

Assessment of WEEE management in Greece

Technical Support to EERA and
the EERA Greek Committee

Final Report

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Report For

European Electronics Recyclers Association (EERA) & EERA Greek Committee (ECORESET SA, EKAN SA, KONSTANTINIDIS BROS SA, HELLENIC ENVIRONMENTAL RECYCLING SA, AEGEAN RECYCLING SA)



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Prepared By

Hara Xirou, Natalie Cretsi Bacolas, Alexandros Stamos, Vasiliki Stergiou

Eunomia Research & Consulting IKE

44 Avenue Vasileos Konstantinou

11635, Athens - Greece

Web www.eunomia.co.uk

Quality Review

Vasiliki Stergiou

Project Manager

Approved By

Chris Sherrington

Project Director

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List of Abbreviations

AADE	Independent authority of public revenues
BoD	Board of Directors
C&F	Cooling & Freezing
CRT	Cathode Ray Tubes
EC	European Commission
EEA	European Economic Area
EEE	Electronical and Electric Equipment
EERA	European Electronics Recyclers Association
EMA	Electronic Waste Registry (HMA)
EMPA	Electronic Producers Registry (EMPA)
EOAN	Hellenic Recycling Agency
EPR	Extended Producer Responsibility
EU	European Union
FPD	Flat Panel Display
IT	Information Technology
JMD	Joint Ministerial Decision
LHA	Large Household Appliances
MS	Member States
OECD	Organisation for Economic Co-operation and Development
PoM	Put on the Market
PRO	Producers Responsibility Organisation
PV panels	Photovoltaic panels
SHA	Small Household Appliances
WEEE	Waste Electrical and Electric Equipment
YPEN	Greek Ministry of the Environment and Energy

Executive Summary

Eunomia Research and Consulting is pleased to present this report to the **European Electronics**

Eunomia Research and Consulting is pleased to present this report to the **European Electronics Recyclers Association (EERA)** and the **EERA Greek Committee (ECORESET SA, EKAN SA (ΕΛΛΗΝΙΚΟ ΚΕΝΤΡΟ ΑΝΑΚΥΚΛΩΣΗΣ ΑΒΕΕ), KONSTANTINIDIS BROS SA (ΑΦΟΙ ΚΩΝΣΤΑΝΤΙΝΙΔΗ ΑΒΕΕ), HELLENIC ENVIRONMENTAL RECYCLING SA (ΚΕΠΑ ΑΒΕΤΕ) and AEGEAN RECYCLING SA (ΑΝΑΚΥΚΛΩΣΗ ΑΙΓΑΙΟΥ ΑΒΕΕ))**.

The context is based on the **Waste of Electrical and Electronic Equipment (WEEE) management in Greece** relative to what is permissible under European Union (EU) law. WEEE is considered one of the fastest growing waste streams and the most complex one in terms of management due to their content.

In respect of the research and data collection, Eunomia engaged with various stakeholders from industry and regulatory bodies to solicit data regarding the existing status of WEEE management in Greece, and understand the procedures of the compilation of data, documentation and reporting along with the processes involved in WEEE management, and relevant perspectives on EEE production in the country. The received valuable input has been analysed, assessed, and integrated in this work.

Assessment of the annual quantities - In Greece, the officially reported EEE PoM quantities reached over 154,421 tonnes in 2019 (166,618 tonnes including the reported PV panels). However, there are WEEE flows that are not managed and documented by the formal WEEE management systems. Greece has reached collection rate of 44.6% of EEE PoM in 2018 and 47.3% in 2019 (64,730 tonnes collected, 2019), which are lower than the respective 45% and 65% EU targets. In terms of recovery targets, it seems that Greece has achieved the minimum recovery targets referred to in the WEEE Directive (2012/19/EU) for all categories, apart from Category 3 – Lamps (76.8% < 80% prepared for reuse and recycled target) and Category 4 - Large equipment (77.5% < 80% prepared for reuse and recycled target).

Assessment of the WEEE management and the associated costs Key challenges identified regarding the WEEE waste management in Greece include the free riding, the ‘scavenging’ of products prior to the hand-over to the recycling plants, the classification and reporting in 64 subcategories of WEEE and the significantly high associated treatment costs. Also, challenges were identified with respect to the different levels of responsibilities during collection and transport of WEEE and with respect to the enforcement and monitoring of the implementation of the legal framework of WEEE in Greece.

Free-Riding - There is little data on the scale of free-riding for EEE in Greece, with the main estimations deriving from PROs and EOAN. According to EPR ‘Appliances Recycling SA’ estimations, EPR fees are currently unpaid in Greece for around up to 15% of the EEE PoM quantities. Based on the above, total EEE PoM in Greece (including free-riding) could be roughly estimated at about 180,000 tonnes (considering 154,421 tonnes officially reported EEE PoM in 2019). Lack of adequate monitoring of free riding is related to (among others): the lack of resources of the responsible inspections department EOAN, lack of communication/ cooperation between the relevant public agencies (EOAN, AADE, etc), time consuming and lengthy procedures to impose the fee and the inadequate monitoring of WEEE imports.

Scavenging - The widespread selective scavenging of products, components and materials at collection points and/or during the transportation from the carriers to a recycling plant, hinders overall quality in treatment and has both environmental and economic consequences. In this respect, among others, it is proposed that it is mandatory for collectors as well as scrap dealers working in the “grey market” to receive a WEEELABEX certificate.

Classification and reporting - From reference year 2019 onwards member states are obliged to report according to the six categories methodology. However, member states may still introduce a number of sub-categories for administrative and pricing purposes. According to EC, Member States and other relevant actors are free to design and use additional (sub-) categories, as long as reporting to the Commission is in line with the requirements of the Directive. Since 2019, Greece **uses the six categories** while the EPR Appliances Recycling considers the classification **in 64 subcategories by the recyclers** which is posing a considerable operational, administrative and cost burden, hindering the sorting and handling processes and increasing the associated costs. Greater harmonisation across EU member states is proposed and common standards in EU level.

Associated costs - The real operational costs of recycling are estimated at more than 200EUR/tn roughly on average (based on the estimations and cost figures provided by participants in this study) and exceed the WEEE treatment costs in Greece considered by the PRO 42.6 €/t in 2019 and 47.2 €/t in 2018. Moreover, in EU level, the average costs associated with the WEEE treatment are estimated at (reference year 2018): ~200 €/tn for Cooling & Freezing equipment (Category 1), ~285 €/tn for Cathode Ray Tubes and ~155 €/tn for Flat Panel Displays (Category 2), ~120 €/tn for Large Household Equipment (Category 4) and ~270 €/tn for Small Equipment and IT (Categories 5 & 6) (according to a recent study conducted by the United Nations University - VIE SCYCLE (*“WEEE Recycling Economics: The shortcomings of the current business model”*)).

Development of proposals - Based on the analysis, a set of strategic recommendations were developed:

- Improvement of the small WEEE collection.
- Bring metal scrap/illegal treatment to the WEEE reporting loop and tackle scavenging.
- Ensure that WEEE stays intact until its proper treatment.
- Greater harmonization of the classification in subcategories of WEEE across the EU and simplification of the current subcategories classification in Greece with respect to avoiding unnecessary bureaucratic burden while ensuring the necessary data reporting.
- Harmonize the calculation methodology of the WEEE targets across the EU.
- Ensure the proper collection and treatment of PV panels.
- Enforce the Greek legal framework and monitoring.
- Raise Communication and public awareness.
- Promote the circular economy model - reuse & recovery of the critical raw materials.

A detailed close-up photograph of a leaf's venation. The image shows a network of dark, branching veins against a light green, textured background. The veins are arranged in a complex, interconnected pattern, with several prominent, thicker veins running across the frame. The overall appearance is that of a healthy, well-vascularized leaf.

1.0

Introduction

1.1 Scope and Objectives

Eunomia Research and Consulting is pleased to present this report to the **European Electronics Recyclers Association (EERA)** and the **EERA Greek Committee (ECORESET SA, EKAN SA (ΕΛΛΗΝΙΚΟ ΚΕΝΤΡΟ ΑΝΑΚΥΚΛΩΣΗΣ ΑΒΕΕ), KONSTANTINIDIS BROS SA (ΑΦΟΙ ΚΩΝΣΤΑΝΤΙΝΙΔΗ ΑΒΕΕ), HELLENIC ENVIRONMENTAL RECYCLING SA (ΚΕΠΑ ΑΒΕΤΕ) and AEGEAN RECYCLING SA (ΑΝΑΚΥΚΛΩΣΗ ΑΙΓΑΙΟΥ ΑΒΕΕ)**).

The context is based on the **Waste of Electrical and Electronic Equipment (WEEE) management in Greece** relative to what is permissible under European Union (EU) law. The focus of the work is on the WEEE management value chain and particularly **Table 1-1**. presents the project objectives and tasks.

Table 1-1 Project Objectives and Tasks

Task 1 - Assessment of the annual quantities of WEEE
<ul style="list-style-type: none"> - Assessment of the quantities of EEE put on the Greek market (PoM – mainly imported /produced) including those that are imported but are not officially registered (under EMPA), therefore not considered within the PoM calculation. - Examine whether there are deviations from the existing data estimations/calculations for WEEE in Greece. - Methodology to improve the calculation/assessment of the achievement of the WEEE minimum collection and recovery targets.
Task 2 - Assessment of the costs associated with WEEE management
<ul style="list-style-type: none"> - Key steps associated to WEEE management, covering: collection infrastructure, dismantling and separation and treatment processes including decontamination. - Assessment of the costs associated with each step in the value chain. - Key stakeholders involved in each step. - Challenges and opportunities arising from each step.

This report constitutes the final report presenting the outputs of Task 1 and Task 2.

Table 1-2 presents the structure of this report.

Table 1-2 Report Structure

<p>1. Methodological approach</p> <ul style="list-style-type: none"> ○ Research and Data collection - Section 0 ○ Study Limitations - Section 1.3 ○ Existing EU and Greek Policy Context - Section 1.4 <p>2. Assessment of the annual quantities of WEEE in Greece</p> <ul style="list-style-type: none"> ○ Quantities Put on the Market (PoM) – Section 2.1
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- Compliant Producers and Free riding - [Section 2.2](#)
- Collection of WEEE - [Section 2.3](#)
- Recycling and Recovery of WEEE - [Section 2.4](#)

3. Assessment of the costs associated with WEEE management

- Legislative Context and EU guidance on the necessary costs and EPR - [Sections 3.1.1](#)
- WEEE Value Chain and Cost Structure - [Section 3.2](#)
- Assessment of WEEE management costs in Greece - [Section 3.3](#)

4. Development of Proposals - [Section 4.0](#)

- Improve Small WEEE Collection
- Bring metal scrap/illegal treatment to the WEEE reporting loop
- Ensure WEEE stays intact until its proper treatment
- Eliminate scavenging
- Harmonize the calculation methodology of the WEEE targets across the EU
- Properly collect and treat PV panels
- Enforce the Greek legal framework and monitoring
- Raise Communication and public awareness
- Promote the circular economy model - reuse & recovery of the Critical raw materials

5. Appendices

- Supporting Documents (letter of support, questionnaires) - [Appendix A 1.1](#)
- Necessary costs and the extended producer responsibility costs - [A 1.2](#)
- Non-exhaustive List of WEEE - [Appendix A 1.3](#)

1.2 Research and Data Collection

In respect of the research and data collection, Eunomia engaged with various stakeholders from industry and regulatory bodies to solicit data regarding the existing status of WEEE management in Greece, and understand the procedures of the compilation of data, documentation and reporting along with the processes involved in WEEE management, and relevant perspectives on EEE production in the country.

The received valuable input has been analysed, assessed, and integrated in this work. A range of relevant shareholders were contacted by email or/and structured telephone and online interviews and several supporting documents were prepared to enable effective data gathering. The supporting documents prepared - a formal letter for the provision of the necessary data, and templates of the Questionnaires per type of stakeholder –are provided in the [Appendix 1.1 Supporting Documents](#). **Table 1-1** presents the key stakeholders contacted and the sources of data.

Table 1-3 Primary & Secondary Research sources and Key Stakeholders contacted

Primary Research (stakeholder engagement through interviews and by email)

The stakeholders contacted through structured interviews or/and via email include:

- the **Ministry of Environment and Energy (YPEN)** - Directorate of Waste Management, Department of Waste Registry, Licensing and Statistics
- the **Hellenic Recycling Agency (EOAN)**¹ – Τμήμα ΣΕΔ & Διεύθυνση Επιθεωρήσεων και Ελέγχων
- **Recycling facilities for WEEE in Greece** (which treated >75% of WEEE collected in 2020²):
 - **ECORESET SA** (located in Attica Region)
 - **EKAN SA** (ΕΛΛΗΝΙΚΟ ΚΕΝΤΡΟ ΑΝΑΚΥΚΛΩΣΗΣ ΑΒΕΕ) (located in Peloponnese Region)
 - **KONSTANTINIDIS BROS SA** (ΑΦΟΙ ΚΩΝΣΤΑΝΤΙΝΙΔΗ ΑΒΕΕ) (located in Thessaloniki, Central Macedonia Region)
 - **HELLENIC ENVIRONMENTAL RECYCLING SA** (ΚΕΠΑ ΑΒΕΤΕ) (located in Larissa, Thessaly Region)
 - **AEGEAN RECYCLING SA** (ΑΝΑΚΥΚΛΩΣΗ ΑΙΓΑΙΟΥ ΑΒΕΕ) (located in Lesbos island, North Aegean Region)
- the existing **EPR schemes for WEEE in Greece**
 - **Appliances Recycling SA** (ΑΝΑΚΥΚΛΩΣΗ ΣΥΣΚΕΥΩΝ ΑΕ)
 - **Fotokyklosi** (ΦΩΤΟΚΥΚΛΩΣΗ ΑΕ)

Secondary Research (literature review)

With respect to this study, important input, publications, and reports were considered, such as:

- **Reports provided by the European Electronics Recyclers Association (EERA)**³ and **other reports**
 - Magalini F. & Huisman J. (2018), WEEE Recycling Economics: The shortcomings of the current business model, United nations University, UnU - VIE SCYCIE.
 - Magalini F. & Stillhart R. (2019), SCAVENGING OF WEEE: environmental and economic consequences for society, SOFIES.
- **Strategic Plans and Annual Reports for WEEE in Greece:**
 - The National Waste Management Plan (2020-2030)⁴
 - Annual Reports from EOAN
 - Annual Reports from the EPR schemes for WEEE in Greece
- **Eunomia Research & Consulting previous work and reports**
 - Report for the European Commission (2022) ‘Online Free-riding and EPR: Study on the feasibility of regulatory and technical measures with the objective of improving Extended Producer Responsibility compliance and tackling free-riding in the case of online sales’
 - Hilton, M. et al. (2019), ‘Extended Producer Responsibility (EPR) and the Impact of Online Sales’, OECD Environmental Working Papers, No. 142, OECD Publishing, Paris.⁵

¹ <https://www.eoan.gr/>

² Based on 2020 data received from EOAN, the recycling facilities and the Appliances Recycling SA EPR scheme for WEEE.

³ <https://www.eera-recyclers.com/publications>

⁴ <https://www.eoan.gr/%CE%B5%CF%83%CE%B4%CE%B1-2020-2030/>

⁵ <https://www.eunomia.co.uk/reports-tools/extended-producer-responsibility-online-sales/> & <https://www.eunomia.co.uk/tackling-freeriding-epr-online-sales/>

- **Other Reports** (by UNITAR, etc.)
 - C.P. Balde , G. Iattoni , C. Xu, T. Yamamoto, Update of WEEE Collection Rates, Targets, Flows, and Hoarding 2021 in the EU27, United Kingdom, Norway, Switzerland, and Iceland, 2022, SCYCLE Programme, United Nations Institute for Training and Research
 - C.P. Balde, E. D’Angelo, V. Luda O. Deubzer, and R. Kuehr (2022), Global Transboundary E-waste Flows Monitor - 2022, United Nations Institute for Training and Research (UNITAR), Bonn, Germany
- Data from the Hellenic Association of Photovoltaic Companies⁶ (It is noted that the relevant data were shared by the Hellenic Recycling Agency)
- Data from the Hellenic Statistical Authority (ELSTAT)⁷ (It is noted that limited data were available by ELSTAT)
- Data from the ‘Stop waste crime’ LIFE PROWhIBIT⁸ project management team (coordinating beneficiary: the Ministry of Environment and Energy and the responsible General Directorate of Corps of Inspectors) (It is noted that limited data were available)

Finally, a **Site visit** at the premises of a recycling facility for WEEE in Greece (in August 2022) was conducted; the site visit provided valuable insight into the WEEE treatment processes which might not have been available otherwise.

In terms of data collection, it is noted that Confidentiality Agreements were signed between Eunomia and the recycling facilities that shared input⁹, so data are deemed to be confidential, and intended to be used only for the purposes of this project. In particular, data presented in this report are aggregated and anonymised. However, it is noted that there were several challenges with respect to the data collection (lack of data, especially with respect to the WEEE management costs, etc.) which are further analysed in the following section ([Section 1.3](#)).

1.3 Study Limitations

The project team ensured to collate all data available in the public domain and data provided by the key stakeholders. Eunomia’s approach to this study and particularly the costs associated with WEEE management is informed by an agreed understanding that what is sought is a strategic analysis and recommendations regarding the WEEE Management in Greece, considering the limited data availability.

Key challenges involve lack of quantitative data especially regarding the costs associated with WEEE management which fall under commercial confidentiality as such there were limited or not available) and inconsistency of the data received from various sources which made it difficult to compare and assess.

1.4 Existing Policy Context

This section presents the main EU policies and national legislation regarding WEEE management in Greece.

⁶ <https://helapco.gr/en/>

⁷ <https://www.statistics.gr/en/home/>

⁸ <https://stopwastecrime.gr/en/partners/#>

⁹ 4 out of the 5 recycling facilities for WEEE in Greece that were contacted provided data.

1.4.1 European Policies and Targets set

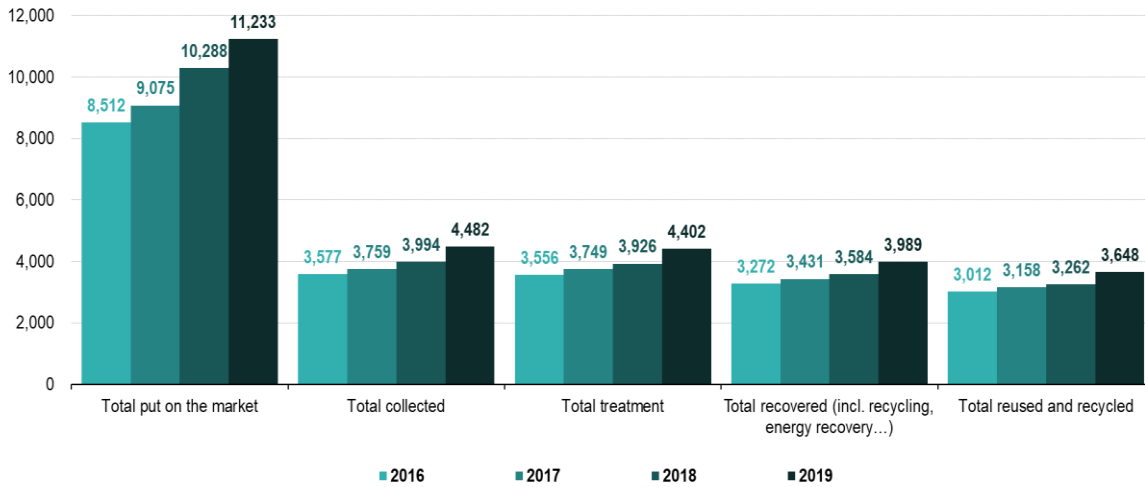
Table 1-4 Key EU policies on WEEE

Key EU WEEE related policies
<ul style="list-style-type: none">▪ Waste Framework Directive - Directive 851/2018/EU of the European Parliament and of the Council of 30 May of 2018 amending Directive 2008/98/EC on waste Text with EEA relevance▪ WEEE Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE) (recast) Text with EEA relevance▪ RoHS Directive - Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast) (Text with EEA relevance)▪ EC/2017/699 - Commission Implementing Regulation (EU) 2017/699 of 18 April 2017 establishing a common methodology for the calculation of the weight of electrical and electronic equipment (EEE) put on the market of each Member State and a common methodology for the calculation of the quantity of waste electrical and electronic equipment (WEEE) generated by weight in each Member State (Text with EEA relevance.)▪ Directive (EU) 2018/849 - Amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment▪ Commission Implementing Regulation (EU) 2019/290 - Establishing the format for registration and reporting of producers of electrical and electronic equipment to the register (Text with EEA relevance.) Directive (EU) 2018/849 - Amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment▪ Commission Decision 2006/690/EC - Commission Decision of 12 October 2006 amending, for the purposes of adapting to technical progress, the Annex to Directive 2002/95/EC of the European Parliament and of the Council as regards exemptions for applications of lead in crystal glass (notified under document number C(2006) 4789) (Text with EEA relevance)▪ Commission Implementing Decision (EU) 2019/2193 - Laying down rules for the calculation, verification and reporting of data and establishing data formats for the purposes of Directive 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE)

1.4.1.1 European existing status

WEEE is considered one of the fastest growing waste streams and the most complex one in terms of management due to their content in hazardous materials as well as valuable materials (e.g. precious metals) along with the specific and expensive management processes required to achieve recovery as hazardous substances need specific and expensive management to avoid environmental and health hazards. From 2016 to 2019 the amount of EEE PoM shows a continuous growth (32%) reaching up to 12 million tonnes in 2019, a growth shown also in collection and treatment (Figure 1-1).

Electrical and electronic equipment (EEE) put on the market and waste EEE collected, treated, recovered, recycled and prepared for reuse, EU, 2016–2019
(thousand tonnes)



Note: 2019 data, as well as 2018 data for put on the market and 2011 data for reused and recycled EEE waste: Eurostat estimates
Source: Eurostat (online data code: env_waseleeeos and env_waselee)

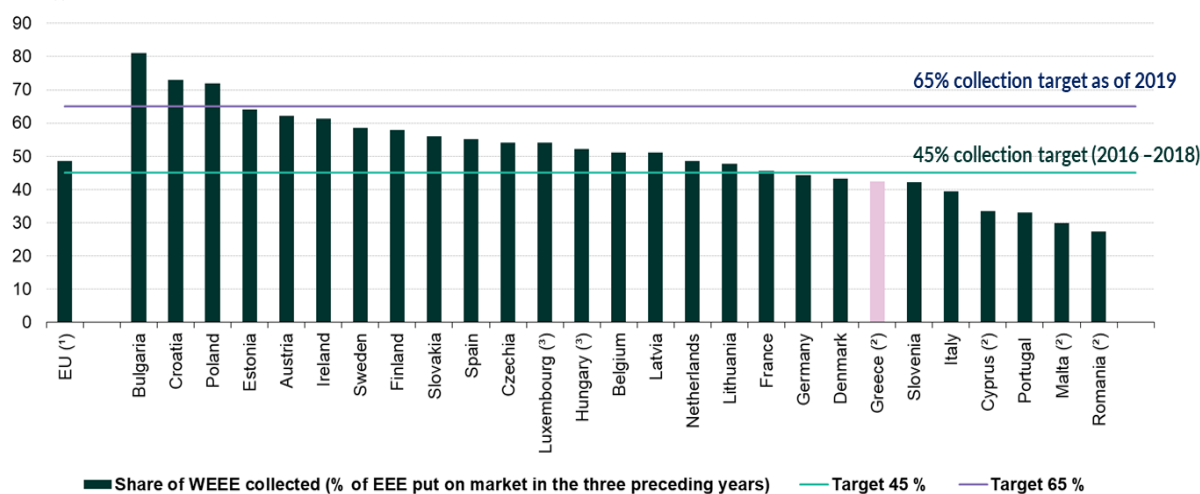
Figure 1-1 EEE PoM and WEEE collected, treated, recovered, recycled, and prepared for re-use in the EU

Regarding the collection rate, the majority of the EU member States (18 out of the 27) have achieved the 45% target, with only three MS (Bulgaria, Croatia, Poland) achieving the 65% collection target with the collection rate ranging between 72% to 81% and three MS (Estonia, Austria and Ireland) nearly achieving it ranging from 61.3 % % to 64.2). Greece has reached collection rate of 44.6%in 2018 and 47.3% in 2019.

Despite the high collection rates of the named MS, for 2019 the average collection rate for the EU (27) is low, reaching up to 48.5% (calculated by the average WEEE volume collected in relation to the average weight of EEE put on the market the three proceeding years – 2016 to 2018) higher than the 45% target but close to 20% lower than the 65% target set by the 2012 WEEE Directive (Figure 1-2).

Total collection rate for waste electrical and electronic equipment (WEEE), 2019

(% of the average weight of WEEE put on the market in the three preceding years (2016-2018))



(*) Eurostat estimate.

(‡) Data on collection 2018 instead of 2019; % of average weight of WEEE put on the market in years 2015-2017.

(‡) 65 % target not applicable, since Luxembourg and Hungary have chosen the calculation methodology based on share of WEEE generated. See Figure 2b.

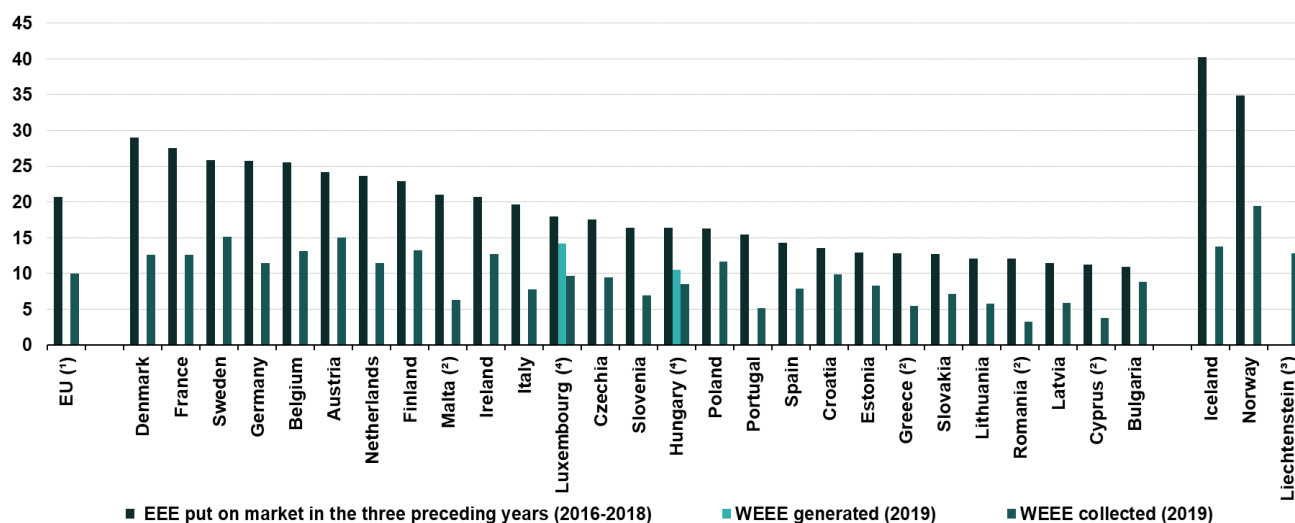
Figure 1-2 Total collection rate for waste WEEE 2019 (Source: Eurostat, 2022¹⁰)

The WEEE collected in 2019 in the EU was estimated at 10kg per inhabitant, higher than the 4kg per inhabitant target of 2015, while the average WEEE put on the market over the period 2016-2018 was estimated at 20.7 kilograms per inhabitant. The differences in WEEE in the collected amounts reflect the differences in WEEE consumption level between countries and the differences in the performances of the respective waste collection schemes.¹¹

¹⁰ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics_-_electrical_and_electronic_equipment#Electronic_equipment_.28WEEE.29_put_on_the_market_and_WEEE_collected_by_country

¹¹ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics_-_electrical_and_electronic_equipment&oldid=556612#Electronic_equipment_.28WEEE.29_put_on_the_market_and_WEEE_processed_in_the_EU

Electrical and electronic equipment (EEE) put on the market in the three preceding years (2016-2018), waste EEE generated in 2019 and waste EEE collected in 2019
(kilograms per inhabitant)



Note: Countries are ranked based on data on EEE put on the market in the three preceding years.

(¹) Eurostat estimate.

(²) Data on collection 2018 instead of 2019; average weight of EEE put on the market in years 2015-2017.

(³) Put on the market and WEEE generated not applicable.

(⁴) Collection rate calculation methodology based on share of WEEE generated.

Source: Eurostat (online data code: env_waseleees and env_waselee)

Figure 1-3 EEE PoM (2016-2018), WEEE generated/PoM and WEEE collected in 2019

Source: Eurostat, 2022

1.4.2 Greek Legal framework on WEEE

1.4.2.1 Key Greek laws and policies

In Greece WEEE management is subject to Extended Producer Responsibility and it is undertaken by the responsible producers either individually through the organisation of take-back systems, or through Producer Responsibility Organisations (PROs). The main Greek legislation applicable to (W)EEE management transposing EU legislation is presented in Table 1-3.

Table 1-5 Key Greek Legal Framework on (W)EEE management

Key Greek Legal framework
<ul style="list-style-type: none"> Law 4819/2021 (ΦΕΚ 129/Α/23.7.2021) - Holistic framework on waste management, transposition of Directives 2018/ 851 and 2018/852 of the European Parliament and European Council on the 30th of March 2018. JMD ΥΠΕΝ/ΔΔΑ/81492/1651 (ΦΕΚ 4382/Β/22.9.2021) - Transposition of Directive (EE) 2018/849 of the European Parliament and Council of the 30th March 2018 JMD ΥΠΕΝ/ΔΔΑ/81490/1650/2021 (ΦΕΚ 4382/Β/22.9.2021) - Transposition of Directive 2018/849 of the European Parliament and the Council of the 30th March 2018, on the amendment of Directives 2000/53/EC End of life vehicles and 2006/66/EC regarding batteries and accumulators, and 2012/19/EU regarding WEEE

- National Waste Management Plan 2020-2030 (ΦΕΚ 185/Α/29.9. 2020) and the latest revision of October of 2022
- JMD Η.Π.23615/651/Ε.103 (ΦΕΚ 1184/Β/9-5-2014) - Defining rules, terms and conditions to waste management of electrical and electronic equipment (WEEE) in compliance with Directive 2012/19/EC
- Presidential Decree 15/2006 (ΦΕΚ 12/Α/3.2.2006) - Amendment of Presidential Decree 117/2004 (Α' 82), in compliance with Directive 2003/108/EC
- Presidential Decree 117/2004 (ΦΕΚ 82/Α/5.3.2004) - Measures, terms and programme of WEEE management, in compliance with Directives 2002/95/EC and 2002/96/EC

1.4.2.2 EEE Categories and Targets

The recast WEEE Directive stipulates the reporting of six (6) EEE categories to be reported by MS starting from 2019, instead of ten (10) that were previously reported, based on the rules set out in Commission Implementing Decision 2019/2193, on calculation, verification and reporting of data.

Also, the recast of the WEEE Directive (2012/19/EU) introduced high targets of the collection, recycling, and recovery of WEEE, to be achieved from each Member State (MS) (including Greece), and to submit their results to Eurostat annually. The set of targets from 2016 onwards are presented below.

Table 1-6 Collection Targets according to WEEE Directive (2012/19/EU)

Applicable	Collection Targets
From 2015 onwards	At least 4 kg / capita of WEEE from private households OR the same weight as the average amount of WEEE collected in that MS in the three preceding years; (whichever of the two figures that is highest shall continue to apply)
From 2016 to 2018	45% of EEE PoM Calculated based on the total weight of WEEE collected; and the average weight of EEE put on the market in the three preceding years.
As of 2019	65% of EEE PoM Calculated based on the total weight of WEEE collected; and the average weight of EEE put on the market in the three preceding years. OR 85% of WEEE generated on the territory of that Member State (up to MS to define their way of calculation)

Table 1-7 Categories of EEE covered by Directive 2012/94/EU and minimum Recovery Targets applicable by category from 15 August 2018

WEEE categories	Minimum Recovery Targets	
	shall be Recovered	shall be Prepared for Re-use and Recycled
Category 1 -Temperature exchange equipment	85%	80%
Category 2 - Screens, monitors and equipment containing screens having a surface greater than 100 cm ²	80%	70%
Category 3 – Lamps	-	80%

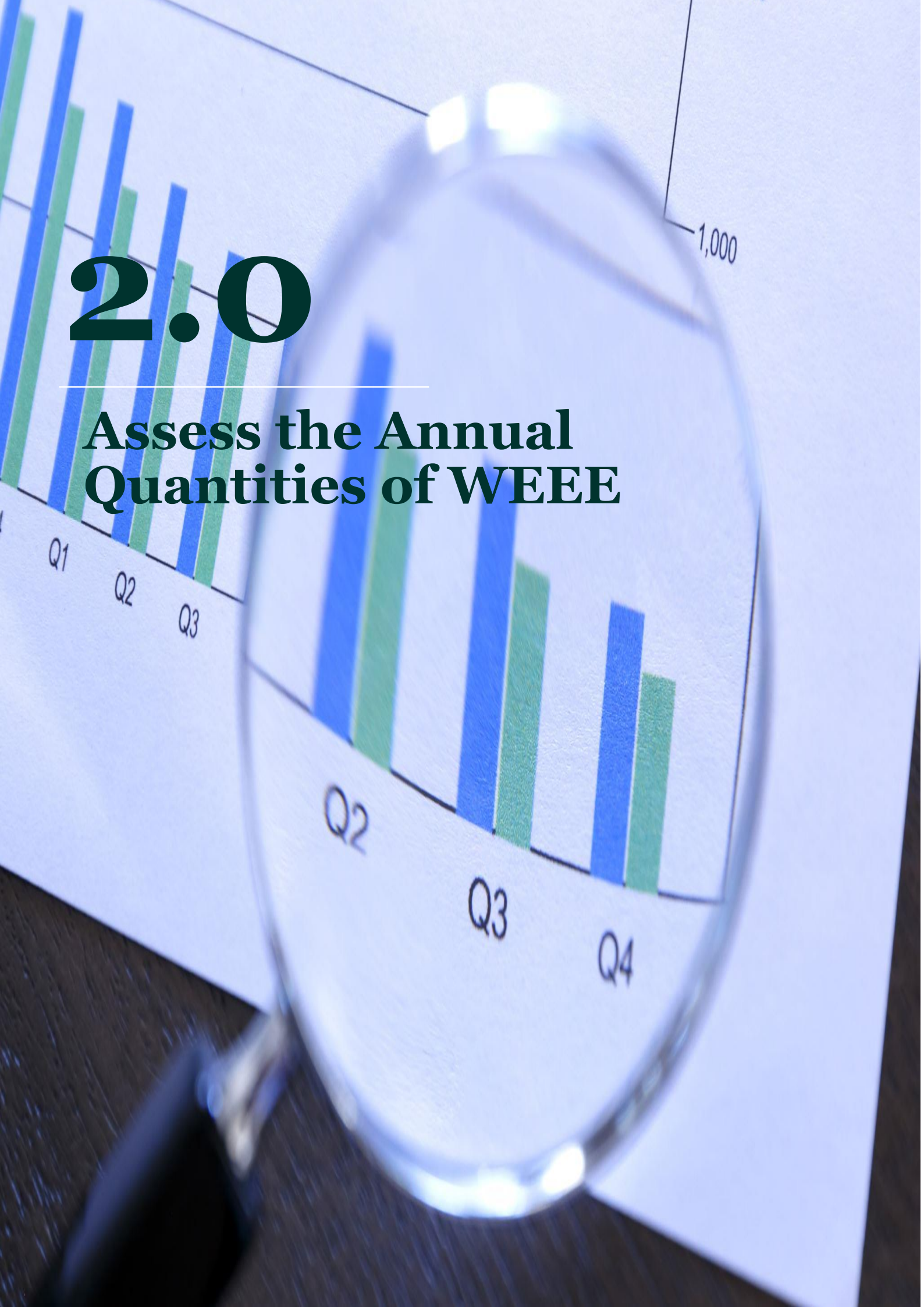
WEEE categories	Minimum Recovery Targets	
Category 4 - Large equipment (any external dimension more than 50 cm)	85%	80%
Category 4b – PV panels*	-	-
Category 5 - Small equipment (no external dimension more than 50 cm)	75%	55%
Category 6 Small IT equipment and telecommunication equipment (no external dimension more than 50 cm) e.g. Mobile phones	75%	55%

*PV panels fall under the 4th category, however category 5 also includes small equipment with integrated photovoltaic panels. The Directive does not set a specific target for PV panels

The Directive does not apply to specified items regarding the safety or defence of a MS, medical equipment, and equipment designed to be sent into space. A non-exhaustive list of the EEE categories along with the excluded categories from the WEEE Directive is provided in the Appendix.

2.0

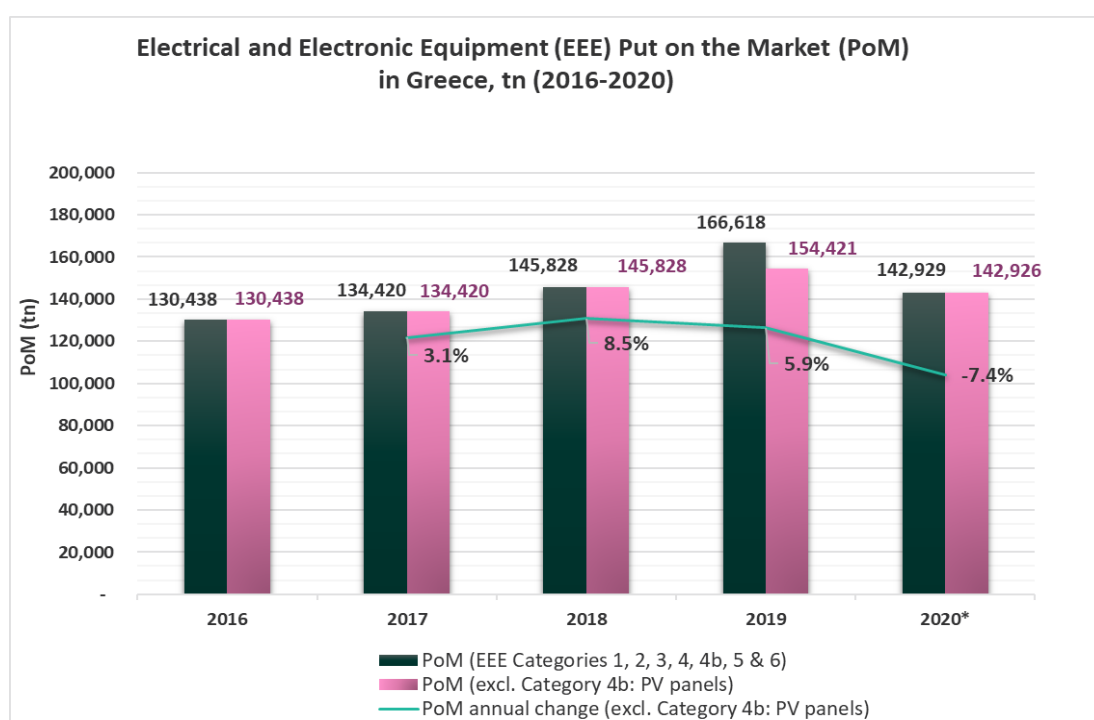
Assess the Annual Quantities of WEEE



2.1 Quantities Put on the Greek Market

2.1.1 Preface – an overview of the Greek EEE market and of the EEE quantities PoM in Greece

WEEE is an emerging waste stream within the EU and at a global level due to the development and increase in consumption of electrical and electronic items. Figure 2-1 presents the officially reported annual quantities of EEE put on the Greek Market for the years 2016-2020. In 2019, the officially reported EEE PoM quantities reached over **154,421 tonnes** (166,618 tonnes including the reported PV panels)¹².



*2020 from Annual reports of the two PROs & 2020 PoM from EOAN – awaiting approval from EOAN BoD (It is noted that the PROs annual reports are submitted to EOAN)

Figure 2-1 EEE put on the Greek market over 2016 – 2020 ¹³

Free-Riding

However, there are WEEE flows that are not managed and documented by the formal WEEE management systems. The enforcement of EPR obligation on producers is one of the most common problems in Greece, as not all producers are fulfilling their obligations. There is little data on the scale of free-riding for EEE in Greece, with the main estimations deriving from PROs and EOAN estimations. According to 2018 data

¹² With respect to the analysis of this study, the 2019 data is considered (the most recent officially reported data provided by the responsible Greek Authorities). The decrease of the PoM quantities between 2019-2020 could be attributed to the pandemic.

¹³ Source: EOAN (Υπ. Αρ 4876/16-09-2022 έγγραφο) & PROs Annual reports 2019 & 2020 (Απολογιστικές Εκθέσεις 2019, 2020 Ανακύκλωση Συσκευών & Φωτοκύκλωση)

based on a recent OECD study¹⁴, EPR fees are currently unpaid for around 5-10% of the value of the EEE put on the market in OECD countries. Based on the EPR 'Appliances Recycling SA' estimations (2020 annual report and 8/2022 response to questionnaire)¹⁵, EPR fees are currently unpaid in Greece for around up to **15% of the EEE PoM quantities**. Based on the above, **total EEE PoM in Greece (including free-riding) could be roughly estimated at about 180,000 tonnes** (considering 154,421 tonnes officially reported EEE PoM in 2019 - Figure 2-1). Moreover, it is noted that based on the recent publication *'The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential'* by UNU/UNITAR, ITU & ISWA¹⁶, Greece is identified as one of the countries in Southern Europe with the highest e-waste generation which is estimated at 181,000 tonnes in 2019. Further analysis on the free-riding is provided in Section 2.2.

Changes in quantities between 2017-2020

According to Figure 2-1, the sales of EEE in Greece show continuous annual growth of 3.1%, 8.5% and 5.9% respectively for the years from 2017 up to 2019 based on the data provided by EOAN. The main reasons for this growth, following a period where the market was shrinking due to the financial crisis, could be attributed to the stabilisation of the financial environment in the country along with the increase of tourism and thus of the requirements of tourist accommodation (Airbnb, rooms to let etc.) which have been equipped with new EEE as well as EU and nationally funded energy saving programs (Exoikonomo) to improve the energy class of households providing incentives to poor and vulnerable households in the form of an increased grant rate. Despite the continuous growth in EEE PoM quantities overall over the period of 2017-2019, in 2020 there was a decrease of 7.4% (PoM without the PV panels) which could be attributed to the covid-19 crisis. It is noted that the 2020 PoM data provided data from EOAN have not yet been approved by the Board of Directors of the organisation.

It is also noted that the EEE PoM quantities of 2018 provided by EOAN show a small deviation from the 2018 PoM data that were presented in ESDA 2020-2030 (National Waste Management Plan). In ESDA 2020-2030, published in 2020, the EEE PoM quantities were estimated at 143,045tn, slightly lower than the quantities provided by EOAN (145,828 tn, Figure 2-1).

Category 4b: PV panels

Amongst the categories falling under the WEEE Directive is the management of photovoltaic (PV) panels, due to the continuous increase of their application and the expectations for increase as the EU is trying to decarbonise and to transition to a net zero economy. The recast WEEE Directive, mandates that all MS should include PV panels producers under the EPR obligations, to ensure their proper collection and treatment. As such PV panels are to be reported by each MS regarding their separate collection and treatment and in priority along with temperature exchange equipment containing ozone-depleting substances and fluorinated greenhouse gases (category 1), fluorescent lamps containing mercury

¹⁴ Hilton, M. et al. (2019), 'Extended Producer Responsibility (EPR) and the Impact of Online Sales', OECD Environmental Working Papers, No. 142, OECD Publishing, Paris.

¹⁵ Sources:

- 5/8/2022 'Appliances Recycling SA' response to questionnaire

- EPR 'Appliances Recycling SA' 2020 annual report ("[...] μία εκτίμηση με επιφύλαξη, καθώς δε μπορεί να βασιστεί σε καταγεγραμμένα επίσημα στοιχεία, είναι ότι πιθανά οι ποσότητες ΗΗΕ που δεν καταγράφονται (κατά βάρος) να είναι μεταξύ 5% και του 15%.")

¹⁶ Forti V., Balde C.P., Kuehr R., Bel G. The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential. United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR) - co-hosted SCYCLE Programme, International Telecommunication Union (ITU) & International Solid Waste Association (ISWA), Bonn/Geneva/Rotterdam.

https://www.researchgate.net/publication/342783104_The_Global_E-waste_Monitor_2020_Quantities_flows_and_the_circular_economy_potential

(category 3), and small equipment (categories 5 and 6).¹⁷ PV panels, according to the Decision (EU) 2019/2193 fall under the fourth (4th) category of the six categories of WEEE, as a subcategory (category 4b).

Following the 2019/2193 Decision, in 2019, in order to understand the PV panels market in Greece and to set their management accordingly, EOAN approached the Hellenic Association of Photovoltaic Companies (HELAPCO), representing the major active PV companies in production, trading, installation and maintenance of photovoltaic systems in Greece, and a member of SolarPower Europe. The association provided an estimate of 12,196.97 tonnes of PV panels PoM in Greece in 2019. Up until 2020 HELAPCO and PV panels producers in general weren't under any EPR scheme, a situation which changed in 2020 when HELAPCO joined one of the two EPR schemes on WEEE in Greece, Fotokiklosi S.A.

2.1.2 Quantities PoM per category of Electric and Electronic Equipment

In order to assess the (W)EEE existing situation in Greece, a deeper assessment of the PoM EEE quantities has been made at a per category level (Figure 2-2 and Table 2-1) based on the six categories that the recast of the WEEE Directive has set for reporting.

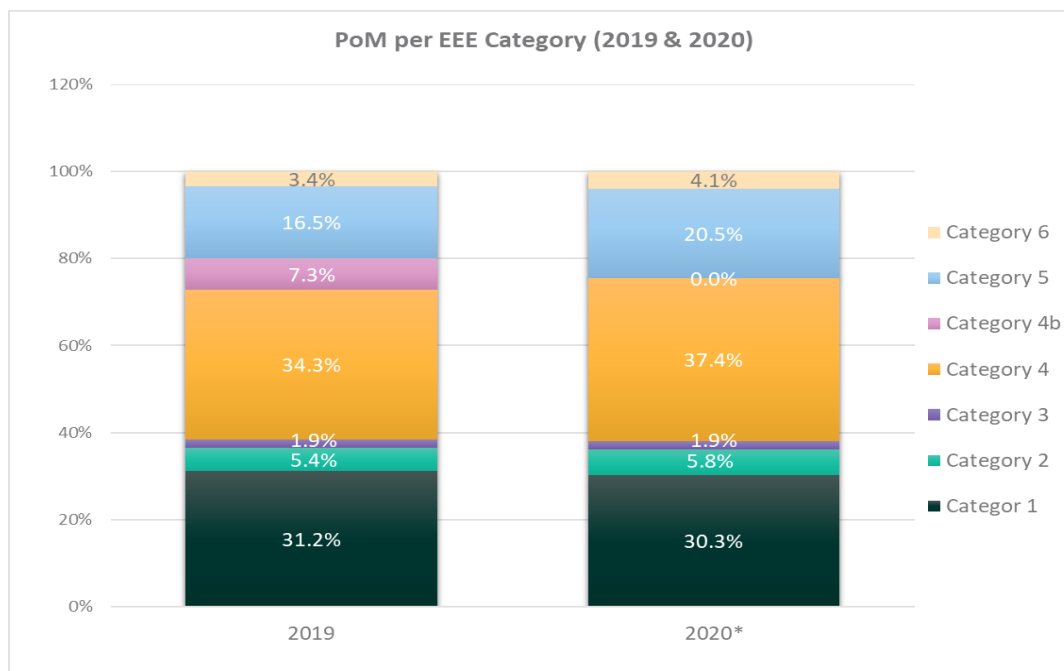


Figure 2-2 PoM per EEE category (%), 2019 – 2020 – Greece ¹⁸

Regarding the ratio of each category in the overall PoM, over 2019-2020, aside from the 4b category (PV panels) no significant changes have been shown. The categories with the highest presence per weight are category 1 and category 4, with an increase in categories five and six, as expected. (Figure 2-2)

¹⁷ WEEE Directive Article 5

¹⁸ Sources: EOAN (Υπ. Απ 4876/16-09-2022 document) & PROs Annual Reports (Annual Reports 2019, 2020 Appliances Recycling & Fotokiklosi)

Table 2-1 PoM Quantities per EEE category, Greece (2019-2020)

Category of EEE (PV panels not included)	POM Quantities per EEE category, Greece			
	2019 (tn)	2020 (tn)	Change (tn) (2019-2020)	Change (%) (2019-2020)
Category 1 - Temperature exchange equipment	51,931	43,265	- 8,666	-16.7%
Category 2 - Screens, monitors and equipment containing screens having a surface greater than 100 cm²	9,007	8,349	- 658	-7.3%
Category 3 – Lamps	3,169	2,728	- 441	-13.9%
Category 4 - Large equipment (any external dimension more than 50 cm)	57,127	53,496	- 3,631	-6.4%
Category 5 - Small equipment (no external dimension more than 50 cm)	27,510	29,236	1,726	6.3%
Category 6 - Small IT equipment and telecommunication equipment (no external dimension more than 50 cm)	5,674	5,849	175	3.1%
TOTAL	166,618	142,928	- 11,495	-7.4%

The overall PoM quantities seem to be decreased in 2020 (in comparison to 2019) by 7.4% on average (PoM without the PV panels) which is being attributed as previously mentioned in the covid-19 crisis (Figure 2-2). The biggest decrease reported in Category 1 (temperature exchange equipment) which can be attributed to the covid-19 crisis (halt in construction and tourism sector). Out of the 6 categories only two (categories 5 and 6) have increased over the period of 2019-2020, which could be partially attributed to the switch to remote working and remote education increasing the needs for electronic devices under these categories such as personal computers, printers, mobiles etc.¹⁹ (Table 2-1)

¹⁹ <https://www.moneyreview.gr/business-and-finance/economy/85184/foyntonei-i-machi-gia-ta-meridia-agoras-stis-oikiakes-syskeves/>

2.2 Compliant Producers and Free riding

2.2.1 Compliant Producers

According to the WEEE Directive all producers including producers supplying EEE by means of distance communication (e.g. web platforms, on-line sales websites), or through their authorised representative (EPR schemes), that put EEE on the market of each MS are mandated to be registered in a register set-up by each MS, as to facilitate their monitoring in regards to their compliance to the WEEE Directive.²⁰ The register is to be accessible online for producers to be able to provide all the relevant information reflecting their activities in the MS they provide their products.

In Greece, the national registry is the named EMPA (ΕΜΠΑ), and it is under the supervision of EOAN. When registered on EMPA the producer is getting a national identification code. In EMPA producers or the PRO they are members of, are providing information regarding their compliance such as their name and type of business, contact information, selling technique (e.g. distance selling) and information on the reporting period, category of EEE (based on the six categories), the quantities put on the national market, by weight, quantity of waste of EEE separately collected, recycled (including prepare for reuse), recovered and disposed of (by weight and per category) within the MS, in another EU MS or outside the Union.²¹

Based on the data from EOAN and the Annual reports of the existing WEEE PROs in Greece (Appliances Recycling SA and Fotokyklosi SA), there were 3,321 producers registered in the PROs and the national registry (Table 2-2).

Table 2-2 Registered producers under the existing WEEE PROs in Greece

Existing WEEE PROs in Greece	Registered Producers	
	2020	2021*
Appliances recycling S.A.	2,016	2,186
Fotokiklosi S.A.	329	409
Total registered ('active agreements')	2,345	2,595

**Data for 2021 registered producers by Appliances Recycling S.A. website and Fotokiklosi S.A. published 2021 Annual Report*

Appliances Recycling S.A. is the largest WEEE PRO in Greece representing over 93% of the registered producers in the Greek market. On the PROs Annual report, they divide their registered producers based on whether their agreements have been 'active' or 'non-active'. These 'non-active' agreements can be assumed to be producers that either haven't reported any quantities or haven't paid their fees to the PRO, and therefore can be potential free-riders.

²⁰ WEEE Directive, Article 16

²¹ WEEE Directive Annex X, Part A and B

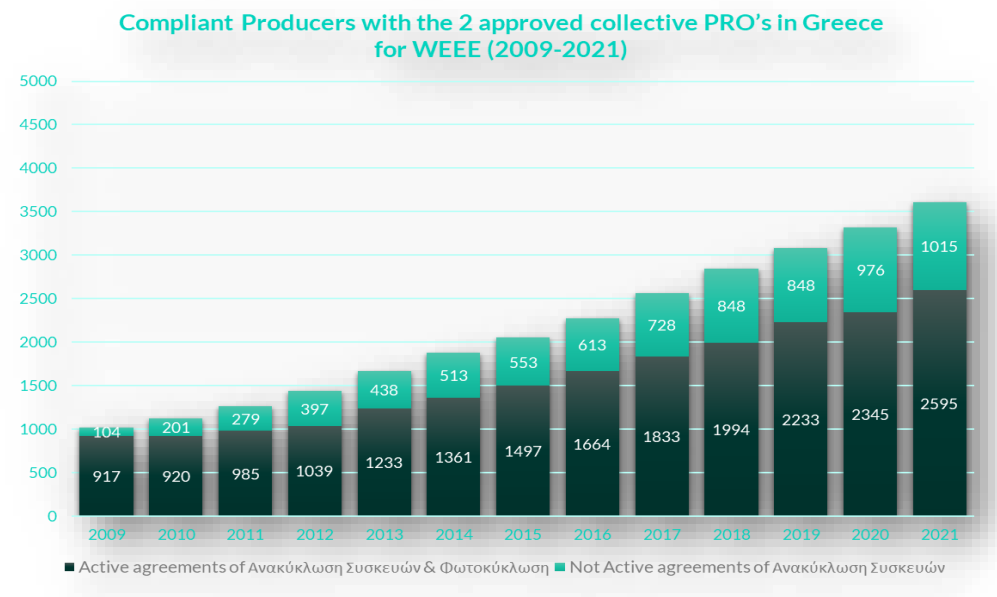


Figure 2-3 Compliant WEEE producers in Greece

Source: 2020 Annual Reports of two WEEE PROs (Appliances Recycling S.A. & Fotokiklosi S.A.)

The number of the registered Greek producers is steadily increasing in annual basis (despite the termination of 97 contracts in 2020 (source: Appliances Recycling S.A. for 2020). Based on ‘Appliances Recycling SA’ data, the majority of the ‘active’ producers are under Category 4 and 5 (1,351 and 1,451 producers accordingly), followed by the Category 6 (655), Category 1 (380 producers), Category 2 (341 producers) and Category 3 (227 producers).

2.2.2 Free riding

As already mentioned, the enforcement of EPR obligation on producers is one of the most common problems in the EU, as not all producers are fulfilling their obligations. Free-riding is a common problem in all waste streams but mostly in EEE, where there is high value to weight ratio, on which no real data are available to assess the scale of the problem.²²

As free-riding is defined the situation where someone can benefit from a good or a service without paying for it, in the case of waste management, free-riders are the non-compliant producers with the EPR obligations for the products they sell, but “benefit” from the waste management services (i.e. collection, and treatment) provided and financed by the compliant producers.²³

Free – riders may consist of ²⁴

- producers not undertaking their financial obligations (through a PRO or individually) including retailers from traditional as well as distance communication (online) retailers, resulting in distortions of the market and the creation of unfair competition between compliant and non-compliant producers, the cost of waste management fall to the compliant producers;

²² <https://documentcloud.adobe.com/spodintegration/index.html?locale=en-us>

²³ Eunomia Research & Consulting, 2021. Online free-riding and EPR

²⁴ <https://documentcloud.adobe.com/spodintegration/index.html?locale=en-us>

- producers not paying their EPR fees resulting in higher waste management cost for the complying producers, challenging the undertaken waste management activities - According to OECD 2018 data, EPR fees are currently unpaid for around 5-10% of the value of the EEE put on the market in OECD countries;
- producers underreporting or incorrect reporting their PoM quantities resulting in unreliable data on PoM and recycling and recovery calculations (underreported PoM results in overreported recycling rates).

There is little data on the scale of free-riding EEE in Greece, with the main estimations deriving from PROs estimations. According to OECD 2018 data, EPR fees are currently unpaid for **around 5-10%** of the value of the EEE put on the market in OECD countries. According to EOAN and the PRO, Appliances Recycling S.A., the estimation on free-riding in Greece is higher. Based on the EPR 'Appliances Recycling SA' estimations (2020 annual report and 8/2022 response to questionnaire) ²⁵, **EPR fees are currently unpaid in Greece for around up to 15% of the EEE PoM quantities**. Based on the above, **total EEE PoM in Greece (including free-riding) could be roughly estimated at about 180,000 tonnes** (177,584 tonnes =154,421 tonnes * 1,15 - considering 154,421 tonnes officially reported EEE PoM in 2019 - Figure 2-1) as already presented in a previous section (Section 2.1). This is further supported based on the recent publication 'The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential' by UNU/UNITAR, ITU & ISWA²⁶, where Greece is identified as one of the countries in Southern Europe with the highest e-waste generation which is estimated at 181,000 tonnes in 2019.

The **causes** of free-riding may include the following ²⁷

- The complexity of EPR schemes
- The high cost of compliance
- Low risks of non-compliance – the ramifications (i.e. penalty, imposition of fines) are low and unable to deter them
- Low awareness of producers on their legal obligations, the information regarding their legal obligations in terms of waste management is not easily attainable or comprehensible, especially on overseas producers

Moreover, free-riding is also related to the increase of online sales, where consumers have access to sellers, who in many cases do not comply with the EPR regulations.²⁸ The inclusion of online retailers in the EPR obligations has only recently entered into force with the recast of WEEE Directive as well as the amended Waste Framework Directive as they have been transposed in Greek legislation. According to

²⁵ Sources:

- 5/8/2022 'Appliances Recycling SA' response to questionnaire

- EPR 'Appliances Recycling SA' 2020 annual report ("[...] μία εκτίμηση με επιφύλαξη, καθώς δε μπορεί να βασιστεί σε καταγεγραμμένα επίσημα στοιχεία, είναι ότι πιθανά οι ποσότητες ΗΗΕ που δεν καταγράφονται (κατά βάρος) να είναι μεταξύ 5% και του 15%.")

²⁶ Forti V., Balde C.P., Kuehr R., Bel G. The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential. United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR) - co-hosted SCYCLE Programme, International Telecommunication Union (ITU) & International Solid Waste Association (ISWA), Bonn/Geneva/Rotterdam.

https://www.researchgate.net/publication/342783104_The_Global_E-waste_Monitor_2020_Quantities_flows_and_the_circular_economy_potential

²⁷ Eunomia Research & Consulting, 2021. Online free-riding and EPR

²⁸ OECD, 2020. Extended Producer Responsibility and the Impact of online sales

the legislation the EPR obligations fall under the online platforms administrator unless the retailer provides an EMPA registry certificate.²⁹

Worldwide but in Greece as well, online sales have significantly increased especially during the pandemic period, where up to 90% of the sales have been made online. According to 2021 research by the E-Business research Centre (ELTRUN) of the Athens University of Economics and the Greek Association of Businesses and Retail Sales (SELPE), 50% of internet users have purchased an item through online retailers., with online purchases representing on average 10% of their total purchases. Out of those purchases 34% were on EEE, the second highest, and a 17% on toys, gift items and jewellery.³⁰

Moreover, a 2021 study by Eunomia Research & Consulting³¹ on free-riding of online sellers, comparing the retailers of two major world-wide platforms (Amazon and eBay), in Germany, with the national producer registers has shown that across all product groups of EEE, a 50% of online sellers (minimum) were either not registered or have been underreporting the PoM quantities. Free-riding rates vary across the subcategories of EEE but sellers of IT and telecommunications equipment (i.e. category five and six) have the highest rates of non-compliance up to 80%. According to the research the underdeclared material circulating is estimated at a range of 2% to 4% of the total reported PoM weight which can be estimated in the revenue lost for EPRs of €30M to €160M.

In their annual reports the PROs are referring to the problem of free-riding, which they attribute to the deficiencies of the system and especially on the lack of monitoring, control and implementation mechanisms by the responsible authorities, and the existence of discrepancies in legislation especially regarding the categorisation of the (W)EEEE, and the new legislative provisions and the amendment of the previous ones in adoption of the EU Directives, regarding the organisational aspects of PROs, and the delays in providing adequate clarifications.

Both PROs are conducting inspections in regards to free-riders, and any findings regarding non-compliant producers are submitted to EOAN. In the case of refusal of reporting from the producers the PROs are terminating their contracts but they mention that one of the biggest reasons why producers are non-compliant has to do with the lack of preventive measures and inadequate enforcement of behalf of the responsible authorities.

According to Greek legislation the monitoring and enforcement of legislation to producers is under the jurisdiction of EOAN. Even when the PROs identify free-riders through their research, other than informing the producer on their obligations, they do not have the authority to take any actions other than submitting an official statement to EOAN.

According to EOAN, there is currently no specific way of calculating or assessing the free-riding. The monitoring department of EOAN mainly focuses on the submitted complaints about free-riders either by the PROs or by compliant competitors. In 2022, EOAN has processed and sent warning letters for failure to comply to 100 producers of which only 10% has responded. EOAN has also been in contact with big

²⁹ Law 4819/2021, Article 11

³⁰ https://eltrun.org/Ανακοίνωση_Τύπου_2022 https://eltrun.org/Ανακοίνωση_Τύπου_2022

³¹ Eunomia Research & Consulting, 2021. Online free-riding and EPR

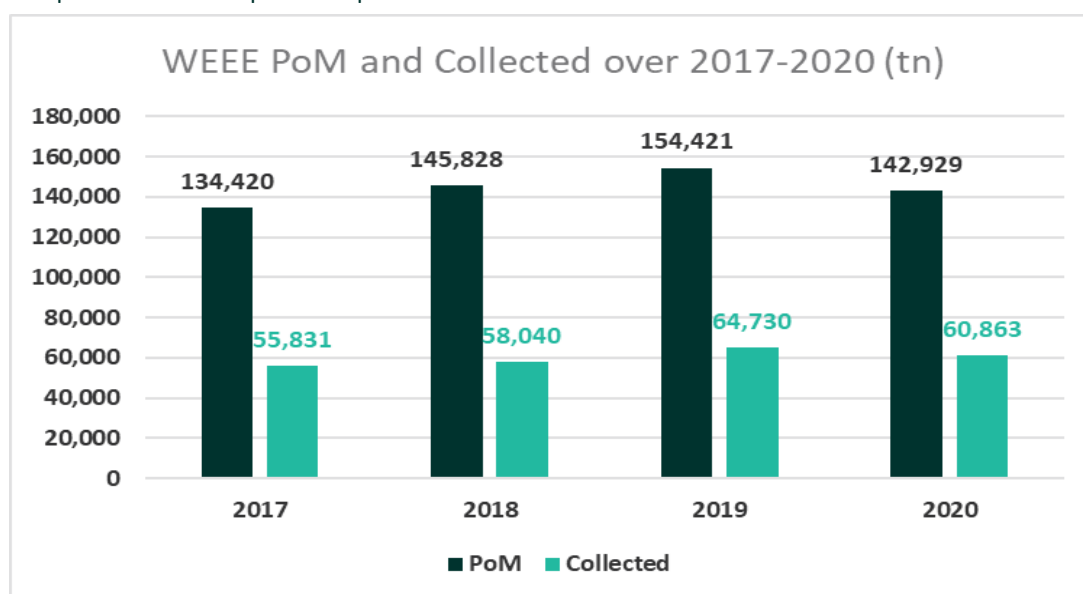
online platforms based in Greece, in order to inform them on their obligations or the obligations of their sellers. The reasons behind the lack of adequate monitoring of free riding, is related to³²:

- The lack of resources of the inspections department (understaffed) and lack of communication/cooperation between public agencies (EOAN, AADE, etc).
- Time consuming and lengthy procedures to impose the fee.
- Inadequate monitoring of WEEE imports (e.g. no specific details as to the type/category of WEEE is imported only the weight, hard to control due to the free movement of goods within the EU).
- The reluctance in submitting official complaints to EOAN about potential offenders.

2.3 Collection of Waste Electric and Electronic Equipment (WEEE) in Greece

2.3.1 Preface – Key facts on Collection

Figure 2-4 presents the annual quantities of WEEE collected in Greece for the years 2017-2020, compared to the EEE quantities put in the Greek market.



*2020 from Annual reports of the two PROs & 2020 PoM from EOAN – awaiting approval from EOAN BoD

Figure 2-4 EEE PoM and WEEE Collected in Greece (2017-2020)

Source: EOAN (Υπ. Αρ 4876/16-09-2022 έγγραφο), & EOANs Annual Report 2017-2018, published November 2020

Annual collection of WEEE increased from 2017 to 2019, by 4% (2017-20218) and 11.5% (2018-2019) respectively. There is a small decrease of the collected quantities of approximately 6% between 2019-

³² EOAN, interview 5th September 2022

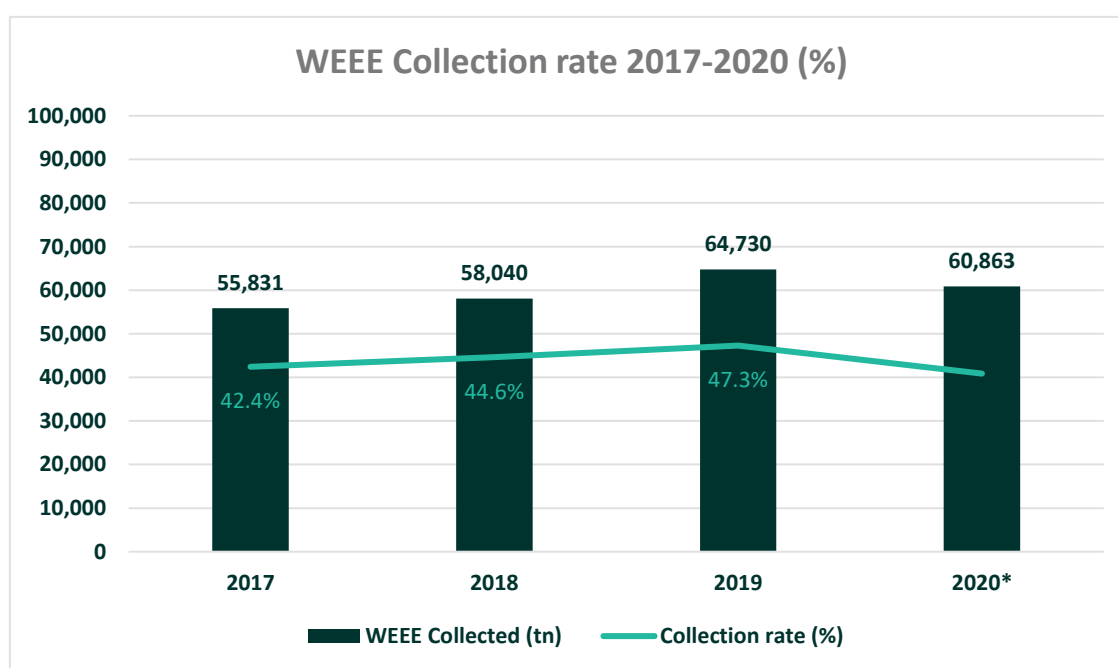
2020 that can be attributed to the pandemic, similar to the PoM quantities decrease for the same period (7%).

Although quantities collected have increased between 2017-2019, collection rates for Greece are low compared to the EU targets.

2.3.2 Collection Rate

According to Article 7 of the Directive 2012/19/EU (recast), Greece shall ensure the implementation of the ‘producer responsibility’ principle and, on that basis, that a minimum collection rate is achieved annually. From 2016, the minimum collection rate is 45 % calculated on the basis of the total weight of WEEE collected in a given year in Greece, expressed as a percentage of the average weight of EEE put on the market in the three preceding years in Greece. From 2019, the minimum collection rate to be achieved annually is 65 % of the average weight of EEE put on the market in the three preceding years in Greece³³.

Figure 2-5 presents the collection rates achieved in years 2017-2019 for Greece.



*2020 from annual reports of the two PROs – awaiting approval by the EOAN BoD

Figure 2-5 WEEE collection rate in Greece over the period of 2017 - 2020

Source: EOAN (Υπ. Αρ 4876/16-09-2022 έγγραφο), & EOANs Annual Report 2017-2018, published November 2020

Compared to the EU targets, Greece has reached 44.6% collection rate in 2018 and 47.3% in 2019, which are lower than the minimum collection EU targets 45% and 65% respectively.

³³ or alternatively 85 % of WEEE generated on the territory of that Member State.

It is noted that based on a 2022 UNITAR study 'Update of WEEE Collection Rates, Targets, Flows, and Hoarding – 2021 in the EU-27, United Kingdom, Norway, Switzerland, and Iceland'³⁴ which includes the calculation of the collection rates using both the two calculation methods described in the WEEE Directive, the collection rate for Greece for 2021 is calculated: 42% collection rate in relation to PoM of three preceding years (65% EEE PoM Target) or 33% collection rate in relation to WEEE Generated in the same year (85% WEEE Generated Target) (Figure 2-6).

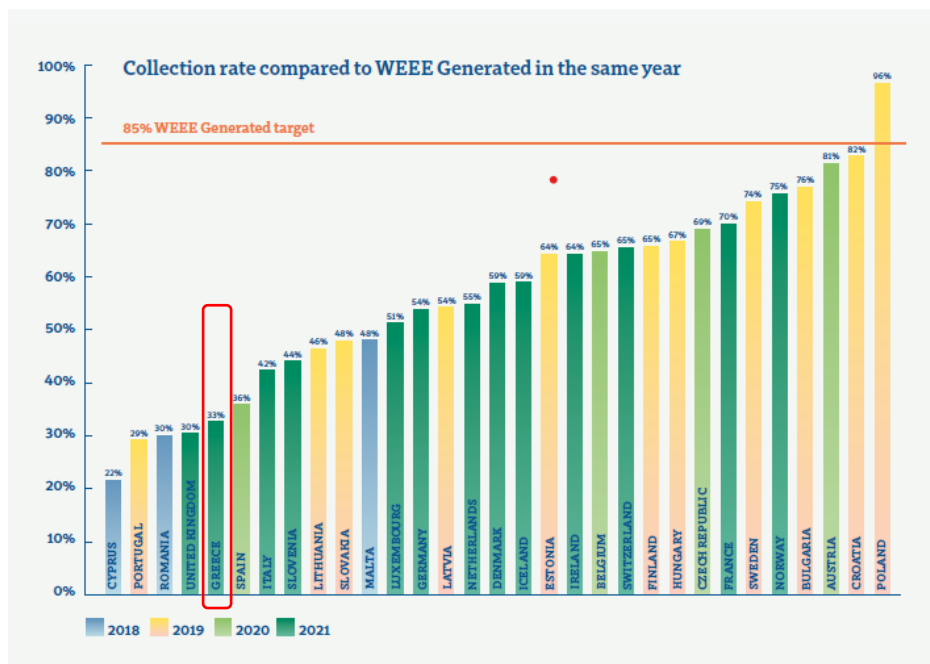
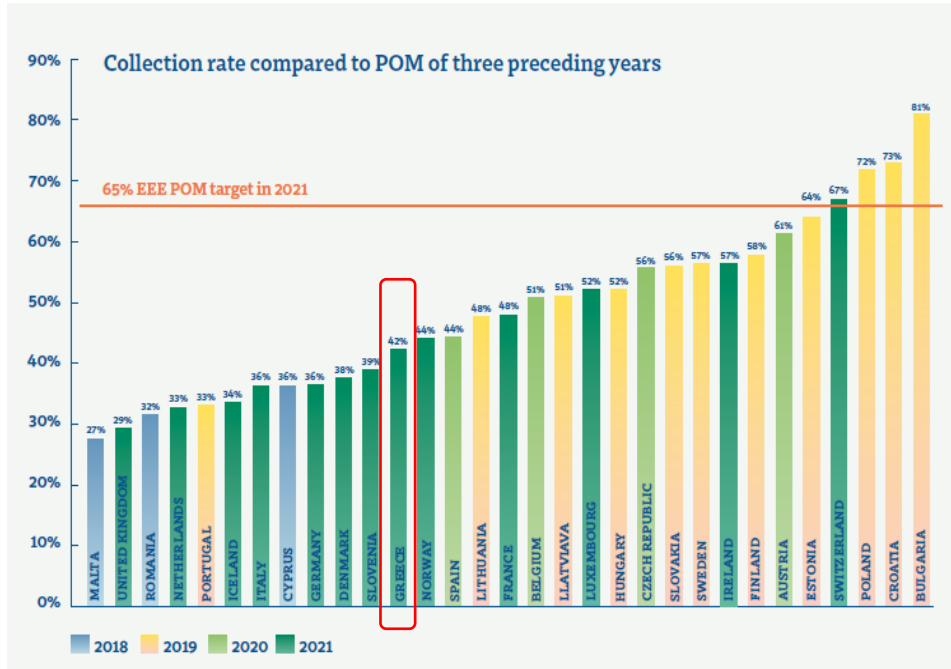


Figure 2-6 Calculation of the collection rates included in a 2022 UNITAR study

Source: Update of WEEE Collection Rates, Targets, Flows, and Hoarding – 2021 in the EU-27, United Kingdom, Norway, Switzerland, and Iceland, 2022, SCYCLE Programme, United Nations Institute for Training and Research

³⁴ C.P. Balde, G. Iattoni, C. Xu, T. Yamamoto, Update of WEEE Collection Rates, Targets, Flows, and Hoarding – 2021 in the EU-27, United Kingdom, Norway, Switzerland, and Iceland, 2022, SCYCLE Programme, United Nations Institute for Training and Research (UNITAR) - <https://www.scycle.info/new-study-update-of-weee-collection-rates-targets-flows-and-hoarding/>

2.3.3 Quantities Collected per category of Electric and Electronic Equipment

Table 2-3 and Figure 2-7 present the WEEE collected per category in Greece in 2019 and 2020, based on data provided by EOAN and the two existing PROs (Appliances Recycling & Fotokiklosi).

Table 2-3 Quantities of WEEE collected per category, Greece (2019-2020)

Categories	WEEE Quantities Collected per Category, Greece			
	2019 (tn)	2020 (tn)	Change (tn) (2019-2020)	Change (%) (2019-2020)
Category 1 Temperature exchange equipment	15,761	15,336	-425	-2.7%
Category 2 Screens, monitors and equipment containing screens having a surface greater than 100 cm ²	7,704	6,922	-782	-10.2%
Category 3 Lamps	514	472	-42	-8.2%
Category 4 Large equipment (any external dimension more than 50 cm) e.g. Washing machines	30,111	28,525	-1,586	-5.3%
Category 4b PV panels	0	0	0	0
Category 5 Small equipment (no external dimension more than 50 cm) e.g. Smoke detectors	7,531	6,451	-1,080	-14.3%
Category 6 Small IT equipment and telecommunication equipment (no external dimension more than 50 cm) e.g. Mobile phones	3,105	3,154	49	1.6%
TOTAL	64,730	60,863	3,867	-6%

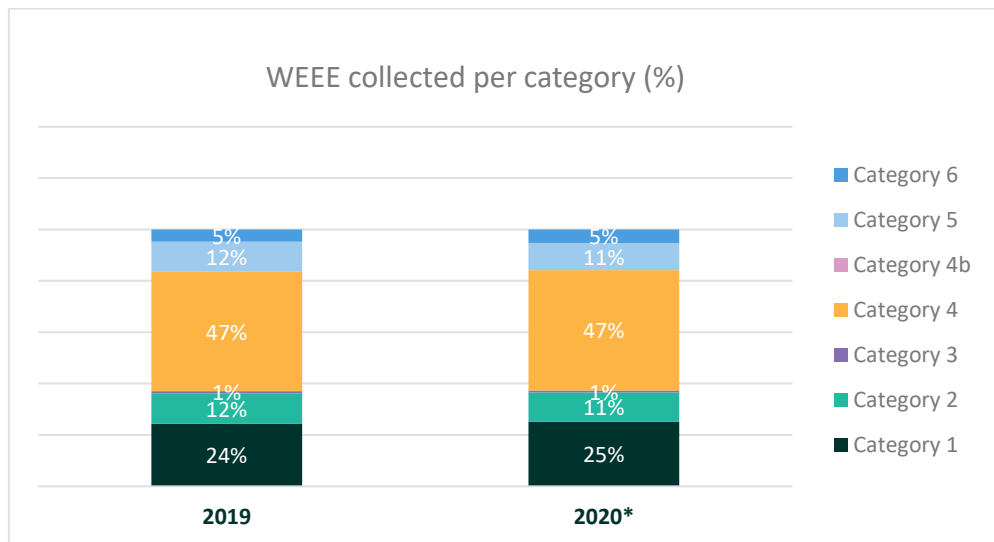


Figure 2-7 Collection of WEEE per category, 2019 and 2020

*2020 from annual reports of the two PROs – awaiting approval from EOAN BoD

Sources: EOAN (Υπ. Αρ 4876/16-09-2022 έγγραφο) & PROs Annual reports (Annual Reports 2019, 2020 Appliances Recycling & Fotokiklosi)

Overall, the percentages per category of WEEE collected in Greece in 2019 & 2020 are relative to the percentages per category of EEE PoM in 2019 & 2020 analysed in Section 2.1.2. However, it is noted that WEEE of Category 4 (Large equipment) seem to have a higher collection rate compared to the other categories and taking into consideration the PoM quantities.

Small WEEE of categories 5 and 6 is a challenging waste stream, with low collection rates, but with high value of interest due to the valuable materials embedded in them. It is estimated that in an EU level, a 25% to 50% of Europeans store their unused and old devices at home. Despite their value, their treatment can be costly and can impact the demand of small WEEE by recyclers.³⁵

PV panels

There is no available/limited data on the collection of category 4b (PV panels) considering the lack of a PRO for PV panels until 2020 (see section 2.1), the nature of the PV panels (average lifespan more than 20 years) and the recent market penetration³⁶. The Directive does not set a specific collection target for PV panels.

2.3.4 Quantities Collected per Region in Greece

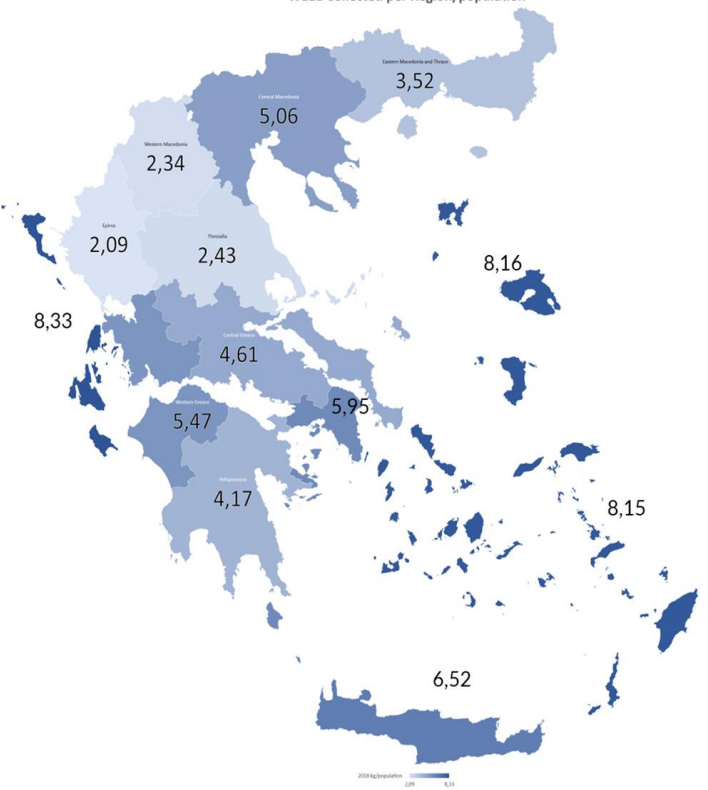
As previously mentioned, Greece has reached the collection of about 5.71 kg of WEEE per capita in 2019 and 5.32 kg of WEEE per capita in 2020 (source: ELSTAT & PRO Appliances Recycling SA Annual reports (ANAKYKΛΩΣΗ ΣΥΣΚΕΥΩΝ ΑΕ). Figure 2-8 and Table 2-4 present the collection of WEEE per capita and per region for the 13 Regions of Greece (2018-2020).

³⁵). Romagnoli, V., Bruijine, E., Drapeau, P., et al. (2022), *Study on options for return schemes of mobile phones, tablets and other small electrical and electronic equipment in the EU*, European Commission, Directorate-General for Environment. Publications Office of the European Union, <https://data.europa.eu/doi/10.2779/237189>

³⁶ <https://weee-forum.org/wp-content/uploads/2021/06/WEEE-Forum-PV-Panels-Issue-Paper-2021-Final.pdf>

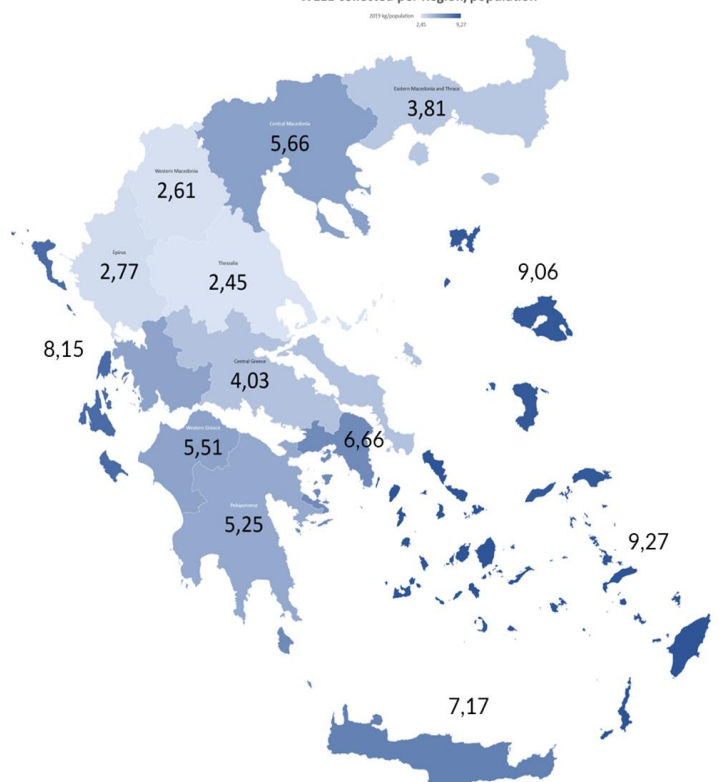
2018

WEEE Collected per Region/population



2019

WEEE collected per Region/population



2020

WEEE Collected per Region/population

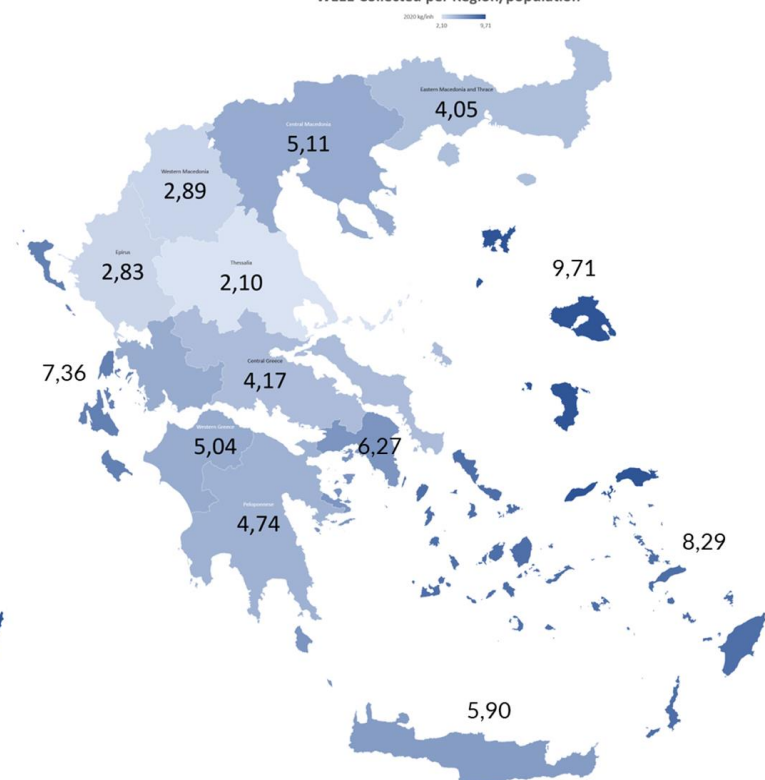


Figure 2-8 WEEE Collected per capita per Region of Greece (kg/capita)

Source: ELSTAT & PRO Annual reports (Απολογιστικές Εκθέσεις 2019, 2020 Ανακύκλωση Συσκευών ΑΕ)

Table 2-4 WEEE collected per capita and per Region in Greece (2018 - 2020)

a/a	Regions of Greece	WEEE collected per Region (kg/capita)			Population (ELSTAT)
		2018	2019	2020	
1	East Macedonia & Thrace	3.52	3.81	4.05	608.182
2	Attica	5.95	6.66	6.27	3.828.434
3	North Aegean	8.16	9.06	9.71	199.231
4	Western Greece	5.47	5.51	5.04	679.796
5	Western Macedonia	2.34	2.61	2.89	283.689
6	Epirus	2.09	2.77	2.83	336.856
7	Thessaly	2.43	2.45	2.10	732.762
8	Ionian Islands	8.33	8.15	7.36	207.855
9	Central Macedonia	5.06	5.66	5.11	1.882.108
10	Crete Island	6.52	7.17	5.90	623.065
11	South Aegean Islands	8.15	9.27	8.29	309.015
12	Peloponnese	4.17	5.25	4.74	577.903
13	Central Greece	4.61	4.03	4.17	547.390
	On Average (Greece)	5.19	5.71	5.32	10,816.286

Source: ELSTAT & PRO Appliances Recycling SA Annual reports (ΑΝΑΚΥΚΛΩΣΗ ΣΥΣΚΕΥΩΝ ΑΕ)

The region with the highest collection in kg per capita for 2019 and 2020 and much closer to the EU average (around 10 kg per capita) seem to include:

- North Aegean with a collection of 9.06 kg per capita and 9.71 kg per capita
- South Aegean with 9.27 kg per capita and 8.29 kg per capita, and;
- Ionian Islands of 8.15 kg per capita and 7.36 kg per capita.

While the regions with the lowest collection in kg per capita for 2019 and 2020 seem to include:

- Epirus with 2.77 kg per capita and 2.83 kg per capita;
- West Macedonia with 2.61 kg per capita and 2.89 kg per capita, and;
- Thessaly with 2.45 kg per capita and 2.10 kg per capita.

It could be assumed that the reasons behind these differences have to do with the specific local characteristics of the regions. The regions with the highest WEEE collection per capita (kg/capita) seem to be island regions where possibly the information regarding waste management is more easily communicated and potentially there is less scavenging due to the high cost of transport to the mainland. On the other hand, the lower collection of WEEE per capita (kg/capita) in other regions, may be attributed partially to the high presence of the informal sector (scavengers) in these regions (e.g. Thessaly).

2.3.5 Collection Points Distribution

In 2020, there were in total 25.155 collection points in Greece. In particular, there were 16.749 points by the PRO Appliances Recycling S.A., and 8.406 points by the PRO Fotokiklosi SA. Both PROs are continuously increasing their collection points network to improve their collection services. Appliances Recycling has the majority (66%) of collection points distributed in the country. (To note that Appliances Recycling has a coverage of more than 90% of the Greek market)..

The main type of collection points/modes in Greece include:

- Collection from businesses (B2B) (in total 4,234 collection points, in 2020));
- Collection points in municipalities (collection bins in public buildings or collection in containers) (in total 5,526 collection points, in 2020);
- Collection points in retail stores of EEEE (in total 6,606 collection points, in 2020)
- Scrapyards (328 collection points throughout Greece).

Figure 2-9 presents the distribution of collection points per Region of Greece.

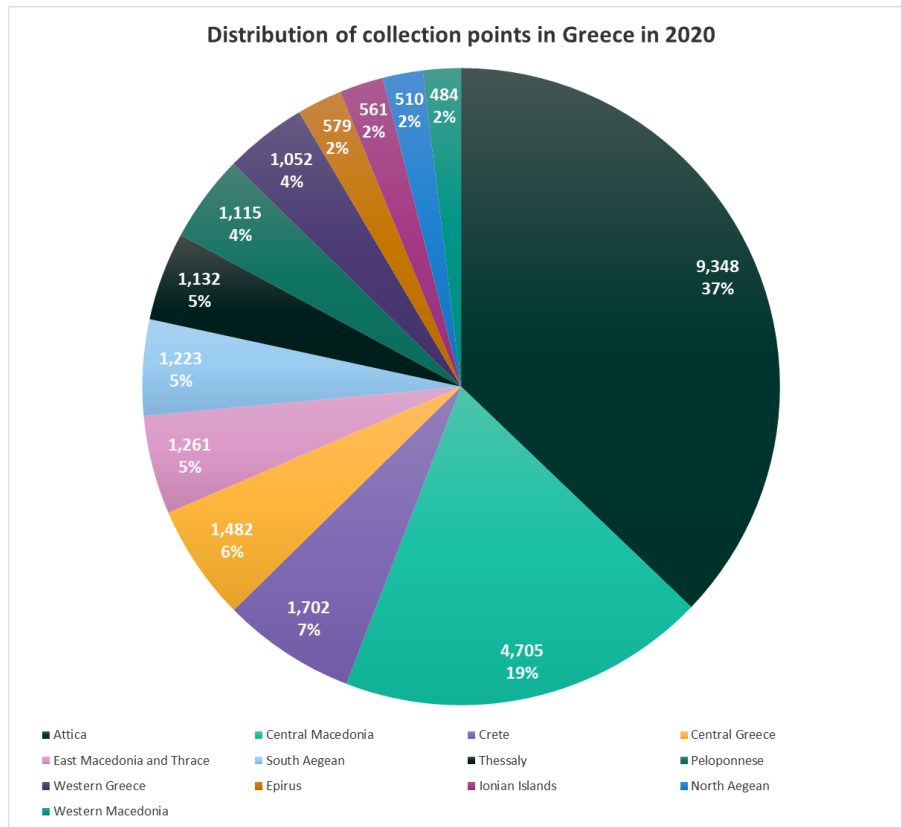


Figure 2-9 Distribution of collection points in Greece in 2020

Source: 2020, annual reports of the two PROs

Over 50% the collection points are located in Attiki and Central Macedonia, considering that these two areas have the highest concentration (53%) of the country’s population. The areas with the lowest number of collection points are Epirus, Ionian Islands, North Aegean and Western Macedonia.

2.4 Recovery of Waste Electric and Electronic Equipment (WEEE) in Greece

2.4.1 Preface – Key facts on Recovery

Table 2-5 presents the annual quantities of WEEE prepared recovered in Greece in 2019, based on the official data provided by EOAN.

Table 2-5 Quantities of WEEE Recovered in Greece in 2019

Category	Prepare for reuse (tn)	Recycling (tn)	Prepare for Reuse & Recycling (tn)	Recovery (tn)	WEEE treated in the Member State (tn)	WEEE treated in another Member State (tn)
	[1]	[2]	[3]=[1]+[2]	[4]	[5]	[6]
Category 1: Temperature exchange equipment	0.11	13,069.85	13,069.96	14,670.48	15,517.07	0.00
Category 2: Screens, monitors and equipment containing screens having a surface greater than 100 cm ²	0.13	5,555.95	5,556.08	6,001.35	7,731.35	0,00
Category 3: Lamps	0.00	395.47	395.47	421.22	236.14	204.74
Category 4: Large equipment (any external dimension more than 50 cm) e.g. Washing machines	114.64	2,3216.58	23,331.22	26,276.65	29,464.98	0,00
Category 5: Small equipment (no external dimension more than 50 cm) e.g. Smoke detectors	1.17	6,249.55	6,250.72	6,855.10	7,838.84	0,00
Category 6: Small IT equipment and telecommunication equipment (no external dimension more than 50 cm) e.g. Mobile phones	55.25	2,510.32	2,565.57	2,887.84	3,630.63	0,00
Total	171.30	50,997.72	51,169.02	57,112.64	64,419.01	204.74

Source: EOAN official data

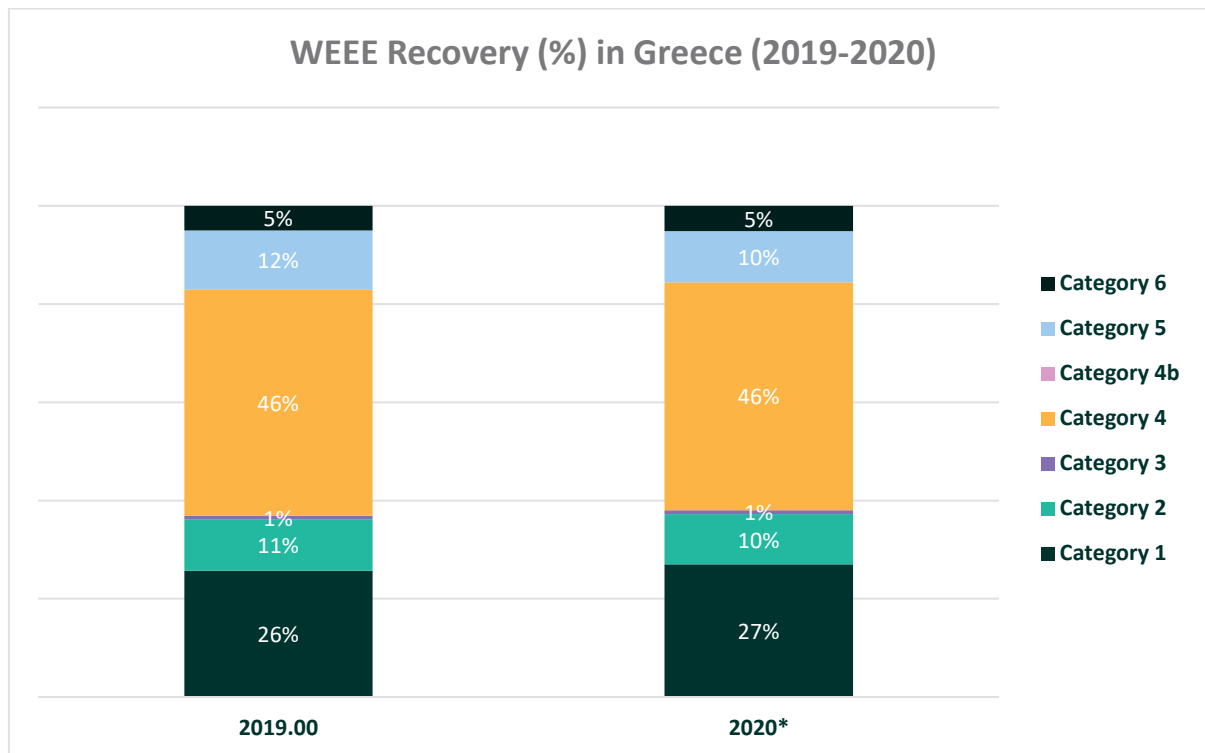
2.4.2 Recovered quantities of WEEE per Category

Table 2-6 and Figure 2-10 present the WEEE recovered per category in Greece in 2019 and 2020, based on the data provided by EOAN and by the two PROs in Greece (Appliances Recycling & Fotokiklosi).

Table 2-6 WEEE recovered in Greece (2019,2020)

Categories	WEEE Quantities Recovered per Category, Greece			
	2019 (tn)	2020 (tn)	Change (tn) (2019-2020)	Change (%) (2019-2020)
Category 1: Temperature exchange equipment	14,670	14,641	-30	-0.2%
Category 2: Screens, monitors and equipment containing screens having a surface greater than 100 cm ²	6,001	5,551	-451	-7.5%
Category 3: Lamps	421	438	17	4.1%
Category 4: Large equipment (any external dimension more than 50 cm) e.g. Washing machines	26,277	25,195	-1,082	-4.1%
Category 5: Small equipment (no external dimension more than 50 cm) e.g. Smoke detectors	6,855	5,629	-1,226	-17.9%
Category 6: Small IT equipment and telecommunication equipment (no external dimension more than 50 cm) e.g. Mobile phones	2,888	2,810	-78	-2.7%
TOTAL	57,113	54,263	- 2,850	-5%

*2020 from Annual reports of the two PROs – not yet approved by EOAN BoDs



*2020 from Annual reports of the two PROs – awaiting approval from EOAN BoDs

Figure 2-10 Recovery of WEEE per category, Greece (2019,2020)

Sources: EOAN (Υπ. Αρ 4876/16-09-2022 έγγραφο) & PROs Annual reports (Annual Reports2019, 2020 Appliances Recycling & Fotokiklosi)

2.4.3 Recovery Targets

Table 2-7 presents the **achievement of the recovery targets for Greece for each category** based on the official data and the calculation of targets provided by EOAN for the year 2019.

In accordance with Article 11 of the Directive 2012/19/EU (recast), the achievement of the targets shall be calculated, for each category, by dividing the weight of the WEEE that enters the recovery or recycling/preparing for re-use facility, after proper treatment in accordance with Article 8(2) with regard to recovery or recycling, by the weight of all separately collected WEEE for each category, expressed as a percentage. Preliminary activities including sorting and storage prior to recovery shall not count towards the achievement of these targets.

Table 2-7 Recovery targets, Greece (2019)

For WEEE falling within category	Minimum Recovery Targets referred to in Article 11 (Directive 2012/19/EU) ³⁷		Achievement of Recovery Targets for Greece (2019)	
	% Recovered	% Prepared for re-use and recycled	% Recovered	% Prepared for re-use and recycled
Category 1 -Temperature exchange equipment	85%	80%	93.1%	82,9%
Category 2 - Screens, monitors and equipment containing screens having a surface greater than 100 cm2	80%	70%	77.9%	72.1%
Category 3 – Lamps	-	80%	81.8%	76.8%
Category 4 - Large equipment (any external dimension more than 50 cm)	85%	80%	87.3%	77.5%
Category 5 - Small equipment (no external dimension more than 50 cm)	75%	55%	91.0%	83.0%
Category 6 Small IT equipment and telecommunication equipment (no external dimension more than 50 cm) e.g. Mobile phones	75%	55%	93.0%	82.6%

Based on the above, it seems that Greece has achieved the minimum recovery targets referred to in the WEEE Directive (2012/19/EU) for all categories, apart from Category 3 – Lamps (76.8% < 80% prepared for reuse and recycled target), Category 4 - Large equipment (77.5% < 80% prepared for reuse and recycled target) and Category 2 (77.9% < 80%).

³⁷ Regarding all WEEE separately collected in accordance with Article 5 and sent for treatment in accordance with Articles 8, 9 and 10, Member States shall ensure that producers meet the minimum targets set out in Annex V of the Directive 2012/19/EU.

3.0

**Assess the Costs
associated with WEEE
Management**

3.1 Introduction

This section considers the associated costs of WEEE management and analyses the role of each stakeholder/party, the arising scope issues and the associated costs breakdown with respect to the involved parties (producers, EPR scheme, recyclers, etc.) in the WEEE management in Greece.

As already mentioned, Eunomia's approach to this study and particularly the costs associated with WEEE management is informed by an agreed understanding that what is sought is a strategic analysis and recommendations regarding the WEEE Management in Greece, considering the limited data availability.

The structure of this section includes the analysis of the following parts:

- **The Introduction**, including:
 - Reference to the **broader legislative context and drivers**
 - Analysis of the '**necessary costs**' and **the extended producer responsibility costs related to WEEE management**
- **The WEEE Value chain and cost structure;**
- **The Cost Categories & Key stakeholders** involved in each step of the value chain; and
- **The Assessment of WEEE management costs in Greece** (considering the study limitations)

3.1.1 Legislative Context

The revised Waste Framework Directive (DIRECTIVE (EU) 2018/851) at Recital 21, recognises the necessity of EPR schemes for efficient waste management and indicates their different levels of effectiveness and performance between Member States. Consequently, the Directive suggests the **setting of general minimum requirements for such EPR schemes**.

At Recital 22, it is also noted that the general minimum requirements **should reduce costs and boost performance, as well as ensure a level playing field**, including for small and medium-sized enterprises and e-commerce enterprises, and avoid obstacles to the smooth functioning of the internal market. They should also contribute to the **incorporation of end-of-life costs** into product prices and provide incentives for producers, when designing their products, to take better into account recyclability, reusability, repairability and the presence of hazardous substances. Overall, those requirements should improve the governance and transparency of EPR schemes and reduce the possibility of conflicts of interest emerging between organisations implementing EPR obligations on behalf of producers of products and waste operators that those organisations contract.

Article 8a of the Directive establishes the general minimum requirements for EPR schemes. However, the European Commission acknowledged the risk that elements of Article 8a will be implemented in different ways across EU Members. Thus, Eunomia undertook a study to support preparation of the Commission's guidance on the implementation of the general minimum requirements for EPR schemes set out in Article 8a.

The study focuses among others, on necessary costs (Article 8a4(c)) which describe in a detailed way the approaches that can be applied to ensure that the financial contributions paid by producers to comply with their EPR obligations, where discharged collectively, do not exceed the costs that are necessary to provide waste management services in a cost-efficient way. Such costs, as noticed at Recital 24, should be established in a transparent way between the actors concerned, including producers, their organisations and public authorities.

According to Article 8a (1), where EPR schemes are established in accordance with Article 8(1), Member States shall define in a clear way **the roles and responsibilities of all relevant actors involved**, including producers of products placing products on the market of the Member State, organisations implementing EPR obligations on their behalf, private or public waste operators, local authorities and, where appropriate, re-use and preparing for re-use operators and social economy enterprises.

In particular, at Article 8a (4), the Directive states that Member States shall take the necessary measures to ensure that **the financial contributions paid by the producer of the product to comply with its EPR obligations**:

- **Cover the following costs for the products that the producer puts on the Market** in the Member State concerned:
 - **Costs of separate collection of waste and its subsequent transport and treatment, including treatment necessary to meet the Union waste management targets, and costs necessary to meet other targets and objectives, taking into account the revenues from re-use, from sales of secondary raw material from its products and from unclaimed deposit fees.**
- Do not exceed the costs that are necessary to provide waste management and the economic viability of the extended costs shall be established in a transparent way between the actors concerned.

3.1.2 Necessary costs and extended producer responsibility costs in the context of WEEE management in Greece

The analysis included in this section is based on Eunomia's work for the Commission on the Extended Producer Responsibility Schemes³⁸ (It is noted that guidance from the Commission³⁸ has not been published until now). In particular, the aim of this section is to provide a better understanding of the producer obligations and the general minimum requirements regarding EPR schemes with respect to the producer responsibility costs in the Greek context. Further analysis and legislative context on the necessary costs and the extended producer responsibility costs is provided in the Appendix (A 1.4).

³⁸ Study to Support Preparation of the Commission's Guidance for the Extended Producer Responsibility Schemes', Report for DG Environment of the European Commission (Eunomia, (April 2020)

3.1.2.1 Level of responsibility and application in the Greek WEEE waste management context

The Greek legislation has incorporated the revised Waste Framework Directive. According to the Law 4819/2021, regulations are set for PROs, producer obligations and the general minimum requirements regarding EPR schemes.

At Article 9 Paragraph 2, it is indicated that every EPR scheme in Greece:

- Is obliged to have a clearly defined geographical, product and material coverage and is not limited to areas, products and materials where the collection and management of waste is most profitable. Special provision is required for islands and remote areas,
- Offers appropriate availability of waste collection systems in the areas, products and materials referred to above,
- Has the necessary financial means or the financial and organizational means to fulfill his obligations in the context of the extended responsibility of the producer,
- Implements an adequate self-monitoring mechanism supported by regular independent audits for its annual assessment.
- Must make available to the public information on its website on an annual basis regarding the achievement of the waste management objectives and in the case of collective fulfillment of EPR obligations, information also regarding (among others) the financial contributions paid by the producers and the selection procedure for recyclers.

The financial contributions paid by producers to the PROs for their compliance with the obligations arising from the extended responsibility of the producer shall cover the following according to Article 9 Par.3(a):

- Costs of separate collection and subsequent transport and treatment of the waste, including the treatment required to achieve the Union's waste management objectives and costs of achieving the other objectives referred to EPR schemes' targets, taking into account the revenues from reuse, sales of secondary raw materials and from unclaimed disposal fees, such as landfill fees and disposal costs, as well as the percentage of the financial contribution attributed to the Hellenic Recycling Organization (EOAN), according to Article 98.
- Cost of providing sufficient information to waste owners.
- Cost of gathering data and submitting reports/
- Cost of raising awareness and informing citizens about waste prevention and separate collection.
- The cost of self-audits of the PROs, including regular independent audits, and
- administrative costs.

It is worth mentioning that the Greek Law 4819/2021, indicates as well as the revised Directive that the financial contribution paid by producers shall not exceed the costs necessary to provide waste management services in a cost-effective manner and this cost is shared transparently between the stakeholders (producers).

PROs are generally responsible for the overall supervision and operation of WEEE collection, transfer, and management operations, mainly regarding the provision of appropriate collection equipment and the audit of compliance with the agreed terms between those responsible for transport, reuse, recycling and recovery and PROs themselves. However, the integration of the Directive into the Greek legislative

framework needs greater specialization and adaptation based on the terms and conditions in which the Greek WEEE alternative management market operates.

3.2 Waste Electric and Electronic Equipment Value Chain and Cost Structure

In this section is presented the WEEE value chain in Greece and the associated cost along with the key stakeholders involved at each step of the value chain.

3.2.1 WEEE Value Chain

The WEEE value chain refers to the associated processes undertaken within the WEEE recycling facility to ensure the proper treatment, recycling, and recovery of WEEE. The main processes undertaken are displayed in Figure 3.1

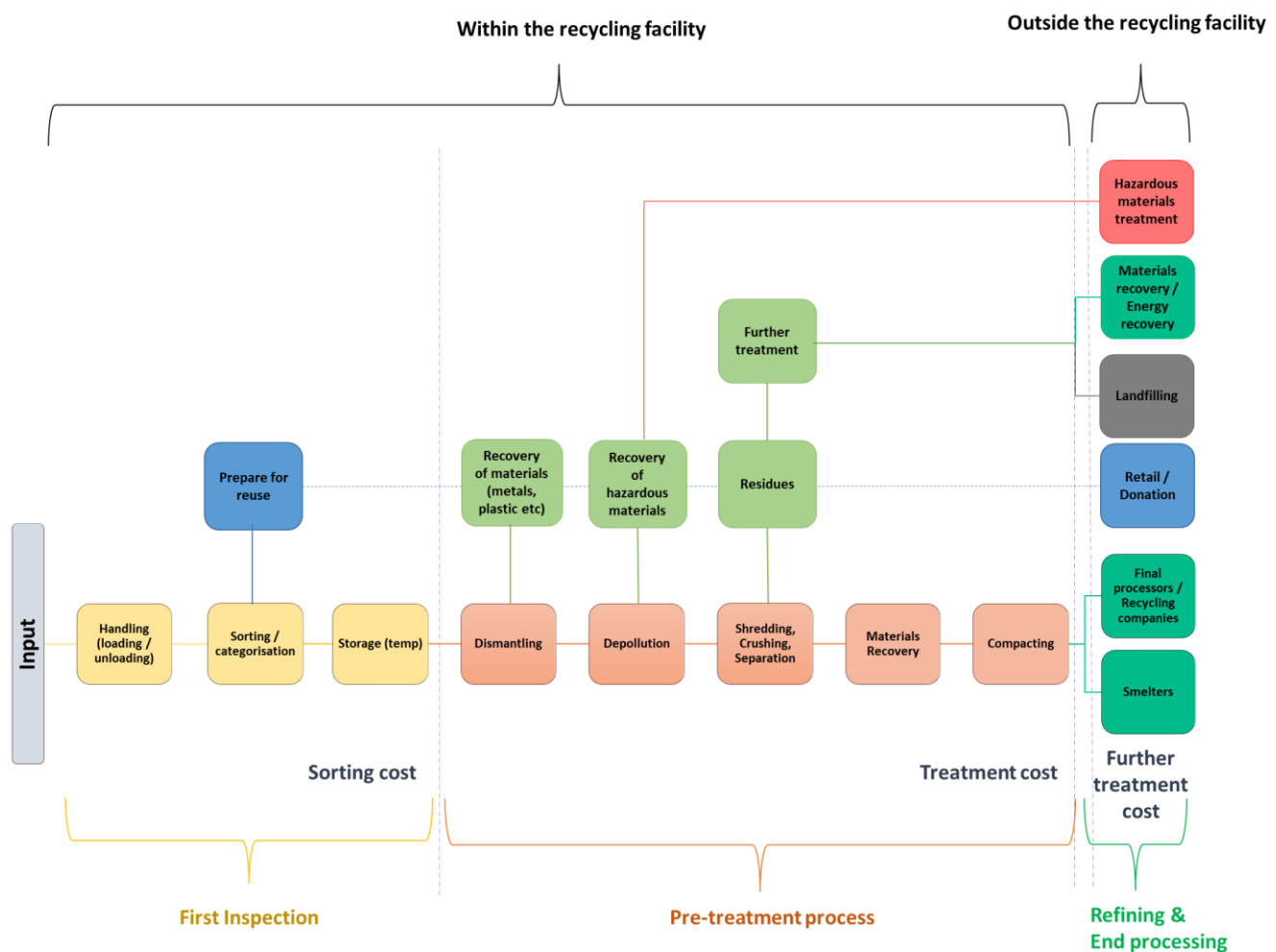


Figure 3-1 WEEE Value chain and associated costs

Source: Eunomia

First Inspection

The first inspection stage of the WEEE value chain includes the handling of the feedstock, the sorting per WEEE category (according to EU and national legislation and the directions provided by the PRO) and the temporary storage of the sorted WEEE before they enter the pre-treatment stage.

Upon the first inspection process, the input/feedstock is unloaded and then sorted to 64 different product categories (a prerequisite of the PRO Appliances Recycling S.A.), weighed, and moved to separate predetermined places within the facility or placed into cages for separate pre-treatment depending on the type of WEEE. In the facilities that provide re-use and repair processes, at this stage, the reusable equipment and components are separated from the rest of the WEEE and are prepared for re-use (repair and refurbishment).

Pre-treatment process

The pre-treatment stage includes the dismantling, depollution, and the material separation stage and material recovered, and finally the baling. Pre-treatment in most of the facilities is performed in a combination of manual and mechanical treatment process, but there are also the chemical or metallurgic processes³⁹.

The depollution process takes place after the initial dismantling, in either a manual or mechanical process depending on the type of WEEE and the available technology of the facilities. During the depollution the treatment operator removes all liquids, substances, preparation, and components from WEEE, according to Directive 2002/96/EC.

The removal of the hazardous waste contained within the appliances, ensures that the hazardous substances will not be released to the environment or distributed to fractions, unless subsequent treatment of the substances is secured through the proper treatment methods, as described in WEEE Directive Article 8 and Annex VII.

After the separation stage is completed, the recovered materials are compacted/baled and stored in a separate storage stage until they are shipped to the final processors, refineries, or disposal facilities.

Refining and End – processing

This stage is performed outside of the WEEE treatment facilities, and it is where the recovered materials are shipped to for their recycling. The recovered materials, residues and hazardous materials are the following:

- Smelters and steel mills – recovered metals
- Final processors/recyclers – recovered plastic, glass
- Cement factories – energy recovery of materials of high calorific value;
- Hazardous materials treatment plants – hazardous substances ;
- Landfills of industrial landfills – any residues that might occur from the pre-treatment processes that cannot be recovered.

³⁹ <https://cewaste.eu/wp-content/uploads/2021/04/CEWASTE-Final-Public-Raport.pdf>

In the facilities that perform reuse and repair processes, the outcomes from the repair stage are either being sold or donated to the personnel in the factories or to charities.

3.2.2 Key Stakeholders involved in each step of the value chain

Collection and recovery targets set by the WEEE Directive and its amendments are highly ambitious and for some MS highly unlikely to be achieved based on their current performance.

The striving of most MS to achieve the targets lies in the complexity of the WEEE products regarding their design, their collection and their treatment involving many actors (the producers, retailers, recyclers, brokers, dealers and traders, preparing for reuse business and scavengers, smelters etc.⁴⁰)

The WEEE value chain is fragmented with multiple stakeholders being involved at each step including producers (EPR), consumers and recyclers. The WEEE Directive mentions that the cost of recycling is under the producers or their legal representative (e.g. PROs), however it is not clearly stated the exact obligations that need to be covered. As such more specific costs associated with e-waste treatment and in certain cases in collection as well, are being passed on to treatment facilities and not covered in the required extent by the producers and/or EPR, as acclaimed by the recyclers. On the other hand, the PROs are arguing that these specificities fall under the handling of e-waste which is being covered while the treatment facilities believe that these costs should be covered by the EPR (see section **A 1.2.2**)

The main actors involved in the WEEE value chain are:⁴¹

- **Producers of EEE and Consumers/users**
- **Environmental authority**, enforcement inspectorate (YPEN and EOAN): responsible for the licencing of facilities, monitoring and enforcement of legislation;
- **PRO:** (Appliance Recycling S.A. is the main supplier of the feedstock/input to the treatment facilities in Greece). PROs are responsible for the collection and treatment of the WEEE but are not responsible to enforce the producers to comply as they have no legal authority, responsibility, mechanisms, influence or lever to access WEEE or divert from reaching the name actors (e.g. informal sector/scavengers, WEEE traders and brokers etc);
- **Distributers:** any natural or legal person in the supply chain, who makes EEE available on the market;⁴²
- **Recycling facilities** formally accredited, permitted and equipped facilities, to collect/take back and/or recycle WEEE or materials streams ensuing from WEEE. In Greece the WEEE recycling facilities are part of a PRO;
- **Informal sector / scavengers:** the illegal collection from unregistered scrapyards and backyard collectors (mainly from specific minorities, homeless people and immigrants), or stored quantities from previous years
- **Scrap dealers:** legitimate or illegitimate scrap collectors and treatment facilities who collect and manage WEEE as scrap. In many cases. In Greece certain scrap yards are registered with the PROs

⁴⁰ https://weee-forum.org/wp-content/uploads/2020/11/EPR-and-the-role-of-all-actors_final.pdf

⁴¹ NewInnoNet (2016) Analysis of the WEEE value chain

⁴² WEEE Directive, Article 3

(Appliances recycling S.A. is cooperating with more than 250 scrap yards) with the majority of them being unregistered and even unlicensed. The registered scrapyards are getting a paid compensation for having collection points in their facilities (container) from which the PRO is collecting and then delivers them to one of the treatment facilities⁴³

- **WEEE traders and brokers:** these actors buy WEEE and sell them to other parties not necessarily in the same country and not always in a legal way, in unknown destinations of illegal exports most of which is assumed to end-up in Africa or Asia for some form of material recovery. These actors are a challenge for both PROs (unable to close their mass balances) and to recycling facilities due to the unfair competition and the loss of quantities (loss of revenue due to the loss of incoming quantities);
- **Metallurgical Industry:** The end-users of the metallic recovered material, where further refining and use as a raw material is happening. The metallurgical industries can be divided in three production operations: primary (processing of ores to extract metals to produce alloys); secondary (using scrap and salvage for the manufacturing of alloys); and miscellaneous (industries with operations producing or using metals for final products. They include aluminium and copper smelters and blast furnaces.
- **Other specialised material recyclers:** Recycling facilities for materials other than metals e.g. plastic, glass, oils, concrete, mercury etc.
- **Hazardous waste companies, Industrial landfills** for disposing hazardous materials, recycling plants of hazardous materials, treatments plants for distraction of Hazardous materials.

3.2.3 Cost categorisation at each step of the value chain

The entailed costs regarding the WEEE value chain are difficult to determine as the value chain of WEEE recycling is complicated, fragmented and dispersed, involving multiple stakeholders⁴⁴. As such it is not safe to make any generic estimations of the entailed cost and it can only be calculated and estimated on a case study basis⁴⁵

The factors affecting the functioning of the WEEE regulated market for collection and treatment are:

- The value (positive intrinsic) of certain WEEE products;
- The volatility commodity prices;
- The compliance costs (legal requirements, depollution and labour, certification of confirmity), and;
- The scale of scavenging of products and material, which lowers the quality of treatment.

The complexity of the WEEE value chain and the related costs are affected by factors directly and indirectly involved in the process of WEEE treatment. ⁴⁶

The direct costs can be categorised as: ⁴⁷

- **Capital costs** that include the costs related to the processing of waste such as the infrastructure (buildings, machines, equipment) but also the purchase of patents etc.

⁴³ 2020 Annual Report Appliances Recycling S.A.

⁴⁴ <https://lup.lub.lu.se/luur/download?func=downloadFile&recordId=9052944&fileId=9052983>

⁴⁵ EERA (2016) WEEE recycling Economics

⁴⁶ EERA (2016) WEEE recycling Economics

⁴⁷ EERA (2016) WEEE recycling Economics

- **Technical costs** regarding the personnel costs associated with the administrative work such as office, and overhead not directly working in production.
- **Operational costs** related to the production process. The operational costs can be subcategorised as follows:
 - **Basic operational costs**, including the costs related to the depollution process, the production process itself, waste disposal, maintenance of equipment, energy consumption, etc. and
 - **Quality and service costs**, including the costs related to quality, waste characterisation, proper reporting, and compliance with the best available technology – BAT and standards etc in this category can be included the certification cost, in this case the certification of WEEELABEX.
 - The WEEELABEX certification for the treatment facilities is a mandatory requirement by the EPR scheme that monitors the facilities to fulfil all the mandatory environmental, social and treatment requirements according to the WEEE directive and the relative EU and national legislation. The monitoring and inspections for the certification take place once a year by an external auditor. Additional audits may be conducted by EPR's, licensing authorities, financing schemes and insurance representatives.

Indirect costs for a recycling facility are related to the input and the cost entailed in further treatment; these can be the transactional cost related to transportation in the phase of recycled materials, including costs associated with the search for and assessment of buyers and sellers, negotiation on quality and prices, and monitoring.

Input costs

The input (feedstock) of the facility is ensured mainly from the EPR system with which the facilities are registered under (e.g. Appliance Recycling S.A.) along with the input from non – liable producers (individuals, businesses unrelated to EEE sales, production, distribution, scavengers etc). The operators are not involved in the transportation/distribution of the received quantities except for the case of the recycling facility in North Aegean, where due to the specificities of the coverage area (islandic region) in certain occasions the facility is required to cover a part of the collection cost.

First Inspection costs

The entailed costs in handling and sorting are under the operational and more specifically the quality and services cost. They involve costs occurring from the workers involved in handling and sorting linked with the time required to complete these tasks and the cost of the working hours.

Pre- treatment costs

Pre-treatment cost include any costs related to the treatment process. In the treatment facilities the shredding, crushing and separation is performed, manually, mechanically or with a combination of manual and mechanical process.

The entailed cost in WEEE treatment is determined by the type of treatment each facility implements, manual or mechanical treatment, or a combination of the two. The most expensive procedure out of the two is considered to be the manual, due to the labour cost (depending on the average salary and annual working hours in the country), however the recovered material is of higher quality than that from the mechanical treatment.

To be able to determine the cost of manual treatment there are certain factors and data that are required to be collected:⁴⁸

- The average cost of salaries and annual working hours in the country;
- Utilities cost (prices for energy and fuel) of the country;
- Average rental and construction costs;
- Purchase prices for equipment and infrastructure;
- Achievable revenues or disposal costs for each output fraction;
- Average transport distances for each downstream scenario;
- Local interests for credits and savings;
- Taxation;
- Quantities of produced output fractions;
- Required staff, investments, and equipment;
- Required space for administration, dismantling, storage etc.;
- Expected revenues and operational costs.

3.2.4 Classification and reporting by recyclers in subcategories & associated costs

3.2.4.1 WEEE reporting categories under the WEEE Directive in EU member states

Under the current WEEE Directive 2012/19/EU, the scope is widened to include all EEE, unless specifically excluded. Alongside this change, from August 2018 the current WEEE categories are six as follows (as already presented in the above sections):

- **Category 1:** Temperature exchange equipment
- **Category 2:** Screens, monitors & equipment containing screens having a surface greater than 100 cm².
- **Category 3:** Lamps
- **Category 4:** Large equipment (any external dimension more than 50 cm) including, but not limited to: Household appliances; IT and telecommunication equipment; consumer equipment; luminaires; equipment reproducing sound or images, musical equipment; electrical and electronic tools; toys, leisure and sports equipment; medical devices; monitoring and control instruments; automatic dispensers; equipment for the generation of electric currents. This category does not include equipment included in categories 1 to 3.

⁴⁸ https://www.step-initiative.org/files/documents/green_papers/Step_GP_BCT_final.pdf

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

From reference year 2019 onwards member states are obliged to report according to the six categories methodology. However, **member states may still introduce a number of sub-categories for administrative and pricing purposes.** In particular, according to the European Commission FAQ on WEEE Directive 2012/19/EU : “Member States and other relevant actors are free to design and use additional (sub-) categories, as long as reporting to the Commission is in line with the requirements of the Directive.”

In this respect, some EU countries use over twenty sub-categories, which increases the reporting formats and consequently the administrative and cost burden. For example, Germany from August 2018, uses the six categories with 17 sub-categories⁴⁹.

3.2.4.2 WEEE classification and reporting categories in Greece

From year 2019, **Greece uses the six categories while the EPR Appliances Recycling considers additional classification in 64 subcategories** as presented in the EPR ‘Appliances Recycling SA 2019 annual report. The EPR Fotokyklosi uses the six categories. Figure 3-2 presents the 64 subcategories considered by the EPR Appliances Recycling.

It is evident, as supported by the recycling facilities in Greece, that **the classification, sorting and reporting in 64 subcategories is posing a considerable operational, administrative and cost burden, hindering the sorting and handling processes and increasing the associated costs.**

It is noted that according to the EPR ‘Appliances Recycling SA 2019 Annual Report, the above sub-categories may be modified, if required, based on the available statistical data (for Greece and EU).⁵⁰ Until the release of this report, there is no update.

⁴⁹ <https://www.ecosurety.com/news/2018-weee-category-changes-in-germany-what-you-need-to-know/>

⁵⁰ Source: 2019 Annual Report, EPR ‘Appliances Recycling SA: “Οι υποκατηγορίες ΗΗΕ οι οποίες από την 1/1/2019 εφαρμόζονται πλήρως στο σύνολο της διαχειριστικής αλυσίδας των ΑΗΗΕ. Οι υποκατηγορίες αυτές [...] εφόσον αυτό απαιτηθεί, αναμένεται να τροποποιηθούν, μετά και την άντληση και αξιοποίηση στατιστικών στοιχείων (σε εγχώριο και ευρωπαϊκό επίπεδο).”

ΟΝΟΜΑΣΙΑ ΝΕΑΣ ΥΠΟΚΑΤΗΓΟΡΙΑΣ - ΚΩΔΙΚΟΠΟΙΗΣΗ				Κωδικός ΕΚΑ	UNU Code	ΠΑΛΙΑ ΥΠΟΚΑΤΗΓΟΡΙΑ	
1	1Α (ΨΥΓΕΙΑ ΚΑΤΑΨΥΚΤΕΣ)	1Α1 (ΨΥΓΕΙΑ ΟΙΚΙΑΚΟΥ ΤΥΠΟΥ cat1-4)	1Α1100 Ψυγεία - Καταψύκτες Οικιακού τύπου full (unknown insulation)	16 02 11* 16 02 13*	0108, 0109	1a	
		1Α1200 Ψυγεία - Καταψύκτες Οικιακού τύπου no insulation (unknown insulation)	16 02 11* 16 02 13*	1a			
		1Α2 (ΨΥΓΕΙΑ ΜΗ-ΟΙΚΙΑΚΟΥ ΤΥΠΟΥ cat. 5)	1Α2100 Ψυγεία - καταψύκτες Μη Οικιακού τύπου cat.5 full (unknown insulation)	16 02 11* 16 02 13* 20 01 23* 20 01 35*		1a	
		1Α2200 Ψυγεία - καταψύκτες Μη Οικιακού τύπου cat. 5 no (unknown insulation)	16 02 11* 16 02 13* 20 01 23* 20 01 35*	1a			
		1Α3 (ΑΜΜΟΝΙΑ)	1Α3000 Ψυγεία Αμμωνίας	16 02 11* 16 02 13* 20 01 23* 20 01 35*		1a	
		1Β (ΚΛΙΜΑΤΙΣΤΙΚΑ)	1Β1100 Κλιματιστικά Οικιακού και Φορητού τύπου (Εξωτερικές μονάδες)	16 02 11* 16 02 13* 20 01 23* 20 01 35*		1β	
	1Β1 (ΟΙΚΙΑΚΑ & ΦΟΡ.)	1Β1210 Κλιματιστικά Οικιακού και Φορητού τύπου (Εξωτερικές μονάδες) full	16 02 11* 16 02 13* 20 01 23* 20 01 35*	1β			
	1Β1220 Κλιματιστικά Οικιακού και Φορητού τύπου (Εξωτερικές μονάδες) no	16 02 11* 16 02 13* 20 01 23* 20 01 35*	1β				
	1Β1300 Κλιματιστικά Οικιακού και Φορητού τύπου (Αυτόνομα / Φορητές μον.)	16 02 11* 16 02 13* 20 01 23* 20 01 35*	1β				
	1Β2 (ΜΗ-ΟΙΚΙΑΚΑ)	1Β2100 Κλιματιστικά Μη-Οικιακού και Μεγάλου τύπου (Εξωτερικές μονάδες)	16 02 11* 16 02 13* 20 01 23* 20 01 35*	1β			
	1Β2200 Κλιματιστικά Μη-Οικιακού και Μεγάλου τύπου (Εξωτερικές μονάδες)	16 02 11* 16 02 13* 20 01 23* 20 01 35*	1β				
	1Γ (ΕΛΑΙΑ)	1Γ (ΕΛΑΙΑ)	170000 Εξοπλισμός που περιέχει έλαια	16 02 13* 20 01 35*	0112	1γ1	
1Δ (ΔΙΑΝΟΜΕΙΣ)	1Δ (ΔΙΑΝΟΜΕΙΣ)	1Δ0000 Διανομιές με φύλη - καταψύξη (unknown insulation)	16 02 11* 16 02 13* 20 01 23* 20 01 35*	1002	10α		
1Ε (ΑΦΥΓΡΑΝΤΗΡΕΣ)	1Ε (ΑΦΥΓΡΑΝΤΗΡΕΣ)	1Ε0000 Αφυγρανήρες	16 02 11* 16 02 13* 20 01 23* 20 01 35*	0112	1β		
1Ζ (ΆΛΛΑ)	1Ζ (ΆΛΛΑ)	1Ζ0000 Άλλος εξοπλισμός με ρευστά (εκτός νερού)	16 02 11* 16 02 13* 20 01 23* 20 01 35*		1β		
2	2Α (ΟΘΟΝΕΣ & ΕΞΟΠΛΙΣΜΟΣ ΜΕ ΟΘΟΝΕΣ >100 cm2)	2Α1100 Οθόνες (Τηλεοράσεις) FPD full (unknown type)	16 02 13* 20 01 35*	0408	4a2		
		2Α1120 Οθόνες (Τηλεοράσεις) FPD no (unknown type)	16 02 13* 20 01 35*	0408	4a2		
		2Α1210 Οθόνες (Monitor) FPD full (unknown type)	16 02 13* 20 01 35*	0309	3a2		
		2Α1220 Οθόνες (Monitor) FPD no (unknown type)	16 02 13* 20 01 35*	0309	3a2		
		2Α2110 Οθόνες (Τηλεοράσεις) CRT full	16 02 13* 20 01 35*	0407	4a1		
		2Α2120 Οθόνες (Τηλεοράσεις) CRT no	16 02 13* 20 01 35*	0407	4a1		
		2Α2210 Οθόνες (Monitor) CRT full	16 02 13* 20 01 35*	0308	3a1		
		2Α2220 Οθόνες (Monitor) CRT no	16 02 13* 20 01 35*	0308	3a1		
		2Β (ΕΞΟΠΛΙΣΜΟΣ ΜΕ ΟΘΟΝΕΣ)	2Β1 (LAPTOPS)	2Β1000 Laptop/Notebooks	16 02 13* 20 01 35*	0303	3β
		2Β2 (TABLETS)	2Β2000 Tablets	16 02 13* 20 01 35*	0303	3β	
2Β3 (ΠΑΙΧΝΙΔΙΑ)	2Β3000 Παιχνιδιομηχανές με οθόνη	16 02 13* 20 01 35*		7α			
2Β4 (ΆΛΛΑ)	2Β4000 Λοιπός εξοπλισμός με οθόνη	16 02 13* 20 01 35*		7α			
3	3Α (ΛΑΜΠΗΡΕΣ ΕΚΚ. ΛΕΡΙΩΝ)	3Α (ΕΚΚΕΝΩΣΗΣ)	3Α0000 Λαμπτήρες εκκένωσης αερίων (unknown type)	20 01 21* 16 02 13* 20 01 35*	0502, 0503, 0504	5β	
		3Β (LED)	3Β0000 Λαμπτήρες LED	16 02 14 20 01 36	0505	5β	
		3Α1 (ΟΙΚΙΑΚΕΣ κ1)	3Α1000 Οικιακές (κατ.1) η/λην Θερμοσίφωνων / πλυντηρίων	20 01 35* 20 01 36 16 02 13* 16 02 14	01, 0101, 0102, 0103, 0104, 0105, 0106	1γ1	
4	4Α (ΟΙΚΙΑΚΕΣ κατ.1)	4Α2 (ΠΛΥΝΤΗΡΙΑ)	4Α2110 Πλυντήρια Οικιακού τύπου full	16 02 13* 16 02 14 20 01 35* 20 01 36	0104	1γ1	
		4Α2120 Πλυντήρια Οικιακού τύπου no	16 02 13* 16 02 14 20 01 35* 20 01 36	1γ1			
		4Α2200 Πλυντήρια Επαγγελματικού τύπου	16 02 13* 16 02 14 20 01 35* 20 01 36	1γ1			
		4Α3100 Θερμοσίφωνες OTHER	16 02 14 20 01 36	1γ2			
		4Α3200 Θερμοσίφωνες PU	16 02 11* 16 02 13* 20 01 23* 20 01 35*	1γ3			
		4Β (ΟΙΚΙΑΚΕΣ κατ.2)	4Β (ΟΙΚΙΑΚΕΣ κ2)	4Β0000 Οικιακές (κατ.2)		20 01 35* 20 01 36 16 02 13* 16 02 14	0201, 0202, 0203, 0204, 0205
	4Γ (PV PANELS)	4Γ (PV PANELS)	4Γ0000 PV PANELS (unknown type)	20 01 35* 20 01 36 16 02 13* 16 02 14	0002		
	4Δ (ΉΧΟΣ-ΕΙΚΟΝΑ)	4Δ (ΉΧΟΣ-ΕΙΚΟΝΑ)	4Δ0000 Ήχος, Εικόνα	20 01 35* 20 01 36 16 02 13* 16 02 14		4β	
	4Ε (ΦΩΤΙΣΤΙΚΑ ΕΙΔΗ)	4Ε (ΦΩΤΙΣΤΙΚΑ)	4Ε0000 Φωτιστικά είδη	20 01 35* 20 01 36 16 02 13* 16 02 14	0405	5α	
	4Ζ (ΕΡΓΑΛΕΙΑ)	4Ζ (ΕΡΓΑΛΕΙΑ)	4Ζ0000 Εργαλεία	20 01 35* 20 01 36 16 02 13* 16 02 14	0602	6	
	4Η (ΠΑΙΧΝΙΔΙΑ)	4Η (ΠΑΙΧΝΙΔΙΑ)	4Η0000 Παιχνίδια	20 01 35* 20 01 36 16 02 13* 16 02 14	0703	7β	
	4Θ (ΙΑΤΡΙΚΑ)	4Θ (ΙΑΤΡΙΚΑ)	4Θ0000 Ιατρικά	20 01 35* 20 01 36 16 02 13* 16 02 14		8β	
	4Ι (ΠΑΡΑΚ.-ΕΛΕΓΧΟΣ)	4Ι (ΠΑΡ.-ΕΛΕΓΧΟΣ)	4Ι0000 Παρακολούθηση - Έλεγχος	20 01 35* 20 01 36 16 02 13* 16 02 14	0902	9	
	4Κ (ΑΥΤΟΜΑΤΟΙ ΔΙΑΝ.)	4Κ (ΑΥΤ. ΔΙΑΝΟΜΕΙΣ)	4Κ1000 Αυτόματοι Διανομιές (ΑΤΜ)	20 01 35* 20 01 36 16 02 13* 16 02 14		10β	
	4Κ2000 Αυτόματοι Διανομιές (Λοιποί)	4Κ2000 Αυτόματοι Διανομιές (Λοιποί)	4Κ2000 Αυτόματοι Διανομιές (Λοιποί)	20 01 35* 20 01 36 16 02 13* 16 02 14	1001	10γ	
	4Λ (ΕΞΟΠΛΙΣΜΟΣ Ι.Τ.)	4Λ (ΕΞΟΠΛ. ΙΤ)	4Λ0000 Εξοπλισμός Ι.Τ. (unknown type)	20 01 35* 20 01 36 16 02 13* 16 02 14	0307	3β	
5	5Α (ΟΙΚΙΑΚΕΣ κατ.1) <50 cm ύψος <= 60cm πλάτος <= 60cm βάθος	5Α (ΟΙΚΙΑΚΕΣ κατ.1)	5Α0000 Οικιακές (κατ.1)	20 01 35* 20 01 36 16 02 13* 16 02 14	0114	1γ1	
		5Β (ΟΙΚΙΑΚΕΣ κατ.2)	5Β0000 Οικιακές (κατ.2)	20 01 35* 20 01 36 16 02 13* 16 02 14	0201, 0202, 0203, 0204, 0205	2	
		5Γ (PV PANELS)	5Γ (PV PANELS)	5Γ0000 PV PANELS (unknown type)	20 01 35* 20 01 36 16 02 13* 16 02 14	0002	
		5Δ (ΉΧΟΣ-ΕΙΚΟΝΑ)	5Δ (ΉΧΟΣ-ΕΙΚΟΝΑ)	5Δ0000 Ήχος, Εικόνα	20 01 35* 20 01 36 16 02 13* 16 02 14	0401, 0402, 0403, 0404, 0405, 0406	4β
		5Ε (ΦΩΤΙΣΤΙΚΑ ΕΙΔΗ)	5Ε (ΦΩΤΙΣΤΙΚΑ)	5Ε0000 Φωτιστικά είδη	20 01 35* 20 01 36 16 02 13* 16 02 14	0506, 0507	5α
		5Ζ (ΕΡΓΑΛΕΙΑ)	5Ζ (ΕΡΓΑΛΕΙΑ)	5Ζ0000 Εργαλεία	20 01 35* 20 01 36 16 02 13* 16 02 14	0601	6
		5Η (ΠΑΙΧΝΙΔΙΑ)	5Η (ΠΑΙΧΝΙΔΙΑ)	5Η0000 Παιχνίδια	20 01 35* 20 01 36 16 02 13* 16 02 14	0701, 0703	7β
		5Θ (ΙΑΤΡΙΚΑ)	5Θ (ΙΑΤΡΙΚΑ)	5Θ0000 Ιατρικά	20 01 35* 20 01 36 16 02 13* 16 02 14	0801	8β
		5Ι (ΠΑΡΑΚΟΛ.-ΕΛΕΓΧΟΣ)	5Ι (ΠΑΡ.-ΕΛΕΓΧΟΣ)	5Ι1100 Ανχνευτές καπνού Ραδιενεργοί	16 02 13* 16 02 14 20 01 35* 20 01 36		9
		5Ι1200 Ανχνευτές καπνού Μη Ραδιενεργοί	5Ι1200 Ανχνευτές καπνού Μη Ραδιενεργοί	5Ι1200 Ανχνευτές καπνού Μη Ραδιενεργοί	16 02 13* 16 02 14 20 01 35* 20 01 36	0901	9
5Ι2000 Παρακολούθηση - Έλεγχος (Λοιπός εξοπλισμός)	5Ι2000 Παρακολούθηση - Έλεγχος (Λοιπός εξοπλισμός)	5Ι2000 Παρακολούθηση - Έλεγχος (Λοιπός εξοπλισμός)	16 02 13* 16 02 14 20 01 35* 20 01 36		9		
5Κ (ΑΥΤΟΜΑΤΟΙ ΔΙΑΝΟΜΕΙΣ)	5Κ (ΑΥΤ. ΔΙΑΝ.)	5Κ0000 Αυτόματοι Διανομιές	20 01 35* 20 01 36 16 02 13* 16 02 14	1001	10γ		
6	6Α (ΕΞΟΠΛΙΣΜΟΣ Ι.Τ.) <50 cm ύψος <= 60cm πλάτος <= 60cm βάθος	6Α (ΕΞΟΠΛ. ΙΤ)	6Α0000 Εξοπλισμός Ι.Τ. (unknown type)	20 01 35* 20 01 36 16 02 13* 16 02 14	0301, 0302, 0304, 0305	3β	
		6Β (ΠΑΙΧΝΙΔΙΟΜΗΧΑΝΕΣ)	6Β (ΠΑΙΧ/ΝΕΣ)	6Β0000 Παιχνιδιομηχανές (Κονσόλες)	20 01 35* 20 01 36 16 02 13* 16 02 14	0702	7β
		6Γ (ΚΙΝΗΤΑ ΤΗΛΕΦΩΝΑ)	6Γ (ΚΙΝ. ΤΗΛΕΦΩΝΑ)	6Γ0000 Κινητά τηλέφωνα	20 01 35* 20 01 36 16 02 13* 16 02 14	0306	3β
		6Δ (ΤΟΝΕΡ/ΜΕΛΑΝΙΑ)	6Δ1 ΤΟΝΕΡ	6Δ1000 Τόνερ (unknown type)	16 02 15* 16 02 16		3γ
		6Δ2 ΜΕΛΑΝΙΑ	6Δ2000 Μελάνια (unknown type)	6Δ2000 Μελάνια (unknown type)	16 02 15* 16 02 16		3γ
		6Ε (ΚΑΛΩΔΙΑ)	6Ε (ΚΑΛΩΔΙΑ)	6Ε0000 Καλώδια	20 01 35* 20 01 36 16 02 13* 16 02 14		3β

Figure 3-2 WEEE classification and reporting in 64 sub-categories for Greece

Source: 2019 Annual Report, EPR 'Appliances Recycling SA

3.3 Assessment of WEEE Management Costs in Greece

This section provides a more strategic approach to the factors affecting WEEE management costs in Greece. As already mentioned (Section 1.3 Study Limitations), Eunomia’s approach to this study and particularly the costs associated with WEEE management is informed by an agreed understanding that what is sought is a strategic analysis and recommendations regarding the WEEE Management in Greece, considering the limited data availability.

Thus, the focus is on the analysis of the direct and indirect factors that could potentially affect the operating costs of a recycling unit. These factors are related both to deficiencies in the legislative framework and to the absence of transparency in the operation of PROs, as well as external factors related to the removal of valuable materials from the WEEE before these arrive at the units.

In this context, reports from European sources available in the public domain, data from the PRO ‘Appliances Recycling S.A.’ and data collected from the communication/interviews with the Greek recyclers were used. (Cost data were aggregated and anonymised with respect to this study)

3.3.1 Cost Assessment

3.3.1.1 Associated Costs with WEEE treatment

In its annual reports for 2019 and 2020, Appliances Recycling S.A. assesses the cost of WEEE treatment, in the context of a detailed description of its economic activities. The assessment is carried out based on the reported rates of the Scheme for the collection & transport of WEEE as well as based on the net management and treatment costs reported by the recyclers. The estimated treatment costs are included in the total direct costs of the PRO for the management of WEEE, which also consider the costs for collection, transport, temporary storage, and sorting services.

Table 3-1 Treatment Costs of WEEE according to Appliances Recycling S.A.

Source: PRO Annual reports (Απολογιστικές Εκθέσεις 2018, 2019, 2020 Ανακύκλωση Συσκευών ΑΕ)

	2018	2019	2020 ⁵¹
Quantities (t)	55,990	61,753	59,090
Quantities % Change	-	10.3%	-4.3%
Treatment Costs (million €)	2.64	2.63	2.67

A rough estimate of the cost per tonne carried out shows a range of management costs considered from **42.6 €/t in 2019** (lowest) to **47.2 €/t in 2018** (highest) based on the data provided in the above table 14.

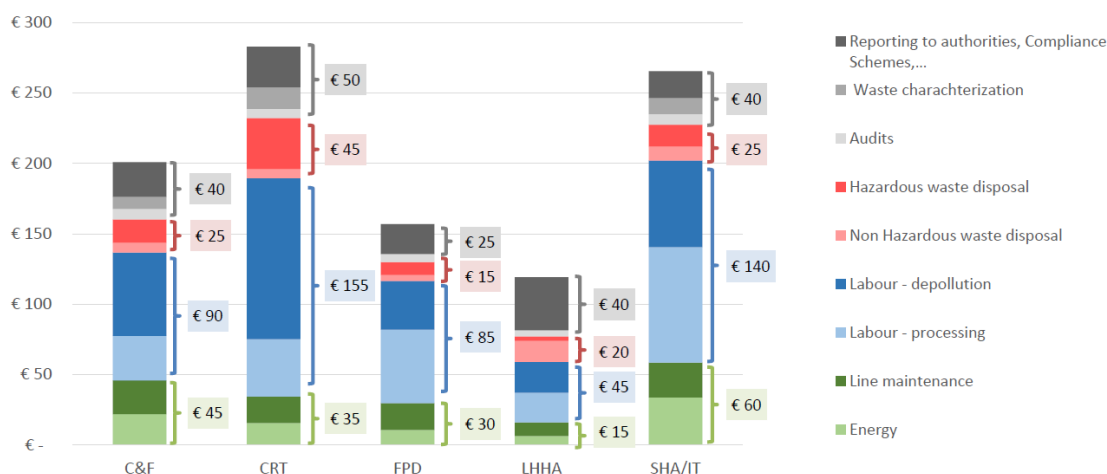
According to the estimations and cost figures provided by participants in this study (Greek recycling facilities), **the real cost per tonne of WEEE managed in Greece is much higher and is estimated at more than 200 €/tn** on average. Based on EU cost data in a recent study conducted by the United Nations

⁵¹ The 2020 Annual Report of Appliances Recycling S.A. is not yet approved by EOAN.

University, UNU - VIE SCYCLE ('WEEE Recycling Economics: The shortcomings of the current business model')⁵² the average costs associated with the WEEE treatment are (reference year 2018):

- ~ **200 €/tn** for Cooling & Freezing (C&F) equipment - **Category 1**
- ~ **285 €/tn** for Cathode Ray Tubes (CRT) and ~**155 €/tn** for Flat Panel Displays (LHHA) - **Category 2**
- ~ **120 €/tn** for Large Household Equipment (LHHA) - **Category 4**
- ~ **270 €/tn** for Small Equipment and IT (SHA/IT) - **Categories 5 & 6**

It is noted that current cost data are considerable higher than the 2018 cost data presented above. Figure 3-3 presents the analysis of the above average costs per WEEE category⁵³.



* These costs are **not** total treatment costs per cat. Excluded are capital, depreciation, other staff, office costs, etc

Figure 3-3 Average costs for compliant recycling of WEEE categories, 2018 EU data

Source: 2018 IERC Presentation IERC: "WEEE Recycling Economics – The shortcomings of the current business model", United Nations University, UNU - VIE SCYCLE

3.3.2 Challenges and Opportunities

It is very important for the protection of the environment, to fully apply the appropriate procedure for the treatment of waste. Therefore, it is also important to ensure that the waste streams will be directed towards the appropriate treatment in the recycling facilities. However, the treatment of post-consumer e-waste is challenging due to the challenges in collection, sorting and dismantling, the main barriers of which are being summarised as follows.⁵⁴

3.3.2.1 Challenges in Collection & Treatment

Enforcement of regulation

The EU has in place one of the strictest regulations regarding WEEE legislation, to improve the collection and efficiency of recycling, enhance the secondary market of covered materials within the EU and to

⁵² Magalini F. & Huisman J. (2018), WEEE Recycling Economics: The shortcomings of the current business model, United nations University, UnU - VIE SCYCLE. https://www.researchgate.net/publication/327282498_WEEE_Recycling_Economics_-_The_shortcomings_of_the_current_business_model

⁵³ According to the 2018 UNU - VIE SCYCLE study, the analysis was based on data provided by 13 EERA Members, encompassing 27 treatment locations in 13 countries for a total volume reported of 465,000 tons.

⁵⁴ <https://lup.lub.lu.se/luur/download?func=downloadFile&recordId=9052944&fileId=9052983>

minimize the environmental impact of the treatment processes and thus the EUs dependency on imported EEE and materials. These requirements have been transposed to all MS’s national legislation including Greece (see section 1.4.2). Despite legislation in place however, the optimization of the recycling practices is still challenging, and the existing policy frameworks and instruments fail to be implemented fully at a national level due to the lack of monitoring and enforcement.⁵⁵

Complex design and materials used.

The complexity of EEE design increases the difficulties of recovering all materials, with certain types of EEE containing at least 69 elements. An example of the complexity in design is the components and the contained materials of smartphones.

Table 3-2 Materials/Components contained in EEE

Source: El-Kretsen (2019); Responsible Minerals Initiative et al. (2018)

Components	Contained materials
Cases	Plastic, aluminium, iron and copper
Printed circuit board	Aluminium, copper, gold, nickel, silver, plastic
Microphone / speaker	Copper, iron, nickel, rare earth elements (neodymium, samarium)
Battery	Cobalt, graphite, lithium, nickel
Screens	Glass, tin, rare earth elements

The complexity of certain WEEE design, and the difficulty in separating and recovering the materials are significant factors affecting the cost of the process. Depending on the type of dismantling each facility uses (manual/mechanical) the quality of the extracted/separated material and the cost is different. Manual dismantling ensures higher quality (less if any residues) than mechanical dismantling and separation however the manual process is more costly than mechanical.

Different levels of responsibilities during Collection & Transport of WEEE in Greece

The Common Ministerial Decision 23615/651/E.103 (2014), provides a first framework of responsibilities and appropriate actions to be taken regarding the organization of the WEEE collection and transport network. As a first step, and according to Article 5A, it is explicitly mentioned that for the companies that carry out the processes of WEEE management, the relevant licenses and the cooperation agreements with the respective PROs are mandatory.

In general, the certain Decision provides for mandatory separate collection of WEEE from household waste. Regarding the collection of WEEE, Greek legislation distinguishes two cases, depending on whether the waste is of private household origin or not. In the first case, the end user discards the WEEE at the collection points which are either municipal (determined by the municipalities in cooperation with the PROs) or located in retail stores and private sector businesses, public services, or public bodies. For WEEE of non-household origin, the legal collectors/transporters who collaborate with the respective PROs collect from the users' facilities/premises, while the issuance of a Receipt Certificate is also mandatory.

⁵⁵ <https://lup.lub.lu.se/luur/download?func=downloadFile&recordId=9052944&fileId=9052983>

With reference to the responsibilities for collection and transportation (in the stages of which the phenomenon of scavenging is observed) and according to the Common Ministerial Decision 23615/651/E.103 (2014) the following are highlighted:

- PROs are responsible for the coordination and supervision of the collection and transfer, with the corresponding procedures defined in the approval decisions of these systems by EOAN. In addition, PROs must also define measures to ensure the proper operation of the collection points, in the context of the cooperation agreements drawn up with the interested parties for the placement of collection points.
- Municipalities are obliged to determine collection points taking into account population density and to ensure their availability and accessibility, while they are also obliged to organize the collection and transport of bulky and heavy WEEE from the end-user's premises/private households. Therefore, for the WEEE received by the municipalities, they are also responsible for maintaining the condition in which the WEEE were received, until they are delivered to the transport companies/distributors.
- Distributors, if they provide a new product, are required to receive retired electronic and electrical equipment from end users, free of charge. Also, they must have a space with specific specifications for the disposal of very small WEEE in their stores, which they then deliver to legal collectors-transporters. For the space they have, they should take measures to ensure their proper operation.
- In addition to the aforementioned obligations (licensing etc.), the collectors/transporters must keep records on the quantities they transport as well as ensure the integrity of the collected/transported waste in order to optimize the reuse process and limit the dangerous substances that may be contained.

In practice, the responsibilities regarding the collection and transport network are not completely clear., especially in remote or islandic areas. According to recyclers, in these types of areas the collection costs fall to them instead of the PRO, affecting the transparency and effective functioning of the collection network. This is an aspect that should be further examined.

The implementation of many provisions of the Law is carried out based on their unilateral interpretation and as this is reflected in the contracts between the interested parties (recyclers, collectors/transporters etc.) and the PROs. For example, as it was found in the context of this study, many transporters do not show the appropriate care when transporting WEEE, despite the commitments and the relevant licenses they have with the PROs.

Therefore, in the event that the quality of transported WEEE is degraded under the responsibility of the transporters, the recyclers should immediately report such events to the PRO and it should take the necessary actions (cancellation of the contract with the transporter, etc.). As mentioned by the recyclers, due to the continuous reception of damaged WEEE, they suffer losses (less revenue from sales of secondary raw materials or reusable products). In the meantime, large quantities of damaged WEEE may also affect the national recycling targets and as a general issue, the transport conditions of WEEE is something that as an overall issue the PRO should be concerned with.

3.3.2.2 Scavenging of valuable components of WEEE

Products discarded by consumers are often scavenged. The theft of valuable electrical and electronic components does significant financial damage to e-scrap recyclers across Europe, by reducing tonnage of WEEE sent to them, and reducing the materials' total value. According to EERA's reports (2018 & 2019)⁵⁶, collection categories Screens, Cooling and Freezing, Large Household and IT are those which scavenging is recorded with greater frequency. Although the reports do not specify their data by country, Figure 18 below lists percentages for scavenging in component materials of the products of each category.

Depending on the equipment, some scrapyards pay up to 50€ for a piece of EEE and they may either be part of or not of a PRO. Smaller EEE are being disposed of in municipal waste either being landfilled or incinerated as previously mentioned.

In addition to scavenging of whole products, during the steps prior to the transfer to the recycling facilities, components and materials with a high value are removed. Apart from the environmental and social consequences of this improper management, the economic consequences under the current business model, adopted by the producers' compliance schemes in Europe, have a direct impact on the profitability of recyclers.

Regarding the responsibilities during collection of WEEE in Greece, as analyzed before, the municipalities are mostly responsible for the collection of bulky or heavy household WEEE, such as those included in category 4 (Large household equipment). It is a common practice in Greece for consumers who want to dispose of old electric or electrical household equipment to contact the relevant municipal services and follow the instructions given to them regarding the time and place at which they should have deposited the waste. As the collection is not carried out immediately, it is common for consumers to deposit the waste in the public space designated for them by the Municipality, and its collection to be carried out at a later date. **During this time, the waste product is likely to be scavenged.**

EERA has estimated the scavenging level per product category⁵⁷ for 2016 and 2018 respectively, indicating scavenging only at collection points or during the steps prior to the hand-over to recycling facility and not calculating separation from the householders (see below).

⁵⁶ Magalini F. & Huisman J. (2018), WEEE Recycling Economics: The shortcomings of the current business model, Conducted by United Nations University, UNU - VIE SCYCLE, Commissioned by EERA & Magalini F. & Stillhart R. (2019), SCAVENGING OF WEEE: environmental and economic consequences for society, Conducted by SOFIES, Commissioned by EERA.

⁵⁷1) Cooling & freezing, 2) Screens, 3) Large Household Appliances, 4) Small Household Appliances & IT

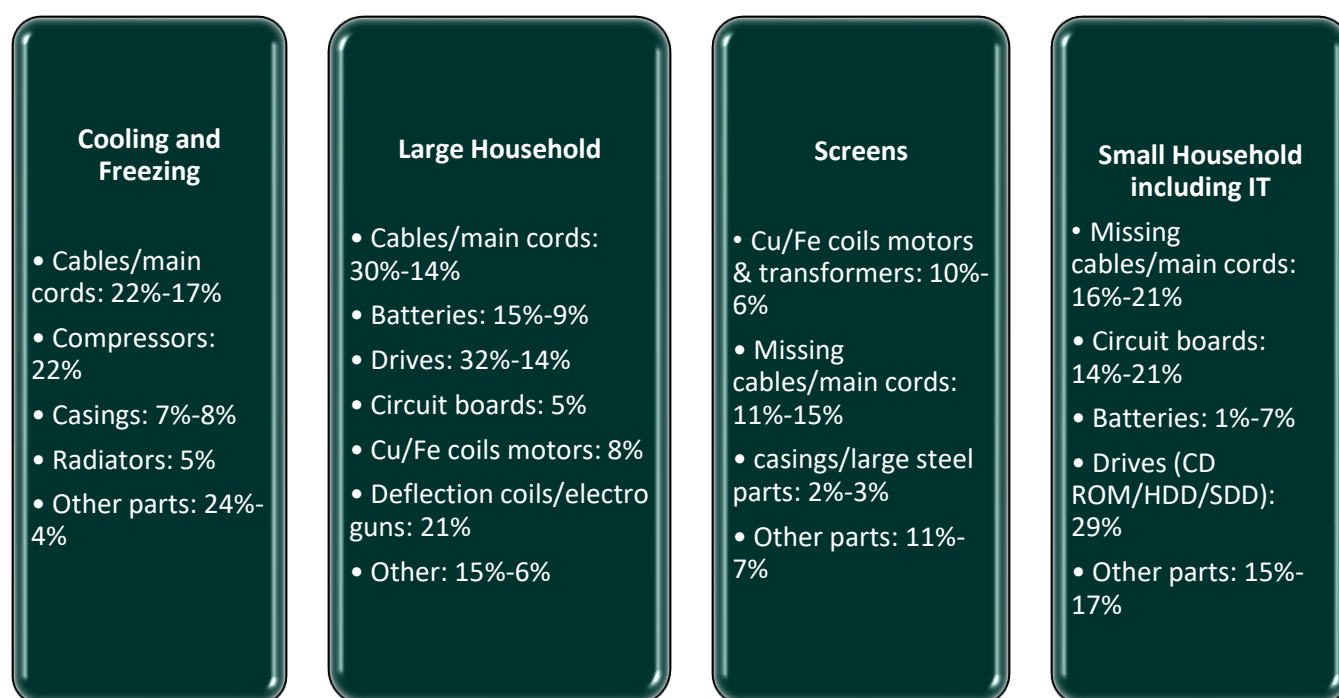


Figure 3-4 Scavenging level per product category, 2015-2018

Source: Magalini F. & Huisman J. (2018), WEEE Recycling Economics: The shortcomings of the current business model, Conducted by United nations University, UnU - VIE SCYCLIE, Commissioned by EERA & Magalini F. & Stillhart R. (2019), SCAVENGING OF WEEE: environmental and economic consequences for society, Conducted by SOFIES, Commissioned by EERA.

At the same time, along with the very serious environmental impacts from the improper management of hazardous waste included in the materials (e.g. CFC), recyclers also suffer the financial impacts (profitability issues). Based on the current business model adopted by Compliance Schemes in Europe, contracts are only indexed on fluctuation of main commodities and are not considering that scavenging of components and materials is also not predictable and varying over time. In many cases market dynamics cause higher scavenging when the value of commodities is higher and fees paid by Compliance Scheme, as a consequence, are lower. For example, Appliances Recycling S.A. in 2020⁵⁸ made a significant increase in the purchase prices of air conditioners and ferrous WEEE, to formally collect and treat them. One of the reasons that led to a reduction in collection costs of Appliances Recycling S.A. in 2020, was the increase in secondary market raw materials resulting in a dramatic increase in scrap prices. For this reason, several quantities of WEEE were sent to the smelters/steel mills.

In addition, EERA' reports conducted an estimation regarding losses (both in euro and quantities per year) related to scavenged components for the years 2016 and 2018 per product category:

⁵⁸ According to the Annual Report of Appliances Recycling S.A. for 2020.

Table 3-3 Estimated losses related to scavenged components, in euros and Kilotons, 2015-2018

Categories	Estimated losses in Euro and Kilotons per year					
	Euros (millions/year)			Kilotons (kt/year)		
	2016	2018	% Difference	2016	2018	% Difference
Cooling & freezing	17	17	0%	51	51	0%
Screens	25	15	-40%	17	11	-35.3%
Large Household Appliances	9	6	-33.3%	19	12	-36.8%
Small Household Appliances & IT	120	112	-6.67%	81	77	-4.9%
TOTAL	171	151	-11.7%	168	152	-9.5%

Source: Magalini F. & Huisman J. (2018), WEEE Recycling Economics: The shortcomings of the current business model, Conducted by United nations University, UnU - VIE SCYCIE, Commissioned by EERA & Magalini F. & Stillhart R. (2019), SCAVENGING OF WEEE: environmental and economic consequences for society, Conducted by SOFIES, Commissioned by EERA.

Loss of quantities

Besides the scavenging a challenge in in WEEE value chain is the loss of quantities collected or treated, as a result either of the activity of the informal sector, the illegal collection from unregistered scrapyards and backyard collectors (mainly from specific minorities, homeless people and immigrants), hoarding (stored quantities) or wrongful discard of WEEE.

There are no studies currently on the effect of the informal sector in a Greek context. A study is being carried out regarding to environmental crime in Greece part of which is the waste crime, which includes the illegal disposal, management, or trafficking of waste. The informally collected quantities are likely to be exported, sent to car shredders, or go through other channels and are difficult to be detected.

The estimated quantities of the informal sector according to Appliances Recycling S.A. could be counted between 25% to 40%.

Most of the illegally collected and treated quantities lost to the recycling facilities, are treated in a non-compliant way (e.g. no depollution according to set standards) and can be either sold directly to the processing industry (smelters) of up to 50€ per WEEE (depending the type of WEEE) or illegally exported.⁵⁹

Many WEEE quantities are lost due to the illegal exports. WEEE are deliberately classified as other items, by declaring non-hazardous waste codes for hazardous wastes or using codes of products for waste

⁵⁹ Anthesis(2019). Report for the WEEE Fund: An independent study on Waste Electrical and Electronic Equipment (WEEE) flows in the UK

disguised as second hand goods, in order to deceive the law enforcement authorities⁶⁰. Certain WEEE contain precious metals as well as rare materials of value (e.g. gold, copper and nickel, indium, palladium etc) making them an attractive trade. This phenomenon is being sustained due to the inadequate resources for monitoring, enforcement as well as the low penalties for the infringers. The large-scale exports of WEEE from the EU are mainly destined to Africa and Asia⁶¹.

Lastly, quantities of WEEE are being lost as many small household appliances are being discarded in residual waste instead on the designated/certified drop-offs which are then being carried to landfills⁶² or in the case of Greece, to illegal or uncontrolled waste dumps.^{63.#}

Sorting

According to the recyclers sorting can be a costing procedure as it is time consuming, since it is being done mostly through manual work, and complicated and demanding, due to the requirement of skills/education from the workers in order to do the sorting correctly. WEEE Directive has set the reporting of the categorisation to 6 categories in order to simplify the sorting procedure for the recycling facilities, however the sorting within the facilities is being determined, especially in Greece by the PRO. As already mentioned, the reporting of WEEE in 64 subcategories, is hindering the sorting process and increasing significantly the costs associated.

⁶⁰ <https://stopwastecrime.gr/en/what-is-environmental-waste-crime/>

⁶¹ European Environment Agency (2012). *Movements of waste across the EU's internal and external borders*, Copenhagen. <https://www.eea.europa.eu/publications/movements-of-waste-EU-2012/file>

⁶² Anthesis(2019). Report for the WEEE Fund: An independent study on Waste Electrical and Electronic Equipment (WEEE) flows in the UK

⁶³ <https://stopwastecrime.gr/en/what-are-the-trends-in-greece/>



4.0

**Development of
Proposals**

4.1 Focus on Small WEEE Collection

It is estimated that **important quantities of small WEEE end in the residual waste bins in Greece**. According to EU estimations, **1.4 kg/capita of WEEE⁶⁴ in Europe ends up among residual waste, and most of this is small WEEE**, which is supported by recent reports from UNITAR (2020) and WEEE FORUM (2020)⁶⁵. Small IT as mentioned before, is also regarded as one of the categories **with a higher percentage of scavenging**. Achieving minimum collection rates especially for this stream can often be challenging in most Member States including Greece, compared to other types of WEEE.

In order to achieve higher collection rates, **it is required to take cost effective and proportionate measures that prevent small WEEE from ending up in residual waste**.

For Greece, this may mean, inter alia, **increasing the density and visibility of collection points** considering the particular characteristics of each geographical area in the country, **designing more effective logistics and improved targeted communication campaigns**. Moreover, **appraising the feasibility of collecting small WEEE directly from households** could be considered. This is also suggested by the WEEE FORUM, in particular: the feasibility of collecting small WEEE directly from private households in the same bin as mixed dry recyclables, with segregation/sorting at material recovery and sorting facilities.

In the absence of Pay as You Throw generally in Greece, it could be also worth considering **a ban on the disposal of WEEE to residual waste as some countries have, including Switzerland, Ireland and Belgium**, which may both help to collect WEEE and meet the targets, but also to prevent the risk of landfilling and incineration of hazardous materials.

4.2 WEEE ending up in metal scrap/ illegal treatment & scavenging

It seems that quantities of **WEEE often end up in mixed metal scrap** (and might be recorded as metal scrap in waste statistics, instead of WEEE)⁶⁶. More disturbingly, part of that flow **is treated illegally at rudimentary scrapyards**, which may not have been licensed to manage WEEE or even be shipped outside Europe for processing. Most of that WEEE flow consists of **large and rich in valuable materials items, such as large household equipment, cooling, and freezing equipment**. According to UNITAR study (2020), collecting robust data on the amount of WEEE included in metal scrap could be problematic, due to the lack of reporting of illegal operations and the lack of harmonized data.

Mandatory handover is one of the most common policy approaches across Europe. According to this, all **WEEE management is carried out exclusively by permitted WEEE collectors and recyclers that are**

⁶⁴ EU28 plus Norway, Iceland and Switzerland

⁶⁵ Source: WEEE FORUM (2020), An enhanced definition of EPR and the role of all actors.

⁶⁶ Also supported in the WEEE FORUM's report (2020).

contracted with PROs, and all WEEE that is collected by actors other than permitted actors, has to be handed over either to the PROs or the rest of the permitted actors. Alternatively, it could be required that **the scrap dealers' permits include reporting of separated WEEE from scrap received at their facilities**. When the operator receiving WEEE mixed with scrap is not allowed to treat WEEE, this should be separated from the scrap and handed over to a licensed treatment operator/recycler. A stricter approach could be to gradually ban collection of WEEE mixed with scrap. This approach requires high enforcement in order to avoid the creation of new parallel unreported flows of WEEE mixed with scrap.

Dealing with scavenging

It is estimated that more than 2,000 tonnes of WEEE (mainly small WEEE) are collected but not received at the recycling units and treated properly, based on estimations and data provided by EOAN and the recyclers with respect to this study. In Greece, unfortunately, no data records about WEEE scavenging are available and thus, the impact of these practices could not be accurately quantified.

Firstly, a detailed analysis of the amount that falls outside the legitimate recyclers' reach should be conducted, with the participation of all the necessary actors (PROs, municipalities, collectors, recyclers etc.). Thus, Greece's relevant authorities will have a quantified assessment of the current situation.

Secondly, as supported by the WEEE FORUM (2018)⁶⁷, **it could be considered as mandatory for scrap dealers working in the 'grey' market to obtain a WEEELABEX certificate to remain in business**. Furthermore, **legally binding standards may also create the conditions for fair competition** among all stakeholders, as all of them will have to pay for similar quality of treatment/recycling.

4.3 Receiving 'damaged' WEEE for recycling

WEEE that is received by recyclers and is in poor condition (damaged) due to the conditions of storage and transportation by the transporters or collectors or other reasons (scavenging, etc.), **is much more likely not to yield the same quality of materials for recovery or recycling**, and environmental implications as hazards from improper handling pollute the environment. The quality of the WEEE should be verified initially upon receipt from the collection points and when the receipt certificate is issued. Also, upon receipt the recycler shall check the quality of the WEEE received.

In the event that the transport is carried out by an official transporter with an active contract with the PRO, and the WEEE has been damaged at the responsibility of the carrier, a fact that indicates non-compliance with the transport specifications, the recycler shall inform the PRO, which accordingly shall take all the necessary measures to ensure the smooth transport conditions of WEEE (communication with transporters, warning, renegotiation of contracts). In case that this is not carried out, compensation should be required directly from the PRO according to the calculated potential losses that the lower quality of WEEE will cause to the recycler. Further measures shall be considered following consultation between the recyclers and the involved stakeholders (PRO, responsible authorities).

⁶⁷ WEEE FORUM (2018): Compliant WEEE recycling. Why making EN 50625 standards legally binding is part of the solution.

4.4 Classification in subcategories of WEEE

As already mentioned, from reference year 2019 onwards member states are obliged to report according to the six categories methodology. However, member states may still introduce a number of sub-categories for administrative and pricing purposes. According to EC, Member States and other relevant actors are free to design and use additional (sub-) categories, as long as reporting to the Commission is in line with the requirements of the Directive.

In this context, since 2019 Greece uses the **six categories of WEEE** while the EPR Appliances Recycling requests the classification **in 64 subcategories by the recyclers** which is posing a **considerable operational, administrative and cost burden, hindering the sorting and handling processes and increasing the associated costs**.

Greater harmonisation across EU member states is proposed and common standards in EU level. For Greece, it is recommended a simplification of the current subcategories classification with respect to avoiding unnecessary bureaucratic burden while ensuring the necessary data reporting.

4.5 Calculation/ assessment of the achievement of the WEEE minimum collection and recovery targets

As the current EU waste hierarchy promotes waste prevention and the extension of the life of appliances, all actors in the following years will focus on enhancing the **durability, reparability and reusability** in order to **extend the lifetime of electrical and electronic products**. Thus, there are emerging methodological constraints expected to arise with the high collection targets under the PoM approach.

The EEE PoM target methodology has been reviewed in several respects, also indicated by the United Nations Institute for Training and Research recently ⁶⁸: **data availability, accuracy, simplicity, harmonizing, and economic effects and the observed volatility of the PV panels and free riders**. Also considering the **fluctuations of the amounts of PoM from year to year that arise**, they could be matched with **changes in the consumption behavior** in the society and seem to create difficulties with the specific methodology too.

⁶⁸ Source: C.P. Baldé, M. Wagner, G. Iattoni, R. Kuehr, In-depth Review of the WEEE Collection Rates and Targets in the EU-28, Norway, Switzerland, and Iceland, 2020, United Nations University (UNU) / United Nations Institute for Training and Research (UNITAR) – co-hosting the SCYCLE Programme, Bonn, Germany.

With regards to the second methodology, WEEE generated methodology may possibly cause uncertainty arising from the **methodological complexity and the demanding data**, especially considering member states where data availability and consistency is challenging.

It seems necessary that **common and harmonized guidelines shall be provided in EU level for all member states** with respect to the comparability and consistency of the assessment/calculation of the achievement of the WEEE targets across all EU MS.

4.6 Ensuring proper collection and treatment of PV panels

As already mentioned, photovoltaic (PV) panels fall under the (recast) WEEE Directive's mandate that all MS shall include PV panels producers under the EPR obligations (category 4b), to ensure their proper collection and treatment. In Greece, very recently, public authorities have approved one of the existing PROs (Fotokiklosi) to include PV panels into their scope. Currently, data for PV panels is mainly provided by the Hellenic Association of Photovoltaic Companies (HELAPCO), representing the major active PV companies in production, trading, installation and maintenance of photovoltaic systems in Greece.

Also, in terms of collection in Greece, currently there is no available/limited data on PV panels considering the lack of a PRO for PV panels until 2020, the nature of the PV panels (average lifespan more than 20 years) and the recent market penetration⁶⁹. To note that the Directive does not set a specific collection target for PV panels.

Certain PROs, however are still required to report PV panels mixed with category 4, which makes it impossible to trace and monitor the PV panels flows. Using the PoM methodology for calculating the collection rate, as most MS do including Greece, makes it impossible to achieve the targets for PV panels, especially for countries which already have a hard time to achieve the collection target as Greece, considering that Greece is amongst the top 10 solar PV markets (installed GW) for 2019-2020.⁷⁰ Certain MS are trying to compensate the low collection of PV panel by collecting higher amounts of other category 4, which according to WEEE forum, it distorts the Directives basic principles especially the EPR principle. PV panels PoM is increasing world wide and is expected to increase further especially with the new current and future renewable energy policies and the increase of the cost on traditional ways of energy source (e.g. natural gas, petroleum) as such it will affect the collection target.⁷¹

The legislative framework around PV panels has yet to be determined at an EU as well as a national level. The requirements of the PV industry are under discussion with the European Committee for Electrotechnical Standardisation (CENELEC), an organisation mandated by the European Commission to **develop a European standard for the treatment of WEEE, including PV modules.**

⁶⁹ <https://weee-forum.org/wp-content/uploads/2021/06/WEEE-Forum-PV-Panels-Issue-Paper-2021-Final.pdf>

⁷⁰ <https://weee-forum.org/wp-content/uploads/2021/06/WEEE-Forum-PV-Panels-Issue-Paper-2021-Final.pdf>

⁷¹ <https://weee-forum.org/wp-content/uploads/2021/06/WEEE-Forum-PV-Panels-Issue-Paper-2021-Final.pdf>

4.7 Enforcement of the Greek legislative framework and monitoring

Considering the low collection target, and the lack of proper implementation of the Greek legal framework and monitoring, **Greek authorities shall focus on the enforcement of the regulations on WEEE for collection, responsible recycling, responsibilities for collection and transfer, monitoring and auditing.** In that respect, stakeholder and public engagement might be necessary in the initial stages.

Raising awareness of the public sector is key. Municipal and regional authorities responsible for collecting waste as well as large waste (including e-waste) producers such as hospitals, governmental institutions, etc. shall properly report and manage e-waste.

It is also proposed to consider running targeted enforcement campaigns geared in order to ensure that all actors report properly, and process WEEE according to legally binding treatment standards. Emphasis also should be given on achieving better monitoring of all involved stakeholders and PROs.

4.8 Communication campaigns, awareness, and behavior change

According to WEEE FORUM's report (2020), many studies show that there seem to be issues around **citizens not knowing how or where to dispose of their electrical and electric equipment. WEEE often ends up in the waste bin or on the street and picked up by metal scrap dealers that engage in sub-standard or improper practices.** Two other behavioural aspects that influence WEEE collection are hoarding and reuse. It is considered essential for increasing the collection quantities, to run targeted communication and tracking campaigns, in order to monitor hoarding, disposal habits and preferences.

PROs are expected to co-ordinate such campaigns in Greece (maybe alongside PROs from other waste streams such as batteries), which need to be funded through the producers' financial contribution. These campaigns need to go well beyond the passive "recycling" approach, focus on the hazardous material contained in WEEE and **to target specific aspects such as consumer behaviour, hoarding or disposal habits, by providing practical information on where and how to recycle, including product category specific guidance (e.g. small WEEE), making people aware of where the convenient collection and drop-off points are in their local area and addressing data security to overcome barriers to the hoarding of data devices.**

4.9 Contributing towards a circular economy - Critical Raw Materials

In order to mitigate supply risks and the pressure under growing demand, **increasing recovery of critical raw materials from WEEE should be a strategic priority.** From 2010 the European Raw Materials Initiative (RMI) undertook a fourth evaluation of raw materials and concluded that 30 of these were ‘critical’ to the EU due to their high relative economic importance and supply risk⁷². One indicated solution to materials criticality issues would be **the adoption of a circular economy model**, in which products and their **valuable materials are recovered and retained within the economy over multiple product life cycles.**

However, to ensure the recovery and reuse of these materials is viable, value derived from sale of equipment components and recovered materials must be enough to filter back through the recycling value chain to recoup costs incurred. These costs are imposed by recyclers on materials accepted from pre-processors. The lesser quantities of critical materials concentrated in items, yield not enough revenue to recoup recycling costs, resulting in an economic loss for recyclers.

Enhancing reuse of these critical materials or other materials resulting from the recovery and recycling of WEEE in a circular economy, would lead to a greater demand for these materials. Recyclers will be able to increase their revenue by selling larger quantities and at better prices, creating economies of scale. **It is recommended for the Greek public authorities to further promote the circular economy model with respect to ensuring the increase of the WEEE collection and considering the sale prices of secondary materials in the market.**

⁷² Source: European Commission (2020), Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS, 474 final.

Appendix



A 1.1 Supporting Documents

Letter of Support

Από:

European Electronics Recyclers Association (EERA)
Nieuwstraat 47, 5527 AS Hapert, The Netherlands

και τα μέλη της στην Ελλάδα, **ECORESET AE** και **EKAN ABEE**

Σχετικό: Ανάθεση μελέτης Τεχνικής Υποστήριξης στην Ευρωπαϊκή Ένωση Ανακυκλωτών Ηλεκτρονικού Εξοπλισμού (European Electronics Recyclers Association - EERA) και στα μέλη αυτής στην Ελλάδα

Θέμα: Αίτημα παροχής στοιχείων που αφορούν το έργο της εν λόγω μελέτης

Αγαπητές κυρίες/κύριοι,

η Eunomia Research & Consulting είναι η συμβουλευτική εταιρεία που έχει αναλάβει για λογαριασμό της Ευρωπαϊκής Ένωσης Ανακυκλωτών Ηλεκτρονικού Εξοπλισμού (European Electronics Recyclers Association - EERA), των μελών της στην Ελλάδα (ECORESET AE, EKAN ABEE) και των μελών της Ελληνικής Επιτροπής έργου της EERA (ΑΝΑΚΥΚΛΩΣΗ ΑΙΓΑΙΟΥ ΑΒΕΕ, ΑΦΟΙ ΚΩΝΣΤΑΝΤΙΝΙΔΗ ΑΒΕΕ, ΚΕΠΑ ΑΒΕΤΕ), την εκπόνηση της μελέτης "Τεχνική Υποστήριξη στην Ευρωπαϊκή Ένωση Ανακυκλωτών Ηλεκτρονικού Εξοπλισμού (European Electronics Recyclers Association - EERA) και στα μέλη αυτής στην Ελλάδα".

Κύριοι στόχοι της μελέτης είναι η αποτελεσματικότερη διαχείριση των αποβλήτων ηλεκτρικού και ηλεκτρονικού εξοπλισμού (ΑΗΗΕ) στην Ελλάδα και κατ' επέκταση η αξιολόγηση του ποσοστού συλλογής και ανακύκλωσης των αποβλήτων ηλεκτρικού και ηλεκτρονικού εξοπλισμού στην Ελλάδα καθώς και του κόστους διαχείρισης αυτών.

Η συμβολή σας στη συλλογή δεδομένων αναφορικά με τα απόβλητα ηλεκτρικού και ηλεκτρονικού εξοπλισμού (ΑΗΗΕ) στην Ελλάδα κρίνεται σημαντική.

Παρακαλούμε όπως παρέχετε την κάθε δυνατή βοήθεια για τις ανάγκες της μελέτης. Είμαστε στη διάθεσή σας για να συζητήσουμε τα αποτελέσματα, μόλις γίνουν διαθέσιμα.

Για την
European Electronics Recyclers Association (EERA) και τα μέλη της στην Ελλάδα

Με εκτίμηση,

EERA

Julie-Ann Adams
Διευθύνουσα Σύμβουλος

ECORESET

ECORESET Α.Ε.
Σπύρος Καραγιάννης
ΕΔΡΑ: ΟΕΣΗ ΠΡΑΡΗΜΟΥΣΤΑΚΙ
ΑΣΠΡΟΠΥΡΓΟΣ ΑΤΤΙΚΗΣ - Τ.Κ. 193 00
Τεχνικός Διευθυντής
ΑΦΜ: 997689435 - ΜΗΤΡΩΟ ΜΑΕ ΚΩΝΗΘΝ
ΤΗΛ: 216 4008820
ΑΡ.Γ.Ε.ΜΗ. 121755701000

EKAN

Διογένης Βακόντιος
Τεχνικός Διευθυντής

Questionnaires

Questionnaire to the Hellenic Recycling Agency (EOAN)



Σύμβαση: Μελέτη Τεχνικής Υποστήριξης στην Ευρωπαϊκή Ένωση Ανακυκλωτών Ηλεκτρονικού Εξοπλισμού (European Electronics Recyclers Association - EERA) και στα μέλη αυτής στην Ελλάδα

Θέμα: Αίτημα παραχής στοιχείων που αφορούν το έργο της εν λόγω μελέτης - Ερωτήματα

Ερωτηματολόγιο

Questions/ Ερωτήματα	Answers - Description/ Απαντήσεις - Περιγραφή
<p>1. Στοιχεία επικοινωνίας</p> <p>1α. Στοιχεία υπευθύνου επικοινωνίας (όνομα/τμήμα/ρόλος-θέση)</p>	
<p>2. Πληροφορίες</p> <p>2α. Πληροφορίες (συμπεριλαμβανομένων τεμηματωμένων εκτιμήσεων) σχετικά με</p> <ul style="list-style-type: none"> - τις ποσότητες (τ/έτος) και τις κατηγορίες/υπό-κατηγορίες ΗΗΕ που διατίθενται στην αγορά, συλλέγονται με οποιαδήποτε τρόπο, προετοιμάζονται για επαναχρησιμοποίηση, υποβάλλονται σε επεξεργασία, ανακτώνται, επαναχρησιμοποιούνται και ανακυκλώνονται. - τα χωριστά συλλεγόμενα ΑΗΗΕ που εξάγονται, κατά βάρος. 	
<p>2α. Ποια η ποσότητα (τ/έτος) των εισαγωγών ΗΗΕ, που διατέθηκαν στην ελληνική αγορά την τριετία 2019-2021 (ή στοιχεία 3ετίας με τα πιο πρόσφατα διαθέσιμα στοιχεία);</p>	
<p>2γ. Ποιες οι ετήσιες ποσότητες ανακύκλωσης/ανάκτησης συνολικά και ανά κατηγορία (τ/έτος) = Ποσοστά ανάκτησης/ανακύκλωσης</p>	
<p>2δ. Ποιες οι ετήσιες ποσότητες (τ/έτος) ξένων προμηθειών/υπολειμμάτων;</p>	
<p>2ε. Ποια η εκτιμώμενη ποσότητα (τ/έτος), που προέρχεται από μη νόμιμη/ανεπίσημη διακίνηση/συλλογή, ανά κατηγορία;</p>	
<p>2στ. Ποια τα διαθέσιμα (ή εκτιμώμενα) στοιχεία της τριετίας 2019-2021 για προμήθεια ΗΗΕ χωρίς εγγραφή στο Εθνικό Μητρώο Παραγωγών;</p>	
<p>2ζ. Ποια η επίδοση της Ελλάδας στη συλλογή ΑΗΗΕ σε ποσότητες (πιο πρόσφατα διαθέσιμα στοιχεία) συνολικά και ανά κατηγορία/υπό-κατηγορία (τ/έτος);</p>	
<p>2η. Ποια η επίδοση της Ελλάδας την τριετία 2019-2021 (ή τα πιο πρόσφατα στοιχεία) ως προς την ανάκτηση και τον ελάχιστο στόχο (σύμφωνα με το Παράρτημα V, ΚΥΑ 23615/2014);</p>	
<p>3. Άλλα θέματα</p>	
<p>3α. Πόσο υπολογίζεται η εσοφοραδιαφυγή (freeriding) στην Ελλάδα (τ/έτος ή ποσοστιαία);</p>	
<p>3β. Απολογιστικές Εκθέσεις τριετίας 2019-2021 ή πιο πρόσφατα στοιχεία του ΕΟΑΝ και των Συλλογικών Συστημάτων Εναλλακτικής Διαχείρισης ΑΗΗΕ «ΑΝΑΚΥΚΛΩΣΗ ΣΥΣΚΕΥΩΝ ΑΕ» και «ΦΩΤΟΚΥΚΛΩΣΗ ΑΕ».</p>	

Questionnaire to the Recyclers

Σχετικό: Ανάθεση μελέτης Τεχνικής Υποστήριξης στην Ευρωπαϊκή Ένωση Ανακυκλωτών Ηλεκτρονικού Εξοπλισμού (European Electronics Recyclers Association - EERA) και στα μέλη αυτής στην Ελλάδα

Θέμα: Αίτημα παροχής στοιχείων που αφορούν το έργο της εν λόγω μελέτης - Ερωτήματα

Ερωτήματα	Απαντήσεις/ Επισυναπτόμενο σχετικό αρχείο
1. Γενικές Πληροφορίες (στο βαθμό που είναι διαθέσιμες)	
1α. Επωνυμία επιχείρησης	
1β. Στοιχεία υπευθύνου επικοινωνίας (όνομα/ θέση-ρόλος)	
1γ. Βασικά στοιχεία για τις δραστηριότητες διαχείρισης των ΑΗΗΕ <ul style="list-style-type: none"> - Δυναμικότητα μονάδας/ων διαχείρισης ΑΗΗΕ (μέγιστη/πραγματική δυναμικότητα, t/έτος) - Περιοχή κάλυψης (Περιφέρειες/Π.Ε./Δήμοι καλύπτονται από τις υπηρεσίες διαχείρισης των ΑΗΗΕ) - ΑΗΗΕ που διαχειρίζεται η μονάδα/ες ανά: <ul style="list-style-type: none"> ο Κατηγορία ΑΗΗΕ ο τύπο ΑΗΗΕ (οικιακής/ μη οικιακής προέλευσης) ο κωδικό ΕΚΑ 	
1δ. Βασικά στοιχεία που αφορούν τη διαχείριση των ΑΗΗΕ από την επιχείρησή σας: <ul style="list-style-type: none"> - Στάδια διαχείρισης των ΑΗΗΕ (έλεγχο-διαλογή/ ταξινόμηση σε κατηγορίες, προετοιμασία για επαναχρησιμοποίηση, αποσυναρμολόγηση, επεξεργασία/ανάκτηση) - Τεχνολογία/ βασικός εξοπλισμός της μονάδας/ων διαχείρισης των ΑΗΗΕ που διαθέτετε - Σύμβαση Συνεργασίας με το/τα συστήματα εναλλακτικής διαχείρισης ΑΗΗΕ (Ανακύκλωση Συσκευών) 	
2. Πληροφορίες για ποσότητες	
2α. Ποιες οι εισερχόμενες ποσότητες κατά βάρος (t/έτος) , για τα έτη 2019, 2020 & 2021, ανά κατηγορία ΗΗΕ;	
2β. Ποιες οι εκροές κατά βάρος (t/έτος) (πχ. προϊόντα επεξεργασίας, προϊόντα προς επαναχρησιμοποίηση, υπόλειμμα, κ.α.) (2019,2020 & 2021)	
2γ. Ποιες οι ετήσιες ποσότητες ανάκτησης/ ανακύκλωσης συνολικά και ανά κατηγορία (t/έτος) – Ποσοστά ανάκτησης/ ανακύκλωσης	
2ε Στοιχεία σχετικά με μη νόμιμη/ανεπίσημη διακίνηση/συλλογή (κατηγορίες ΑΗΗΕ, εκτιμώμενες ποσότητες, λοιπά στοιχεία) εφόσον έχετε υπόψη	
2στ Λοιπά σχόλια/ στοιχεία, προβληματικές πρακτικές που θα θέλατε να παραθέσετε επί των ποσοτικών στοιχείων	

Ερωτήματα	Απαντήσεις/ Επισυναπτόμενο σχετικό αρχείο
<p>3. Πληροφορίες για τα κόστη/ οικονομικά στοιχεία</p>	
<p>3α. Ποιος ο υφιστάμενος υπολογισμός κόστους (ποια κόστη περιλαμβάνονται, μεθοδολογία)</p>	
<p>3β. Ποια τα κόστη επεξεργασίας (ανά κατηγορία ΗΗΕ και ανά τι εισερχόμενου υλικού στη μονάδα επεξεργασίας) Επιμερισμός/ανάλυση του κόστους επεξεργασίας: - ανά κατηγορία ΑΗΗΕ] - ανά στάδιο επεξεργασίας (πχ. απορρύπανση, τεμαχισμό, αποσυναρμολόγηση, μηχανική επεξεργασία, κλπ.)</p>	
<p>3γ. Κόστη διάθεσης υπολειμμάτων επεξεργασίας (προς τελική διάθεση/ενεργειακή αξιοποίηση)</p>	
<p>3δ. Στοιχεία για το κόστος συλλογής/μεταφοράς (ανά τι/ανά km ή άλλο) εφόσον έχετε υπόψη</p>	
<p>3ε Άλλα κόστη (εφόσον δεν περιλαμβάνονται στα άνω), ενδεικτικά:</p> <ul style="list-style-type: none"> • Ενοίκιαση χώρου/εγκαταστάσεων & εξοπλισμού • Μισθοδοσία προσωπικού • Ετήσια δαπάνη συντήρησης εγκαταστάσεων & εξοπλισμού • Κόστη που σχετίζονται με τη διαδικασία ανακύκλωσης/ανάκτησης (π.χ. κόστος αποθήκευσης, διάθεσης επικίνδυνων αποβλήτων κ.λ.π.) • Άλλα κόστη 	
<p>4. Άλλα θέματα ενδιαφέροντος</p>	
<p>4α. Κύριες προκλήσεις σχετικά με τη διαδικασία ανακύκλωσης/ανάκτησης (περιβαλλοντικά, ρυθμιστικά, τεχνικά θέματα, θέματα περιβαλλοντικής αδειοδότησης, υποδομών/ εξοπλισμού, ποιοτικών χαρακτηριστικών, οικονομικών κινήτρων κ.λ.π.)</p>	
<p>4β. Αναφέρετε τυχόν προϊόντα, που λόγω πολυπλοκότητας των υλικών τους, αυξάνουν τη διάρκεια των διαδικασιών και το κόστος επεξεργασίας τους, σε οποιαδήποτε φάση των διεργασιών</p>	
<p>4γ Άλλα θέματα</p>	

Questionnaire to the EPR scheme ‘Appliances Recycling S.A.’

Σύμβαση: Μελέτη Τεχνικής Υποστήριξης στην Ευρωπαϊκή Ένωση Ανακυκλωτών Ηλεκτρονικού Εξοπλισμού (European Electronics Recyclers Association - EERA) και στα μέλη αυτής στην Ελλάδα

Θέμα: Αίτημα παροχής στοιχείων που αφορούν το έργο της εν λόγω μελέτης - Ερωτήματα

Ερωτηματολόγιο

Questions/ Ερωτήματα	Answers - Description/ Απαντήσεις - Περιγραφή
1. Γενικές Πληροφορίες	
1α. Επωνυμία επιχείρησης	
1β. Στοιχεία υπευθύνου επικοινωνίας (όνομα/ οργανισμός/ ρόλος-θέση)	
2. Άλλες Πληροφορίες	
2α Μπορείτε να μας αποστείλετε τις Απολογιστικές Εκθέσεις της τριετίας 2019-2021 (ή τις πιο πρόσφατες);	
2β. Ποιοι οι μέθοδοι εκτίμησης/καθαρισμού της εισφοροδιαφυγής;	
2γ. Πόσο υπολογίζεται η εισφοροδιαφυγή, σύμφωνα με τα στοιχεία σας (τν.έτος);	
2δ. Υπάρχουν πρόσφατα διαθέσιμα στοιχεία, για την παραβατικότητα, ως προς τη διαχείριση ΑΗΗΕ;	
2ε. Προβλέπονται να πραγματοποιηθούν προσαρμογές ή διαφοροποιήσεις στην εισφορά των παραγωγών με βάση τη συμμόρφωσή τους με οικολογικά/κυκλικά κριτήρια (eco-modulation fee);	
2στ. Ποια η εκτιμώμενη ποσότητα, που προέρχεται από μη νόμιμη/ανεπίσημη διακίνηση/συλλογή;	
2ζ. Με ποιες μονάδες ανακύκλωσης/ανάκτησης συνεργάζεστε;	

A 1.2 Necessary costs and extended producer responsibility costs in the context of WEEE management

The analysis included in this section is based on Eunomia's work for the Commission⁷³. It is noted that guidance from the Commission has not been published until now.

A 1.2.1 Summary of waste management costs to be covered by EPR schemes.

Article 8a(4)(a) states that the requirements concerning the types of costs to be covered through producer responsibility "shall not apply to extended producer responsibility schemes established pursuant to Directive 2000/53/EC, 2006/66/EC or 2012/19/EU". Member States may, therefore, depart from the cost coverage requirements explained in this section provided that:

In respect of WEEE, under Directive 2012/19/EU, the financing requirements under Article 12 are outlined, principally that "**producers provide at least for the financing of the collection, treatment, recovery and environmentally sound disposal of WEEE from private households that has been deposited at collection facilities**". Moreover, "**Member States may, where appropriate, encourage producers to finance also the costs occurring for collection of WEEE from private households to collection facilities**".

In addition, Article 13 covers WEEE from users other than private households: It is indicated that Member States shall ensure that "the financing of the costs for the collection, treatment, recovery and environmentally sound disposal of WEEE from users other than private households resulting from products put on the market after 13 August 2005 is to be provided for by producers".

Although these exceptions exist and the main waste to which the provisions of Article 8a(4)(a) apply is packaging waste, where future Directives establish producer responsibility schemes, the Article may apply to them. In order to ensure that producer responsibility obligations are met, some Member States may make use of deposit refund schemes; others may rely on municipal or other third-party collection systems; and for some material streams, Member States may prefer schemes to establish their own separate collection. The cost considerations set out in this section will be applicable to all of these approaches but may be most relevant to situations where waste is collected through municipal systems. However, the cost estimates made in these sections will apply to all approaches (deposit system, third party collection systems, etc.).

Operational costs

⁷³ Study to Support Preparation of the Commission's Guidance for the Extended Producer Responsibility Schemes', Report for DG Environment of the European Commission (Eunomia, (April 2020)

Producers should bear the operational costs of collecting and managing the material they put on the market so that this material can be recycled. The specific operational costs of waste collection will depend on the collection system that is adopted in each Member State. However, in combination, the elements of the waste collection system must be adequate to meet the targets.

According to Eunomia's study for the Commission entitled 'Recommendations for Guidance' (2020), operational costs are likely to include⁷⁴:

- Direct vehicle, staff and container costs (both capital and running costs) associated with the collection of waste for reuse or recycling;
- The costs of maintaining capital items such as vehicles and containers;
- The costs of establishing, maintaining and running vehicle depots, intermediate sites such as transfer stations and other facilities necessary to support the collection service;
- The costs of sorting or processing waste so that it can be reused or recycled, and the costs of any preparing for reuse or recycling operations necessary to turn the waste into a raw material suitable for use by manufacturers;
- The costs of the transportation of waste that has been collected for reuse or recycling, so that it reaches final treatment;
- Corporate overheads (e.g. IT, HR, financial services) associated with operating the service;
- The management costs of marketing and selling reused items or recycled materials (if this is carried out by municipalities or other collectors, rather than by producers); and
- Any return infrastructure and counting centres associated with deposit schemes.

Supporting services

Producers should bear the costs of the services necessary to support the operational activities involved in collecting and managing the relevant material. The specific supporting services that are necessary to put in place will be determined in the context of each Member State to meet any relevant targets. Examples of supporting services will include:

- Communications –at the level and of the type necessary to achieve the required behaviour from citizens e.g. steps that can be taken to prevent and reduce waste, steps that can be taken to enable waste items to be reused or prepared for reuse etc.
- Enforcement costs –i.e. the costs of putting in place systems to ensure that producers, waste management organisations, businesses and citizens follow the rules Member States put in place to transpose the new directives into their law.
- Efficiency reviews to ensure that services are run at the lowest cost necessary to achieve the objectives and targets set out in the Directives;
- Data gathering, recording, analysis and reporting costs; and
- Performance incentives to encourage waste prevention and reuse (e.g. a financial reward where tonnage of waste per capita is kept below an agreed target level), high recycling rate (e.g. a financial reward where an agreed target level is achieved).

Material Value

⁷⁴ This is not intended as an exhaustive list, as Member States should examine the operational elements of any current or planned service to identify all operational costs relevant to the materials for which producers are responsible. Where Member States, or other Directives, introduce additional targets or requirements, producers may be obligated to cover the costs of meeting them –for example, they may be required to meet operational costs associated with the collection of products that are littered or that are collected as part of the mixed waste stream.

Producers are responsible only for the net costs of waste management. Where the material that they put on the market has a value when recycled, the costs should be offset by the value obtained from the sale of material. One way to achieve this is to give ownership of the relevant material to producers, typically through a producer responsibility organization. Under such a system, arrangements would need to be made to ensure that producers do not incur costs, or receive income, for material that does not fall within the responsibility. If the material sale function is fulfilled by an entity other than the producer responsibility organization, and if that other entity retains the income from materials, the income received should be netted off the waste management costs incurred by the entity when considering the amount that producers should pay. This income figure should be net of the costs of treatment of waste (e.g. sorting of recycling), along with any intermediate transport of material.

PRO costs

Producers should also bear the reasonable and proportionable costs of running any PROs that are established to perform functions on the producers' behalf. PROs should be transparent regarding the costs they incur in fulfilling their functions and established on a non-for-profit basis.

It is worth mentioned that some additional costs may arise, under specific conditions, and there are specific characteristics which include:

- Substantial capital costs, associated with putting in place new services necessary to meet the targets (i.e. where the necessary service changes to meet the targets require substantial capital costs, Member States may require producers to fund initial capital investments).
- In case overheads costs are shared between elements of the collection system that are subject to producer responsibility and elements that are not, Member States should ensure that there is a reasonable process of apportionment in place to make sure that the costs passed on to producers are fair in respect of the material or waste stream being managed. The share of costs that is borne by producers should be reasonable and proportionate.
- Wider costs, which refer to Member States' choice of expanding the scope to include some costs not explicitly required to be covered under the Waste Framework Directive, such as the costs of managing material in residual waste or litter.
- Charges to Waste Holders; the person responsible for the material at the point when it becomes waste (the "holder" of the waste), rather than the business that put it on the market (the producers), pays for the costs of its collection, treatment and disposal. This approach increases competition between waste collectors.

A 1.2.2 Introduction, legal basis and application of 'necessary' costs related to WEEE management

This section addresses the question of how to determine whether the costs borne by producers "*do not exceed the costs that are necessary to provide waste management services in a cost-efficient*" as mentioned before according to Article 8a4(c). As mentioned at Eunomia's study, "necessary costs" may be understood as the net operational and management costs of a system for the handling—as a minimum—separately collected recyclable material, from collection through to the completion of the recycling operation, together with the costs of supporting activities such as communications and data acquisition and management. Such a system must be adequate to achieve relevant targets and acceptable to those who must use it.

Costs are only to be considered “necessary” if they relate to expenditures that:

- Are attributable to the delivery of the relevant services;
- reflect the delivery of a system which is efficient within the geography, housing types and demographics in whose context it operates;
- can be appropriately assigned to the products put on the market by the producer;
- reflect a system that is value maximizing as regards the costs of material management and the value obtained from the recyclable material; and,
- are arrived at in a way that provides a reasonable level of transparency.

“Necessary costs” are therefore the costs of the waste management-related activities needed to meet certain targets and objectives, provided that those activities are shown to be undertaken cost-effectively. Under normal circumstances, producers must meet the full necessary costs of meeting the relevant targets. However, Article 8a(4)(i) foresees that, where justified by the need to ensure proper waste management and the economic viability of the EPR scheme, a Member State may depart from requiring the full costs to be met, provided that at least 80% of the necessary costs are covered by the EPR scheme and that the remaining costs are borne by original waste producers or distributors. In the case of EPR schemes established before 4 July 2018 to attain waste management targets and objectives solely established in Member State legislation, Article 8a(4)(iii) requires only that the producers of products bear at least 50% of the necessary costs.

Applicable Targets and Objectives

The costs that producers must meet are those necessary to meet certain targets and objectives and it is very important to clarify which targets are referred to, as numerous objectives are stated in the Waste Framework Directive. These are expressed in quite general terms (e.g. to minimise the negative effects of the generation and management of waste on human health and the environment, to move towards a European recycling society, the protection of the environment and human health). It is challenging to clearly define costs that may reasonably be attributed to producers in the service of achieving these objectives, and in practice the focus of EPR will be on the achievement of the targets.

The first indent of Article 8a(4)(a) of the WFD requires Member States to ensure that the producer covers the necessary costs for the products that the producer puts on the market that relate to *“separate collection of waste and its subsequent transport and treatment, including treatment necessary to meet the Union waste management targets, and costs necessary to meet other targets and objectives as referred to in point (b) of paragraph 1”*. Article 8a(1)(b) requires Member States to *“set waste management targets, aiming to attain at least the quantitative targets relevant for the extended producer responsibility scheme as laid down in this Directive... and Directive 2012/19/EU of the European Parliament and of the Council, and set other quantitative targets and/or qualitative objectives that are considered relevant for the extended producer responsibility scheme”*.

Geographical Application

At a regional or local level, the application of the waste hierarchy and the obligations on separate collection may in some cases result in higher or lower recycling levels. However, Article 8a(3)(a) obliges Member States to ensure that any EPR arrangement has: a clearly defined geographical, product and material coverage without limiting those areas to those where the collection and management of waste

are the most profitable. Recital 25 of Directive 2018/851/EU further clarifies that continuity of waste management services throughout the year has to be ensured, even if the targets and objectives are met. Therefore, any Member State's extended producer responsibility arrangements must ensure that appropriate waste management services are put in place across the entirety of the Member State's inhabited geographical area, to a sufficient standard to ensure that both the separate collection requirements and the relevant targets are met.

Interpretation of Application

Article 8a(4)(a) makes producers responsible for meeting the costs of reusing and/or recycling the products that they put on the market and schemes must at least meet the specific targets and objectives in the relevant directives. However, if meeting the wider objectives and targets necessitates recycling a greater proportion of the material for which producers are responsible than is mandated by the specific targets, producers remain financially responsible for cost; their financial responsibility does not end at the point when the specific target is met, especially where the recycling activity contributes to the meeting of other targets.

For example, when the door-to-door collection by municipalities is required, the principle of cost coverage would apply to all of these services. PROs would not be able to fully fund the cost of its own on-street container provision and then just the proportion of the costs of the door-to-door collections required to 'top up' the tonnage required to meet the specific target. Cost coverage would apply equally to the whole system necessary to achieve the targets. In addition, the fundamental principle of end-of-life cost coverage is respected, in a way that is consistent with the requirement for the inclusion of "treatment necessary to meet the Union waste management targets".

These costs are not limited to operational expenditures (collection, transport, and treatment/processing, net of material revenues and any other income (e.g. unclaimed deposit fees)). They also include the costs of providing information to waste holders to let them know how to manage their waste appropriately and gathering data on waste management to show the extent to which the targets are being met. In addition, producers must meet the costs of any organisation(s) or systems that are put in place to co-ordinate extended producer responsibility, which is referred to as Producer Responsibility Organisations (PROs).

It is reasonable to infer that the costs for which Member States must make producers responsible for are, as a minimum, the costs of collecting, treating and managing the wastes for which they are responsible –across the territory of the member state –so that it can be reused or recycled. Member States may, of course, draw the scope of the costs for which producers are made financially responsible more widely. Although Article 8a(4) does not require the inclusion of such costs, neither does it preclude their inclusion; indeed, this appears to be encouraged by Article 14, which states that: "*In accordance with the polluter-pays principle, the costs of waste management, including for the necessary infrastructure and its operation, shall be borne by the original waste producer or by the current or previous waste holders.*".

Approach to Determining Necessary Costs

Establishing the necessary costs of waste management within any Member State must achieve two goals in order to make EPR schemes effective:

- The system must ensure that the correct total amount of financial contributions is gathered from producers to fully cover the net costs of managing their waste within the territory of the Member State (subject to the scope of the scheme in the relevant Member State), and that these costs are sufficient to support activities that deliver the targets described above; and
- The system must provide a method of allocating funds to waste collection and sorting operations, which will often be delivered by third parties such as municipalities and waste management companies, and others engaged in the transport, processing and treatment of waste.

According to Eunomia's study, an approximation of the necessary costs was made:

"Necessary costs" are the net operational and management costs of an adequate and acceptable system for the handling separately collected recyclable material, from collection through to the completion of the recycling operation, together with the costs of supporting activities such as communications and data acquisition and management. Costs are only to be considered "necessary" if they relate to expenditures that:

Under Article 8a(4)(a)

- Are attributable to the delivery of the relevant services –ones that can be assigned, with relative confidence and accuracy, to the costs implied by the products put on the market by producers of certain products.
- Reflect a system that is value maximizing as regards the costs of material management and the value obtained from the recyclable material.
- Are arrived in a way that provides a reasonable level of transparency.

and Under Article 8a(4)(c)

- Reflect the delivery of a system which is efficient within the context of a particular locale.

Each underlined term is briefly explained below.

Adequacy

The design of a waste management system is a critical determinant of its cost. Approaches to collection and treatment differ greatly across Europe. In some cases, the public bodies that have been responsible for collecting waste have been unwilling, or unable (for example, because of financial constraints), to adopt more costly and more effective systems.

In order to comply with Directive 2018/851, the design of a system in any particular case should be suitable to perform at a level that will deliver a level of recovery that:

- Meets the specific waste stream recovery targets set out in the Directives; and
- Contributes sufficiently to meeting the wider waste management targets, in line with the expectations of the Member State regarding how the overall targets will be met.

It must also comply with the Waste Framework Directive's requirements regarding the separate collection of materials for recycling. Only a system that is designed in such a way that it can meet the targets and objectives can be considered adequate. It may also be reasonable for a Member State to require producers to fund services that are thought to be capable of exceeding the targets, rather than

just to barely meet them, in order to minimise the risk that the targets are not in the end achieved and to contribute as necessary to meeting wider Union targets. This is because:

- It is difficult to design a system to achieve exactly a target recycling rate. In order to maximise the chance of achieving a target, it may be necessary for Member States to implement and fund a system that has the capacity to exceed it. To do otherwise heightens the risk of failure (and, at a Member State / producer level, negative financial consequences). If this results in collection systems that collect for recycling more material than is necessary for producers to meet their specific targets, it would appear contrary to the aims of EPR if public funds, rather than producers, bore the costs associated with the collection, treatment (etc.) of material for recycling over and above the necessary minimum.
- In most instances, the nature of the delivery of services will be such that it is difficult to identify a configuration that 'just' meets a given target and does not exceed it. The question arises as to whether producers should be expected to meet all the costs for the necessary service, even if recycling targets are exceeded, or only a defined fraction, reflecting the fact that the services in place exceed the target the producers are meant to achieve. It is worth considering that funding only 'up to target' could leave service providers with a funding gap which grows as their performance improves: this would seem to be unfair;
- If producers are only required to fund 'up to' target, this could open the way for a degree of cherry-picking where producers pull away from funding, for example, collections in more rural, or very dense urban areas, where costs of service provision may justifiably be higher to achieve a given level of performance or service.

A Member State (preferably in discussion with producers and waste management organisations) may take the view that it is reasonable to expect some regions to achieve higher recycling rates than others (e.g. due to differences in demographics or housing stock). However, Member States should bear in mind the requirement of Article 8a(3)(a) that producers should not limit the geographical scope of their responsibility to areas "*where the collection and management of waste are the most profitable*".

Producers should be required to contribute resources on the basis that they will provide for adequate collection systems in each area of the Member State. Although it is acknowledged that performance will vary between areas, an adequate service has to be provided across each Member State, rather than, for example, only in the areas of a Member State where a service is cheapest to provide.

Making collection systems adequate may necessitate greater costs being incurred to provide services in some locations than in others. For example, where citizens are difficult to engage in recycling due to particularly diverse or transient populations, there may be a need for more expenditure on communication, perhaps even including door-to-door visits to advise citizens regarding how to use the collection system correctly.

These additional costs should be reflected in the approach to establishing what costs must be met by producers, and in the distribution of funds, so as to ensure that services in all parts of the Member State are adequately funded. Where additional costs have to be incurred in order to meet the local share of targets, these costs should be recognised to be necessary in order to achieve the targets. Service design should be reviewed periodically, especially where the expected level of performance is not being achieved. Such a review may result in a decision that the service model needs to be revised, or that additional training, support or communications are required in order to enable the targets to be met. The costs of such additional effort should be considered 'necessary costs'.

Acceptability

The design of collection system should take account of local circumstances and be reasonably convenient for citizens to use. Collection systems should be acceptable in terms of societal and industry norms in the Member State, not just to producers.

Making collection systems acceptable may necessitate greater costs being incurred to provide services in some locations than in others. For example:

- Where it is impractical for households to store multiple, large containers at home, it may be necessary to collect material more frequently.
- In areas that regularly experience hot temperatures, it will be problematic to use reduced waste collection frequency as a means of optimising collection cost and encouraging citizens to recycle, which may make it more expensive to achieve high levels of recycling.
- Where citizens are difficult to engage in recycling due to particularly diverse or transient populations, there may be a need for more expenditure on communication, perhaps even including door-to-door visits to advise citizens regarding how to use the collection system correctly.
- Amongst the factors that shape the design of the system that is funded by producers are the operational and social norms in different member states. In Scandinavia, for example, collection systems that rely on manual handling are not used, and even where manual handling might be economically advantageous, a system that avoided manual handling would not exceed the necessary costs.

The additional costs of a service that is acceptable, over one that might be operationally possible but unacceptable, should be reflected in the approach to establishing what costs must be met by producers, and in the distribution of funds, so as to ensure that all parts of the Member State are funded so as to deliver an acceptable level of service. Several Member States have introduced a mandatory or voluntary minimum level of collection service that citizens can expect, or have specified a preferred design for collection systems. Member States may wish to consider whether, in their case, standardisation of this type would help to:

- Avoid each municipality having to individually research, assess and decide upon the design of its services;
- Ensure that residents of all municipalities receive an adequate level of service;
- Avoid disagreements with producers over the design of the service appropriate to a particular municipality;
- Avoid disagreements over the correct balance between source separation and subsequent sorting, thereby helping to simplify and standardise infrastructure needs; and
- Facilitate communication regarding recycling at a national (or even European) level.

Adoption of a preferred service model may be a reasonable requirement to ensure that all areas receive an acceptable level of service; and the costs of delivering that service model may be considered 'necessary', even where it may not be the cheapest possible way to achieve the required targets within a particular municipality. Member States may also wish to issue research-based guidance on the collection systems that are likely to be most effective, having regard to the different circumstances that may apply in different geographical areas. The analysis behind this guidance may also inform the design of the modelling that helps to determine the appropriate financial contributions and allocations of funds between waste management organisations.

Attributability and Assignment

The bodies delivering recycling services for producers may do so as part of a wider suite of waste services. Combining the collection of material that is subject to EPR with the collection of other material is likely to help reduce collection costs over all, and increase convenience for citizens (e.g. where packaging and non-packaging paper are collected together). It can also allow a wider range of economic instruments (e.g. pay as you throw, landfill tax) if the services required to meet producers' obligations are met through integration into a wider municipal service. However, it can make it more difficult to attribute to the recycling part of the system its proper share of some costs (e.g. where overheads, sites, vehicles and/or employees are shared between the EPR-funded recycling service and other operations). While producers should pay a proportionate contribution to such costs, they should be required only to meet the costs of a system that are reasonably attributable to the services needed to meet the targets, unless the Member State has widened the scope of producer responsibility. Many producer responsibility schemes cover a range of products that vary in the materials they contain and how readily they can be recycled. In these cases, where collection and recycling services are being offered for a range of products, the allocation of costs to specific types of products might be necessary so that producers of one product type are not cross-subsidising producers of another. In such cases, producers need to be assured that costs are appropriately assigned and that no producer is subject to costs that are substantially greater than necessary to manage the waste arising from their products.

Value maximizing

The revised Directive makes clear that the costs that producers should bear should be considered net of revenues associated with the sale of recyclables, and of unclaimed deposits. It is therefore important that –if producers do not themselves undertake the task of marketing materials –those responsible for doing so achieve the best sale prices that they reasonably can, through effective engagement with the market. The system of collection and treatment should be value maximising, having regard to net costs.

Transparency

The revised Directive speaks directly to the matter of establishing costs in a transparent way between the relevant actors. Where considerations such as commercial confidentiality mean that it is impractical to achieve complete transparency regarding costs, the process by which the costs are arrived should be transparent, so that producers have assurance regarding the outcome.

Efficiency

While the foregoing sections relate to the requirements of Article 8a(4)(a), the issue of efficiency is raised under Article 8a(4)(c). It therefore applies to Directives that are outside the scope of Article 8a(4)(a). The issue that is addressed through the requirement that the costs to producers “do not exceed the costs that are necessary to provide waste management services in a cost-efficient way” is the concern that producer responsibility organisations and/or service delivery bodies might run services inefficiently, so that the cost of delivering the target level of performance is greater than it needs to be.

Producers should be required only to meet the costs of a system that is efficient, at least as compared with systems in operation elsewhere in the Member State or in Member States that are broadly comparable. This issue might make it especially important to benchmark costs, especially in

those cases where public sector contractors are the incumbent service providers, and where they have not been exposed to competition in the marketplace. The issue of how efficiency might be established is not straightforward. Much of the thinking that has gone into the development of current practice in the management of producer responsibility schemes has focused on how to demonstrate efficiency.

A 1.2.3 Current Practices in Applying ‘Necessary Costs’ Across Europe

While the concept of “necessary costs” is new to the revised Waste Framework Directive, in practice producer responsibility schemes have been looking to achieve the maximum benefit from the minimum financial inputs for many years, to reassure the producers that they implement a cost-effective service.. The study team sought to identify practices in existing producer responsibility schemes that applied concepts similar in nature to the principle of “necessary costs” so as to find examples of good practice to echo and common problems to avoid in the application of Article 8a.

To obtain evidence, Eunomia’s study undertook the following activities:

- Stakeholder workshop: Brief discussion of the key issues related to determining necessary costs.
- Literature Review: Eunomia sought out documents that set out the basis for financial transfers from producers to others, but in practice there were few publicly available details.
- Survey, gathering directly from relevant PROs and relevant authorities (such as Environment Ministries and Environment Agencies) the types of costs that producers were required to cover, and any measures (whether written into law or as a matter of practice) adopted to ensure that producers bear only necessary costs.
- Follow up information requests: Eunomia followed up by email or telephone with some survey respondents and other interested parties whose responses indicated that they might be able to provide further information that would be of use in developing an approach to necessary costs. The evidence review revealed a range of practices, as there were lessons from the survey that could be carried forward into guidance on establishing necessary costs, but no one scheme provided an ideal model.

Direct Delivery Compliance

In a small number of cases, producers have direct responsibility for undertaking or arranging collections and/or treatment, rather than collections being run centrally through EPR schemes, or relying on municipalities or other organisations to fulfil these responsibilities. A prominent example is the WEEE scheme in Germany: The producers/authorised representatives are required to provide appropriate containers for the WEEE collection from the municipalities. The municipality notifies the EAR⁷⁵ foundation of any full container. The EAR foundation assigns one of the registered producers to pick up that container in that specific municipality (and properly dispose of the WEEE according to the waste hierarchy and provide an appropriate empty container in exchange).

Since the producer provides the empty container itself, it is up to every producer to find a cost-efficient solution. The responsible producer is determined by the EAR foundation according to a scientifically acknowledged method of calculation. The producer is free to hire a third party to help fulfil its obligations

⁷⁵ [Elektro-Altgeräte Register]

(to pick up the WEEE container from the collection point and replace it with an empty one) in an appropriate way⁷⁶.

In such a scheme, the producers are directly responsible for finding a collection and treatment solution that they are satisfied represents good value for money. The risk of producers being dissatisfied with the cost-effectiveness of services is low –although such a system has little opportunity to benefit from economies of scale, so the overall costs may be higher than might be achieved through co-ordination.

This model can be effective where the number of containers is relatively small –where, for example, collections are via producer-run take-back sites or municipal drop-off centres; or where the product requires specialised treatment. In such scenarios, the producers incur costs directly, and are at liberty to change the arrangements if they believe that the targets can be met in a more cost-effective way. However, it is difficult to envisage how it could be applied cost-effectively in other contexts, such as door-to-door collections of materials such as packaging. Despite its high level of transparency, it is unlikely to be an efficient way of organising the delivery of waste collection services for high volume materials (though it may have a role in relation to specialist materials that arise in small quantities (e.g. high-value WEEE, coffee pods).

PROs Pay Third Parties

In many cases, PROs obtain services from third parties on behalf of their members. This may be through direct procurement of services, or through payments to entities such as municipalities that undertake or procure service provision, but which are not directly responsible to the PRO. Where PROs procure services directly, this typically involves the PRO specifying the services that it wishes to obtain, and then commissioning them through competition. For example, in Germany the EPR systems carry 100% of the responsibility of financing and organizing collection, sorting and recycling of packaging to meet national targets.

PROs must tender for sorting capacity to cover their registered tonnage, which may also include trading of materials –although this is sometimes undertaken by the PROs directly. However, there are regular tenders for collection and sorting contracts. The German system operates collection contracts with a three-year duration. Municipalities can participate in tenders, but (except for a small number of low-value aspects of service provision, such as making available sites for containers) have to compete with private waste management companies. The costs of the resulting contracts for collection are shared by PROs according to their market share.

The PROs define a lead negotiator by “drawing lots” according to their market share (so, a PRO with 10% market share would be in charge of 10% of the randomly drawn collection areas being negotiated in a particular year). This lead negotiator negotiates on behalf of all PROs, and is incentivized to achieve a good financial outcome by being required to cover at least 50% of the collection cost in the tendered area. In other cases, PROs make payments to third parties indirectly, through supporting the value of recycled materials. For packaging, the UK and Poland operate systems of tradeable packaging recovery notes (PRNs) whose value is determined by market forces.

Where too little material is being collected to meet the recovery target for a particular type of packaging, the value of PRNs increases, incentivising greater captures and efficient recycling. Where collection and

⁷⁶ According to Umweltbundesamt (UBA) – German Environment Agency.

treatment systems are yielding sufficient tonnage, the value of PRNs is low. In some cases, this activity is carried out by a single, national, PRO; in other cases, there are multiple PROs, each commissioning or funding services on behalf of the organisations that choose to join them. In these types of arrangements, assurance regarding costs is provided through two main mechanisms: 1) The PRO can utilise competition to obtain the best price; and 2) Producers can hold the PRO accountable for the costs it incurs on their behalf;

It is also possible to utilise competition between PROs as a means of providing producers with assurance that, if the costs they would incur under one scheme appear high, there may be alternatives available. Where there is a single PRO, producers can be concerned that their monopoly position fails to incentivise the PRO to keep costs to a minimum. Some respondents –especially those already closely involved in the operation of competitive PROs–mention the importance of competition between PROs in providing assurance regarding costs; however, this perception is not necessarily shared universally.

Where there are multiple PROs, this may give rise to duplication of management costs and infrastructure, although competition can be a driver of efficiency. However, the costs of PRO administration are small compared with the costs of the waste management services they secure for their members. While efficient administration may help to contain costs, it is unlikely to result in significant differentiation in fees.

Provided that all PROs are required to offer services of a good standard, the principal way in which they may be able to achieve price differentiation would be through effective commissioning/procurement.

The system of indirect payments in its Polish and UK instances does not ensure that producers meet the costs of collecting and sorting recycling. Instead, it is focused on making sure that the targets are met by acting as a supplementary source of funding to established waste management systems that are funded by other means.

The system in the Netherlands allocates payments on the basis of material recycled, but instead of setting the level of support based on market principles, the amount available reflects the total cost of waste management, on average. This ensures that the total cost of recycling is met but tends to allocate producer responsibility payments inefficiently.

Unless the targets can be met by focusing on areas from which collections can be accomplished relatively cheaply, material price support would need to rise to the levels necessary to incentivise the required level of recycling in more challenging municipalities. This would result in producers paying more than the necessary costs of waste management in those areas where collection costs are lower, while still risking under-funding the areas that face the greatest challenges.

It is important to note the combined emphasis on competition and standards. Producers have highlighted as evidence of competition's benefits the reduction in costs for WEEE compliance in Austria when competition was introduced. However, the introduction of price competition also resulted in competition on standards, and concerns that this led to a diminution in them. It also appears that competition can go beyond the point where it achieves substantive benefit –the UK, for example, has more than 20 compliance schemes for WEEE, and it is unclear to what extent this multiplicity of schemes adds value, especially in the absence of clear minimum standards that PROs must meet.

It is concluded that, especially if monopoly PROs are used, they must be transparent in their own costs (e.g. through publicly available audited financial statements) and demonstrate that the costs of the services that they commission are reasonable (e.g. by procuring those services through competitive tender, although other means may also be acceptable). They should also demonstrate that these costs are apportioned equitably across producers.

Systems that rely on supporting the value of recycled materials in order to fund collections can be effective in meeting relatively low targets, where there is perhaps some justification for focusing on “low hanging fruit” to keep costs to a minimum. However, where recycling targets increase, the system appears likely to become inefficient in allocating resources to third parties so as to meet only the necessary costs. The UK system has also resulted in significant year-to-year fluctuations in the level of price support, especially in relation to WEEE, when the performance of collectors has not been sufficient to meet the required targets –creating a lack of predictability for both producers and collectors that does not appear to be conducive to supporting longer-term investments in services and infrastructure.

In all cases, PROs should demonstrate that their funding system is capable of delivering services that are able to meet the targets set in directives, and to meet the requirements set out in the EU law. This can be demonstrated either through establishing minimum service standards in law (for example, in respect of collection services for packaging materials), adherence to audited standards where available, e.g. the WEEELABEX or Cenelec standards for WEEE management. This may require a process of inspection and enforcement by national authorities, which producers would reasonably be expected to fund.

PROs Pay Third Parties but Set Conditions

The cases in which Article 8a(4) is most relevant are where the collection and/or treatment of end-of-life obligated products is undertaken by a third party that is not appointed directly by the PRO (i.e. the role of producers is mainly one of funding activities undertaken by those over whom they have no direct control). Such schemes are relatively widespread and can inform the development of guidance on Article 8a. A common system is for PROs to make direct payments to municipalities. However, rather than simply pay the costs incurred by municipalities, they may seek to limit the payments to the necessary costs by applying a formula to determine the value of the payment, or they may require/expect that municipalities establish the cost-effectiveness of their service through open tendering.

The collection of materials will, in accordance with existing collection structures of the public waste management authority, be undertaken by the company (private or public) which makes the economically most advantageous tender in an electronic call for tenders (competitive tender), and which is suitable for the task⁷⁷.

Spanish local entities have... the responsibility of providing their citizens with municipal waste management. Ecoembes and each local entity in Spain are therefore required to sign a cooperation agreement that details the waste management services that should be financially covered by the producer.

In this light, Ecoembes has established an operational model including payments formulas, which is reflected in said agreements, and is underpinned by ‘efficient’ costs. This model aims at optimising the operations while pursuing a quality control system to ensure that industry payments cover efficiently-

⁷⁷ According to Umwelt Bundesamt (UBA) –German Environment Agency.

run services. The model entails establishing basic service conditions for all local entities. These conditions are at the same [time] matched with a series of objective specificities linked to the entities' territory and population that may impact the delivery of the services. An economic value is attributed to each of these elements.

Examples of collection systems include lateral, back and upper loading, buried containers, pneumatic recovery and bags. Examples of entities' specificities include their urban, semiurban and rural status; their floating population (seasonal, non-seasonal); the existence of small islands; population elements (dispersion index); urban elements (horizontality index); among others. Examples of technical and economic efficiency elements include collection from containers filled at least at 66% of their capacity, 90% efficiency average in the collection routes, among others.

Through this operational model, multiple combinations of services and entities' specificities are allowed, giving way to the most coherent service for separate collection and sorting of waste materials possible for each individual local entity. The resulting information is finally modelled, and a cost is defined for both separate collection and sorting services⁷⁸.

In their negotiations, they advocate in general for a "competitive price policy": even if there is no competition between municipalities, ARA is not prepared to pay more for the same service than private companies are offering⁷⁹.

The collection is undertaken by municipalities on behalf of the producers, but all the system is paid by the PRO schemes, on behalf of the producers (packers in this case). The amount paid by the PRO scheme to the Urban Waste Management Systems/Municipal Systems, is fixed by law, and this contribution was calculated using a model developed by a university that took into account several inputs that were necessary to calculate the cost of collection, sorting and transport, like, for example, the packaging material and the area of the country areas with higher or lower population density). Is important to also refer that all stakeholders were involved in the construction of this model, to guarantee a fair value⁸⁰.

In such a scheme, a great deal clearly depends on the design of the tender process or the funding formula that determines the payments made to municipalities (or other collectors). The challenge is to ensure that producers meet all the relevant costs, but that these are no higher than is necessary for the materials for which they are responsible, and that municipalities are remunerated in a way that reflects the costs that are necessary to incur in order to achieve an appropriately high level of recycling in their area, while not rewarding inefficient services.

- For funding formulae, various Member States including Spain and Portugal have developed systems for assessing the costs of packaging waste management that could be developed further by other Member States to meet the requirements of their own producer responsibility systems for this and other material streams.
- For tender processes, FostPlus in Belgium has continuous participation in the commissioning process, whether as part of the initial procurement process or as part of a regular process of cost review with municipalities. There is a standard method by which municipalities report their costs, which is subject to audit. This ensures that the system does not dictate whether municipalities should outsource services but allows for consistent comparison of costs and provides assurance to producers that costs do not exceed the necessary level.

⁷⁸ Ecoembes, Spain

⁷⁹ Altstoff Recycling Austria AG (ARA)

⁸⁰ Portuguese Agency for the Environment

Whichever of these systems might be used, it will be necessary to ensure that the costs associated with the waste streams for which producers are responsible are separable so that the costs can be disaggregated from the costs of managing the wider waste stream. Several EPR schemes already make some form of adjustment in seeking to attribute 'the packaging-related share' of the costs of collecting paper and cardboard together (for example, in Cyprus, there is a deduction in the cost associated with the collection of non-packaging paper).

An additional important consideration is the proper scope of the responsibilities of municipalities – should they, for example, be responsible for the management of the sale of recyclable material. Where municipalities (or any bodies other than those controlled by producers) have this responsibility, there is a risk that producers may take the view that the sale price achieved is not optimal. One way to overcome this issue is to ensure that under all schemes, producers themselves, or those acting on their behalf, are responsible for marketing the secondary materials. In practice, this might not always be happening, in which case, some assurance might be sought from producers that materials are not being sold at prices below what the market can support: if nothing else, those selling materials should have an incentive to fetch the best price, consistent with developing positive relationships with end users.

A 1.3 Non-Exhaustive list of WEEE under WEEE Directive & Non - applicable to WEEE Directive WEEE categories

Non-Exhaustive list of WEEE that fall under the WEEE Directive:	
WEEE categories	Type of WEEE
Category 1: Temperature exchange equipment	<ul style="list-style-type: none"> • Refrigerators • Freezers • Equipment which automatically delivers cold products, Air conditioning equipment • Dehumidifying equipment • Heat pumps • Radiators containing oil and other temperature exchange equipment using fluids other than water for the temperature exchange.
Category 2: Screens, monitors and equipment containing screens having a surface greater than 100 cm²	<ul style="list-style-type: none"> • Screens • Televisions • LCD photo frames • Monitors • Laptops • Notebooks.
Category 3: Lamps	<ul style="list-style-type: none"> • Straight fluorescent lamps • Compact fluorescent lamps • Fluorescent lamps • High intensity discharge lamps - including pressure sodium lamps and metal halide lamps • Low pressure sodium lamps, LED.
Category 4: Large equipment (any external dimension more than 50 cm) e.g. Washing machines	<ul style="list-style-type: none"> • Washing machines • Clothes dryers • Dish washing machines • Cookers • Electric stoves • Electric hot plates • Luminaires • Equipment reproducing sound or images • Musical equipment (excluding pipe organs installed in churches) • Appliances for knitting and weaving • Large computer-mainframes • Large printing machines • Copying equipment • Large coin slot machines • Large medical devices • Large monitoring and control instruments • Large appliances which automatically deliver products and money

<p>Category 4b: PV panels</p>	<ul style="list-style-type: none"> • Photovoltaic panels.
<p>Category 5: Small equipment (no external dimension more than 50 cm) e.g. Smoke detectors</p>	<ul style="list-style-type: none"> • Vacuum cleaners & Carpet sweepers • Appliances for sewing • Luminaires • Microwaves & Scales • Ventilation equipment, Smoke detectors, Heating regulators, Thermostats • Irons, Toasters & Electric kettles • Electric knives • Clocks and Watches & Calculators • Appliances for hair and body care & Electric shavers • Video cameras, Video recorders • Radio sets, Hi-fi equipment & Equipment reproducing sound or images, Musical instruments • Electrical and electronic toys & Sports equipment • Computers for biking, diving, running, rowing, etc. • Small Electrical and electronic tools, medical devices, monitoring and control instruments • Small Appliances which automatically deliver products, • Small equipment with integrated photovoltaic panels.
<p>Category 6: Small IT equipment and telecommunication equipment (no external dimension more than 50 cm) e.g. Mobile phones</p>	<ul style="list-style-type: none"> • Mobile phones • GPS • Pocket calculators • Routers • Personal computers • Printers • Telephones

<p>The non-applicable list to the WEEE Directive 2012/94/EE does not apply (Article 2, paragraph 3 & 4):</p>	
<ul style="list-style-type: none"> • equipment necessary for the protection of the essential interests of the security of Member States (including arms, munitions and war material intended for specifically military purposes) 	
<ul style="list-style-type: none"> • equipment specifically designed and installed as part of another type of equipment that is excluded from or does not fall within the scope of this Directive, which can fulfil its function only if it is part of that equipment 	
<ul style="list-style-type: none"> • filament bulbs. 	
<ul style="list-style-type: none"> • equipment designed to be sent into space; 	
<ul style="list-style-type: none"> • large-scale stationary industrial tools; 	
<ul style="list-style-type: none"> • large-scale fixed installations, except any equipment which is not specifically designed and installed as part of those installations; 	
<ul style="list-style-type: none"> • means of transport for persons or goods, excluding electric two-wheel vehicles which are not type-approved; 	
<ul style="list-style-type: none"> • non-road mobile machinery made available exclusively for professional use; 	
<ul style="list-style-type: none"> • equipment specifically designed solely for the purposes of research and development that is only made available on a business-to-business basis; 	

Eunomia Research & Consulting IKE

44 Avenue Vasileos Konstantinou

11635, Athens - Greece

Web www.eunomia.co.uk

