Activating Circular Services in the Electric and Electronic Sector

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Deliverable 6.2. Position paper with recommendations for policy makers

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Executive Summary

Electrical and Electronic Equipment (EEE) and, consequently, the amounts of waste from this equipment are particularly significant in a Circular Economy (CE) context: both from the consumers perspective which consider important their reparability as well as from manufacturers/recycling companies' point of view for the possibility to recycle the valuable materials such as rare earth elements (e.g.: iron, steel, aluminium, etc.) contained in the electronic devices.
Moreover, embracing the logic of "recycling" and "reuse" becomes economically advantageous both for manufacturers and end-users. Suffice it to say that taxation on waste (i.e.: landfill taxes) over the years has never stopped growing, and the prospect is to move more and more in the direction of contributory differentiation based on the "polluter pays " principle.
Therefore, in this context it is important that the concept of circularity begins a pillar both for manufactures and end-users for all the industrial sectors including the Electrical and Electronic (EE) sector.

The aim of this deliverable is to provide Policy Recommendations for policy makers/EU political institutions to overcome legislative barriers towards circularity in the E&E sector. These recommendations are highlighted in this Summary to give the reader a first overview of what is recommended to policy makers and actors, involved in the E&E value chain, for the improvement of the circularity of E&E equipment.
Current legislation, regulation and policy have been also examined to identify and propose potential measures to improve policy related to the developed products and services in the E&E sector.

Methodological approach

To identify policy recommendations the following methodological steps have been carried out:

1. Analysis of policy framework including an overview of the current EU legislative framework in the E&E sector: desk research, interlinkages with other C-SERVEES activities and involvement of Consortium partners.
2. Identification and analysis of non-technical barriers (legislative, economic, social) and identification of countermeasures: online interviews with EEE manufacturers and recyclers of the target products.
3. Stakeholder consultation: internal (consortium partners) and external consultation (Advisory Board members, members of associations participating in waste management standardisation tables, etc.).
4. Analysis of findings and development of policy recommendations: analysis of the above steps and inclusion of recommendations from available public documents.

Results / Policy recommendations

Throughout the methodological steps a few policy recommendations have been identified. The list of specific recommendations for the E&E sector below is mainly based on the countermeasures proposed by the consulted stakeholders on how to overcome the legislative barriers. In particular, the following recommendations are worth mentioning:

- Legislators shall provide financial, informational and regulatory incentives to stimulate the repair, re-use and remanufacture of products.
- The EU and Member States shall develop guidelines and/or public campaigns targeting the main actors to increase awareness, understanding and compliance with the regulatory framework.
- The European Commission, along with the Member States, shall engage the final users in awareness-raising programs, improving accurate identification of materials and their proper disposal into separate collection systems.
- The European Commission, together with policy makers, shall differentiate the regulations according to the product specifics, preserve the requirements of CE at EU-wide level, to avoid market fragmentation resulting from different national laws and discrimination among product categories.
- Policy makers shall consider the real needs of all stakeholders while updating the framework below:
  - ✓ Limit values in REACH Directive, the CMRT or the SVHC list,
  - ✓ WEEE Directive to better address competencies and responsibilities of stakeholders. Most Member States invest producers with the responsibility to meet collection targets, even though they do not even possess full access to all the WEEE at its end-of-life cycle.
  - ✓ POPs Regulation may turn into a major obstacle, especially in the recycling of plastic waste. For example, the introduction of lower threshold for some substances (like PBDE) can make it very difficult to recycle this waste stream.
  - ✓ Strong restriction foreseen from the revision of the Waste Shipment Regulation regarding the export of waste from the EU (cross-border movement), without distinction between proper treated waste and untreated waste, can hamper the export of waste needed for the recovery of CRM.
- The cooperation of the whole value chain with national and local authorities across Europe is fundamental to achieve recycled content targets.
- Public authorities should express recommendations, via procurement policies, to promote the use of products with a higher content of recycled plastic.
- Manufacturers shall analyze the impacts of their products, according to the LCA-based method, for a decision-making guide for CE. From the policy standpoint, LCA studies should be required as an element of public procurement practices or invitations to EU project tenders.
- Manufacturers shall indicate, through the application of a standard, the grade of recycled material that they require from their component suppliers. The term

"recycled content" does not suffice to incite the suppliers of recycled materials (recyclers) to meet appliance manufacturers' demand, because it is insufficiently specific. A specific grade will encourage recyclers to produce recycled materials that manufacturers actually require in producing their products i.e.: to allow the recyclers to anticipate and accommodate demand. The grades of recycled material could be developed by the R&D team of the manufacturer company or by Standards Bodies such as CENELEC, one of the three EU standardization bodies, with the active support of producers.

- Technology developers shall provide technical and technological recommendations regarding standardization, normalization and obsolescence of equipment and regarding instruction manuals that enable and facilitate maintenance and repair, technical data sheets, availability of spare parts, languages of documentation, etc.

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Acronyms and abbreviations

AB	Advisory Board
APPLia	Asociación Española de Fabricantes e Importadores de Electrodomésticos
ASSORAEE	Associazione Recupero Apparecchiature Elettriche ed Elettroniche
B2B	Business to Business
B2C	Business to Customers
CE	Circular Economy
CEBMs	Circular Economic Business Models
CEP	Circular Economy Package
CMRT	Conflict-Minerals Reporting Template
CRM	Critical Raw Materials
DDT	Dicloro Difenil Tricloroetano
DG	Directorate General
DPP	Digital Product Passport
EC	European Commission
EEE	Electrical and Electronic Equipment
EoL	End of Life
EoW	End of Waste
EPR	Extended Producer Responsibility
EPREL	European Product Database for Energy Labelling
ErP	Energy related Products
ESPR	Ecodesign for Sustainable Products Regulation
EU	European Union
JRC	Joint Research Centre
LCA	Life Cycle Analysis
LOU	Loughborough University
MS	Member States
POPs	Persistent Organic Pollutants
Q2	Second quarter

REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
R&I	Research and Innovation
RoHS	Restriction of Hazardous Substances Directive
SAT	Osterreichische Gesellschaft fur System- und Automatisierungstechnik Verein
SVHC	Substances of Very High Concern
WEEE	Waste Electrical and Electronic Equipment
WP6	Work Package 6
WSR	Waste Shipment Regulation

1 Introduction

The Activating Circular Services in the Electric and Electronic Sector project (C-SERVEES) aims to boost a resource-efficient Circular Economy (CE) in the Electrical and Electronic (E&E) sector through the development, testing, validation and transfer of new Circular Economic Business Models (CEBMs).
The main objective of Work Package 6 (WP6) is to provide key enabling tools for boosting the replicability and transferability of the new CEBMs and services across the European Union (EU).

This Deliverable represents the work carried out in Task 6.2 regarding policy recommendations for EU political institutions to overcome legislative barrier towards circularity in E&E sector.
Its purpose is indeed to investigate the current legislative framework and bottlenecks encountered at the EU level for the circularity in the E&E sector within the whole product life cycle, and to give specific countermeasures to overcome the legislative barriers
From these countermeasures a set of policy recommendations addressed to policy makers and actors involved in the E&E sector was identified.

The different steps followed to identify the policy recommendations are shown in the other sections of this document.
Moreover, according to the description of Task 6.2 in the Grant Agreement, this deliverable is also focused on other aspects that have been briefly investigated:

- the concept of Eco-design to integrate environmental sustainability considerations into the characteristics of a product,
- the End-of-Waste (EoW) criteria for certain waste streams present in WEEE to promote the opportunity of adopting EoW currently available and provide recommendations to set EoW criteria for other relevant waste streams.
- the feasibility of setting specific targets for the recovery, preparation for re-use and/or recycling of certain WEEE streams that has been evaluated as well as the promotion for inclusion in Eco-design Directive of requirements for EEE other than those related to energy efficiency.

Within this Deliverable, besides Section 1 that constitutes the Introduction, the following sections are included:

- Section 2 presents the followed methodological approach to carry out the activity.
- Section 3 describes the current legislative framework analysis.
- Section 4 investigates the main EU non-technical barriers (legislative, social, economic) and gaps in regulation towards E&E circularity and propose some ideas to overcome them.
- Section 5 describes the process of stakeholders' consultation on the above topics.
- Section 6 proposes an overview of a few policy recommendations as potential measures to overcome the identified legislative bottlenecks.
- Section 7 draws the conclusions of the present study.
- Section 8 provides the references.

2 Methodological Approach

To pursue the objective of the study, the work has been divided in four main subtasks. The methodological approach followed in each of them is described in the following paragraphs.

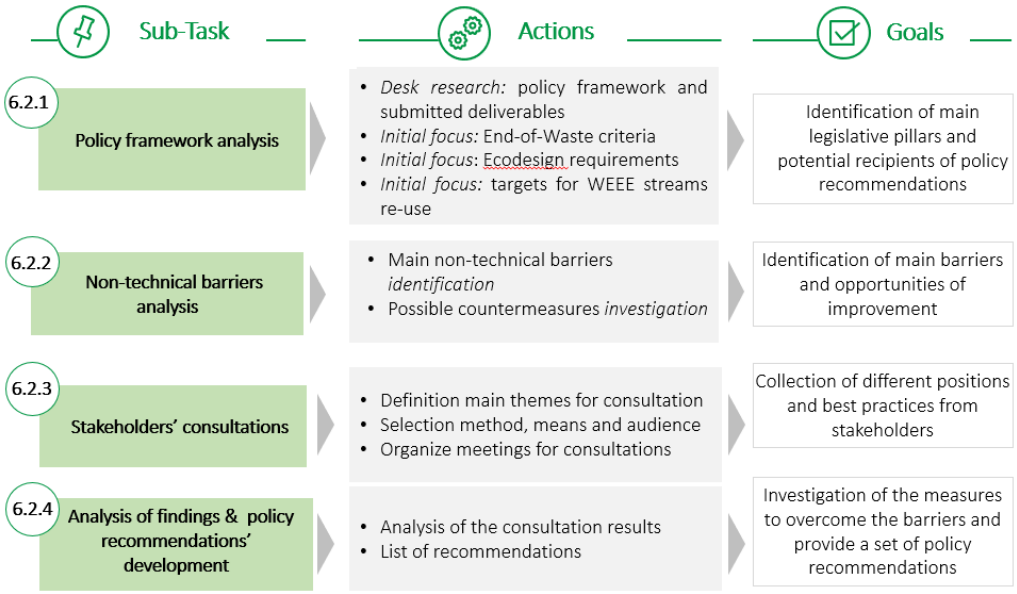


Figure 2.1: T6.2 Subtasks, Actions and Goals

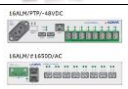
Sub-task 6.2.1. Analysis of policy framework

- *Desk research* on EU *policy framework*: picture of the current scenario with a focus on the EoW criteria for some relevant WEEE streams, the Ecodesign Directive requirements of for EEE and targets for WEEE streams re-use.
- Analysis of the *information provided* by the AB and other stakeholders especially in WP1 (D1.1, D1.2, D1.3), WP2 (D2.1) and WP8 (D8.1).
- Involvement of *Consortium partners* to obtain useful information and for a support in specific activities (e.g.: LOU and WEEE Forum for D1.1 and D.2.1 or ERION for their experience in WEEE and confirmation on the main legislative pillars and main actors involved within the regulatory framework).
- Interlink with *other RINA's activities*: T6.1 on Ecodesign and T6.3 on standardization.

Sub-task 6.2.2. Analysis of non-technical barriers

- Involvement of *Consortium partners* (e.g.: ERION, WEEE Forum, etc.) for their experience in WEEE and further feedback on the main legislative pillars and the potential recipient of policy recommendations.
- *Online interviews* with EEE manufacturers and recyclers of the target products (see Table below) to investigate the above topics with a focus on demos products.

Table 2.1: C-SERVEES Target Products, Manufacturers and Involved Partners

C-SERVEES Target products		Partner	Product life cycle
Washing machines		ARCELIK	Design, production and use steps in E&E sector
Laser toner cartridges		LEXMARK	Design, production, use and end-of-life steps in E&E sector
Telecom Advanced Link Monitoring (ALM) products		ADVA	Design, use and end-of-life steps in E&E sector
TV sets and displays		ARCELIK	Design, production and use steps in E&E sector
Various		Indumetal, EMAUS	End-of-life step

Sub-task 6.2.3. Stakeholders' consultation

The main topics discussed have been:

- Investigation on EoW criteria.
- Investigation on the promotion of the inclusion in Eco-design Directive of requirements for EEE other than those related to energy efficiency.
- Ideas on the feasibility of setting specific targets for the recovery, preparation for re-use and/or recycling of certain WEEE streams.
- Presence of legislative barriers in E&E sector and ideas on how to overcome them.

The main involved – internal and external – stakeholders have been:

- WEEE Forum and its third part Electrao.
- Consortium partner ERION.
- Members of the associations as ASSORAEE.
- C-SERVEES AB members (through previous contacts from SAT for activities carried out in D8.1).

The methodology for the stakeholders' engagement (in term method, means, audience and timeline) is detailed in Chapter 5 Stakeholders' consultation.

Sub-task 6.2.4. Analysis of findings & development of policy recommendations

- Analysis of the above-mentioned investigated aspects and results.
- Inclusion of recommendations from available public documents.

3 Current EU legislative framework in E&E sector

Leveraging the initial information provided by the work done in WP2, the current EU legislative framework has been analysed, starting from the main law for Waste from Electrical and Electronic Equipment, i.e.: the WEEE Directive (2012/19/EU) (1).
Other directives applicable to E&E sector can be summarised in the following regulatory framework, reported chronologically, based on their latest updates:

- Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Directive (2006/1907/CE) (2).
- Eco-design/Energy related Products (ErP) Directive (2009/125/EC) (3) and Eco-design Commission Regulation (EU) 2021/341 (4).
- Restriction of Hazardous Substances (RoHS) Directive (2011/65/EU) (5).
- EU Circular Economy Packages (CEP) (6).
- Energy Labelling Regulation (2017/1369/EU) (7) and energy labelling Regulation (EU) 2021/340 (8).
- Waste Framework Directive (2018/851/EU amending 2008/98/EC) (9);
- Others: Persistent Organic Pollutants (POPs) Regulation 2019/1021/EU (10), Packaging Directive 2018/852/EU (11).

Moreover, one of the principles around which the European legislation has been defined is the Extended Producer Responsibility principle (EU EPR). Extended Producer Responsibility (EPR) systems have been criticized to provide little incentive for producers to eco-design. To this end, an incentive scheme, called eco-modulation, based on modulated product fees according to their level of eco-design has recently been introduced.

The following paragraphs describes the main points of each above-mentioned regulations.

WEEE Directive

Mainly sustainable production and consumption habits are intended by the Directive. Generation, prevention and preparation for reuse promotion are principal activities considered.
The Directive sets quantitative requirements for the collection of WEEE: from 2019, the minimum collection rate to be achieved annually shall be 65 % of the average weight of EEE placed on the market in the three preceding years in the Member State concerned, or alternatively 85 % of WEEE generated on the territory of that Member State.
Forthcoming CE actions relevant to WEEE Directive and C-SERVEES products can be:

- Increase the recycled plastic content in washing machine parts.
- Improve the refurbishment and dismantling processes and provide information about printers to the recycling partners (information to share could also be required by GDPR Regulation) for printers.

- Design for recycling, eco-design approach in production and design for recycling, assign components to most efficient recycling pathways, provide recyclers with bill of materials to aid recycling, for Telecom ALM.
- Increase the recycled plastic content in TV parts for TV sets and displays.

EU Circular Economy Packages

The Circular Economy Package (CEP) is a pack of measures and legislative proposals adopted by the EC to boost sustainable growth and help Europe make the transition towards a more CE.
It introduces a revised legislative framework, identifying steps for the reduction of waste and establishing an ambitious and credible long-term path for waste management and recycling.

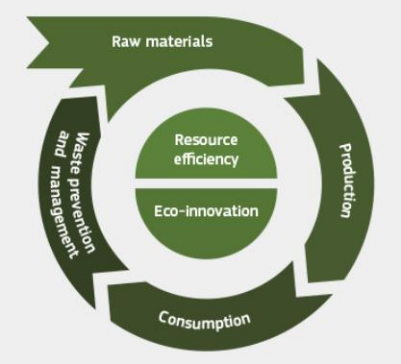


Figure 3.1: Circular Economy Package (CEP) Principles. Source: EC

The adoption of action plan includes several initiatives, such as:

- Legislative proposal for substantiating green claims made by companies.
- Review of requirements on packaging and packaging waste in the EU.
- New policy framework on bio-based, biodegradable and compostable plastics.
- Measures to reduce the impact of microplastic pollution on the environment.

Energy Labelling Regulation

The Energy Labelling Regulation complements the Eco-design Directive; in fact, the requirements for product energy labelling are often adopted alongside Eco-design implementing measures.

The Regulation gives indication by labelling and standard product information of the consumption of energy and other resources by energy-related products.

The evolution of energy labelling process runs in parallel with the establishment of products' mandatory requirements and relates to the indication of the consumption of energy and other resources by energy-related products through labelling and information to end-users. The suppliers shall ensure that products, that are placed on the market, are accompanied, for each individual unit, free of charge, with accurate printed labels and with product information sheets in accordance with this Regulation.

Extended Producer Responsibility principle (EU EPR)

EPR is a policy tool that extends the producer's financial and/or operational responsibility for a product to include the management of the post-consumer stage, in order to help meet national or EU recycling and recovery targets. EPR policies thus generally shift the waste management cost or physical collection partially or fully from local governments to producers.

Restriction of Hazardous Substances Directive (RoHS) Directive

The RoHS Directive bans the use of certain hazardous substances (such as lead, mercury, cadmium, hexavalent chromium and some polybrominated flame retardants) in EEE.

Forthcoming CE actions relevant to RoHS Directive and C-SERVEES products can be:

- Decrease packaging waste in washing machines.
- Provide information about printers to LEXMARK recycling partners for printers.
- Design for longevity Telecom ALM.
- Decrease packaging waste and develop renting/leasing model for B2B customers for TV sets and displays.

REACH Directive

Concerning the Registration, Evaluation, Authorisation and restriction of Chemicals, REACH applies to substances manufactured or imported into the EU in quantities of 1 tonne or more per year. Generally, it applies to all individual chemical substances stand alone, in preparations or in articles.

Forthcoming CE actions relevant to REACH Directive and C-SERVEES products can be:

- Design for longevity for Telecom ALM.
- Develop renting/leasing model for B2B customers for TV sets and displays.

Waste Framework Directive

The directive sets the basic concepts and definitions related to waste management, such as definitions of waste or recycling. It introduces the waste hierarchy, the Polluter Pays principle and the Extended Producer Responsibility and sets out separate collection targets. Forthcoming CE actions relevant to Waste Framework Directive and C-SERVEES products can be:

- Decrease packaging waste, increase recycled plastic content in packaging for washing machines.
- Improve the refurbishment and dismantling processes and provide information about printers to LEXMARK recycling partners for printers.
- Decrease packaging waste and increase recycled plastic content in packaging for TV sets and displays.

Eco-design/ Energy related Products (ErP) Directive

The aim of the Energy-related-Products (ErP) Directive, also known as Eco-design, is to promote a framework for the integration of environmental aspects into the design of equipment. A focus on Eco-design Directive is presented in Section 3.1.

Forthcoming CE actions relevant to Eco-design and C-SERVEES products can be:

- Increase recycled plastic content in washing machine parts for washing machines.
- Increase recycled plastic content in TV parts for TV sets and displays.

POPs Regulation and Packaging Directive

The POPs Regulation aims to protect human health and the environment with specific control measures that:

- Ban or severely restrict the production, placing on the market and use of POPs.
- Minimise the environmental release of POPs that are formed as industrial by-products.
- Make sure that stockpiles of restricted POPs are safely managed.
- Ensure the environmentally sound disposal of waste consisting of POPs or contaminated by POPs.

Packaging and Packaging Waste Directive sets out measures and requirements for the prevention, re-use, and recovery of packaging wastes in MS. MS must ensure that packaging placed on the market complies with the essential requirements. The Directive implies the Producer Responsibility principle.

The legal (and other non-technical) bottlenecks encountered at the EU level for the circularity in the E&E sector are analysed in Section 4.

3.1 Focus on Eco-Design Directive

Following the concept of Eco-design as an instrument for the CE in term of integration of environmental sustainability considerations into the characteristics of a product and the processes taking place throughout the product's value chain, the Eco-design Directive refers to the following regulations for specific ErP such as some of the C-SERVEES target products:

- Commission Regulation (EU) 2019/2023 (12): eco-design requirements for household washing machines and household washer-dryers,
- Commission Regulation (EU) 2019/2021 (13): eco-design requirements for electronic displays (televisions),

while other C-SERVEES target products:

- laser toner cartridges can be associated within imaging equipment category (which covers copy machines, multifunctional devices (MFDs), printers and fax machines), for which Eco-design guidelines can be found in a voluntary agreement proposed by industry sectors (14);
- telecom ALM product line and, in general, in Information and Communications Technology (ICT) sector no equivalents to such regulation exist at this moment.

The Eco-design Directive provides consistent EU-wide rules for improving the environmental performance of products, such as household appliances, information and communication technologies or engineering.
The directive sets out minimum mandatory requirements (15) for the energy efficiency of these products.
On March 2022 the EC (Directorate-General for Environment) published a proposal for a new Eco-design for Sustainable Products Regulation (ESPR) (16) which establishes a framework to set Eco-design requirements for specific product groups to improve their circularity and environmental sustainability aspects other than energy performance.

3.2 Focus on End-of-Waste Criteria

Definition and Regulatory Framework of End of Waste (EoW)

"End of Waste (EoW)", or Cessation of Waste Status, refers to a process whereby a waste, subjected to a recovery process, loses that status to acquire that of a product.

The notion of EoW originated in the EU with Waste Framework Directive 2008/98/EU while its revised version (2018/851/EU) establishes certain conditions that have to be complied with by the EoW requirements. In fact, a given waste may only cease to be a waste if it has undergone a recovery operation and meets all the following conditions:

1) The substance or object is commonly used for specific purposes.
2) A market or demand exists for such a substance or object.
   These first conditions hinder the possibility to establish EoW Criteria for materials for which a use and a market are not defined yet. This could be considered as an implicit barrier in the Directive: a market or the use for certain materials depends on the policy framework itself, that permits to consider them not only waste but actual raw materials to treat them as such.
3) The substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products.
   This condition underlines the fundamental concept that an EoW material must not require special measures or treatment compared with the equivalent primary raw material. This obligation for no other processes on the material output from a process, in order to reuse it as input for other processes, can be seen as a constraint. Furthermore, the EoW material must be considered as a raw material and not more like waste, and therefore the same policies and standards shall be applied.
4) The use of the substance or object will not lead to overall adverse environmental or human health impacts.
   In this last condition, if a substance ceases to be waste, it does not need to rely on the waste legislation to ensure the human health and the environmental safety, but all the risks are covered by the products legislation.

The EoW definition and status is important also in a view of legislation on transboundary shipment of waste and the importance of traceability.

EoW criteria for certain WEEE streams

A few already set EoW criteria from the Commission laid down criteria for the following materials:

- Iron, steel and aluminium scrap. Council Regulation N° 333/2011/EU (17).

- Glass cullet. Commission Regulation N° 1179/2012/EU (18).
- Copper scrap. Commission Regulation N° 715/2013/EU (19).

EoW criteria for other WEEE waste stream

In order to set recommendations to set end-of-waste criteria for other WEEE waste streams the following EU studies have been considered:

- At a MS (national) level, the 2020 EC report "Study to assess member states (MS) practices on by-product (BP) and end-of waste (EoW)" (20) aims to increase transparency about MS approaches to the regulation and implementation of EoW status by identifying the legal framework and its implementation practices and to make recommendations on how to design national legal regimes on EoW status that provide the best outcome from a CE perspective while ensuring that relevant chemical and product legislation is observed, and adverse environmental and human health impacts are avoided.

A detailed analysis of specific waste/material streams and procedures established in the MS was performed and the following main recommendations have been expressed for framing future national legal /enforcement regimes for EoW status:

- Improvement of knowledge and enhancing monitoring and reporting of specific waste streams directed to recycling / EoW.
- Improve public perception and consumer acceptance of material streams managed under EoW regimes.
- Enhance statistical transparency on EoW material streams.
- Arbitration in case of disagreement on the status of waste/EoW.
- Enhanced preparedness of competent authorities.
- Provide legal certainty through applied formal procedures.
- Enhanced procedural efficiency.
- Information on material/waste streams to be used for several purposes.
- Markets available for EoW to absorb the generated material streams.
- Support to innovative recycling/recovery technologies.
- Establish databases on case studies / single approaches taken on specific waste/material streams.
- Enhance standardization for waste/material streams regulated under EoW regimes and related proceedings.

- The report "*Key recommendations for the development of further EU-wide EoW criteria*" published in 2021 by EEB and ECOS (21) suggest the following:
  - Setting and prioritizing the new European EoW criteria
    - EoW criteria should ensure a certain quality of secondary raw materials, exclude hazardous properties, set strict limits for pollutants and limit the presence of foreign materials.
    - Waste that has ceased to be waste should not be used for energy recovery or incineration as this would cause adverse impacts on the environment and human health (e.g.: solid recovered fuels and refuse-derived fuels).
    - EoW status should preferably be defined at EU level as national EoW status will de facto create a risk for misinterpretation by national authorities. If national EoW status is made possible, they should be reported to the

European Commission for scrutiny and to all other national Member States, thus enabling mutual recognition. Each state would assess whether they can recognize the other national EoW status.

- A specific status should be explored for 'preparing for re-use' activities. When compared to recyclables, waste products collected to be prepared for re-use will not go through the same processes as they do not hold the same risks in terms of impact on the environment. Preparing for re-use is also higher in the EU waste hierarchy than recycling.

➢ The development of EoW criteria

- Wastes containing hazardous substances and/or with hazardous properties should be excluded from the EoW status.
- Waste that has ceased to be waste shall comply with EU legislation without any exemption.
- EU-wide traceability requirements on waste that has ceased to be waste should be set:
  - If national EoW status applies, national public databases of waste streams with an EoW status should be set, if not already created, and include information on the inspections and tests performed.
  - Reporting requirements from MS to the European Commission through Eurostat should also be enlarged to EoW production and usage.
  - The European Commission should monitor EoW compliance.
  - Operators should report data on the production of EoW materials and on the quantities ceasing to be waste according to the defined European EoW criteria to better assess the uptake of EoW criteria – and recycled materials – in the future.

3.3 Targets for WEEE streams re-use

Within this section, the feasibility of setting specific targets for the recovery, preparation for re-use and/or recycling of certain WEEE streams has been evaluated.

The reference regulatory framework, i.e.: WEEE Directive, within article 11 "*Recovery targets*" and annex V "*Minimum recovery targets referred to in article 11*", lays down recycling and recovery targets for every WEEE category (table below) which must be met by industry of treatment.

It is worth mentioning that the current WEEE Directive does not contemplate specific re-use targets, however, re-use contributes to achieving the WEEE Directive targets. Reuse versus recycling can be recommended as it is higher up the waste management hierarchy.

Table 3.1: WEEE Directive Recycling and Recovery Targets for WEEE Category

WEEE category	% which should be recycled+re-use	% which should be recovered
1, 4	*80%*	*85%*
2	*70%*	*80%*
5, 6	*55%*	*75%*
3	*80% (only recycling)*	-

Categories of EEE covered by WEEE Directive – Annex III
1. Temperature exchange equipment 2. Screens, monitors, and equipment containing screens having a surface greater than 100 cm^2 3. Lamps 4. Large equipment (any external dimension more than 50 cm) 6.Small IT and telecommunication equipment (no external dimension more than 50 cm)

According to Eurostat statistics (22) the majority of MS seems to achieve the recycling and recovery targets.

4 Identification of non-technical barriers and countermeasures

This section describes the analysis of non-technical barriers in term of identification of the main barriers hampering the establishment of CE in the E&E sector and opportunities of improvement.

The below results have been expressed thanks to the contribution of:

1) Review of interlinked C-SERVEES deliverables such as D1.2 for examples of WEEE handlers' assessment of technical opportunities and legislative enablers, as well as suppliers' and business end-users' (B2B) assessment of social opportunities and enablers.
2) ERION as Consortium partner for its experience in WEEE.
3) Interviews, organized with the support of ERION, with C-SERVEES manufacturers and recyclers of the target products (figure below) to understand what critical issues they encounter in implementing the models developed during the project and/or in their business activity (from the economic, social, legislative and technical point of view),
4) Other stakeholders' consultation (i.e.: WEEE FORUM, Electrao, ASSORAEE, AB members, etc.).

Figure 4.1: C-SERVEES Manufacturers and involved partners Logos

The results of these contributions have been summarised in the below table.

Table 4.1: Non-technical barriers and countermeasures

Non-technical barriers		Countermeasures
Economic	• Lack of financial business case and lack of incentives for new CE models: customers expect both greener and cheaper products, while for manufacturer/recycler CE usually means higher costs • Raw/virgin materials are too cheap compared to secondary/Critical Raw Materials (CRM)	• New financial business case: make circular business/products/services the best economical choice for buyers, trying to incentivise end-users to buy products made using CE models by making them economically attractive. Incentivise recycling with funding to manage the recycling process with a balance between the cost of recovering components and the cost of buying new components (cheaper, at the moment). • Tax virgin materials globally and internationally (like CO_2 carbon market) as an incentive to make remanufacturer/recycling of second-hand products more attractive and promote their use • Enforce ban on landfilling of materials with an available recycling alternative
Social	• Lack of products' transparency for consumers: the idea of repaired product as inferior quality, sign of low income is still actual. There is a need to fill the lack of data on the impacts (economic, environmental, etc.) of each product to show at the consumers the responsibility in choosing the product	• Campaigns to change the perception of repaired products among citizens and increase consumers awareness on the product impact • Incentives for consumers to change old products with more performing ones for example updating the energy label regulation with impact information to stimulate the purchase and choice of more efficient products
Legislative	• Lack of legislative requirements and application guidelines in term of CE understanding/awareness • Lack of discrimination among products categories • Lack of Global Consensus on regulatory framework, presence of gaps in product standardisation between MS. This brings competition (not coordination) between MS to introduce national laws (fragmentation of the market) • Lack of a clear regulatory framework for the processes which are needed to prepare the product for reuse (e.g.: authorization issues, difficulties in ensuring compliance with safety requirements and the warranty period for products prepared for reuse, difficulties in complying with the new energy labelling system and marketing requirements). • Barriers due to specific directives/regulations, for example:	• Campaigns to increase awareness, understanding and compliance with regulatory framework. For example, the CEP sets a social challenge as a change of mind, but greener products/services will only have an effect when they will be purchased and used by consumers (B2C) and business (B2B). For this reason, consumers and potential users must find them attractive due to economic, social and/or environmental reasons • Differentiate regulations according to the specificity of individual products but need to maintain the requirements of CE at international level (national laws could bring to market fragmentation) • Examination of EU and MS laws in E&E sector to create an EU-wide legislation for a unified market, in this way:

Non-technical barriers		Countermeasures
	- Limit values in REACH Directive, the Conflict-Minerals Reporting Template (CMRT) or the Substances of Very High Concern (SVHC) list. Frequent changes means that even with proper (tool-based) tracking of the supply chain, every new template will classify the complete supply chain as "red-flagged". This approach goes against the longevity of the product and materials recycling. - WEEE Directive to better address the competencies and responsibilities of stakeholders. In fact, most MS require to producers the responsibility to meet collection targets, while these do not have full competences to access all WEEE reaching its end of life. - POPs Regulation (current revision and looking at the agree reach between EP and Council) could be a strong barrier, especially for the recycling of plastic waste. In fact, the EU institutions are lowering the threshold for some substances (like PBDE), at a level which makes it very difficult to recycle this waste stream. - The treatment of some kind of waste (like thin fractions) that WEEE treatment plants need to export in order to be treated properly, can be done only in a few plants in extra-EU countries. These plants need a great quantity of waste (i.e.: thin fraction) to obtain CRM by a sustainable process. Therefore, the strong restriction foreseen from the WSR Directive revision regarding the export of waste out EU (cross-border movement), without distinction between proper treated waste and problematic/untreated waste (like mixed plastic waste or whole WEEE) can hamper the export of waste needed for the recovery of CRM	- Resolve conflicting national implementations of directives and harmonise national action plans will stimulate the internal market for secondary materials. - CE general view: the single small manufacturer has no power to determine the direction of the market toward a CE business model. - avoid, for example, that WEEE produced outside Europe (the most part), create problems to the entire chain if they would be collected in Europe (i.e. containing level of substances not in line with EU law, reducing the possibility to have a proper recycling). The development of an international standard regarding WEEE management would promote the harmonisation of the WEEE treatment across all the countries • From the recyclers point of view the changing limit values, requirements and/or definitions in legislations hinder technological investments. On the other hand, a relatively constant legislative environment fosters and promotes investments in WEEE recycling. Long-term planning/setting of limit values will also allow time for the preparations necessary to meet a given requirement.

Even if out of the scope of the investigation, the following technical barriers emerged from the investigation:

- Lack of balance between new technologies and products development or recycling advance.
- Difficulties in complying with collection categories (e.g.: tablet collection takes place in recovery operation "*R4 - Recycling/reclamation of metals and metal compounds*" usually but should take place in recovery operation "*R3s - Recycling/reclamation of organic substances which are not used as solvents, including composting and other biological transformation processes").

- Difficulties in using recycled materials in compliance with the current regulatory framework. For example, for plastic and other recycled materials, this is the case for the compliance with REACH e RoSH directives, POPs Regulation or limit values in standard UNE- EN 50625-1:2014 related to collection, logistics and treatment requirements for WEEE for the treatment.
  Moreover, for plastic an obstacle is seen in the inability to obtain food grade approval from the European Food Safety Authority (EFSA) for post-consumer plastics from WEEE (which therefore cannot be used in specific applications, such as the inside of refrigerators that are in contact with food).
- Lack of a standard for managing *pay-per-use/pay-per-service* business models (e.g.: to regulate end-of-life management).
- Too much heterogeneity between the products also of the same brand. It makes the recycle difficult.

5 Stakeholders' consultation

In this section RINA described the methodology adopted for the collection of different positions and best practices from the project stakeholders.

Table 5.1: Stakeholders' Actors and Engagement

Who	What	How
• Consortium partners: ERION, WEEE Forum and its Third Party Electrao	• EoW criteria for WEEE streams • Promotion of the inclusion in Ecodesign Directive of requirements for EEE other than those on energy efficiency • Feasibility of setting specific targets for the recovery, preparation for re-use and/or recycling of certain WEEE streams • Legislative barriers and ideas to overcome them	• Short questionnaire through e-mail • Follow-up email/calls, if needed
• ASSORAEE		
• C-SERVEES Advisory Board members		

Organisation	Type of organisation	Region
Relight/TREEE	WEEE treatment	EU
Umicore	WEEE treatment	EU
University of Limerick	Academia	EU
thinkstep	Academia	EU
ANARPLA (Spanish Plastic Recyclers Association)	Secondary raw materials	ES
iNEMI (International Electronics Manufacturing Initiative)	EEE Manufacturer	out EU
Siemens	EEE Manufacturer	EU
CECIMO (European machine tool industries)	EEE Manufacturer	EU
CDC RAEE	WEEE Clearing House	EU
RREUSE	WEEE re-use	EU
EIT RawMaterials	Academia	EU
Panasonic	EEE Manufacturer	out EU
Green Electronics Council	Standards	USA
Hitachi	EEE Manufacturer	out EU
Nokia	EEE Manufacturer	EU
Centre for Sustainable Design, University for the Creative Arts	Academia	EU
University of Northampton	Academia	UK
Toshiba	EEE Manufacturer	out EU
APPLiA (former CECED, European Committee of Domestic Equipment Manufacturers)	EEE Manufacturer	EU

Figure 5.1: AB members. Source: C-SERVEES Project - D8.1

6 Policy recommendations to overcome legislative barrier and recipients

6.1 Recipient for policy recommendations

In this section the main potential recipients of policy recommendations to overcome legislative barrier towards circularity in E&E sector are shown.
Each of the following actors can be involved as part of the communication and dissemination activities conducted in WP8.

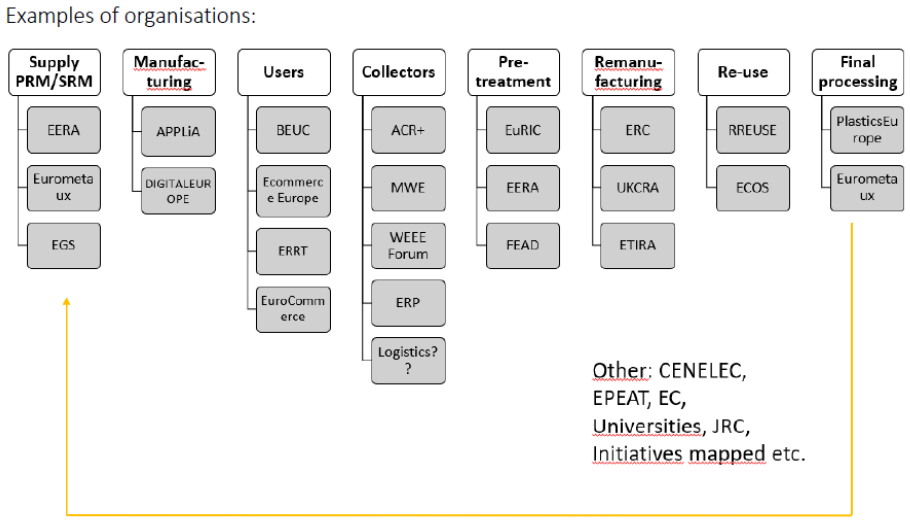


Figure 6.1: Examples of Stakeholder's Organisations. Source: C-SERVEES Project

One of the main recipients for recommendations are identified in policy actors as key stakeholders involved in the development of technical regulations and activities for standardization as well as EC Directorate-General departments (i.e.: DG Environmental, DG Energy, etc.) as actors who are focused on developing and implementing the EU's energy policy, supported by the European Commission's science and knowledge service (JRC).

Involved figures can be the standardization bodies (Table 6.1) for the development of existing and/or new certification schemes to measure E&E circularity index, i.e.: the recycled content.

Table 6.1: Recipient for policy recommendations: Standards Bodies

Worldwide	Europe	National (C-SERVEES project MS)
• ISO (International Organization for Standardization) • IEC (International Electrotechnical Commission) • ITU (International Telecommunication Union)	• CEN (European Committee for Standardization) • CENELEC (European Committee for Electrotechnical Standardization) • ETSI (European Telecommunications Standards Institute)	• UNI (Ente Nazionale di Unificazione) - Italy • CEI (Comitato Elettrotecnico Italiano) - Italy • DIN (Deutsches Institut für Normung) - Germany • AFNOR (Association Française de Normalisation) - France • BS (British Standards) - UK

The recommendations can also be a concern to producers, consumers and recyclers (and their associations) participating in waste management standardization tables, as:

- APPLiA: home appliance manufacturers association in Europe with 24 Direct Members and 25 National Associations covering 24 countries.
- WEEE Forum: international Association of Electronic Waste Producer Responsibility Organisations.
- DigitalEurope: leading trade association representing digitally transforming industries in Europe.
- European Environmental Bureau (EEB): the largest network of environmental citizens' organisations in Europe.

Examples of other stakeholders' figures between consumers associations/network, manufacturers and retail subject or recycling partners are presented in the table below.

Table 6.2: Recipient for policy recommendations: consumers, manufacturers and recyclers

Consumers	Manufacturers and retail	Recyclers
• ECU: European Consumer Union • ANEC: European Consumer Voice in Standardization • Euroconsumers: international network of organisations and consumers such as Altroconsumo (Italy), Test-Achats (Belgium), Deco Proteste (Portugal), Ocu (Spain) • BEUC: 45 independent consumer organisations from 32 countries • ANEC: European consumer voice in standardisation • Zero Waste Europe: European NGO to reduce waste	• DIGITALEUROPE association • CEMEP: European Committee of Manufacturers of Electrical Machines and Power Electronics) • EECA: *European Electronic component manufacturers association* • ZVEI: German Electrical and Electronic Manufacturers' Association • iNEMI: international Electronics Manufacturing Initiative • *CRM Alliance:* Critical Europe Raw Materials Alliance • PlasticsEurope: trade association, which represents plastics manufacturers operating in EU • ERA Global: Electronic World Retailing Association • EuCER: European Consumer Electronics Retail Council	• EuRIC: European Recycling Industries' Confederation • EERA: European Electronics *Recyclers* Association • RREUSE: International network representing social enterprises active in re-use, repair and recycling • FEAD: European Waste Management Association • Orgalim: representative of Europe's technology industries

6.2 Policy Recommendations

The paper "*Products and circular economy, Policy recommendations derived from Research & Innovation projects*", (23) published by EC's DG for Research and Innovation (R&I) and based on a review of more than one hundred R&I projects in 2020, offers a collection of universal (i.e. not relating to a specific sector) policy recommendations for EU political institutions to increase the CE of products and processes.

Table 6.3: Policy Recommendations Derived from R&I Projects

Demand side recommendations	Supply/manufacturer side recommendations
• The EC shall intensify the research for mechanisms and impacts of markets consumption patterns to give the consumers a more active role in R&D efforts related to product circularity • Create opportunities and demand for circularity through CE incisive policy measures and promotion of new bottom-up practices • Policy makers to implement actions for circular products/services to be accessible and available in the market (e.g.: through taxation on virgin materials or landfilled/incinerated waste) • Dissemination of a wider range of product-related CE information by the EC to support consumers in an informed individual decision-making process.	• Probe the potential of circular products and processes in the industry through collaboration between the EC and manufacturers on the identification of suitable classes of products for product-service systems • Raise the circularity readiness level in the industry through EC's analysis of specific challenges preventing Small Medium Enterprises from engaging in circular practices; authorities shall launch awareness campaigns to support CE regulatory compliance • Simulate resource-efficient and circular design, sourcing and manufacturing. The EC shall consider an extended life-circle perspective and potential environmental trade-offs to avoid unintended consequences of the incorporation of circularity into eco-design policies. The EC shall investigate the use or adaptation of the existing tools to increase product circularity through eco-design

Other crosscutting recommendations expressed in the paper are shown below:

- Collaboration between the EC and stakeholders to identify KPIs for environmental products/processes to define and measure circularity; substantiate the relationship between CE and GHG emissions, and benchmark CE policies against GHG reduction targets.
- Create a level playing field for CE: the EC and MS shall investigate how to introduce a minimum and a maximum tariff for both landfilling and incineration, to incentivise waste prevention and eco-design.
- Policy makers shall provide financial, informational and regulatory incentives to stimulate the repair, re-use and remanufacturing of products. Price is the main factor preventing costumers from buying a EEE, therefore, incentives for buying re-used/refurbished products or products with recycled content should be introduced.

The list of specific recommendations for the E&E sector below is mainly based on the countermeasures proposed by the consulted stakeholders on how to overcome legislative barriers (see Section 4 *Identification of non-technical barriers and countermeasures* and Section 5 *Stakeholders' consultation*):

- The Commission together with Member States shall develop guidelines documentation and/or public campaigns targeting the main actors (manufacturers, recyclers, consumers and potential users, administration, managers, distribution, etc.) to increase awareness, understanding and compliance with the regulatory framework in E&E sector.

- The Commission, along with the Member States, shall engage the final users in awareness-raising programmes, improving accurate identification of materials and their proper disposal into separate collection systems. This measure should incentivize people, for example, to take advantage of dedicated collection channels for electronical and electrical devices, rather than storing or incorrectly discard them. The citizen's contribution is essential for the correct delivery of waste.

- The Commission, together with policy makers, shall differentiate the regulations according to the products specifics, preserve the requirements of CE at EU-wide level, to avoid market fragmentation resulting from different national laws and discrimination among product categories.

- Technology developers shall provide technical and technological recommendations regarding standardisation, normalization and obsolescence of equipment and regarding instruction manuals that enable and facilitate maintenance and repair, technical data sheets, availability of spare parts, languages of documentation, etc.

- The cooperation of the whole value chain with national and local authorities across Europe is fundamental to achieve recycled content targets, foster innovation on material used in manufacturing new technologies in line with ever growing technical requirements, and implement handling methods of products and materials at the end of their life cycle.

- The Commission, the Parliament and the Council should bring the global consensus to a unified market view by creating an EU-wide legislation applicable to the E&E sector. These initiatives should be instrumental to:
  - resolve conflicts in the national implementations of the EU directives and harmonise national action plans to stimulate the internal market for secondary materials;
  - support a global market vision on CE, which would be able to influence the market direction in favour of small manufactures needs;
  - develop an international standard on WEEE management that would promote the harmonisation of WEEE treatment across all the countries. Such standard would avoid issues like WEEE produced outside Europe (the vast majority) impacting on the entire chain when they are collected in Europe (i.e.: WEE

containing level of substances not compliant with EU law thus preventing proper recycling).

- C-SERVEES work on demos (D4.4) show how manufacturers shall analyze the impacts of their products, according to LCA-based method, for a decision-making guide of CE. LCA analysis quantifies the environmental impact with different indicators, including but not limited to Global Warming Potential (GWP), human toxicity, water eutrophication, resource depletion, etc.
  The challenge will be for everyone to have a basic knowledge of types and quantities of materials within products' components; databases such as LCA tools, could be of support if advanced enough to ensure the assessment and quantification of environmental impact of existing materials and new ones being introduced.
  From a policy standpoint LCA studies could be integrated by policy makers as requirements (voluntary or mandatory) within procurement practices and/or invitations to EU projects tender.
- Public authorities should express recommendations, via procurement policies, to promote the use of products with higher content of recycled plastic.
- Manufacturers shall state their required grade of recycled material (i.e.: plastics) to their components' suppliers, to reflect the level of purity (or, conversely, contamination by other elements). "Recycled content" is no longer a sufficient measure for manufacturers and the introduction of specific grades would drive the recyclers' (suppliers of recycled material) production to anticipate and meet the manufacturers' actual needs. R&D team of manufacturing companies, or Standards Bodies such as CENELEC (one of the three EU standardisation bodies), should develop the grades of recycled material with the active support of producers.
- Policy makers shall consider the real needs of all stakeholders while updating the framework below:
  - limit values in REACH Directive, the CMRT template or the SVHC list.
  - WEEE Directive to better address competencies and responsibilities of stakeholders. Most MS invest producers of the responsibility to meet collection targets, even though they do not even possess full access to all WEEE at their end-of-life cycle.
  - POPs Regulation may turn into a major obstacle, especially in the recycling of plastic waste. For example, the introduction of lower threshold for some substances (like PBDE) can make it very difficult to recycle this waste stream. And again, the strong restrictions introduced by the WSR Directive revision regarding the export of waste out the EU (cross-border movement), without a distinction between of properly treated waste and untreated one, can hamper the export of waste needed for the recovery of CRM.
- The platform designed within C-SERVEES project (D3.7 "Expanded minimum viable product") can help policy makers in implementing Circular Economy Business models. In fact, the Information Exchange Platform helps different stakeholders (i.e.: producers, manufacturers, end users, etc.) to connect with each other and share all the interesting resources needed to perform different recovery and reconditioning processes in the best possible way. With the

functionalities offered by the system, users can discover which companies are involved in circular economy processes, start new relationships, consult all available information such as documents, files, step-by-step guides, etc. and also have conversations within the platform, adding new useful information to it. Moreover, thanks to the integration between tools of the ICT platform, users can connect information between the Information Exchange Platform and the Logistic Platform to optimize logistics and reduce the environmental impact related to reverse logistics (i.e.: transport operation for collecting recovery materials and/or end of life products).

The policy recommendations shown in this report are the consequence of the investigation carried out thanks to internal and external stakeholders in EEE sector but, considering that the main regulatory framework applies to other sectors and equipment, the results can be replicated across sectors and scaled to the Member State level.

7 Conclusions

Focus of this deliverable is to provide policy recommendations addressed to policy makers in the E&E sector. These policies have been identified based on the countermeasures proposed by the consulted stakeholders on how to overcome the legislative barriers towards EEE circularity described in this deliverable.
According to the analysis carried out in this deliverable, the main legislative barriers against EEE circularity include:

a) lack of legislative requirements and application guidelines in term of CE understanding and awareness (some MS have a proper legislative framework towards CE but they need guidance to apply the proper one);
b) lack of discrimination among products categories (differentiate regulations according to the specificity of individual products could bring to market fragmentation);
c) lack of global consensus on regulatory framework (lack of product standardisation between countries make difficult to work in a coordinated way and open the competition between MS for national laws. The development of an international standard regarding WEEE management would promote the harmonisation of the WEEE treatment across all the countries);
d) lack of a clear regulatory framework for the processes which are needed to prepare the product for reuse.

The policy recommendations highlighted some interesting points to focus on:

a) Guidelines aimed at increasing awareness and compliance with regulatory framework in E&E sector shall be developed by Commission and Member States;
b) Legislators shall provide financial, informational and regulatory incentives to stimulate the repair, re-use and remanufacture of products;
c) The European Commission, with the Member States, shall engage the final users in awareness-raising programmes, improving accurate identification of materials and their proper disposal into separate collection systems;
d) The European Commission, together with policy makers, shall differentiate the regulations according to the product specific to avoid market fragmentation resulting from different national laws;
e) Manufacturers shall analyse the impacts of their products, according to the LCA-based method,
f) Manufacturers shall indicate, through the application of a standard, the grade of recycled material that they require from their component suppliers.

8 References

1. *WEEE Directive (2012/19/EU), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012L0019. .*
2. *Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Directive (2006/1907/CE), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02006R1907-20140410.*
3. *Ecodesign/Energy related Products (ErP) Directive(2009/125/EC), https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32009L0125.*
4. *Commission Regulation (EU) 2021/341 of 23 February 2021 amending Regulations (EU) 2019/424, 2019/1781, 2019/2019, 2019/2020, 2019/2021, 2019/2022, 2019/2023 and 2019/2024 with regard to ecodesign requirements.* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2021.068.01.0108.01.ENG&toc=OJ%3AL%3A2021%3A068%3ATOC : s.n.
5. *Restriction of Hazardous Substances Directive (RoSH), https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:174:0088:0110:en:PDF#:~:text=This%20Directive%20lays%20down%20rules,and%20disposal%20of%20waste%20EEE.*
6. *EU Circular Economy Packages (CEP), https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en . .*
7. *Energy Labelling Regulation 2017/1369/EU.* s.l. : https://eur-lex.europa.eu/eli/reg/2017/1369/oj.
8. *Energy labelling omnibus Regulation (EU) 2021/340 amending Delegated Regulations (EU) 2019/2013, 2019/2014, 2019/2015, 2019/2016, 2019/2017 and 2019/2018.*
9. *Waste Framework Directive (2018/851/EU).* s.l. : https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32018L0851.
10. *Persistent Organic Pollutants (POPs) Regulation 2019/1021/EU.* s.l. : https://echa.europa.eu/it/pops-legislation.
11. *Packaging Directive 2018/852/EU, https://eur-lex.europa.eu/legal-content/IT/TXT/?uri=celex:32018L0852. .*
12. *EC, Commission Regulation EU 2019/2023, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2019.315.01.0285.01.ENG . .*
13. *Commission Regulation (EU) 2019/2021, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32019R2021 . .*
14. *Voluntary ecodesign scheme for imaging equipment, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52013DC0023 . .*

15. *Energy efficient products - Energy label and Ecodesign requirements, https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/energy-efficient-products_en. .*

16. *Proposal for a new Ecodesign for Sustainable Products Regulation (ESPR), https://ec.europa.eu/environment/publications/proposal-ecodesign-sustainable-products-regulation_en . .*

17. *Council Regulation N° 333/2011/EU. Iron, steel and aluminium scrap., https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32011R0333 . .*

18. *Commission Regulation N° 1179/2012/EU. Glass cullet., https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012R1179 . .*

19. *Commission Regulation N° 715/2013/EU. Copper scrap., https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R0715 . .*

20. *EC. 2020. Study to assess member states (MS) practices on by-product (BP) and end-of waste (EoW)., https://op.europa.eu/en/publication-detail/-/publication/beb56eaa-9fc0-11ea-9d2d-01aa75ed71a1/language-en/format-PDF/source-130854906 .*

21. *EEB and ECOS. 2021. Key recommendations for the development of further EU-wide EoW criteria., https://ecostandard.org/wp-content/uploads/2021/01/ECOS-EEB-comments_EoW-criteria_20210122.pdf . .*

22. *Eurostat statistics. 2022. Waste electrical and electronic equipment (WEEE) by waste management operations, https://ec.europa.eu/eurostat/databrowser/view/ENV_WASELEE__custom_2988155/bookmark/table?lang=en&bookmarkId=b70a72b3-4bdb-4229-b9fc-d8832a2c53d7&p.*

23. *EC's DG for Research and Innovation (R&I). 2020. Products and circular economy, Policy recommendations derived from Research & Innovation projects., https://op.europa.eu/en/publication-detail/-/publication/ebf17b4f-850a-11ea-bf12-01aa75ed71a1/language-en/.*