D8.4: Standardization Toolkit

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Authors: Cristina Di Maria, Giovanni Miccichè, Viviana Buscemi, Adriano Ferrara, Elena Mocchio, Federica Fugaroli (UNI)

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EXECUTIVE SUMMARY

The document provides a framework of the main legislative and standardization activities relevant in the framework of TREASURE project. This is aimed to clarify to the public the current state of the art, important preliminary step necessary to explore existing gaps, hence possible solutions. The document also provides necessary knowledge to develop TREASURE activities, promoting interoperability, compliance of project results to current requirements, while avoiding duplication of existing knowledge.

It will firstly describe the main EU legislative initiative for what concerns the recycling of electronics from the automotive sector. Then it will explore the standardization world, presenting the standards mapping carried out within TREASURE project.

Conclusions will present the results of a workshop aimed at identifying existing standardization gaps to be considered as first input for TREASURE standardisation roadmap and possible new standardization activities.

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1. INTRODUCTION

TREASURE is a Research and Innovation Action (RIA) that aims to offer new testing opportunities for new technologies to make the automotive sector more circular.

Its main objectives are:

- to guarantee sustainable use of raw materials in the automotive sector reducing the risks linked to supplies;
- to apply the circular economy paradigm to the automotive sector, acting as examples for the manufacturing macro-sector;
- to deliver better economic, environmental, and social performance for vehicles for all users;
- to create new supply chains around end-of-life vehicles (ELVs), focusing on the circular use of raw materials.

In this way, TREASURE will deliver tangible support for companies in the automotive sector, providing a practical demonstration of the benefits obtainable from the application of the circular economy paradigm, from the point of view of both business and supply chains and of technology and sustainability, through the adoption of industry 4.0 technologies in the management processes of ELVs and their parts.

[1]

To achieve its objectives, it is important that the project activities are backed by existing legislative requirements, and awareness of current standardization solutions existing on the market. This is aimed at avoiding a duplication of work, while ensuring interoperability of the innovative solutions.

Chapter 2 and Chapter 3 are exactly aimed at framing the current main EU legislative and standardization activities, relevant for the recycling of electronics from the automotive sector.

2. MAIN EU LEGISLATIONS STATE OF THE ART

2.1. Waste Electrical and Electronic Equipment (WEEE) Directive

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

Initial legal act:	OJ L 197, 24.7.2012, p. 38–71 http://data.europa.eu/eli/dir/2012/19/oj
Entry into force:	13 August 2012
Consolidated version:	http://data.europa.eu/eli/dir/2012/19/2018-07-04
Entry into force:	4 July 2018

Table 1. The WEEE Directive "ID card"

Directive 2012/19/EU of the European Parliament and of the Council, commonly known as the Waste Electrical and Electronic Equipment Directive or WEEE Directive, is a crucial piece of legislation aimed at managing and reducing electronic waste within the European Union (EU). The Directive has been recast to ensure an effective framework for the handling of waste electrical and electronic equipment (WEEE). This section will provide an overview of the key elements of the Directive, which addresses the end-of-life of many different types of equipment.
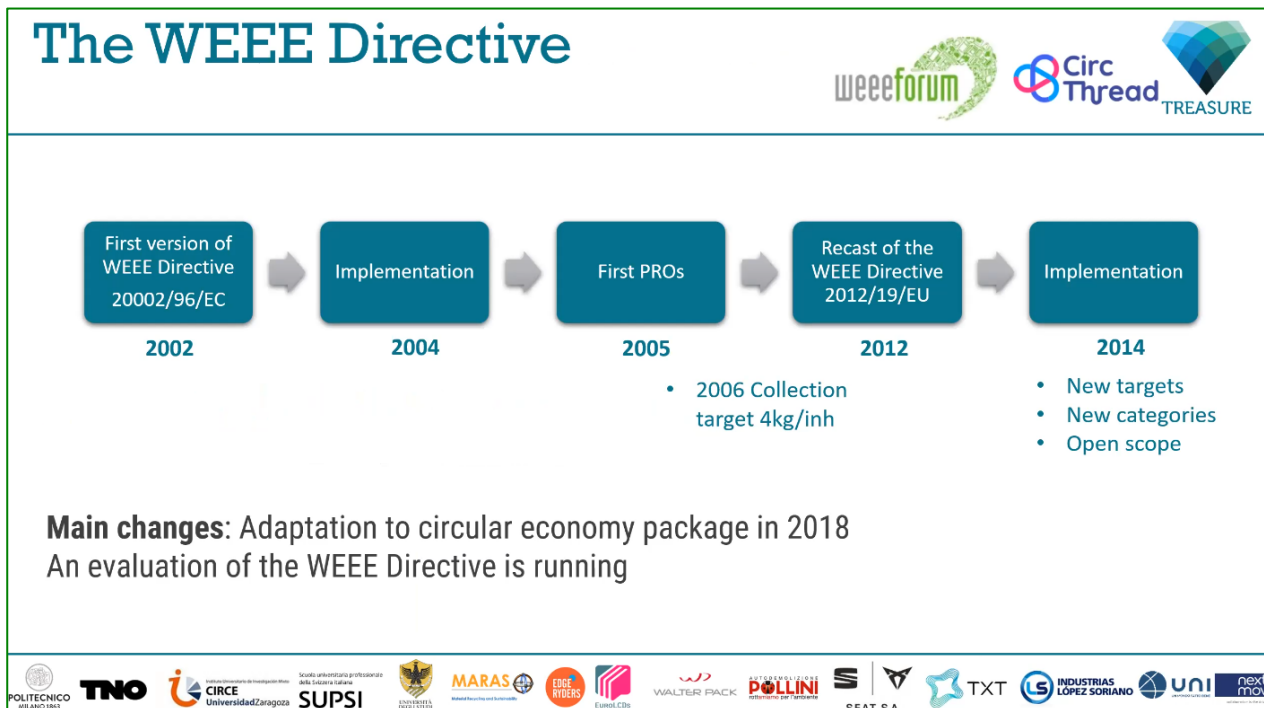
Figure 1. The WEEE Directive timeline (source: WEEE Forum)

The WEEE Directive aims to improve sustainable production and consumption, increase resource efficiency, and contribute to a circular economy. [2]

Indeed, WEEE contains a considerable variety of different materials, some of which can cause serious damage to the environment and to human and animal health, while others are so rare and expensive that their recycling and reuse is economically viable.

The WEEE directive applies to the following categories of electrical and electronic equipment.

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) 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.

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.

6. Small IT and telecommunication equipment (no external dimension more than 50 cm)

The European Commission is considering whether the WEEE Directive is still fit for purpose, can be simplified, or needs to be revised. Several consultations are planned.

The first consultation, which closed on 3 November 2022, allowed for the submission of evidence.

Evaluating EU rules

On June 16th, 2023, it has been opened the consultation period (till September 22nd, 2023) for "evaluating the EU rules".

As reported in the call for evidence [3], this evaluation "is expected to provide evidence on whether the Directive is still fit for purpose, to explore any untapped potential for simplification and burden reduction as well as help to determine whether a review is needed".

This will be done under five evaluation criteria: effectiveness, efficiency, relevance, coherence, and EU added value. The assessment also foresees a costs and benefits analysis.

Three main questions will be asked:

1. To what extent was the implementation of the WEEE Directive successful and which were the main problems and the main challenges and why?
2. Did the EU intervention make a difference?
3. Is the intervention still relevant given developments since its entry into force?

The evaluation will cover the implementation of the WEEE Directive along with the related secondary legislation and any related measures and good practices taken at national level in all Member States.

This may be an important step to also evaluate the relevance of the electronics from the automotive sector since no explicit reference to them is present now in the Directive.

2.2. End-of-Life Vehicles (ELV) Directive

Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles

Initial legal act:	OJ L 269, 21.10.2000, p. 34–43 http://data.europa.eu/eli/dir/2000/53/oj
Entry into force:	18 September 2000
Consolidated version:	http://data.europa.eu/eli/dir/2000/53/2023-03-30
Entry into force:	30 March 2023

Table 2. The ELV Directive "ID card"

In recent decades the automotive industry has been the focus of attention from legislators and civil society regarding environmental and safety aspects, which has led the sector to implement major changes that have resulted in several fleet renewals, with a consequent increase in end-of-life vehicles and waste.

Every year millions of vehicles reach the end of their life in Europe. It is therefore necessary to manage end-of-life vehicles properly to reduce their environmental and economic impact.

The End-of-Life Vehicles Directive (ELV Directive) sets clear targets for the re-use, recycling and recovery of end-of-life vehicles and their components and prohibits the use of hazardous substances (in particular, lead, mercury, cadmium, and hexavalent chromium) in the manufacture of vehicles unless there are no suitable alternatives. [4]

The End-of-Life Vehicles Directive lays down measures which aim, as a first priority, at the prevention of waste from vehicles and, in addition, at the reuse, recycling and other forms of recovery of end-of life vehicles and their components so as to reduce the disposal of waste, as well as at the improvement in the environmental performance of all of the economic operators involved in the life cycle of vehicles and especially the operators directly involved in the treatment of end-of life vehicles.

The Directive has been the subject of numerous amendments, the latest of which came into force last March, and has been complemented by other legislation such as the Directive on the type-approval of motor vehicles regarding their reusability, recyclability, and recoverability.

The European Commission is carrying out the joint review of the End-of-Life Vehicles Directive and the corresponding Directive on the type-approval of motor vehicles regarding their reusability, recyclability, and recoverability, and plans to present a legislative proposal in the course of 2023, after which:

- publishing an accompanying report on the evaluation of the Directive in 2020;
- an evaluation of the Directive published in March 2021;
- an open public consultation on the joint review held from July to October 2021.

Proposal for a Regulation on circularity requirements for vehicle design and on management of end-of-life vehicles [5]

On July 13th, 2023, it has been published a Proposal with new rules covering the entire life cycle:

- **"Design circular**. The preferred option contains short-term obligations for vehicle manufacturers to make available detailed and user-friendly dismantling and recycling information, including the use and location of CRMs in vehicles and information on the share of recycled content in new vehicles. Actions for the medium term include revising the methodology to calculate recyclability and reusability of new vehicles at type-approval stage and developing a circularity vehicle passport. Overall, this anchors circularity requirements into the type-approval of new vehicle types."[2]
- **"Recycled content**. The preferred option is to set a medium level of ambition with target for recycled plastics content of 25% by 2030, of which 25% from closed loop ELV treatment. For steel, this option empowers the Commission to set a target for recycled steel content in newly approved vehicles within three years after the regulation enters into force, based on a feasibility study. The option to set recycled content targets for other materials such as aluminium and CRMs will be assessed in the future, based on changes to automotive designs and the availability of recycling capacity."[2]
- **"Treat better**. The preferred option includes a stricter definition of recycling, a ban on landfill for automotive shredder residue fractions and a medium level of ambition on removal obligations to improve the recovery of key components from ELVs without disproportionate costs on treatment operators. It will increase the recovery of (critical) raw materials and improve the quality of plastics, steel and aluminium fractions."[2]
- **"Collect more**. The preferred option is the most ambitious policy option. Measures such as clearer responsibility allocation for certificates of destruction, binding criteria for distinguishing used vehicles and ELVs, and new enforcement provisions will significantly increase the number of ELVs treated legally in the EU. It will also ban the export of vehicles that are no longer roadworthy, in accordance with the 'do no significant harm' principle."[2]
- **"Provide incentives to increase the collection of ELVs and improve waste treatment**. The preferred option includes financial and organisation incentives by setting EPR requirements to increase the collection of ELVs and to offset the costs of improved treatment quality that cannot be offset by the value of materials and components recovered."[2]
- **"Cover more vehicles**. The preferred option is a phased-in approach to gradually cover more vehicles under the new EU rules by requiring manufacturers to provide information on the composition of their vehicles. It also brings in a set of minimum treatment requirements for end-of-life L3e-L7e category vehicles, lorries, buses and trailers. The preferred option is expected to have a positive impact on the environment by reducing the environmental footprint linked to the production and end-of-life requirements of vehicles." [2]

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[2] Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on circularity requirements for vehicle design and on management of end-of-life vehicles, amending Regulations (EU) 2018/858 and 2019/1020 and repealing Directives 2000/53/EC and 2005/64/EC. Brussels, 13.7.2023. COM (2023) 451 final.

2.3. Critical Raw Materials (CRM): the EU legislative framework

"The production of vehicles is one of the most resource-intensive industries. The automotive industry in the EU is the N°1 consumer of aluminum (42%), magnesium (44%), platinum group metals (63%), natural rubber (67%) and rare earth elements (30% in 2025 and growing exponentially)". [6]

Secure supply of raw materials for EU industry is a long-standing issue, which the EU has been dealing with since 1970s, followed by the adoption of the "European Raw Materials Initiative" in 2008 setting out an integrated strategy to respond to the various challenges related to access to non-energy and non-agricultural raw materials. This initiative is based on three pillars: ensuring fair conditions for access to resources in third countries, promoting a sustainable supply in raw materials from European sources, and promoting resource efficiency and recycling. The first EU-wide list of "essential raw materials" has been identified in 2011, based on the "Report on Critical raw materials for the EU", annex to COM (2011)25 [7] tackling the challenges in commodity markets and on raw materials. The second list of CRMs was published in 2014, the third in 2017 and the fourth in 2020. The number of CRMs identified has been gradually increasing; from 20 CRMs in 2014 up to 30 in 2020.

The European Commission, through the EU Joint Research Centre, updates this list every three years based on two parameters with thresholds to define a CRM, their economic importance and supply risk. For example, the EU imports 93% of its magnesium from China and, as result of this dependency and its economic importance, magnesium is included in the list of CRMs. The CRM list provides a narrower set of materials to focus EU economies on their efforts towards abatement and mitigation of supply chain risks.[3]

In January 2018, the Commission published the "Report on critical raw materials and the circular economy" [9] that highlights the potential for more circular use of CRMs in our economy. Reviewing the areas important to CRMs, the report describes EU policies, refers to key initiatives, presents and provides data sources, identifies good practices, and points to possible further actions.

In 2019, the EU Commission published a new JRC report entitled "Recovery of critical and other raw materials from mining waste and landfills - state of play on existing practices" followed by "Study on the EU's list of Critical Raw Materials (2020)- Final Report" and by two reports containing "critical and non-critical fact sheets" for all 83 candidate Critical Raw Materials.

In September 2020, the Commission also presented a foresight report titled "Critical Raw Materials for Strategic Technologies and Sectors in the EU - A Foresight Study" in which it estimates raw material requirements for growing technologies such as those for clean energy (photovoltaics, wind, storage), electric mobility and digital technologies (ICT, robotics, 3D printing) based on the EU's 2050 climate neutrality scenarios and other forecasts. Provides a 2030 and 2050 outlook of materials demand for these sectors and identifies supply risks and bottlenecks at different levels of supply chains.

In parallel with the advancement of CRM studies, the European Commission in December 2019 published the "European Green Deal" which aims to achieve a sustainable European economy. From 2019 to the present, the European Commission has taken a number of initiatives linked to the European Green Deal and relevant

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[3] "A Digital Product Passport for Critical Raw Materials Reuse and Recycling", Various authors, ed. 2023. [8]

to critical raw materials: "A new Circular Economy Action Plan" for a cleaner and more competitive Europe (COM(2020) 98), the proposal for a Regulation concerning batteries and waste batteries (COM/2020/798), A New Industrial Strategy for Europe (COM(2020) 102), Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability (COM(2020) 474), the ERMA (European Raw Material Alliance)**.**

In May 2021, European Commission updated the "Industrial Strategy for Europe 2020" and with the Commission Staff Working Document – Strategic dependencies and capacities (SWD (2021) 352) it identifies 137 products in sensitive ecosystems for which the EU is heavily dependent on foreign sources.

In November 2021, the European Parliament, in the context of projects in the primary and secondary mining sector, passed a "Resolution on the European Strategy for Critical Raw Materials" in which it referred to the strengthening of primary mining, in addition to measures for ecodesign, material recovery and recycling, and diversification of used raw materials.

Again in 2021, the European Commission published the document "EU Principles for Sustainable Raw Materials" and in 2022 the REPowerEU Plan (COM (2022) 230) with the scope to intensify activities aimed at ensuring the supply of critical raw materials and the development of a legislative proposal in this regard.

Many other EU European legislative and strategic initiatives will have fundamental impacts on the topic of CRMs, such as the Regulation on a framework for setting ecodesign requirements for sustainable products (COM (2022) 142), the Proposal for a Directive on waste electrical and electronic equipment (WEEE) (COM (2023)63) and the European Innovation Partnership on Raw Materials (EIP).

The European Commission's plan ("A green deal industrial plan for the net-zero age") complements ongoing efforts under the European Green Deal and REPowerEU plan and is based on four pillars:

- a predictable and simplified regulatory environment;
- accelerated access to finance;
- improvement of skills;
- opening trade for resilient supply chains.

The first pillar includes the Net-Zero Industry Act and the Critical Raw Materials Act.

Indeed, on 16 March 2023, EC published the proposal for the Critical Raw Materials Act (CRMA) [12] whose main objective is to secure a sustainable supply of CRM to support the green and digital transitions and strengthen the European resilience, considering that CRM are mostly extracted outside of Europe.

The CRMA is based on four pillars:

- Defining priorities and objectives for EU actions
- Improving the EU's monitoring, risk management and governance in the field of CRM
- Strengthening the EU's CRM value chain (mining, refining, processing, recycling) in a global context
- Ensuring a sustainable level playing field across the Single Market.

The CRMA has been under a feedback period until the end of June 2023 after which all the comments received have to be summarised by the European Commission and presented to the European Parliament and Council with the aim of feeding into the legislative debate.

CRMA and Standardization

The CRMA has provided several references on:

- how to use European standards;
- how to make the relationship with international standards;
- what resources can be allocated to support these activities.

CEN and CENELEC welcomed CRMA and prepared a Position paper on Critical Raw Materials [14] with the aim to:

- boost standardization activities on CRM;
- support standardization in consideration to ISO standards;
- provide a background on current standardization activities;
- request that harmonized standards be used as the primary route for standardization in line with the so-called presumption of conformity, according to which a manufacturer is deemed to comply with the requirements of the regulation, by using a harmonized standard.

Looking at the state of the art of European standardization, the following Technical Committees (TC) currently exist, dealing with aluminium, copper, iron, steel, and nickel:

Technical Committee	Scope
CEN/TC 132 Aluminium and aluminium alloys	Standardization in the field of unwrought, wrought and cast products made from aluminium and aluminium alloys, particularly: designations; terms and definitions; material specifications; technical conditions of delivery; dimensions and tolerances; methods of testing specific to aluminium.
CEN/TC 133 Copper and copper alloys	Standardization in the field of unwrought, wrought and cast products made from copper and copper alloys, including designations, terminology; material specifications; conditions of delivery; dimensions and tolerances; methods of testing peculiar to copper alloys.
CEN/TC 459 European Committee for Iron and Steel Standardization	Standardization on the definition, classification, testing, chemical analysis and technical delivery requirements for iron and steel products.
CEN/SS M14 Nickel	Standardization in the field of mining, basic metals and related products.
CEN CLC/JTC 10 Material efficiency aspects for products in scope of Ecodesign legislation	Material efficiency aspects for products in scope of the Ecodesign Directive 2009/125/EC and its future revisions. Producing generic and horizontal CEN-CENELEC publications covering aspects such as assessment methods, design rules, dematerialization, digitalization and transfer of information on a variety of material efficiency topics, in particular (but not limited to): Extending product lifetime; Ability to reuse components or recycle materials* from products at End-of-Life; Use of reused components and/or recycled materials* in products

(*Includes coverage of the European Commission defined list of Critical Raw Materials (CRM). This Joint Technical Committee has published the standard CEI EN 45558:2021 General method to declare the use of critical raw materials in energy-related products. In accordance with standardisation request M/543, it is necessary to consider the "Use and recyclability of Critical Raw Materials to the EU, listed by the European Commission". This standard facilitates this requirement by describing appropriate information on critical materials.

Table 3. CRM existing relevant TCs

3. CURRENT AND FUTURE STANDARDS: A MAPPING

1.1. Standardization world: an overview[4]

Before addressing how it works, it is important to make clear the role and vision of standardisation, which establishes universal standards for a process or a way to do things. Standardisation agreements between stakeholders have a recognised role as facilitator of:

- better quality of life, tailored to the protection of the environment for future generations;
- more powerful and efficient techno-economic system;
- improved harmonised international trade;
- easier communication based on harmonised terminology, symbols and codes;
- more consistent and credible protection of consumer needs and interests;
- health and safety not only at the workplace but also when using products, machinery and equipment in daily life.

The achievement of this vision depends highly on how quality standards are set, how widely they are used, and the actual use of standards by key stakeholders, which varies depending on whether they are mandatory or voluntary.

The evolution of the standards' content

Since the publication of the initial standards at the beginning of the 20th century, the field of standardization has undergone significant evolution. Initially, international and national standards focused on establishing a common terminology and standardizing dimensions. Over time, standardization has progressively expanded to encompass critical areas such as product safety requirements, product and service characteristics, performance levels, and particularly, test methods.

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[4] The content of this section is mostly retrieved from Circthread Deliverable 9.1 "Standardisation Toolkit V1 Online Interactive Tool & Report", which UNI has led.

In the past two decades, a new wave of "third generation" standards has emerged, surpassing conventional boundaries and addressing the most pressing needs of modern societies, including environmental and social challenges. Notably, standardization has aligned itself with the Sustainable Development Goals (SDGs) adopted by the United Nations in 2015. Consequently, new standardization documents have been published, covering various domains such as professions, organizational management, environmental considerations, corporate social responsibility, sustainability, and more recently, the circular economy.

These advancements reflect the ever-growing scope and relevance of standardization, which now goes beyond terminology and dimensions to actively support global progress towards sustainable development.

Standardisation Values

The standardization process is built upon a set of seven fundamental values: consensus, coherence, transparency, openness, voluntariness, independence, and efficiency.

- **Consensus**: consensus serves as the cornerstone of standardization, forming the basis from which all other values stem. It embodies the essence of standardization as a collaborative process, where diverse perspectives, interests, and opinions are shared and incorporated into the drafting of documents.
- **Coherence**: coherence ensures the publication of a comprehensive and non-duplicative set of standards at the national, European, and international levels. It aims to prevent overlap and inconsistencies in the standardization landscape.
- **Transparency**: transparency emphasizes the need for an open and transparent standardization process at every stage. It involves providing clear and accessible information about the process, allowing stakeholders to understand and contribute effectively.
- **Openness**: openness underscores the inclusive nature of the standardization process, welcoming the active participation of stakeholders. It encourages diverse perspectives and expertise, fostering collaboration and collective decision-making.
- **Voluntariness**: voluntariness recognizes the voluntary nature of standards adoption by users. It respects the autonomy of users to freely choose whether to adhere to the requirements outlined in a standard.
- **Independence**: independence highlights the impartiality and independence of Standardization Bodies from dominant industry players. It ensures that the development and maintenance of standards are guided by objectivity and the best interests of all stakeholders.
- **Efficiency**: efficiency encompasses multiple aspects of the standardization process. It pertains to the effectiveness and expediency of standard-setting, the management of conflicting interests, the involvement of all relevant stakeholders, and the overall enhancement of sector efficiency through the application of standards.

Standardization Bodies

Looking from the perspective of European countries, Standardization Bodies can be classified into three primary groups:

1. **International Standards Bodies (ISBs):** This group includes ISO (International Organization for Standardization), ITU (International Telecommunication Union), and IEC (International Electrotechnical Commission). The IEC focuses on standards in the electronics sector, the ITU deals with standards in the telecommunications sector, and ISO covers all other sectors.
2. **European Standardization Bodies (ESBs**): This group consists of CENELEC (European Committee for Electrotechnical Standardization), which handles standards in the electronics sector, ETSI (European Telecommunications Standards Institute), which publishes standards in the telecommunications sector, and CEN (European Committee for Standardization), which covers all other sectors.
3. **National Standards Bodies (NSBs):** These bodies are present in each European country, often with multiple NSBs per country. They generally address broad topics that are divided based on the aforementioned divisions of competence at both the European and international levels. NSBs have the capability to participate, within their specific areas of expertise, in European-level activities as members of CEN, CENELEC, or ETSI. They also engage at the international level, sending their own delegations to attend and vote at technical meetings, and providing official comments and positions on developing documents.

Importantly, NSBs play a significant role in shaping standards by actively participating and contributing at both European and international levels, ensuring their expertise is represented and contributing to the development of high-quality standards.

The main Standardisation Deliverables

The key deliverables of standardization can be categorized as follows:

- **Technical standards**: these are the primary outcomes of the standardization process, providing prescriptive guidelines based on established and widely accepted practices. They undergo periodic revision, confirmation, or amendment, typically every 5 years. Technical standards represent a consolidated state of the art in a specific field.
- **Technical specifications**: similarly to technical standards, technical specifications offer prescriptive guidance but may reflect an ongoing or less mature state of the art. They undergo periodic reviews to ensure they remain up to date and relevant.
- **Technical reports**: these documents serve an informational purpose, providing insights, analyses, or recommendations related to specific topics. They may act as precursors to future standardization activities and are subject to periodic review, like other standardization documents.
- **"Light" standards**: these standards vary depending on the publishing body (e.g., CWA - CEN, IWA - ISO, PdR - UNI). They are considered pre-standards with a narrower consensus base and serve as test documents for potential future standardization activities. "Light" standards address subjects that have not yet achieved a sufficient level of maturity to represent the state of the art. The review period for these standards is relatively shorter.

It is important to note that these deliverables encompass different levels of maturity and applicability within the standardization landscape, providing a range of resources to meet diverse industry needs.

Standards and laws: which is the link?

According to EU Regulation 1025/2012 [16], a standard is defined as a "technical specification, adopted by a recognized standardization body, for repeated or continuous application, compliance with which is not compulsory." Standards are voluntary documents that users can choose to apply, but they may become mandatory if referenced in national laws or other binding publications. This process is known as a "referral mechanism." Referral can take the form of fixed (material) or mobile (immaterial) references.

In the case of fixed referral, legislation explicitly states that a specific standard meets the applicable requirements and thus becomes a mandatory legal requirement. In the case of mobile referral, legislation requires products to meet general conditions such as "state of the art" or "essential requirements," and the standard is cited as one possible means of meeting those requirements. In this scenario, the legislator declares the standard(s) as sufficient but not the only means of fulfilling the mandatory requirements.

In the European Union, the adoption of standards to comply with legislation follows the "harmonized standards mechanism" or "New Approach." Harmonized standards are European standards that have been referenced in the Official Journal of the European Union in connection with a particular Directive/Regulation. These standards can be used to establish a presumption of conformity with the essential requirements of the directive/regulation. National authorities are obligated to recognize that products manufactured in accordance with harmonized standards are presumed to comply with the essential requirements. However, manufacturers have the choice to produce products that do not conform to harmonized standards but must then demonstrate compliance with the essential requirements of the Directive/Regulation through alternative means.

Overall, standards play a crucial role in the European Union's regulatory framework, providing a voluntary yet influential reference for compliance with legal requirements.

Standardisation, Certification and Accreditation

Conformity assessment, also known as certification, is a fundamental aspect associated with standardization. It involves evaluating whether a product, system, service, or even professionals meet the requirements and characteristics outlined in a standard or other standardization document. These requirements encompass various aspects such as efficiency, effectiveness, performance, safety, durability, reliability, environmental impact (e.g., pollution, noise), knowledge, skills, and competencies of individuals, among others. Verification typically involves testing and/or inspection, which may or may not include ongoing verification. The implementation of conformity assessment processes is the responsibility of Conformity Assessment Bodies (CABs).

Conformity assessment is overseen and accredited by accreditation bodies operating at the national, European, and international levels. Accreditation refers to the declaration made by an impartial body regarding the competence, independence, and impartiality of certification, inspection, and verification bodies, as well as testing and calibration laboratories. The accreditation of CABs provides a high level of reliability to conformity and calibration certificates, as well as test and inspection reports, assuring the quality and safety of verified goods and services in the market. Furthermore, accreditation of CABs ensures international recognition. The process of accreditation adheres to the international standard ISO/IEC 17011. In the European Union, EC Regulation 765/2008 mandates each Member State to appoint a national Accreditation Body, granting legal status to this activity and recognizing it as an expression of public authority.
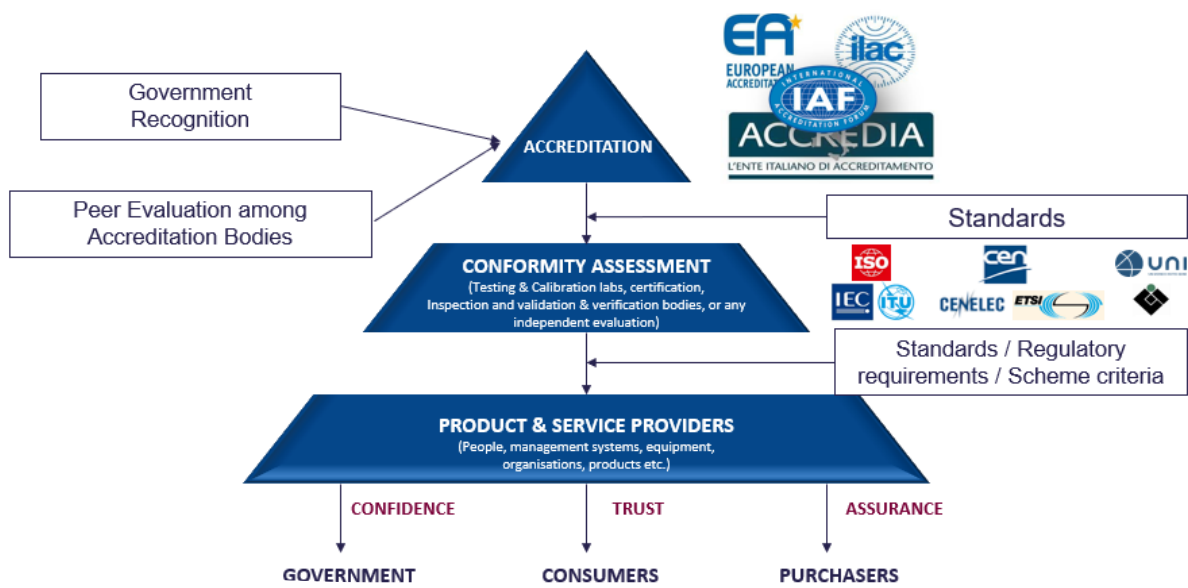
Figure 2. The Accreditation Pyramid = Quality Infrastructure (source: UNI)

Standards and safety requirements

Occupational Health and Safety (OH&S) plays a significant role in European legislation, and standards contribute to meeting the requirements outlined in Directives and Regulations. Various products have OH&S requirements that are addressed by standards. Examples include:

- Industrial and household machinery: standards cover machinery used in industries such as mining, construction, agriculture, lifting equipment, pressure equipment, simple pressure vessels, measuring instruments, sustainable use of pesticides, and personal protective equipment.
- Equipment and protective systems for potentially explosive atmospheres (ATEX): a range of products used in settings like offshore platforms, petrochemical plants, mines, and mills are covered by standards regulated by a specific EU directive. CEN and CENELEC standards address these requirements.
- Risk-oriented standards: OH&S is addressed through standards focusing on areas such as noise, vibration, ergonomics, hazardous substances, and other emerging areas like services, qualifications, and management systems.
- New technologies: with the implementation of technologies like artificial intelligence (AI), occupational health and safety requirements are necessary, especially in areas like automation, data management, additive manufacturing, and robotics.
- Consumer safety: European standards establish safety requirements for everyday products across sectors including:
- Children's products: standards cover toys, childcare articles, high-chairs, and child protection products.
- Sports and recreational products: this includes equipment for various activities, including children's play equipment and bicycles.

- Textiles and daily-use products: standards address safety aspects of clothing, fashion accessories, shoes, leather goods, and other products used in daily life.
- Furniture, furnishings, and cleaning products: safety requirements are established for furniture, furnishings, and cleaning products.
- Lighters, combustible materials, matches, and fuels: standards cover safety aspects of lighters, articles made of combustible materials, matches, and liquid or liquefied gas fuels.
- Food safety: standards consider products from agriculture, fisheries, and forestry to ensure food safety.

These examples demonstrate how European standards support occupational health and safety and promote consumer protection across a wide range of products and sectors.

Standardization and Research&Innovation[5]

Research and development (R&D) is a central focus of innovation policies, as demonstrated by the target of spending 3% of GDP on R&D in the European Union by 2020 and the increasing emphasis on R&D tax credits. However, the true commercial success and economic impact of R&D outcomes can only be achieved through effective transfer of these results into innovative products and processes. To facilitate this transfer, various mechanisms for technology transfer have been established, with standardization being recognized as a valuable instrument for technology transfer at both the EU level (through the Horizon Program) and earlier, in initiatives like the German HighTech Strategy.

Building upon Bozeman's (2000) conceptual transfer model, Blind and Gauch (2009) incorporate standardization as a channel for technology transfer, with standards serving as the objects of transfer.

Specifically, underlined standards act as a means of transferring knowledge and technology to the market through a consensus-based process. By selecting and prioritizing specific knowledge and technologies, resources can be consolidated, so harmonization accelerated. Moreover, this process is open to various stakeholders, including industry, research institutes, institutional actors, consumers and society at large. In the context of publicly funded research programs, standards enable economic efficiency by transforming publicly funded R&D outcomes into public goods.

Unlike patents, standards are affordable and accessible to all interested parties, making them more likely to be widely implemented due to the consensus achieved on their specifications. Additionally, the standardization process itself fosters knowledge sharing and production, as it brings together actors with diverse backgrounds, capacities, and knowledge, including researchers, industry representatives, public administrators, and consumer interest groups. In addition to codifying knowledge within standards, the standardization process facilitates the exchange and generation of tacit knowledge. Moreover, it incorporates inputs from various sources, including implementers of standardized technologies and consumers of standardized end products.

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[5] This section is based on Nesta Working Paper No. 13/15 - The Impact of Standardization and Standards on Innovation

In summary, <u>standardization offers the opportunity to practically implement research outcomes in innovative technologies, products, and services by providing a platform for knowledge transfer, consensus-building, and collaboration among diverse stakeholders</u>.
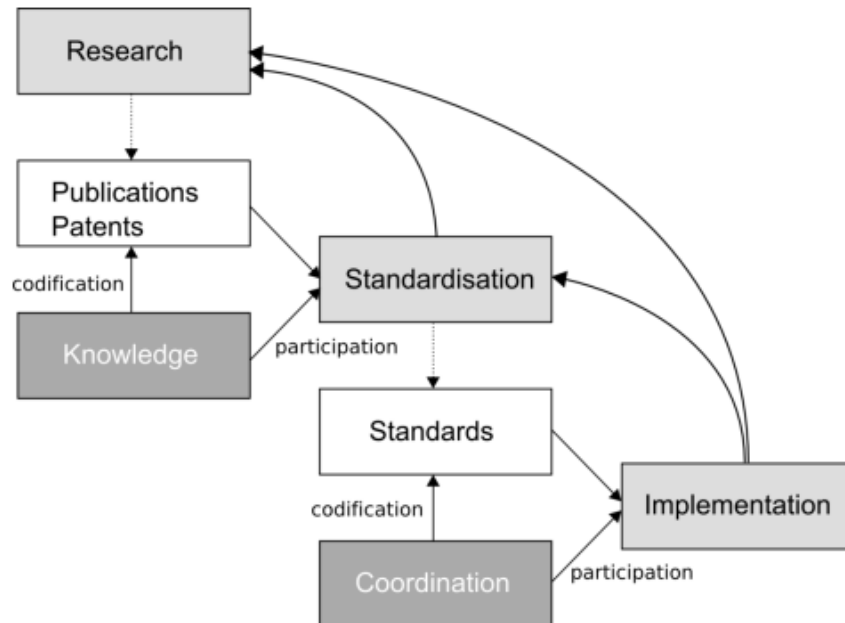
Figure 3. Research and standardisation in a simple technology transfer model (source: Blind and Gauch, 2009, p. 324)

Moreover, standards themselves can serve as framework conditions for future research endeavors. Terminology and classification standards, for example, play a significant role in basic research, while metrology, measurement, and testing standards are more relevant for applied research. Quality, health, and safety standards are crucial for the market introduction of innovative technologies and products as they help mitigate potential risks. Furthermore, compatibility standards can promote the widespread adoption of technologies and products, particularly in network industries. Standards can complement governmental regulations across these dimensions. In emerging research and technology fields, self-regulation through standardization allows stakeholders to establish flexible framework conditions that can later be incorporated into governmental regulations. To fully harness the potential of standards for research, systematic standardization foresights are necessary.

In synthesis, standardization can facilitate research and innovation in several ways:

- **Interoperability**: standards enable the seamless integration and interaction of different technologies or systems. This promotes interoperability between platforms, products, or services, facilitating innovation through the exchange and integration of data.
- **Cost and risk reduction**: well-defined standards can lower the costs associated with developing and implementing new solutions. By providing a common framework, standards help reduce uncertainty and mitigate risks by providing a stable reference point.

- **Compliance and trust**: standards establish a foundation for compliance and objective evaluation of new solutions. They provide shared and well-defined criteria that increase stakeholders' confidence, such as customers or financiers, in adopting innovations.
- **Scalability**: standards facilitate the scalability of innovations. When an innovation aligns with existing standards, it can be more rapidly and widely adopted, unlocking its full potential.

By embracing these aspects, standardization can effectively support research and innovation endeavors.

1.2. Standards mapping, methodology and results

In the previous section, it has been framed how extensive may be the scope of standardization documents: almost all aspect of the economic and social activities can indeed be covered by standards. But, if you do not know the correct reference for the standardization document you are searching, spotting the right one is not always an easy task. This is due to the complexity of technical documents, the enormous number of available standards, and the fact that online semantic searches are not sufficiently effective.

This is why the standardization strategy within Treasure project has started from a mapping of the main technical documents relevant for the scope of the project.

Figure 4. Treasure Standardization strategy (source: UNI)

Methodology

UNI with the support of all Treasure partners has followed several steps to spot the current and under development national, European, and International standards potentially relevant for the project activities. The resulting mapping provides partners, and all interested users, a background potentially useful to avoid a duplication of work.

The Figure 5 below summarizes the steps implemented to carry out the mapping:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101003587

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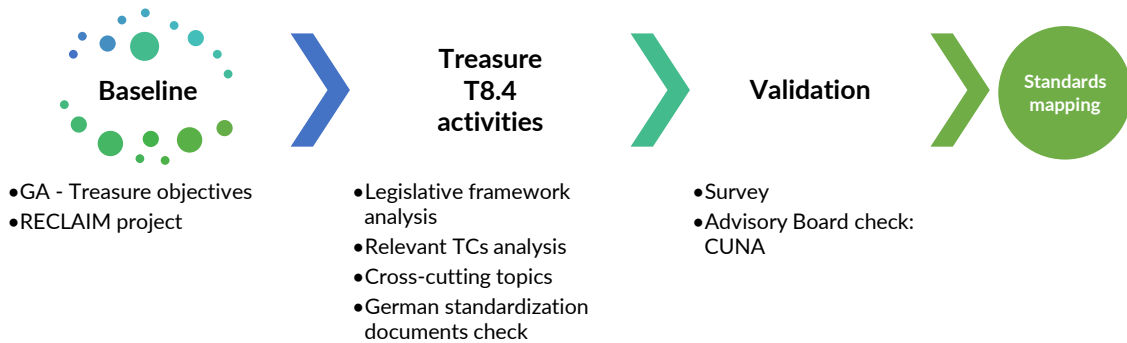
Figure 5. Standards mapping: the methodology (source: UNI)

UNI started from what is already known, the baseline. The baseline includes a check of the Grant Agreement and of the objectives of the Treasure project, against which searching for relevant standards. To consider also the lessons learnt from other EU projects on transversal topics, including circular economy strategies and environmental management, UNI has also checked the standards mapped for the Horizon 2020 project RECLAIM (GA 869884)[6].

After the baseline assessment, dedicated activities were carried out in task T8.4:

1. Analysis of the relevant legislative framework: in particular, the Directive on Waste Electrical and Electronic Equipment (WEEE) and the Directive on End-of Life Vehicles (ELV).
2. From the previous step, it emerged the relevance of the technical body **CLC/TC 111X - Environment** whose working program has been deeply analyzed.
3. In order to also look at some cross-cutting relevant aspects, such as standards regarding Life Cycle Assessment (LCA) and Life Cycle Cost (LCC) in sectors other than automotive (since there is no standardization reference on these topics for the automotive sector); and standards regarding general principles of circular economy. This has brought to further examine the working programs of **ISO/TC 323 - Circular Economy** and **CEN/SS S26 - Environmental management**.
4. Finally, considering the relevance of Germany automotive industry, we have also checked existing standardization documents made by DIN (the German standardization body).

Finally a check was done with partners, through a dedicated survey (on page 41ANNEX 1) and the Advisory Board, in particular CUNA, UNI affiliated body, developing standards for the automotive sector.

Results

The mapping resulting from these steps is a long list of standards. For all these standards, UNI collected the following data: the Standard Reference (the code identifying the document), the Title, Scope (a summary of the content), the International/European/National Technical Committee responsible to publish the document, and its Status (Current or Work in progress).

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[6] https://www.reclaim-project.eu/standardisation-toolkit/

Overall, 86 standards were mapped, of which 72% "current" and 28% "work in progress". Most of these standards relate to sectors different from the automotive. The standards cover the following Areas:

Area	Definition (from ISO catalog when available)
Design	stage of information development that is concerned with determining what information for users will be provided in a product and what the nature of the information will be (SOURCE: ISO/IEC 26514:2008)
Deployment	phase of a project in which a system is put into operation and cutover issues are resolved [SOURCE: ISO/IEC/IEEE 24765:2017(en), 3.1113]. Or process to bring entities or resources into effective action
Assembly	number of component parts fitted together to perform a specific function ISO 10209:2022(en), 3.1.8
Use	activity that the user may perform with or on the product during its whole life cycle Use covers the intended use and the reasonably foreseeable misuse in normal and reasonably foreseeable conditions of use. [SOURCE: ISO 10209:2022(en), 3.14.45]
Reuse	activity of recovering components and materials for further use without reprocessing ISO 21070:2017(en), 3.1.6
Disassembly	process whereby a product is taken apart in such a way that it could subsequently be reassembled and made operational. [SOURCE: IEC 62542:2013, 6.1]
Substance determination	-
Recover of CRMs	List published by EC
Recycling	any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. [SOURCE: ISO/TS 21929-2:2015(en), 3.33]
Traceability systems	ability to trace the origin, processing history, application, distribution or place of materials or products under consideration. [SOURCE: ISO 23664:2021(en), 3.22]
Circular Economy strategy	organisation's approach to achieve circular economy goals
Data exhange format	template/format which presents standardized and trustworthy information on the circularity aspects of a product
Life-cycle	consecutive and interlinked stages of a product system, from raw material to acquisition or generation from natural resources to final disposition [SOURCE: ISO 14040:2006, definition 3.1]
Security, privacy and ethics	Security any of a variety of procedures used to ensure that information exchange is guarded to prevent disclosure to unauthorized individuals. Security measures are intended to prevent disclosure of sensitive information even to those who have valid access to the communication network. Privacy: right of individuals to control or influence what information related to them may be collected and stored and by whom and to whom that information may be disclosed [SOURCE: ISO 7498-2, 3.3.43]
Decision support framework	Includes tools and standards that help the different actors in taking decisions.
Waste management	Waste generation: any residue of a production operation, transformation or use, any substance, material, product that its holder intends for disposal. [SOURCE: ISO 22716:2007(en), 2.36]

ANNEX 2 includes all the standards mapped.

Given the relevance for the project activities and possible future standardization development, several Technical Committees (TCs) at European and International level have been looked more into details. The following focuses detail each of them.

1.2.1. CLC/TC 111x - Environment[7]

Creation date:	14.01.2005
Status:	Active
Secretariat:	NEC (Nederlands Electrotechnisch Comité)
Secretary:	Mr MG. Geertzen (Appointed on 02.10.2018)
Chairperson:	Mr C. Dworak (DE) (Appointed on 02.03.2022, end of term of office (02.03.2025)
CENELEC Project Manager:	Mrs C. Müller

Table 4. CLC/TC 111X "ID Card"

"After the establishment at IEC level of IEC/TC 111 (October 2004), CLC/TC "Environmental standardization for electrical and electronic products and systems" was established to become the CLC/TC 111X "Environment".

Similar to IEC/TC 111, the purpose of CLC/TC 111X is to deal with environmental standardization aspects, to develop horizontal standards on environmental aspects for electrical and electronic products and systems, considering also European Commission Mandates on environmental Directives.

To fulfil this task, CLC/TC 111X is the "mirror" of IEC/TC 111, with 3 additional items:

1. Advisory role to BT on environmental matters: To communicate with and to give advice to CENELEC Bureau Technique (BT) and Technical Committees on questions related to work on environmental issues.
2. To be responsible for CENELEC of CENELEC answer for specific general EC Mandates related to environmental Directives related to electrotechnology (Ecodesign Directive, WEEE and RoHS Directives, ...).
3. Collaboration with CEN SABE to assure coordination and consistency within CENELEC and CEN environmental standardization.
4. Collaborate with CEN/CENELEC JTC10 and CEN/CENELEC EcoCG to coordinate standardization activities related to the Ecodesign." [17]

Currently the scope of the TC is to deal with environmental aspects for electrical and electronic products and systems. To promote activities in CENELEC relevant to reducing detrimental impacts of electrotechnical activities/products/systems on the natural environment (in this context "reducing" means a process of continual environment improvement aimed towards an optimum balance with social, economic, safety and performance requirements). To enhance CENELEC's environmental links with the European legal framework, particularly in the context of standardization aspects of EU environmental regulations and directives. To improve energy and resource efficiency of electrotechnical products and systems as important aspects in order to reduce impacts on the environment (for example climate changes and resource depletion) To prepare the necessary standards framework and in co-operation with other CENELEC Technical Bodies co-

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[7] The content of this paragraph is based on the CLC/TC 111X Business Plan [17]

ordinate the development of, or when necessary produce, the needed standardization deliverables. Product TCs remain autonomous in dealing with environmental aspects relevant to the products included in their scope. To assist product committees in the elaboration of environmental requirements of product standards to foster common technical approaches and solutions for similar problems and thus promote consistency in CENELEC standards. To cooperate with recognized standardization bodies and other relevant organizations for matters of common environmental interest. To communicate with and to give advice to CENELEC BT and Technical Committees on questions related to work on environmental issues.

Reference	Technical body title	Status
CLC/TC 111X/WG 01	Publicity	Disbanded
CLC/TC 111X/WG 02	Database	Disbanded
CLC/TC 111X/WG 03	EuP standardisation programme	Disbanded
CLC/TC 111X/WG 04	End of life requirements for household appliances containing volatile fluorinated substances or volatile hydrocarbons	Disbanded
CLC/TC 111X/WG 05	Substance management and declaration	Active
CLC/TC 111X/WG 06	WEEE Recycling Standards	Active
CLC/TC 111X/WG 07	Development of a proposal for EN 50614 "Requirements for the preparing for re-use of waste electrical and electronic equipment"	Disbanded
CLC/TC 111X/WG 08	Method for quantitative eco design via life cycle assessment and environmental declarations through product category rules for EEE	Active
CLC/TC 111X/WG 09	Task Force to prepare the NWIP for revision of EN 50419	Active
CLC/TC 111X/WG 10	Task force SBP update	Active
CLC/TC 111X/WG 11	Ancillary Action on Material efficient recycling and preparation for re-use of CRMs	Active

Table 5. CLC/TC 111X Structure

Acronym	Country	Organization	Website
OVE	Austria	Austrian Electrotechnical Association	www.ove.at
CEB-BEC	Belgium	Comité Electrotechnique Belge/Belgisch Elektrotechnisch Comité	www.ceb-bec.be
BDS	Bulgaria	Bulgarian Institute for Standardization	www.bds-bg.org
HZN	Croatia	Croatian Standards Institute	www.hzn.hr
CYS	Cyprus	Cyprus Organization for Standardisation	www.cys.org.cy
UNMZ	Czech Republic	Czech Office for Standards, Metrology and Testing	www.unmz.cz
DS	Denmark	Dansk Standard	www.ds.dk
EVS	Estonia	Non-profit Association Estonian Centre for Standardisation and Accreditation	www.evs.ee
SESKO	Finland	Finnish Electrotechnical Standards Association	www.sesko.fi
AFNOR-CEF	France	AFNOR-Comité Electronique Français	www.afnor.org
DKE	Germany	German Commission for Electrical, Electronic and Information Technologies of DIN and VDE	www.dke.de
NQIS/ELOT	Greece	National Quality Infrastructure System	www.elot.gr

MSZT	Hungary	Hungarian Standards Institution	www.mszt.hu
IST	Iceland	Icelandic Standards	www.stadlar.is
NSAI	Ireland	National Standards Authority of Ireland	www.nsai.ie
CEI	Italy	Comitato Elettrotecnico Italiano	www.ceinorme.it
LVS	Latvia	Latvian Standard Ltd.	www.lvs.lv
LST	Lithuania	Lithuanian Standards Board	www.lsd.lt
ILNAS	Luxembourg	Organisme Luxembourgeois de Normalisation	www.portail-qualite.lu
MCCAA	Malta	The Malta Competition and Consumer Affairs Authority	www.mccaa.org.mt
NEC	Netherlands	Nederlands Electrotechnisch Comité	www.nen.nl
NEK	Norway	Norsk Elektroteknisk Komite	www.nek.no
PKN	Poland	Polish Committee for Standardization	www.pkn.pl
IPQ	Portugal	Instituto Português da Qualidade	http://www1.ipq.pt/pt/pages/Homepage.aspx
ISRSM	Republic of North Macedonia	Standardization Institute of the Republic of North Macedonia	http://www.isrsm.gov.mk/en
ASRO	Romania	Romanian Standards Association	www.asro.ro
ISS	Serbia	Institute for Standardization of Serbia	www.iss.rs
UNMS SR	Slovakia	Slovak Office of Standards Metrology and Testing	www.unms.sk
SIST	Slovenia	Slovenian Institute for Standardization	www.sist.si
UNE	Spain	Asociación Española de Normalización	https://www.une.org
SEK	Sweden	Svensk Elstandard	www.elstandard.se
Electrosuisse	Switzerland	Association for Electrical Engineering, Power and Information Technologies	www.electrosuisse.ch
TSE	Türkiye	Turkish Standards Institution	www.tse.org.tr
BSI	United Kingdom	British Standards Institution	www.bsigroup.com

Table 6. CLC/TC 111X Members

Organisation		Start date
ANEC	European consumer voice in standardisation	2014-02-05
APPLiA	home appliance manufacturers in Europe	2013-12-04
DigitalEurope	Trade association representing digitally transforming industries in Europe	2014-05-08
EC	European Commission	2014-01-01
ECOS	Environmental Coalition on Standards	2014-01-31
EERA	European Energy Research Alliance	2014-06-19
EPIA	European Photovoltaic Industry Association	2013-10-16
EUCOLIGHT	European Association of collection and recycling organisations for WEEE lamps and lighting.	2016-02-26
EUROPACABLE	European wire and cable producers	2013-12-12

EuRIC	The European Recycling Industries' Confederation is the umbrella organisation for recycling industries	2014-05-08	
WEEE Forum	International Association of Electronic Waste Producer Responsibility Organisations	2014-01-23	

Table 7. CLC/TC 111X Liaison and Partner organisations

Reference	Title	Mandates	Directives
EN 50419:2006	Marking of electrical and electronic equipment in accordance with Article 11(2) of Directive 2002/96/EC (WEEE)	M/336, M/518	2012/19/EU
EN 50419:2022	Marking of electrical and electronic equipment (EEE) in respect to separate collection of waste EEE (WEEE)	M/336	2012/19/EU
EN 50581:2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances	M/499	2011/65/EU
EN 50614:2020	Requirements for the preparing for re-use of waste electrical and electronic equipment	M/518	2012/19/EU
EN 50625-1:2014	Collection, logistics & Treatment requirements for WEEE - Part 1: General treatment requirements	M/518	2012/19/EU
EN 50625-2-1:2014	Collection, logistics and treatment requirements for WEEE - Part 2-1: Treatment requirements for lamps	M/490, M/518	2012/19/EU
EN 50625-2-2:2015	Collection, logistics & Treatment requirements for WEEE - Part 2-2: Treatment requirements for WEEE containing CRTs and flat panel displays	M/490, M/518	2012/19/EU
EN 50625-2-3:2017	Collection, logistics & treatment requirements for WEEE - Part 2-3: Treatment requirements for temperature exchange equipment and other WEEE containing VFC and/or VHC	M/518	2012/19/EU
EN 50625-2-4:2017	Collection, logistics & treatment requirements for WEEE - Part 2-4: Treatment requirements for photovoltaic panels	M/518	2012/19/EU
CLC/TS 50625-3-1:2015	Collection, logistics & treatment requirements for WEEE - Part 3-1: Specification for de-pollution - General	M/518	2012/19/EU
CLC/TS 50625-3-2:2016	Collection, logistics & Treatment requirements for WEEE - Part 3-2: Technical specification for de-pollution - Lamps	M/518	2012/19/EU
CLC/TS 50625-3-3:2017	Collection, logistics & treatment requirements for WEEE - Part 3-3: Specification for de-pollution - WEEE containing CRTs and flat panel displays	M/518	2012/19/EU
CLC/TS 50625-3-4:2017	Collection, logistics & treatment requirements for WEEE - Part 3-4: Specification for de-pollution - temperature exchange equipment	M/518	2012/19/EU
CLC/TS 50625-3-5:2017	Collection, logistics & Treatment requirements for WEEE - Part 3-5: Technical specification for de-pollution - Photovoltaic panels	M/518	2012/19/EU
CLC/TS 50625-4:2017	Collection, logistics & treatment requirements for WEEE - Part 4: Specification for the collection and logistics associated with WEEE	M/518	2012/19/EU
CLC/TS 50625-5:2017	Collection, logistics & Treatment requirements for WEEE - Part 5: Specification for the final treatment of WEEE fractions - Copper and precious metals		2012/19/EU
CLC/TR 50625-6:2018	Collection, logistics & treatment requirements for WEEE - Part 6: Report on the alignment between Directive 2012/19/EU and EN 50625 series standards and EN 50614	M/518	2012/19/EU
EN 50693:2019	Product category rules for life cycle assessments of electronic and electrical products and systems		-
EN 62321-1:2013	Determination of certain substances in electrotechnical products - Part 1: Introduction and overview		2011/65/EU

EN 62321-2:2014	Determination of certain substances in electrotechnical products - Part 2: Disassembly, disjointment and mechanical sample preparation		2011/65/EU
EN IEC 62321-2:2021	Determination of certain substances in electrotechnical products - Part 2: Disassembly, disjointment and mechanical sample preparation		2011/65/EU
EN 62321-3-1:2014	Determination of certain substances in electrotechnical products - Part 3-1: Screening - Lead, mercury, cadmium, total chromium and total bromine by X-ray fluorescence spectrometry		2011/65/EU
EN 62321-3-2:2014	Determination of certain substances in electrotechnical products - Part 3-2: Screening - Total bromine in polymers and electronics by Combustion - Ion Chromatography		2011/65/EU
EN IEC 62321-3-3:2021	Determination of certain substances in electrotechnical products - Part 3-3: Screening - Polybrominated biphenyls, polybrominated diphenyl ethers and phthalates in polymers by gas chromatography-mass spectrometry using a pyrolyser/thermal desorption accessory (Py/TDâ€'GCâ€'MS)		-
EN 62321-4:2014	Determination of certain substances in electrotechnical products - Part 4: Mercury in polymers, metals and electronics by CV-AAS, CV-AFS, ICP-OES and ICP-MS		2011/65/EU
EN 62321-4:2014/A1:2017	Determination of certain substances in electrotechnical products - Part 4: Mercury in polymers, metals and electronics by CV-AAS, CV-AFS, ICP-OES and ICP-MS		2011/65/EU
EN 62321-5:2014	Determination of certain substances in electrotechnical products - Part 5: Cadmium, lead and chromium in polymers and electronics and cadmium and lead in metals by AAS, AFS, ICP-OES and ICP-MS		2011/65/EU
EN 62321-6:2015	Determination of certain substances in electrotechnical products - Part 6: Polybrominated biphenyls and polybrominated diphenyl ethers in polymers by gas chromatography-mass spectrometry (GC-MS)		2011/65/EU
EN 62321-7-1:2015	Determination of certain substances in electrotechnical products - Part 7-1: Hexavalent chromium - Presence of hexavalent chromium (Cr(VI)) in colorless and colored corrosion-protected coatings on metals by the colorimetric method		-
EN 62321-7-2:2017	Determination of certain substances in electrotechnical products - Part 7-2: Hexavalent chromium - Determination of hexavalent chromium (Cr(VI)) in polymers and electronics by the colorimetric method		-
EN 62321-8:2017	Determination of certain substances in electrotechnical products - Part 8: Phthalates in polymers by gas chromatography-mass spectrometry (GC-MS), gas chromatography-mass spectrometry using a pyrolyzer/thermal desorption accessory (Py/TD-GC-MS)		-
EN IEC 62321-9:2021	Determination of certain substances in electrotechnical products - Part 9: Hexabromocyclododecane in polymers by chromatography-mass spectrometry (GC-MS)		-
EN IEC 62321-12:2023	Determination of certain substances in electrotechnical products - Part 12: Simultaneous determination - Polybrominated biphenyls, polybrominated diphenyl ethers and phthalates in polymers by gas chromatography-mass spectrometry		-
EN IEC 62430:2019	Environmentally conscious design (ECD) - Principles, requirements and guidance		-
EN IEC 62474:2019	Material declaration for products of and for the electrotechnical industry		-
EN IEC 62474:2019 /A1:2021	Material declaration for products of and for the electrotechnical industry		-
EN 62542:2013	Environmental standardization for electrical and electronic products and systems - Glossary of terms		-

Reference		Mandates	Directives
EN IEC 63000:2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances	M/499	2011/65/EU

Table 8. CLC/TC 111X Published Standards

Reference	Title	Mandates	Directives
prEN 50614	Requirements for the preparing for re-use of waste electrical and electronic equipment	M/518	2012/19/EU
prEN IEC 62321-3-1	DETERMINATION OF CERTAIN SUBSTANCES IN ELECTROTECHNICAL PRODUCTS - Part 3-1: Elemental Screening by X-ray fluorescence spectrometry		2011/65/EU
EN IEC 62321-3-4:2023	Determination of certain substances in electrotechnical products - Part 3-4: Screening - Phthalates in polymers of electrotechnical products by high performance liquid chromatography with ultraviolet detector (HPLC-UV), thin layer chromatography (TLC) and thermal desorption mass spectrometry (TD-MS)		-
prEN IEC 62321-8	Determination of certain substances in electrotechnical products - Part 8: Phthalates in polymers by gas chromatography-mass spectrometry (GC-MS), gas chromatography-mass spectrometry using a pyrolyzer/thermal desorption accessory (Py-TD-GC-MS)		-
prEN IEC 62321-10	Determination of certain substances in electrotechnical products - Part 10: Polycyclic aromatic hydrocarbons (PAHs) in polymers and electronics by gas chromatography-mass spectrometry (GC-MS)		-
prEN IEC 62321-11:2022	Determination of certain substances in electrotechnical products - Part 11: Tris (2-chloroethyl) phosphate (TCEP) in plastics by gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS)		-
prEN IEC 62321-13	Determination of certain substances in electrotechnical products - Part 13: Bisphenol A in plastics by liquid chromatography-diode array detection (LC-DAD), liquid chromatography-mass spectrometry (LC-MS) and liquid chromatography-tandem mass spectrometry (LC-MS/MS)		-
prEN IEC 62321-14	DETERMINATION OF CERTAIN SUBSTANCES IN ELECTROTECHNICAL PRODUCTS - Part 14: Determination of SCCPs and MCCPs in electrotechnical products by GC-NCI-MS		-
prEN IEC 63366:2023	Product category rules for life cycle assessment of electrical and electronic products and systems.		-
prEN IEC 63372	Quantification and communication of Carbon FootPRINT and GHG emission reductions/avoided emissions from electric and electronic products and systems â€" Principles, methodologies, requirements and guidance		-
prEN IEC 82474-1	Material declaration â€" Part 1: General requirements		-
prEN IEC 63395	Sustainable management of waste electrical and electronic equipment (e-waste).		-

Table 9. CLC/TC 111X Work Program

1.2.2. CEN/TC 301 - Road vehicles[8]

Creation date:	01.01.1992
Status:	Active
Secretariat:	DIN (Deutsches Institut für Normung)
Secretary:	Mr E. Wern (Appointed on 20.02.2023)
Chairperson:	Mr D. Beinker (Appointed on 20.02.2023, end of term of office 20.02.2029)
CEN Project Manager:	Mr M-A. Carreira da Cruz

Table 10. CEN/TC 301 "ID Card"

The scope of the TC is the preparation of road vehicle European Standards answering essentially to European mandates. Since the automotive industry is acting globally, the international level (ISO/TC 22 Road vehicles) shall have top priority for any other standardization projects.

Reference	**Technical body title**	**Status**
CEN/TC 301/WG 1	Performances measuring methods	Disbanded
CEN/TC 301/WG 2	Safety, Braking with regeneration	Disbanded
CEN/TC 301/WG 4	Vehicle interactions with infrastructure and environment, during charging	Disbanded
CEN/TC 301/WG 5	Safety, other aspects	Disbanded
CEN/TC 301/WG 6	M/421 Vehicle OBD, repair and maintenance information	Active
CEN/TC 301/WG 7	Supplementary grip devices	Active
CEN/TC 301/WG 8	Tires pressure gauges metrology	Disbanded
CEN/TC 301/WG 9	Interoperability between tires pressure gauges with tires pressure management system	Disbanded
CEN/TC 301/WG 10	Seals for digital tachographs	Disbanded
CEN/TC 301/WG 11	Safety of roller brake testers	Active
CEN/TC 301/WG 12	Steel snow chains for vehicle classes N2, N3, M2, M3, O3, O4	Disbanded
CEN/TC 301/WG 13	L-category vehicles RMI	Disbanded
CEN/TC 301/WG 14	Electricity Fuel labelling	Disbanded
CEN/TC 301/WG 15	Safety of machines for mounting and demounting vehicles tyres	Active
CEN/TC 301/WG 16	Performance assessment of the Portable Emission Measuring Systems (PEMS)	Active
CEN/TC 301/WG 17	Plastics recycling and sustainability for road vehicles	Active
CEN/TC 301/WG 18	Electric vehicles batteries	Active

Table 11. CEN/TC 301 Structure

Acronym	**Country**	**Organization**	**Website**
ASI	Austria	Austrian Standards International - Standardization and Innovation	www.austrian-standards.at
NBN	Belgium	Bureau de Normalisation/Bureau voor Normalisatie	www.nbn.be
BDS	Bulgaria	Bulgarian Institute for Standardization	www.bds-bg.org

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[8] Based on the CEN information, [18]

HZN	Croatia	Croatian Standards Institute	www.hzn.hr
CYS	Cyprus	Cyprus Organization for Standardisation	www.cys.org.cy
UNMZ	Czech Republic	Czech Office for Standards, Metrology and Testing	www.unmz.cz
DS	Denmark	Dansk Standard	www.ds.dk
EVS	Estonia	Non-profit Association Estonian Centre for Standardisation and Accreditation	www.evs.ee
SFS	Finland	Suomen Standardisoimisliitto r.y.	www.sfs.fi
AFNOR	France	Association Française de Normalisation	www.afnor.org
DIN	Germany	Deutsches Institut für Normung	www.din.de
NQIS/ELOT	Greece	National Quality Infrastructure System	www.elot.gr
MSZT	Hungary	Hungarian Standards Institution	www.mszt.hu
IST	Iceland	Icelandic Standards	www.stadlar.is
NSAI	Ireland	National Standards Authority of Ireland	www.nsai.ie
UNI	Italy	Ente Italiano di Normazione	www.uni.com
LVS	Latvia	Latvian Standard Ltd.	www.lvs.lv
LST	Lithuania	Lithuanian Standards Board	www.lsd.lt
ILNAS	Luxembourg	Organisme Luxembourgeois de Normalisation	www.portail-qualite.lu
MCCAA	Malta	The Malta Competition and Consumer Affairs Authority	www.mccaa.org.mt
NEN	Netherlands	Nederlands Normalisatie-instituut	www.nen.nl
SN	Norway	Standards Norway	www.standard.no/
PKN	Poland	Polish Committee for Standardization	www.pkn.pl
IPQ	Portugal	Instituto Português da Qualidade	http://www1.ipq.pt/pt/pages/Homepage.aspx
ISRSM	Republic of North Macedonia	Standardization Institute of the Republic of North Macedonia	http://www.isrsm.gov.mk/en
ASRO	Romania	Romanian Standards Association	www.asro.ro
ISS	Serbia	Institute for Standardization of Serbia	www.iss.rs
UNMS SR	Slovakia	Slovak Office of Standards Metrology and Testing	www.unms.sk
SIST	Slovenia	Slovenian Institute for Standardization	www.sist.si
UNE	Spain	Asociación Española de Normalización	https://www.une.org
SIS	Sweden	Swedish Institute for Standards - SIS	www.sis.se
SNV	Switzerland	Schweizerische Normen-Vereinigung	www.snv.ch
TSE	Türkiye	Turkish Standards Institution	www.tse.org.tr
BSI	United Kingdom	British Standards Institution	www.bsigroup.com

Table 12. CEN/TC 301 Members

Organisation		**Start date**
ACEA	The European Automobile Manufacturers' Association	2008-07-24
ACEM	European Association of Motorcycle Manufacturers	2015-06-01
ANEC	European consumer voice in standardisation	2008-07-24

ECOS	Environmental Coalition on Standards	2014-01-31
EGEA		2008-07-24
EUROMOT	European Association of Internal Combustion Engine and Alternative Powertrain Manufacturers	2023-01-05
EuRIC	The European Recycling Industries' Confederation is the umbrella organisation for recycling industries	2022-04-08
FIGIEFA	Automotive Aftermarket Distributors	2008-07-24
SBMC	Swappable Batteries Motorcycle Consortium	2022-06-15

Table 13. CEN/TC 301 Liaison and Partner organisations

Reference	Title	Mandates	Directives
EN ISO 12617:2017	Road vehicles - Liquefied natural gas (LNG) refuelling connector - 3,1 MPa connector (ISO 12617:2015, Corrected version 2016-01-15)	M/533	2014/94/EU
EN 12645:2014	Tyre pressure measuring instruments - Devices for inspection of pressure and/or inflation / deflation of tyres for motor vehicles - Metrology, requirements and testing	M/457	86/217/EEC
EN ISO 14469:2017	Road vehicles - Compressed natural gas (CNG) refuelling connector (ISO 14469:2017)	M/533	2014/94/EU
EN ISO 15118-1:2019	Road vehicles - Vehicle to grid communication interface - Part 1: General information and use-case definition (ISO 15118-1:2019)	M/468	-
EN ISO 15118-2:2016	Road vehicles - Vehicle-to-grid communication Interface - Part 2: Network and application protocol requirements (ISO 15118-2:2014)	M/468	-
EN ISO 15118-3:2016	Road vehicles - Vehicle to grid Communication interface - Part 3: Physical and data link layer requirements (ISO 15118-3:2015)	M/468	-
EN ISO 15118-4:2019	Road vehicles - Vehicle to grid communication interface - Part 4: Network and application protocol conformance test (ISO 15118-4:2018)	M/468	-
EN ISO 15118-5:2019	Road vehicles - Vehicle to grid communication interface - Part 5: Physical layer and data link layer conformance test (ISO 15118-5:2018)	M/468, M/533	2014/94/EU
EN ISO 15118-8:2020	Road vehicles - Vehicle to grid communication interface - Part 8: Physical layer and data link layer requirements for wireless communication (ISO 15118-8:2020)		-
EN ISO 15118-20:2022	Road vehicles - Vehicle to grid communication interface - Part 20: 2nd generation network layer and application layer requirements (ISO 15118-20:2022)	M/581	2014/94/EU
EN ISO 16380:2018	Road vehicles - Blended fuels refuelling connector (ISO 16380:2014, including Amd 1:2016)		2014/94/EU
EN 16661:2015	Road vehicles and Tyre Pressure Gauges (TPG) - Interoperability between Tyre Information Systems (TIS) and TPG - Interfaces and Requirements	M/457	-
EN 16662-1:2020	Road vehicles - Supplementary grip devices for tyres of passenger cars and light duty vehicles - Part 1: General safety and performance requirements		-
EN 16882:2016	Road vehicles - Security of the mechanical seals used on tachographs - Requirements and test procedures	M/502	-
EN 17003:2021	Road vehicles - Roller brake testers for vehicles of more than 3,5 tons GVW - Safety requirements	M/396	2006/42/EC
EN 17186:2019	Identification of vehicles and infrastructures compatibility - Graphical expression for consumer information on EV power supply		2014/94/EU
EN 17347:2021	Road vehicles - Machines for mounting and demounting vehicle tyres - Safety requirements	M/396	2006/42/EC

EN ISO 17409:2020	Electrically propelled road vehicles - Conductive power transfer - Safety requirements (ISO 17409:2020)	M/468	-
EN 17507:2021	Road vehicles - Portable Emission Measuring Systems (PEMS) - Performance assessment		-
EN ISO 18243:2019	Electrically propelled mopeds and motorcycles - Test specifications and safety requirements for lithium-ion battery systems (ISO 18243:2017)		2014/94/EU
EN ISO 18243:2019/A1:2020	Electrically propelled mopeds and motorcycles - Test specifications and safety requirements for lithium-ion battery systems - Amendment 1 (ISO 18243:2017/Amd 1:2020)		-
EN ISO 18246:2023	Electrically propelled mopeds and motorcycles - Safety requirements for conductive connection to an external electric power supply (ISO 18246:2023)	M/468	-
EN ISO 18541-1:2021	Road vehicles - Standardized access to automotive repair and maintenance information (RMI) - Part 1: General information and use case definition (ISO 18541-1:2021)	M/421	-
EN ISO 18541-2:2021	Road vehicles - Standardized access to automotive repair and maintenance information (RMI) - Part 2: Technical requirements (ISO 18541-2:2021)	M/421	-
EN ISO 18541-3:2021	Road vehicles - Standardized access to automotive repair and maintenance information (RMI) - Part 3: Functional user interface requirements (ISO 18541-3:2021)	M/421	-
EN ISO 18541-4:2021	Road vehicles - Standardized access to automotive repair and maintenance information (RMI) - Part 4: Conformance test (ISO 18541-4:2021)	M/421	-
EN ISO 18541-5:2018	Road vehicles - Standardized access to automotive repair and maintenance information (RMI) - Part 5: Heavy duty specific provision (ISO 18541-5:2018)	M/421	-
EN ISO 18541-6:2018	Road vehicles - Standardized access to automotive repair and maintenance information (RMI) - Part 6: L-Category vehicle specific RMI use cases and requirements (ISO 18541-6:2018, Corrected version 2018-05)	M/421	-
EN ISO 18542-1:2012	Road vehicles - Standardized repair and maintenance information (RMI) terminology - Part 1: General information and use case definition (ISO 18542-1:2012)	M/421	-
EN ISO 18542-2:2014	Road vehicles - Standardized repair and maintenance information (RMI) terminology - Part 2: Standardized process implementation requirements, Registration Authority (ISO 18542-2:2014)	M/421	-
EN ISO 19363:2021	Electrically propelled road vehicles - Magnetic field wireless power transfer - Safety and interoperability requirements (ISO 19363:2020)	M/468	-
EN ISO 21058:2021	Road vehicles - Dimethyl Ether (DME) refuelling connector (ISO 21058:2019)		2014/94/EU

Table 14. CEN/TC 301 Published Standards

Reference	Title	Mandates	Directives
prEN ISO 15118-2	Road vehicles - Vehicle-to-grid communication interface - Part 2: Network and application protocol requirements (ISO/DIS 15118-2:2022)		-
prEN ISO 15118-4	Road vehicles - Vehicle to grid communication interface - Part 4: Network and application protocol conformance test (ISO/DIS 15118-4:2021)		-
prEN ISO 15118-9	Road vehicles - Vehicle to grid communication interface - Part 9: Physical and data link layer conformance test for wireless communication (ISO 15118-9:2022)		-

prEN 16662-2	Road vehicles - Supplementary grip devices for tyres of passenger cars and light duty vehicles - Part 2: Specific test procedures		-
WI 00301082	Road vehicles - Post Shredder Technology recycling - Design recommendations for plastic products	M/584	-
WI 00301084	Road vehicles - Supplementary grip devices for tyres of passenger cars and light duty vehicles - Part 3: Production control (self monitoring) and third-party surveillance		-
WI 00301085	Road vehicles -- Rechargeable batteries with internal energy storage -- Instantaneous performance of Li-Ion, Pb, NiMH and combined chemistries electric vehicles modules and batteries	M/579	-
WI 00301086	Road vehicles -- Electrically propelled vehicles -- Steps, conditions and protocols for the safe repair and re-use of modules and batteries originally designed for EV applications	M/579	-
WI 00301087	Road vehicles - Electrically propelled vehicles - Steps, conditions and protocols for repurpose of modules and batteries originally designed for EV applications	M/579	-

Table 15. CEN/TC 301 Work Program

1.2.3. ISO/TC 22 - Road Vehicle[9]

Creation date:	1947
Status:	Active
Secretariat:	AFNOR (Association Française de Normalisation)
Committee manager:	Mme Valérie Maupin
Chairperson:	M Fabien Duboc (until end of 2026)
ISO Technical Programme Manager:	Mr Hakim Mkinsi

Table 16. ISO/TC 22 "ID Card"

All questions of standardization concerning compatibility, interchangeability and safety, with particular reference to terminology and test procedures (including the characteristics of instrumentation) for evaluating the performance of the following types of road vehicles and their equipment as defined in the relevant items of Article 1 of the convention on Road Traffic, Vienna in 1968 concluded under the auspices of the United Nations: mopeds (item m); motor cycles (item n); motor vehicles (item p); trailers (item q); semi-trailers (item r); light trailers (item s); combination vehicles (item t); articulated vehicles (item u).

- **Published ISO standards:** 1001 (link)
- **ISO standards under development:** 209 (link)
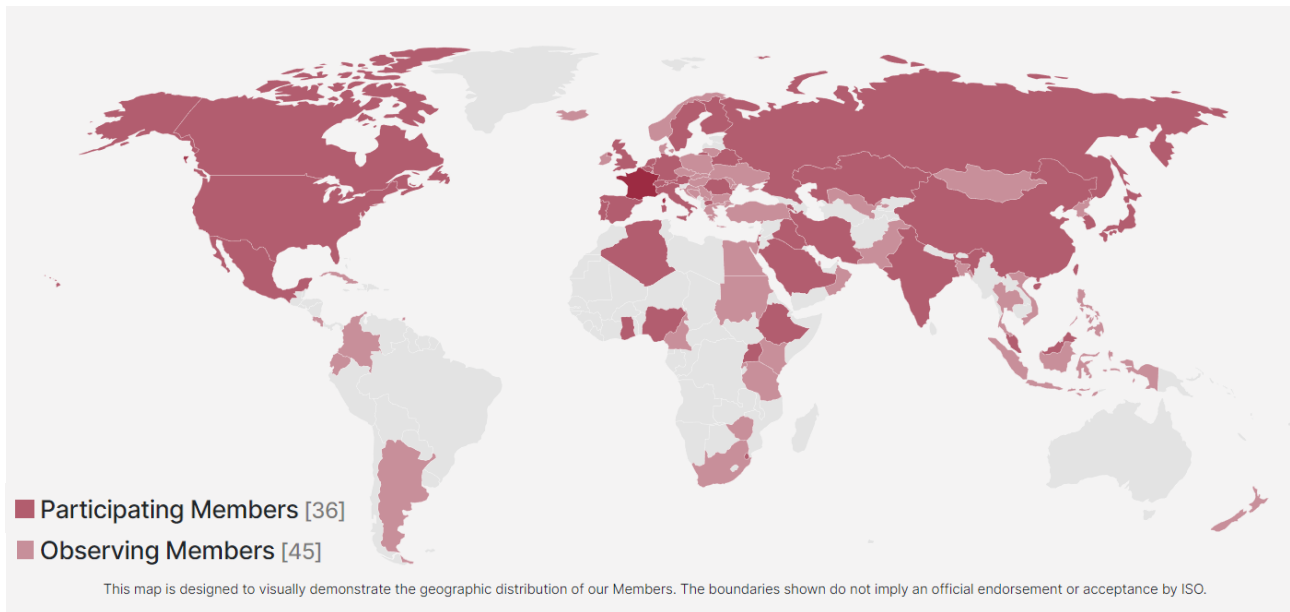
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[9] Based on ISO information, [19]

Figure 6. ISO/TC 22 Participation (source: ISO)

Reference	Title
ISO/TC 22/AG 2	Automated driving coordination group (ADCG)
ISO/TC 22/SAG	Strategic advisory group
ISO/TC 22/WG 17	Code VIN – Code WMI
ISO/TC 22/WG 18	Exterior protection
ISO/TC 43/SC 1/WG 27	Joint ISO/TC 43/SC 1 - ISO/TC 22 WG: Effect of temperature on tyre/road noise testing
ISO/TC 43/SC 1/WG 42	Joint ISO/TC 43/SC 1 - ISO/TC 22 WG: Measurement of noise emission (external) from road vehicles
ISO/TC 43/SC 1/WG 57	Joint ISO/TC 43/SC 1 - ISO/TC 22 WG: In-situ measurements of blocked forces
ISO/TC 43/SC 1/WG 60	Joint ISO/TC 43/SC 1 - ISO/TC 22 WG: Method for transposition of dynamic forces generated by an active component from a test bench to a vehicle
ISO/TC 146/SC 6/WG 13	Joint ISO/TC 146/SC 6 - ISO/TC 22 WG: Determination of volatile organic compounds in car interiors
ISO/TC 22/SC 31	**Data communication**
ISO/TC 22/SC 31/JWG 1	Joint ISO/TC 22/SC 31 - IEC/TC 69 WG: Vehicle to grid communication interface (V2G CI)
ISO/TC 22/SC 31/WG 2	Vehicle diagnostic protocols
ISO/TC 22/SC 31/WG 3	In-vehicle networks
ISO/TC 22/SC 31/WG 4	Network applications
ISO/TC 22/SC 31/WG 5	Test equipment/Data eXchange Formats
ISO/TC 22/SC 31/WG 6	Extended vehicle/Remote diagnostics
ISO/TC 22/SC 31/WG 9	Sensor data interface for automated driving functions
ISO/TC 127/SC 3/JWG 16	Joint ISO/TC 127/SC 3 - ISO/TC 82/SC 8 - ISO/TC 23/SC 19 - ISO/TC 22/SC 31 - ISO/TC 23/SC 15 WG: Secure high speed mobile data communication
ISO/TC 22/SC 32	**Electrical and electronic components and general system aspects**
ISO/TC 22/SC 32/AHG 1	Test method for automotive LiDAR

ISO/TC 22/SC 32/AHG 2	Guidelines for cooperative interference mitigation of automotive millimeter-wave radar
ISO/TC 22/SC 32/AHG 3	Test method for detection performance of millimeter-wave radar
ISO/TC 22/SC 32/WG 1	Ignition Equipment
ISO/TC 22/SC 32/WG 2	Environmental conditions
ISO/TC 22/SC 32/WG 3	Electromagnetic compatibility
ISO/TC 22/SC 32/WG 4	Automotive electrical cables
ISO/TC 22/SC 32/WG 5	Fuses and circuit breakers
ISO/TC 22/SC 32/WG 6	On-board electrical connections
ISO/TC 22/SC 32/WG 8	Functional safety
ISO/TC 22/SC 32/WG 9	Electrical connections between towing and towed vehicles
ISO/TC 22/SC 32/WG 10	Optical components - Test methods and requirements
ISO/TC 22/SC 32/WG 11	Cybersecurity
ISO/TC 22/SC 32/WG 12	Software update
ISO/TC 22/SC 32/WG 13	Safety for driving automation systems
ISO/TC 22/SC 32/WG 14	Safety and Artificial Intelligence
ISO/IEC JTC 1/SC 27/JWG 6	Joint ISO/IEC JTC1/SC 27 - ISO/TC 22/SC 32 WG : Cybersecurity requirements and evaluation activities for connected vehicle devices
ISO/TC 22/SC 33	**Vehicle dynamics, chassis components and driving automation systems testing**
ISO/TC 22/SC 33/WG 2	Vehicle dynamics of passenger cars
ISO/TC 22/SC 33/WG 3	Driver assistance and active safety functions
ISO/TC 22/SC 33/WG 5	Wheels
ISO/TC 22/SC 33/WG 6	Vehicle dynamics of heavy commercial vehicles and buses
ISO/TC 22/SC 33/WG 9	Test scenarios of automated driving systems
ISO/TC 22/SC 33/WG 10	Brake linings and friction couples
ISO/TC 22/SC 33/WG 11	Simulation
ISO/TC 22/SC 33/WG 14	Brake fluids
ISO/TC 22/SC 33/WG 15	Field load specification for brake modulation systems
ISO/TC 22/SC 33/WG 16	Active Safety test equipment
ISO/TC 22/SC 34	**Propulsion, powertrain and powertrain fluids**
ISO/TC 22/SC 34/WG 1	Fuel filters
ISO/TC 22/SC 34/WG 2	Injection equipment
ISO/TC 22/SC 34/WG 3	Air filters
ISO/TC 22/SC 34/WG 4	Piston rings
ISO/TC 22/SC 34/WG 5	Engine test code
ISO/TC 22/SC 34/WG 6	Water injection
ISO/TC 22/SC 34/WG 9	Piston Pins
ISO/TC 22/SC 34/WG 11	Separator performance, laboratory and engine test methods for crankcase ventilation systems
ISO/TC 22/SC 34/WG 14	NOx reduction additive
ISO/TC 22/SC 34/WG 17	Road vehicles – Cleanliness of components
ISO/TC 22/SC 35	**Lighting and visibility**
ISO/TC 22/SC 35/WG 1	Lighting and light-signalling
ISO/TC 22/SC 35/WG 2	Safety glazing
ISO/TC 22/SC 35/WG 3	Visibility
ISO/TC 22/SC 36	**Safety and impact testing**
ISO/TC 22/SC 36/WG 1	Car collision test procedures
ISO/TC 22/SC 36/WG 2	Child restraint systems
ISO/TC 22/SC 36/WG 3	Instrumentation

ISO/TC 22/SC 36/WG 4	Virtual testing
ISO/TC 22/SC 36/WG 5	Anthropomorphic test devices
ISO/TC 22/SC 36/WG 6	Performance criteria expressed in biomechanical terms
ISO/TC 22/SC 36/WG 7	Traffic accident analysis methodology
ISO/TC 22/SC 37	**Electrically propelled vehicles**
ISO/TC 22/SC 37/WG 1	Safety aspects and terminology
ISO/TC 22/SC 37/WG 2	Performance and energy consumption
ISO/TC 22/SC 37/WG 3	Rechargeable energy storage
ISO/TC 22/SC 37/WG 4	Systems and components connected to electric propulsion systems
ISO/TC 22/SC 37/WG 5	Requirements for energy transfer
ISO/TC 22/SC 37/WG 6	Charging performance
ISO/TC 22/SC 38	**Motorcycles and mopeds**
ISO/TC 22/SC 38/WG 1	Pollution and energy
ISO/TC 22/SC 38/WG 2	Electric mopeds and motorcycles
ISO/TC 22/SC 38/WG 3	Functional safety
ISO/TC 22/SC 38/WG 5	Controls
ISO/TC 22/SC 39	**Ergonomics**
ISO/TC 22/SC 39/WG 3	Controls, displays, and tell-tale localization
ISO/TC 22/SC 39/WG 5	Symbols
ISO/TC 22/SC 39/WG 7	Hand reach and R and H point determination
ISO/TC 22/SC 39/WG 8	TICS on-board-MMI
ISO/TC 22/SC 40	**Specific aspects for light and heavy commercial vehicles, busses and trailers**
ISO/TC 22/SC 40/WG 1	Mechanical couplings
ISO/TC 22/SC 40/WG 3	Negative pressure compartment for ambulances
ISO/TC 22/SC 40/WG 4	Exterior fittings
ISO/TC 22/SC 41	**Specific aspects for gaseous fuels**
ISO/TC 22/SC 41/JWG 5	Joint ISO/TC 22/SC 41 - ISO/TC 197 WG: Fuel system components and refuelling connector for vehicles propelled by blends of natural gas and hydrogen
ISO/TC 22/SC 41/JWG 10	Joint ISO/TC 22/SC 41 - ISO/TC 188 WG: Alternative fuels propelled boats
ISO/TC 22/SC 41/WG 3	Fuel system components and refuelling connector for vehicles propelled by gaseous fuel
ISO/TC 22/SC 41/WG 4	Fuel system components and refuelling connector for vehicles propelled by Liquefied Natural Gas (LNG)
ISO/TC 22/SC 41/WG 6	Fuel system components and refuelling connector for vehicles propelled by Liquefied Petroleum Gas (LPG)
ISO/TC 22/SC 41/WG 7	General safety requirements for gaseous fuelled vehicles and terminology
ISO/TC 22/SC 41/WG 8	Fuel system components and refueling connector for vehicles propelled by Dimethyl Ether (DME)
ISO/TC 22/SC 41/WG 9	Training, competence and conformity assessment
ISO/TC 197/JWG 30	Joint ISO/TC 197 - ISO/TC 22/SC 41 WG: Gaseous hydrogen land vehicle fuel system components

Table 17. ISO/TC 22 Structure

1.2.4. CEN/TC 406 - Mechanical products - Ecodesign methodology

Creation date:	07.12.2010
Status:	Active
Secretariat:	AFNOR (Association Française de Normalisation)
Secretary:	Mrs S.E. Brito (Appointed on 19.12.2018)
Chairperson:	Mr P. Vinzio (Appointed on 11.12.2021, end of term of office 11.12.2024)
CEN Project Manager:	Mrs C. Vigneron

Table 18. CEN/TC 406 "ID Card"

The TC deals with standardization in the field of industrial machinery excluding Machinery for the production and use of mechanical power.

Reference	Title	Mandates	Directives
CEN/TR 17004:2016	Mechanical products - Conditions to set up environmental communication models by recognizing sectorial particularities	-	-
EN 16524:2020	Mechanical products - Methodology for reduction of environmental impacts in product design and development	-	-

Table 19. CEN/TC 406 Relevant Published Standards

Reference	Title	Mandates	Directives
WI 00406004 (CEN/TR)	Mechanical products — Order of magnitude of key environmental data	-	-

Table 20. CEN/TC 406 Relevant Work Program

1.2.5. CRM and Rare Earth - TC[10]

In 2021, ISO/TMB (Technical Management Board) established a Strategic Advisory Group (SAG) with the mandate to undertake an analysis of existing and potential standardization work within ISO related to critical minerals - from the point of initial extraction and processing steps through to pre-cursor materials - and make recommendations to the TMB in this regard.

Following the initial mandate, a second phase of work was agreed which requested the SAG to review tools and standards outside ISO on Environmental Social Governance issues (ESG) specific to Critical Minerals, examine the market need of the suggested activities, and set priorities for future work. This work is due to be presented to the TMB in June 2023.

In December 2022, the ISO/TMB/SAG on Critical Minerals launched an International Survey to identify the metals and minerals that ought to be considered as priorities for standardization. The results of this survey

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[10] Reference [20]

pointed to a list of the most used chemical analysis methods and the highest-ranking minerals: antimony, cobalt, chromium, graphite and beryllium. Also identified as critical by this survey were the platinum group metals (in Asia) and niobium (in Europe).

Along to the answers to this survey, a new Technical Committee, ISO/TC on Specialty Minerals and Metals, has been recently established to deal with certain metals and minerals considered critical for the EU: antimony, beryllium, cobalt, chromium, graphite, niobium, platinum group metals. Additional specialty metals and minerals not covered by existing ISO technical committees may be added in future.

Finished products and elements already covered by existing ISO technical committees are excluded: ISO/TC 82 "Mining", ISO/TC 18 "Zinc and zinc alloys", ISO/TC 20/SC 18 "Materials" (under ISO/TC 20 "Aircraft and space vehicles"), ISO/TC 26 "Copper and copper alloys", ISO/TC 79 "Light metals" (aluminum, titanium, magnesium), ISO/TC 132 "Ferroalloys" (manganese, chrome in ferroalloys), ISO/TC 155 "Nickel and nickel alloys", ISO/TC 183 "Copper, lead, zinc and nickel ores and concentrates", ISO/TC 298 "Rare earth", ISO/TC 333 "Lithium". Of course, cooperation and liaisons with all these existing TCs are proposed.

<u>The TC proposed structure concerns terminology, classification, sampling, testing and chemical analysis methods, delivery conditions, excluding sustainability issues.</u>

Two categories of standards are proposed:

1. Basic standards
    o Terms and definitions
    o Classification and designation
    o Delivery conditions: packing, transport and storage

2. Chemical analysis methods standards:
    o All stages of analytical methods, including sampling
    o Chemical analysis

According to this view, the following working groups will be created first:

- WG 1 – Terms and definitions
- WG 2 – Classification and designation
- WG 3 – Packing, transport, storage and delivery conditions

The technical committee is expected to set priorities in terms of which metals and minerals to deal with as a matter of short, middle or longer-term planning.

Rare Earth

Rare earth elements are included in the list of CRMs of the European Commission. They are a group of 17 metals used in various high-tech applications, such as automotive traction motors and wind turbines for which the European economy is a global manufacturing leader. Rare earth elements are not extracted in Europe. The insecurity of supply chains is a central topic of current debates in Europe. Several European experts have expressed an interested to establish an official European platform for exchange on standardization on rare earth.

For this reason, a new CEN/TC "Rare earth" has been established, based on a proposal from the German Standardization body, DIN, to mirror the existing ISO/TC 298 "Rare Earth" (led by China) and decide on the potential adoption of international standards as European standards or by joint develop new standards, serving as an exchange platform for discussion on ISO/TC 298 projects and their potential impact on European countries and stakeholders. The new CEN/TC possible structure will be composed by Working Groups dealing with Testing and Analysis, Elements Recycling and Sustainability and Traceability.

2. CONCLUSIONS

The analysis of the state of the art carried out in Treasure in terms of regulations and standards related to the recycling of automotive electronics depicted a fragmented framework. Even though few examples of attention to this topic can be identified at European and International level, **there is no mainly standardization activity focusing on the recovery of WEEE from automotive sector**, while this topic is becoming an increasingly important matter given needs emerging from the market and possible impact in terms of CRMs (as Treasure project is investigating).

In this context, UNI and other Treasure partners have organized the workshop *"Recycling Automotive Electronics: Exploring Legislative and Standardisation Gaps in the Context of the TREASURE Experience"*. It was held online on May 31st, 2023 and was aimed at presenting the current legislative and standardization framework relevant for the recycling of automotive electronics, while gathering feedbacks from the participants about their needs in the field and any existing standardization gaps.

Figure 7. Treasure workshop (source: UNI)

The workshop was attended by several relevant stakeholders, consisting particularly of companies operating along the entire automotive electronics value chain, but also researchers and standardization experts.

After the presentation of the Treasure project, the audience dived into the main results and perspectives of the analysis of recyclability carried out by MARAS B.V. and into the disassembly process developed by the Treasure project, by the University of Zaragoza.

UNI presented then the results of the state-of-the-art analysis (regulations and standardization mapping), focusing also on the state of the art about the critical raw materials (CRM). CUNA, UNI associated entity, gave some references about the standardization committees and working groups at European (CEN) and International (ISO) level dealing with future standardization activities related to the automotive sector.

In conclusion, WEEE Forum gave an overview of the WEEE directive as the main legislative document to be considered so far for the recovery of the electrical and electronic components.

After the workshop, a survey conducted among the participants confirmed that there is no specific regulations concerning vehicle electronics. However, the sector is undergoing a major transformation due to several factors, such as:

- the rise of electric vehicles (EVs) and autonomous driving (AD) technologies, which increase the demand for software and electronics components in the automotive industry,
- the COVID-19 pandemic and its aftermath, which have disrupted the production and distribution of automotive components, especially semiconductors,
- the intensifying regulation and competition in the global automotive market, which require automakers and suppliers to innovate and adapt quickly. These factors pose significant challenges and opportunities for the automotive industry and its supply chain.

Some of the strategies that automakers and suppliers can adopt to cope with the situation may be:

- collaborating with semiconductor manufacturers to secure long-term supply contracts and increase visibility and flexibility,
- investing in digital capabilities and platforms to enable faster and more efficient software development and integration,
- diversifying the sourcing and manufacturing of critical components to reduce dependence on a single region or supplier,
- exploring new business models and partnerships to capture the value of software and electronics in vehicles.

Regarding Critical Raw Materials (CRM) management, participants were asked how standardization can support the business. The most important inputs collected showed that standardization may support CRM management in several ways, such as:

- enhancing customer satisfaction and loyalty by delivering personalized and relevant messages and offers
- reducing marketing costs and waste by avoiding errors and duplicates in data and campaigns
- increasing sales performance and revenue by enabling better segmentation, targeting, and forecasting of customer needs and behaviors
- facilitating compliance with regulations and standards by ensuring data accuracy and traceability.

To achieve standardization in CRM management, some steps to be followed may be:

- auditing and evaluating your current data collection and analysis methods,
- removing clutter and irrelevant data from your database,
- defining your CRM data standards and rules for different fields and formats,
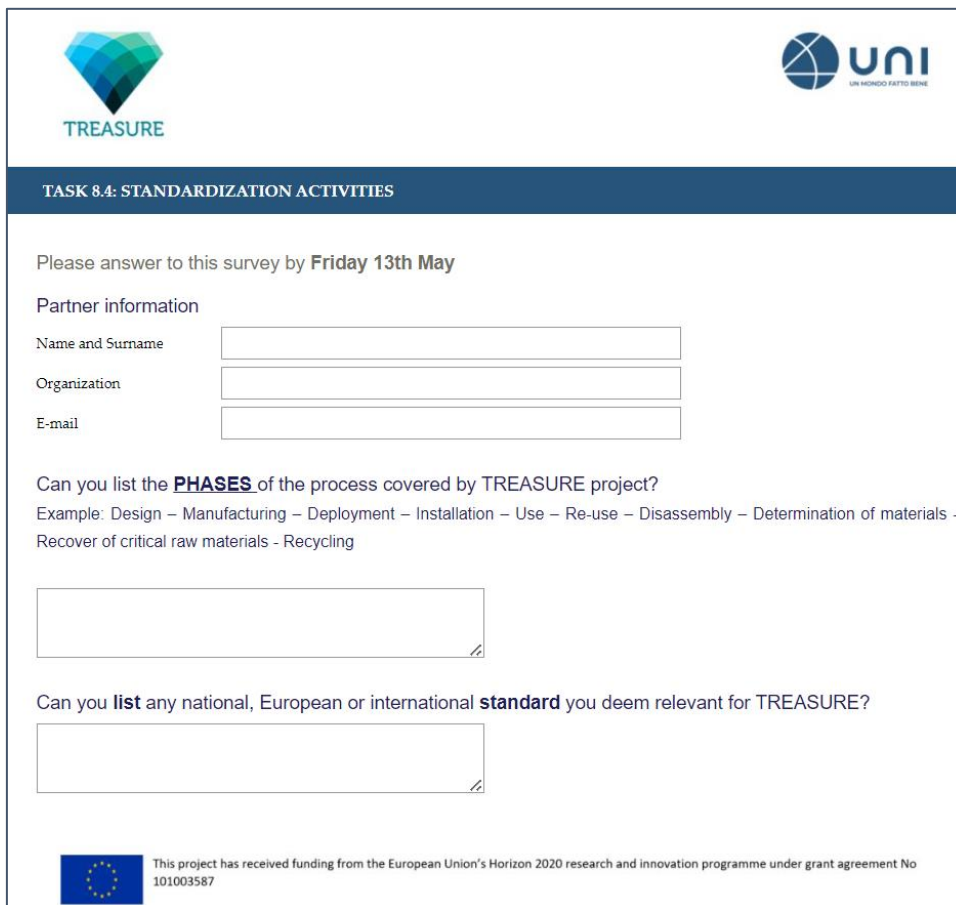- standardizing your data using tools or software that can automate the process.

Finally, the high uncertainty on the digital product passport and how companies can track their raw materials have been reported as critical aspects for the stakeholders.

Based on all these inputs, UNI is exploring with all the Treasure partners which may be the best way to translate the main project results into a new pre-standardization document, CEN Workshop Agreement (CWA). Updates on this side will be presented in the final Deliverable D8.5 Strategic Standardization Roadmap.

3. ANNEX 1

Survey developed by UNI to collect feedbacks for the standards mapping.

https://it.surveymonkey.com/r/TreasureProject

4. ANNEX 2

STANDARD REFERENCE	TITLE	STATUS
EN 62542:2013	Environmental standardization for electrical and electronic products and systems - Glossary of terms	Current
EN IEC 62430:2019	Environmentally conscious design (ECD) - Principles, requirements and guidance	Current
prEN IEC 63372	Quantification and communication of Carbon FootPRINT and GHG emission reductions/avoided emissions from electric and electronic products and systems – Principles, methodologies, requirements and guidance	Work in progress
EN 50693:2019	Product category rules for life cycle assessments of electronic and electrical products and systems	Current
prEN IEC 63366:2023	Product category rules for life cycle assessment of electrical and electronic products and systems.	Work in progress
EN 50625-1:2014	Collection, logistics & Treatment requirements for WEEE - Part 1: General treatment requirements	Current
CLC/TS 50625-3-1:2015	Collection, logistics & treatment requirements for WEEE - Part 3-1: Specification for de-pollution - General	Current
CLC/TS 50625-4:2017	Collection, logistics & treatment requirements for WEEE - Part 4: Specification for the collection and logistics associated with WEEE	Current
CLC/TS 50625-5:2017	Collection, logistics & Treatment requirements for WEEE - Part 5: Specification for the final treatment of WEEE fractions - Copper and precious metals	Current
EN IEC 62321-2:2021	Determination of certain substances in electrotechnical products - Part 2: Disassembly, disjointment and mechanical sample preparation	Current
EN 50581:2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances	Current
EN IEC 63000:2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances	Current
EN 62321-1:2013	Determination of certain substances in electrotechnical products - Part 1: Introduction and overview	Current
prEN IEC 62321-10:2020	Determination of certain substances in electrotechnical products - Part 10: Polycyclic aromatic hydrocarbons (PAHs) in polymers and electronics by gas chromatography-mass spectrometry (GC-MS)	Work in progress
prEN IEC 62321-11:2022	Determination of certain substances in electrotechnical products - Part 11: Tris (2-chloroethyl) phosphate (TCEP) in plastics by gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS)	Work in progress
prEN IEC 62321-12:2022	Determination of certain substances in electrotechnical products - Part 12: Simultaneous determination - Polybrominated biphenyls, polybrominated diphenyl ethers and phthalates in polymers by gas chromatography-mass spectrometry	Work in progress
prEN IEC 62321-13	Determination of certain substances in electrotechnical products - Part 13: Bisphenol A in plastics by liquid chromatography-diode array detection (LC-DAD), liquid chromatography-mass spectrometry (LC-MS) and liquid chromatography-tandem mass spectrometry (LC-MS/MS)	Work in progress
prEN IEC 62321-3-1	DETERMINATION OF CERTAIN SUBSTANCES IN ELECTROTECHNICAL PRODUCTS - Part 3-1: Elemental Screening by X-ray fluorescence spectrometry	Work in progress
prEN 50419:2021	Marking of electrical and electronic equipment (EEE) in respect to separate collection of waste EEE (WEEE)	Work in progress
EN 50419:2006	Marking of electrical and electronic equipment in accordance with Article 11(2) of Directive 2002/96/EC (WEEE)	Current
EN IEC 62474:2019	Material declaration for products of and for the electrotechnical industry	Current

EN IEC 62474:2019/A1:2021	Material declaration for products of and for the electrotechnical industry	Current
EN 50614:2020	Requirements for the preparing for re-use of waste electrical and electronic equipment	Current
prEN 50614	Requirements for the preparing for re-use of waste electrical and electronic equipment	Work in progress
IEC 60300-3-3:2017	Dependability management - Part 3-3: Application guide - Life cycle costing	Current
UNI EN ISO 15663:2021	Petroleum, petrochemical and natural gas industries - Life cycle costing	Current
UNI EN ISO 19008:2018	Standard cost coding system for oil and gas production and processing facilities	Current
ISO 15686-5:2017	Buildings and constructed assets — Service life planning — Part 5: Life-cycle costing	Current
AS/NZS 4536:1999	Life cycle costing — An application guide	Current
ISO/FDIS 20468-8 ed.1-id.77418	Guidelines for performance evaluation of treatment technologies for water reuse systems — Part 8: Evaluation of treatment systems based on life cycle cost	Work in progress
ISO/TS 50044:2019	Energy saving projects (EnSPs) — Guidelines for economic and financial evaluation	Current
VDI 2343 (part 1-7)	Recycling of electrical and electronical equipment	Current
UNI EN ISO 14001:2015	Environmental management systems - Requirements with guidance for use	Current
ISO 10303-44:2019	Industrial automation systems and integration — Product data representation and exchange — Part 44: Integrated generic resource: Product structure configuration	Current
UNI CEI EN 45554:2020	General methods for the assessment of the ability to repair, reuse and upgrade energy-related products	Current
UNI CEI EN 45555:2020	General methods for assessing the recyclability and recoverability of energy-related products	Current
IPC-257 (series)	Product Data eXchange standard	Current
ISO/DTR 59032.2	Circular economy - Review of business model implementation	Work in progress
ISO/WD 59040	Circular Economy — Product Circularity Data Sheet	Work in progress
ISO/CD TR 59031	Circular economy – Performance-based approach – Analysis of cases studies	Work in progress
ISO/CD 59004	Circular Economy – Terminology, Principles and Guidance for Implementation	Work in progress
ISO/PWI TR 59033	Efficient use and management of resources in the circular economy - Good practices for replicability	Work in progress
ISO/CD 59020	Circular Economy — Measuring and assessing circularity	Work in progress
ISO/CD 59010	Circular Economy — Guidance on the transition of business models and value networks	Work in progress
EN ISO 14020:2001	Environmental labels and declarations - General principles	Current
EN ISO 14040:2006	Environmental labels and declarations - General principles	Current
EN ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines	Current

EN ISO 14015:2010	Environmental management - Environmental assessment of sites and organizations (EASO)	Current
EN ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations - Principles and procedures	Current
EN ISO 14051:2011	Environmental management - Material flow cost accounting - General framework	Current
EN ISO 14045:2012	Environmental management - Eco-efficiency assessment of product systems - Principles, requirements and guidelines	Current
EN ISO 14004:2016	Environmental management systems - General guidelines on implementation	Current
EN ISO 14064-1:2019	Greenhouse gases - Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals (ISO 14064-1:2018)	Current
EN ISO 14064-2:2019	Greenhouse gases - Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements (ISO 14064-2:2019)	Current
EN ISO 14064-3:2019	Greenhouse gases - Part 3: Specification with guidance for the verification and validation of greenhouse gas statements (ISO 14064-3:2019)	Current
EN ISO 14021:2016	Environmental management - Water footprint - Principles, requirements and guidelines (ISO 14046:2014)	Current
EN ISO 14046:2016	Environmental management - Water footprint - Principles, requirements and guidelines	Current
CEN ISO/TS 14071:2016	Environmental management - Life cycle assessment - Critical review processes and reviewer competencies: Additional requirements and guidelines to ISO 14044:2006	Current
EN ISO 14067:2018	Greenhouse gases - Carbon footprint of products - Requirements and guidelines for quantification	Current
EN ISO 14044:2006/A1:2018	Environmental management - Life cycle assessment - Requirements and guidelines - Amendment 1 (ISO 14044:2006/Amd 1:2017)	Current
EN ISO 14024:2018	Environmental labels and declarations - Type I environmental labelling - Principles and procedures	Current
EN ISO 14006:2020	Environmental management systems - Guidelines for incorporating ecodesign	Current
CEN ISO/TS 14027:2018	Environmental labels and declarations - Development of product category rules	Current
EN ISO 14034:2018	Environmental management - Environmental technology verification (ETV)	Current
EN ISO 14052:2018	Environmental management - Material flow cost accounting - Guidance for practical implementation in a supply chain	Current
EN ISO 14065:2021	General principles and requirements for bodies validating and verifying environmental information (ISO 14065:2020)	Current
EN ISO 14026:2018	Environmental labels and declarations - Principles, requirements and guidelines for communication of footprint information	Current
EN ISO 14090:2019	Adaptation to climate change - Principles, requirements and guidelines	Current
EN ISO 14005:2019	Environmental management systems - Guidelines for a flexible approach to phased implementation	Current
EN ISO 14050:2020	Environmental management - Vocabulary (ISO 14050:2020)	Current
EN ISO 14040:2006/A1:2020	Environmental management - Life cycle assessment - Principles and framework - Amendment 1 (ISO 14040:2006/Amd 1:2020)	Current
EN ISO 14044:2006/A2:2020	Environmental management - Life cycle assessment - Requirements and guidelines - Amendment 2 (ISO 14044:2006/Amd 2:2020)	Current

EN ISO 14091:2021	Adaptation to climate change - Guidelines on vulnerability, impacts and risk assessment	Current
EN ISO 14008:2020	Monetary valuation of environmental impacts and related environmental aspects	Current
EN ISO 14063:2020	Environmental management - Environmental communication - Guidelines and examples	Current
EN ISO 14021:2016/A1:2021	Environmental labels and declarations - Self-declared environmental claims (Type II environmental labelling) - Amendment 1: Carbon footprint, carbon neutral (ISO 14021:2016/Amd 1:2021)	Current
EN ISO 14007:2020	Environmental management - Guidelines for determining environmental costs and benefits	Current
EN ISO 14002-1:2020	Environmental management systems - Guidelines for using ISO 14001 to address environmental aspects and conditions within an environmental topic area - Part 1: General	Current
EN ISO 14031:2021	Workplace exposure - Quantitative measurement of airborne endotoxins.	Current
EN ISO 14005:2019	Environmental management systems - Guidelines for the phased implementation of an environmental management system, including the use of environmental performance evaluation (ISO/FDIS 14005:2010)	Work in progress
EN ISO 14024:2018	Environmental labels and declarations - Type I environmental labelling - Principles and procedures - Amendment 1 (ISO 14024:1999/DAM 1:2015)	Work in progress
FprEN ISO 14015	Environmental management - Guidelines for environmental due diligence assessment (ISO/FDIS 14015:2022)	Work in progress
prEN ISO 14020	Environmental statements and programmes for products - Principles and general requirements (ISO/DIS 14020:2022)	Work in progress
prEN ISO 14002-2	Environmental management systems - Guidelines for using ISO 14001 to address environmental aspects and conditions within an environmental topic area - Part 2: Water (ISO/DIS 14002-2:2022)	Work in progress
EN ISO 14050:2020/Damd	Environmental management - Vocabulary (ISO 14050:2020)	Work in progress
ISO CD 59014	Secondary materials — Principles, sustainability and traceability requirements	Work in progress

5. ABBREVIATIONS

CEN	CEN, the European Committee for Standardisation, is an association that brings together the National Standardisation Bodies of 34 European countries. CEN provides a platform for the development of European Standards and other technical documents in relation to various kinds of products, materials, services and processes. CEN supports standardisation activities in relation to a wide range of fields and sectors including: air and space, chemicals, construction, consumer products, defence and security, energy, the environment, food and feed, health and safety, healthcare, ICT, machinery, materials, pressure equipment, services, smart living, transport and packaging.
CENELEC	CENELEC, the European Committee for Electrotechnical Standardisation, is an association that brings together the National Electrotechnical Committees of 34 European countries CENELEC prepares voluntary standards in the electrotechnical field, which help facilitate trade between countries, create new markets, cut compliance costs and support the development of a Single European Market. CENELEC supports standardisation activities in relation to a wide range of fields and sectors including: Electromagnetic compatibility, Accumulators, primary cells and primary batteries, Insulated wire and cable, Electrical equipment and apparatus, Electronic, electromechanical and electrotechnical supplies, Electric motors and transformers, Lighting equipment and electric lamps, Low Voltage electrical installations material, Electric vehicles railways, smart grid, smart metering, solar (photovoltaic) electricity systems, etc.

CWA	A CEN Workshop Agreement is an agreement, developed and approved by an open independent workshop structure within the framework of the CEN-CENELEC system. The CEN Workshop Agreement reflects the agreement of the registered participants responsible for its content, who decided to develop this document in accordance with the specific rules and practices available in CEN-CENELEC for the development and approval of CEN/CENELEC Workshop Agreements.
ETSI	European Telecommunications Standards Institute
IEC	International Elechtrotecnical Commission. The IEC is a global, not-for-profit membership organization that brings together more than 170 countries and coordinates the work of 20 000 experts globally.
ISO	International Organisation for Standardisation. The International Organization for Standardisation is an international standard development organization composed of representatives from the national standards organizations of member countries. Membership requirements are given in Article 3 of the ISO Statutes.
ITU	International Telecommunication Union
SDGs	Sustainable Development Goals (United Nations)
TC	Technical committees are the responsible for developing standards.
WEEE	Waste Of Electrical And Electronical Equipment
WEEE Forum	Waste Of Electrical And Electronical Equipment Forum Aisbl
WG	Work Group
WP	Work Package

6. REFERENCES

[1] https://www.som.polimi.it/en/announcing-the-start-of-the-treasure-project/

[2] https://environment.ec.europa.eu/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en

[3] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13420-Waste-from-electrical-and-electronic-equipment-evaluating-the-EU-rules_en

[4] https://environment.ec.europa.eu/topics/waste-and-recycling/end-life-vehicles_en

[5] https://environment.ec.europa.eu/publications/proposal-regulation-circularity-requirements-vehicle-design-and-management-end-life-vehicles_en

[6] https://environment.ec.europa.eu/topics/waste-and-recycling/end-life-vehicles/end-life-vehicles-regulation_en

[7] https://rmis.jrc.ec.europa.eu/uploads/crm-report-on-critical-raw-materials_en.pdf

[8] https://www.mdpi.com/2071-1050/15/2/1405

[9] https://op.europa.eu/en/publication-detail/-/publication/d1be1b43-e18f-11e8-b690-01aa75ed71a1

[10] https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1661

[11] https://www.pubblicazioni.enea.it/le-pubblicazioni-enea/edizioni-enea/anno-2023/il-problema-delle-materie-prime-critiche-per-la-transizione-ecologica.html

[12] https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/critical-raw-materials-act_it#overview-of-the-critical-raw-materials-act

[13] https://circabc.europa.eu/rest/download/7ce37e41-1d9a-4f96-a24b-4f89207700bf

[14] https://www.cencenelec.eu/news-and-events/news/2023/brief-news/2023-06-27-policy-opinion-critical-raw-materials-act/#:~:text=CEN%20and%20CENELEC%20welcome%20the%20European%20Commission%E2%80%98s%20proposal,protection%29%20and%20the%20EU%20external%20policies%20on%20CRMs.

[15] Circthread Deliverable 9.1 "Standardisation Toolkit V1 Online Interactive Tool & Report"

[16] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:316:0012:0033:EN:PDF

[17]https://standards.cencenelec.eu/dyn/www/f?p=305:7:0:25:::FSP_ORG_ID,FSP_LANG_ID:1258637

[18]https://standards.cencenelec.eu/dyn/www/f?p=205:7:0::::FSP_ORG_ID:6282&cs=143E88F87F7332721DB845C9598BE20D0

[19] https://www.iso.org/committee/46706.html

[20] https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials_en