (e.g. hoods, ventilators, space heaters)	4
0108	Fridges (incl. combi-fridges)	1
0109	Freezers	1
0111	Air Conditioners (household-installed and portable)	1
0112	Other Cooling (e.g. dehumidifiers, heat pump dryers)	1
0113	Professional Cooling (e.g. large air conditioners, cooling displays)	1
0114	Microwaves (incl. combined, excl. grills)	5
0201	Other Small Household (e.g. small ventilators, irons, clocks, adapters)	5
0202	Food (e.g. toaster, grills, food processing, frying pans)	5
0203	Hot Water (e.g. coffee, tea, water cookers)	5
0204	Vacuum Cleaners (excl. professional)	5
0205	Personal Care (e.g. tooth brushes, haiir dryers, razors)	5
0301	Small IT (e.g. routers, mice, keyboards, external drives & accessories)	6
0302	Desktop personal computers (excl. monitors, accessories)	6
0303	Laptops (incl. tablets)	2
0304	Printers (e.g. scanners, multi-functionals, faxes)	6
0305	Telecom (e.g. [cordless] phones, answering machines)	6
0306	Mobile Phones (incl. smartphones, pagers)	6
0307	Professional IT (e.g. servers, routers, data storage, copiers)	4
0308	Cathode Ray Tube Monitors	2
0309	Flat Display Panel Monitors (LCD, LED)	2
0401	Small Consumer Electronics (e.g. headphones, remote controls)	5
0402	Portable Audio & Video (e.g. MP3, e-readers, car navigation)	5

(continued)

UNU-KEY	Full Name	EU-6
0403	Music instruments, Radio, Hi-Fi (incl. audio sets)	5
0404	Video (e.g. video recorders, DVD, Blu-ray, set-top boxes)	5
0405	Speakers	5
0406	Cameras (e.g. camcorders, photo, and digital still cameras)	5
0407	Cathode Ray Tube TVs	2
0408	Flat Display Panel TVs (LCD, LED, Plasma)	2
0501	Lamps (e.g. pocket, Christmas, excl. LED and incandescent)	5
0502	Compact Fluorescent Lamps (incl. retrofit and non-retrofit)	3
0503	Straight Tube Fluorescent Lamps	3
0504	Special Lamps (e.g. professional mercury, high & low pressure sodium)	3
0505	LED Lamps (incl. retrofit LED lamps and household LED luminaires)	3
0506	Household Luminaires (incl. household incandescent fittings)	5
0507	Professional Luminaires (offices, public space, industry)	5
0601	Household Tools (e.g. drills, saws, high-pressure cleaners, lawnmowers)	5
0602	Professional Tools (e.g. for welding, soldering, milling)	4
0701	Toys (e.g. car racing sets, electric trains, music toys, biking computers)	5
0702	Game Consoles	6
0703	Leisure (e.g. large exercise, sports equipment)	4
0801	Household Medical (e.g. thermometers, blood pressure meters)	5
0802	Professional Medical (e.g. hospital, dentist, diagnostics)	4
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	5
0902	Professional Monitoring & Control (e.g. laboratory, control panels and inver-tors)	4
1001	Non-Cooled Dispensers (e.g. for vending, hot drinks, tickets, money)	4
1002	Cooled Dispensers (e.g. for vending, cold drinks)	1

Annex 2: Equations for estimating WEEE generated

The following equations were taken from the document The following equations were taken from the document Global E-Waste Monitor 2020: Quantities, flows, and the circular economy potential (Forti, Baldé, Kuerh, & Bel, 2020).

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*

$$E\ waste\ generated\ (n) = \sum_{t=t_0}^{n} POM\ (t) * L^{(p)}(t,n)$$

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:

$$L^{(p)}(t, n) = \frac{\alpha}{\beta^{\alpha}} (n - t)^{\alpha-1} e^{-[(n-t)/\beta]^{\alpha}}$$

Annex 3: Other proposed indicators

Indicator	Formula
WEEE management	
Percentage of WEEE informally collected (%)	$\text{Percentage of WEEE informally collected} = \left(\frac{\text{Total WEEE collected by the informal sector (kg)}}{\text{Total WEEE generated (kg)}}\right) x100$
Percentage of WEEE with unknown destination (%)	$\text{Percentage of WEEE with unknown destination} = \left(\frac{\text{Total WEEE with unknown destination (kg)}}{\text{Total WEEE generated (kg)}}\right) x100$
Total WEEE valorized by category within the country (kg)	$\text{Total WEEE valorized by category within the country (kg)} = \sum_{i=1}^{n} \text{WEEE valorized by category by authorized manager (kg)}$
Total WEEE fractions with environmentally safe final disposal within the country (kg)	$\text{Total WEEE fractions with environmentally safe final disposal within the country (kg)} = \sum_{i=1}^{n} \text{WEEE fractions with environmentally safe final disposal by authorized manager (kg)}$
Total hazardous fractions handled in an environmentally safe manner within the country (kg)	$\text{Total hazardous fractions handled in an environmentally safe manner within the country (kg)} = \sum_{i=1}^{n} \text{hazardous fractions handled in an environmentally safe manner within the country by manager (kg)}$
Total WEEE exported (kg)	$\text{Total WEEE exported (kg)} = \sum_{i=1}^{n} \text{WEEE exported (kg)}$
Economics	
Average cost of WEEE valorization ($/kg)	$\text{Cost of WEEE valorization (\$/kg)} = \frac{\sum_{i=1}^{n} \text{Valorisation cost by authorized manager (\$/kg)}}{\text{Total number of authorized managers reporting}}$
Circular economy	
Percentage of WEEE reincorporated for reuse (%)	$\text{Percentage of WEEE reincorporated for reuse (\%)} = \left(\frac{\text{Total WEEE reincorporated for reuse(kg)}}{\text{Total WEEE formally recovered(kg)}}\right) x100$
Percentage of WEEE reconditioned (%)	$\text{Percentage of WEEE reconditioned (\%)(\%)} = \left(\frac{\text{Total reconditioned WEEE (kg)}}{\text{Total WEEE formally recovered(kg)}}\right) x100$
Total parts or fractions recovered from WEEE reincorporated into production or repair processes (kg)	$\text{Total parts or fractions recovered from WEEE reincorporated into production or repair processes (kg)} = \sum_{i=1}^{n} \text{Parts or fractions of WEEE recovered reincorporatd into production or repair processes by manager (kg)}$

Annex 4: Links of interest for the products mentioned in the text

Argentina

- **Office of the President, Legislation, and Official Notices**

https://www.boletinoficial.gob.ar/detalleAviso/primera/276572/20221128

- **Manual for integral management of WEEE:**

https://www.argentina.gob.ar/interior/ambiente/control/manual-raee

- **Technical guide for the management of plastics from WEEE:**

https://bcrc-argentina.net.ar/wp-content/uploads/2025/03/2025-Guia_plasticos_RAEE_final2-1.pdf

Bolivia

- **Law Nr 755 and Supreme Decree 2954, on Integral Management of Waste:**

http://www.gacetaoficialdebolivia.gob.bo/normas/buscar/2954#:~:text=El%20Decreto%20Supremo%202954%20fue%20publicado%20en,forma%20parte%20integrante%20del%20decreto%20en%20Anexo.

- **IBNORCA (2012) Bolivian Standard (NB) 69019, measures for the environmentally safe management of waste electrical and electronic equipment (WEEE):**

https://www.ibnorca.org/tienda/catalogo/detalle-norma/nb-69019:2012-nid=2779-6#:~:text=Alcance,la%20salud%20y%20el%20ambiente.

- **General Regulations on Extended Producer Responsibility – RM 334/2024:**

https://www.mmaya.gob.bo/marco-legal/resoluciones-ministeriales/

Brazil

- **Decree 10.240 on reverse logistics for EEE:**
https://www2.camara.leg.br/legin/fed/decret/2020/decreto-10240-12-fevereiro-2020-789763-normaatualizada-pe.pdf

- **Law 15.088 that modifies Law No. 12.305 on Solid Waste:**
https://www2.camara.leg.br/legin/fed/lei/2025/lei-15088-6-janeiro-2025-796854-publicacaooriginal-174014-pl.html

- **Decree 12,451 on the regulation of exceptions to the prohibition on the importation of solid waste:**
https://www.planalto.gov.br/ccivil_03/_Ato2023-2026/2025/Decreto/D12451.htm [JP1]

Chile

- **Framework Law 20.920 on waste management (WEEE):**
https://economiacircular.mma.gob.cl/ley-rep/

- **Exempt Resolution 03413/2025 on collection and recovery targets and other obligations associated with batteries, rechargeable batteries, and EEE:**
https://economiacircular.mma.gob.cl/wp-content/uploads/2025/06/Res.-Ex.-3413_2025_Aprueba-Ppta-Decreto-Metas-Pilas-y-Aparatos-Electricos-y-Electronicos.pdf

Colombia

- **Exempt Resolution 03413/2025 on collection and recovery targets and other obligations associated with batteries, rechargeable batteries, and EEE:**
https://www.minambiente.gov.co/wp-content/uploads/2021/06/ley-1672-2013.pdf

- **National Policy for Integral Management of WEEE:**
https://www.minambiente.gov.co/wp-content/uploads/2021/10/Politica_RAEE.pdf

- **Colombian Technical Guide for Integral Management of WEEE:**
https://quimicos.minambiente.gov.co/wp-content/uploads/2024/07/Guia-tecnica-para-la-gestion-integral-de-los-RAEE-2023-MinAmbiente-comprimida.pdf

Costa Rica

- **Regulation for the Integral Management of Electronic Waste Nr. 35933-S:**
https://pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=67850&nValor3=80550&strTipM=TC

- **Technical Guide for the Integral Management of WEEE:**
https://www.ministeriodesalud.go.cr/index.php/biblioteca-de-archivos-left/documentos-ministerio-de-salud/ministerio-de-salud/legislacion-sanitaria/gestion-integral-de-residuos/6079-guia-tecnica-para-la-gestion-integral-de-residuos-electronicos-y-electricos/file

Ecuador

- **Ministerial Agreement Nr. MAATE-2022-067, Instructions for the application of EPR in the integral management of WEEE from domestic sources:**
https://sustanciasyresiduos.ambiente.gob.ec/producto/acuerdo-ministerial-maate-2022-067/

- **Ministerial Agreement Nr. MAATE-2022-097 Instructions for the application of EPR in**
- **the integral management of disused discharge lamps and/or LED lamps:**
https://sustanciasyresiduos.ambiente.gob.ec/producto/acuerdo-ministerial-no-maate-2022-097-instructivo-para-la-aplicacion-de-la-responsabilidad-extendida-del-productor-en-la-gestion-integral-de-lamparas-de-descarga-y-o-lamparas-led-en-desuso/

- **Informative guide for WEEE management:**
https://sustanciasyresiduos.ambiente.gob.ec/producto/guia-gestion-de-raee-en-ecuador/

El Salvador

- **Special Law on Waste Collection, Use, and Final Disposal in El Salvador:**
https://www.andres.gob.sv/marco-legal/
#:~:text=En%20este%20contexto%2C%20la%20Ley,de%20vida%20de%20la%20poblaci%C3%B3n.

- **Technical guide for integral management of waste electrical and electronic equipment in El Salvador:**
https://bibliotecaambiental.ambiente.gob.sv/documentos/guia-tecnica-para-la-gestion-integral-de-los-residuos-de-aparatos-electricos-y-electronicos-en-el-salvador-2/

- **Citizen's guide to responsible management of WEEE:**
https://rcc.marn.gob.sv/handle/123456789/195

Mexico

- **General law for the prevention and integral management of waste:**
https://www.diputados.gob.mx/LeyesBiblio/pdf/LGPGIR.pdf

Nicaragua

- **NTON 05002:2022: Mandatory Technical Standard for the Management of Waste Electrical and Electronic Equipment (WEEE):**
http://legislacion.asamblea.gob.ni/Normaweb.nsf/(All)/525394A99E8D36F706258AFD006C1FD9?OpenDocument

Peru

- **Supreme Decree 009-2019, Special Regime for the Management and Handling of Waste Electrical and Electronic Equipment:**
https://www.gob.pe/institucion/minsa/normas-legales/275925-009-2019-sa

- **Supplementary Provisions to Supreme Decree Nr. 009-2019-MINAM, EEE collection targets, and other provisions:**
https://www.gob.pe/institucion/minam/normas-legales/2399619-035-2021-minam

- **Directorate Resolution Nr. 008-2021-EF/54.01, procedures for the management of state assets, including WEEE:**
https://www.gob.pe/institucion/mef/normas-legales/1923817-0008-2021-ef-54-01

- **Technical guide for the management and handling of WEEE:**
https://www.gob.pe/institucion/minam/informes-publicaciones/5973424-guia-tecnica-para-la-gestion-y-manejo-de-raee

- **Various guides on WEEE management:**
https://www.gob.pe/institucion/minam/colecciones/2523-proyecto-cop-raee

European Union

- **Directive 2012/19/EU of the European Parliament and of the Council of July 4, 2012, on waste electrical and electronic equipment (WEEE):**
https://eur-lex.europa.eu/legal-content/ES/ALL/?uri=CELEX:32012L0019

Uruguay

- **Decree Nor. 292/024, Regulations for the Integral Management of WEEE:**
https://www.impo.com.uy/bases/decretos-originales/292-2024

- **Guide for the classification of Electrical and Electronic Equipment (EEE):**
https://www.gub.uy/ministerio-ambiente/comunicacion/publicaciones/guia-para-clasificacion-aparatos-electricos-electronicos-aee

Venezuela

- **Resolution Nr. 022, Official Gazette Nr. 42,871, that establishes the regulations for the**
- **integral and environmentally safe management of WEEE:**
https://accesoalajusticia.org/normas-para-la-gestion-integral-de-los-residuos-de-aparatos-electricos-y-electronicos-raee/

Bibliography

Baldé, C. P., Kuehr, R., Yamamoto, T., McDonald, R., D'Angelo, E., Althaf, S., Wagner, M. (2024). *Observatorio Internacional sobre Residuos Electrónicos 2024*. Geneva/Bonn: International Telecommunication Union (ITU) and United Nations Institute for Training and Research (UNITAR). Available at https://ewastemonitor.info/wp-content/uploads/2024/12/GEM_2024_ES_11_NOV-web.pdf

Baldé, C., Wagner, M., Iattoni, G., & Kuehr, R. (2020 Nations University (UNU) / United Nations Institute for Training and Research (UNITAR) – co-hosting the SCYCLE Programme, Bonn, Germany.). In-depth Review of the WEEE Collection and Targets in the EU-28, Norway, Switzerland, and Iceland, 2020. Bonn: United.

BAN. (2024). *Basel Action Network*. Available at https://www.ban.org/e-stewardship

Bel, J. (2020). Waste collection systems assessed and good practices identified. *D4.5 Guidelines for successful implementation*.

Brown, A., Laubinger, F., & Börkey, P. (2023). *New Aspects of EPR: Extending producer responsibility to additional product groups and challenges throughout the product lifecycle*. OECD Environment Working Papers. Paris: OECD Publishing. doi: https://doi.org/10.1787/cfdc1bdc-en

ELAC Platform. (2011). *Guidelines for the management of Waste Electrical and Electronic Equipment (WEEE) in Latin America: Results of a Regional Public-Private Working Group*.

European Commission. (2015). *Study on WEEE recovery targets, preparation for re-use targets and on the method for calculation of the recovery targets*. European Union.

European Parliament and Council of the European Union. (2008). Directive 2008/98/CE on waste and repealing certain Directives. Available at http://data.europa.eu/eli/dir/2008/98/spa

European Parliament and Council of the European Union. (2012). European Directive 2012/19/EU on waste electrical and electronic equipment (WEEE). Estrasburgo: Strasbourg: Official Journal of the European Union L 197/52 del 24.7.2012.

Forti, V., Baldé, C., & Kuehr, R. (2018). *E-waste Statistics: Guidelines on Classifications, Reporting and Indicators, Secondo Edition*. Bonn: United Nations University, ViE. Available at https://collections.unu.edu/eserv/UNU:6477/RZ_EWaste_Guidelines_LoRes.pdf

Forti, V., Baldé, C., Kuerh, R., & Bel, G. (2020). *Global E-Waste Observatory – 2020:* Quantities, flows, and circular economy potential. Bonn/Geneva/Rotterdam: United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR) – SCYCLE program, International Telecommunication Union (ITU) and International Solid Waste Association (ISWA): https://www.itu.int/en/ITU-D/Environment/Documents/Publications/2022/REM_LATAM_2022_ENG_Final.pdf

Iniciativa Regional para el Reciclaje Inclusivo. (2013). *Characterisation of the informal recycling sector in Latin America and the Caribbean*. Acceture.

International Standarization Organization. (2025). *Online Browsing Platform (OBP)*. Available at ISO 14001:2015(es): https://www.iso.org/obp/ui#iso:std:iso:14001:ed-3:v1:es

International Telecommunication Union. (2018). Recommendation ITU-TL.1021. *Extended producer responsibility – Guidelines for sustainable e-waste management*.

International Telecommunication Union. (2018). Recommendation ITU-T L.1030. *E-waste management framework for countries*.

International Telecommunication Union. (2024). Recommendation ITU-T L.1031. *Guideline for the development of an e-waste management system and achieving the e-waste targets of the Connect 2030 Agenda*.

International Telecommunication Union. (2022). Recommendation ITU-T L.1036. *Scheduled waste management for a base station (inclusive of e-waste)*.

International Telecommunication Union. (2025). Recommendation ITU-T L.1037. *Requirements for the collection, transportation, storage, dismantling, valorization and final disposal of WEEE*. Available at https://www.itu.int/rec/T-REC-L.1037/en

International Telecommunication Union and United Nations Industrial Development Organisation. (2025). *Management of waste electrical and electronic equipment in Latin America: Current situation and outlook*. Geneva. Available at https://www.itu.int/pub/T-ENV-ENV-2025-3

International Telecommunication Union et al. (2015). *Sustainable Management of Waste Electrical and Electronic Equipment in Latin America*. ITU, Basel Convention, CRBAS- Basel Regional Center for South America. Available at https://www.itu.int/dms_pub/itu-t/oth/0b/11/t0b110000273301pdfs.pdf

International Telecommunication Union and World Economic Forum. (2021). *Policy practices for e-waste management: Tools for fair and economically viable extended producer responsibility*. Ginebra. Available at https://www.itu.int/en/ITU-D/Environment/Documents/Publications/2021/Toolkit_Africa_final.pdf

It Recycle. (October 2023). *MEDIUM*. Available at https://itrecycle2020.medium.com/the-role-of-ngos-in-promoting-it-recycling-540eb580becb

Judicial Branch of the Republic of Costa Rica. (s.f.). *Dictionary*. Available at https://diccionariousual.poder-judicial.go.cr/index.php/diccionario

Laubinger, F. e. (2021). *Modulated fees for Extended Producer Responsibility schemes (EPR)*. OECD Environment Working Papers, No. 184. Paris: OECD Publising. doi: https://doi.org/10.1787/2a42f54b-en

Lindhqvist, T., & Ryden, E. (2018). *CASE STUDY OF THE SWEDISH AUTOMOBILE TAKE-BACK*. Lund University.

Ministry of Environment and Sustainable Development of Colombia. (2022). *Resolution 0851 of 2022*. Bogotá. Available at https://www.minambiente.gov.co/wp-content/uploads/2022/08/Resolucion-0851-de-2022.pdf

Ministry of Environment and Sustainable Development of Colombia. (2023). *Technical guide for the integral management of WEEE*. Bogotá, Colombia. Available at https://www.minambiente.gov.co/wp-content/uploads/2021/10/Politica_RAEE.pdf

OECD. (2024). *Extended Producer Responsibility: Basic facts and key principles*. OECD Environment Policy Papers, No. 41. Paris: OECD Publishing. doi: https://doi.org/10.1787/67587b0b-en

OECD. (2001). *Extended Producer Responsibility: A Guidance Manual for Governments*. Paris: OECD Publishing. doi: https://doi.org/10.1787/9789264189867-en

OECD. (2024). *Economic Instruments for the Circular Economy in Italy: Opportunities for Reform*. Paris: OECD Publishing. doi: https://doi.org/10.1787/33e11c28-en

RIOS™ Recycling Industry Operating Standard. (2024). *RIOS Certified Recycler*. Available at RIOS Certified Recycler: https://rioscertification.org/

Schluep, M., Müller, E., & Rochat, D. (October 2012). *e-Waste Assessment Methodology Training & Reference Manual*. Switzerland: EMPA.

Secretariat of the Basel Convention. (2017). *Basel Convention Glossary of Terms*. SBC, UNEP, UN.

STEP. (2018). *Developing Legislative Principles for e-waste policy in developing and emerging countries*. United Nations University/STEP.

STEP. (2020). *Partnerships between the informal and the formal sector for sustainable e-waste management*.

Sustainable Recycling Industries (SRI). (2017). *Extended Producer Responsibility: Assessment Report*. Egypt. Available at https://www.sustainable-recycling.org/reports/extended-producer-responsibility-assessment-report/

Sustainable Recycling Industries (SRI). (2017). *Extended Producer Responsibility: Assessmet Report*. Egypt.

UNACEM. (2024). *UNACEM GROUP*. Available at https://grupounacem.com/noticias/unacem-logro-reemplazar-54-del-combustible-fosil-por-alternativo-para-producir-cemento-en-su-planta-en-ecuador/?utm_source=chatgpt.com

United Nations. (s.f.). United Nations Department for General Assembly and Conference Management. Retrieved from UNTerms: https://unterm.un.org/unterm2/en/view/72c7364d-a5e7-46b5-8f03-f48ca5d44402

United Nations Industrial Development Organization. (2007). *Guía para la gestión integral de los residuos sólidos urbanos*. Vienna. Available at https://downloads.unido.org/ot/47/45/4745768/72852_Gua_Gestin_Integral_de_RSU.pdf

United Nations Environment Program. (1992). *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal*. Basel. Available at http://www.basel.int/portals/4/basel%20convention/docs/text/baselconventiontext-s.pdf

United Nations Environment Program. (2011). Environmentally Sound Management (ESM) Criteria Recommendations. Partnership for Action on Computing Equipment (PACE).

United Nations Statistics Division. (2025). *UNdata A world of information*. Global E-Waste Observatory – 2020: Quantities, flows, and circular economy potential. Bonn/Geneva/ Rotterdam: United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR) – SCYCLE program, International Telecommunication Union (ITU) and International Solid Waste Association (ISWA): https://data.un.org/Glossary.aspx?q=waste

United Nations University. (2018). Solving the E-Waste Problem | Step White Paper. *Developing Legislative Principles for e-waste policy in developing and emerging countries*. Available at https://www.step-initiative.org/files/_documents/whitepapers/StEP_WP_Standard_20140602.pdf

WASTE. (2001). *Gestión Integrada y Sostenible de Residuos – El Concepto*. Países Bajos. Available at https://www.ircwash.org/sites/default/files/Klundert-2001-Integrated.pdfWEEE FORUM. (2020). *An enhanced definition of EPR and the role of all actors*.

World Customs Organization. (s.f.). *Topics: Nomenclature and Classification of Goods*. Available at What is the Harmonized System (HS)?: https://www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx

World Trade Organization. (s.f.). *Glossary of terms*. Retrieved from Guide to "WTO jargon": https://www.wto.org/spanish/thewto_s/glossary_s/glossary_s.htm

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