



SUSTAINABLE
RECYCLING
INDUSTRIES

The ISO 59014 standard



STUDY ON THE POSITIONING OF ISO 59014
IN RELATION TO INTERNATIONAL WEEE
MANAGEMENT STANDARDS

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Acronyms

BC	Basel Convention
BSI	British Standard International
CEN	European Committee for Standardization
CoC	Code of Conduct
CRT	Cathode Ray Tube
Empa	Swiss Federal Institute for Materials Science and Technology
EPR	Extended Producer Responsibility
ISEAL	International Social and Environmental Accreditation and Labelling Alliance
ISO	International Organization for Standardization
FM	Focus Material
IWA	International Workshop Agreement (by ISO)
JWG	Joint Working Group
LCA	Life Cycle Assessment
PCB	Polychlorinated Biphenyl
PWB	Printed Wiring Board
R2	Reuse. Recycle (R2 standard)
S-LCA	Social Life Cycle Assessment
SA	Subsistence activity
SC	Special Committee
SECO	State Secretariat of Economic Affairs
SERI	Sustainable Electronics International
SMS	Stewardship Management System (e-stewards)
SNV	Swiss Association for Standardization
SRI	Sustainable Recycling Industries
TC	Technical Committee
UNU	United Nations University
WEEE	Waste Electrical and Electronic Equipment
WEEELABEX	WEEE Label of Excellence
WRF	World Resources Forum
WRFA	World Resources Forum Association

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Executive summary

ISO 59014, published in 2024, is a sustainability-focused standard that establishes principles, requirements, and guidance for the responsible handling of secondary raw materials. Developed through a multi-stakeholder approach, it supports the transition to a circular economy by ensuring that materials are recovered in an environmentally and socially responsible manner.

This study focuses on the case of WEEE management. It compares ISO 59014 with three international WEEE-related standards:

- » **CEN 50625** (European Standard): This standard focuses on material recovery, depollution, and operational compliance within Europe. While it emphasizes traceability, it does not incorporate broader sustainability principles like life cycle assessment or social responsibility.
- » **R2v3** (Responsible Recycling Standard): A global standard prioritizing environmental health, reuse, and worker safety, however, it lacks a structured approach to social impact considerations and does not fully implement traceability across the material chain.
- » **e-Stewards**: This is designed to prevent unethical WEEE disposal. This standard enforces strict controls on hazardous materials and prohibits exports to developing countries. While robust, its restrictive framework focuses more on compliance than on the broader sustainability principles outlined in ISO 59014.

A key distinction of ISO 59014 is its holistic emphasis on sustainability. Unlike other standards in this sector, ISO 59014 does not replace but serves as a framework that integrates life cycle assessment (LCA), circular economy perspective, traceability, ethical labor practices, and inclusivity, explicitly acknowledging the role of workers engaged in subsistence activities¹ within the recycling chain. The standard seeks to ensure non-destructive recovery processes, ethical handling of materials, broader stakeholder engagement and improved material traceability throughout the value chain upstream and downstream, promoting transparency and accountability. Ultimately, ISO 59014 bridges the gap between environmental responsibility, social impact, and efficient material recovery.

Keywords:

[e-waste; WEEE; R2; CEN 50625 series; e-stewards; Waste Electrical and Electronic Equipment; standardisation; subsistence activities; informal sector; ISO]

1) A distinction was made between 'individuals in subsistence activities' and 'informal workers' or 'informal sector' and agreement was reached not to use these terms synonyms. No consensus exist on the definition of 'informal sector' or 'informal workers' tending to have a negative connotations. Hence, the ISO standard decided to establish the use of 'individuals/workers engaged in subsistence activities'.

1 Introduction

1.1 Motivation

Sustainability in the management of secondary raw materials has become a key challenge for ensuring the future supply of raw materials for industry and society. Achieving this requires a shift from a linear to a circular economy approach. ISO standards can play a central role in the global harmonization of economic activities. The ISO 59000 family of standards aligns with the objectives of a circular economy and provides the framework for future economic development.

In 2024, the ISO 59014 standard was published as the result of a multi-stakeholder development and co-creation process. This new standard addresses the sustainability and traceability of secondary raw materials by defining principles, requirements and recommendations. It is intended to contribute to closing the cycles of materials in a sustainable way and to equally address all parties involved in the recycling of materials. For the first time in the history of an ISO standard, this standard provides guidance for individuals in the subsistence economy and for organizations that engage with individuals in subsistence activities.

In the context of implementing the ISO 59014 standard, the question on dissemination and application of the standard arises. Taking as an example the case of Waste Electrical and Electronic Equipment (WEEE), the aim of this report is to clarify in which areas and for what type of organizations the application of the new standard could be focused on and how it could be positioned in relation to existing international standards on WEEE management.

1.2 Study questions

Two main questions were addressed in this report:

- a) How will the ISO 59014 standard complement existing international WEEE standards, or overlap with them?
- b) What benefits would companies have when they implement ISO 59014, if they already have certifications on one of the mentioned international WEEE standards?

1.3 Scope of the study

The study covers the ISO 59014:2024 standard and the following three international WEEE standards: CEN 50625 series, R2v3:2020 and e-stewards v4.1:2022 (see Table 1).

The following standards which are related to some extent to the approach and concept of the ISO 59014 standard, were also examined. However, it was ultimately decided not to include them in the comparison:

- » **BSI 8001:2017:** Framework for implementing the principles of the circular economy in organizations – Guide
- » **EN 45555:2019:** General methods for assessing the recyclability and recoverability of energy-related products
- » **E-stewards:2023:** The e-Stewards® Standard for Ethical and Responsible Repair, Refurbishment, and Reuse of Electronic Equipment and Information Technology (e-Stewards Repair Standard V1.0)

The British Standard on Circular Economy **BSI 8001:2017** is designed to cater to organizations with differing levels of understanding of the circular economy – from those starting out to those more advanced in their thinking and wanting to review, sense or check their approach. ISO 59014 has a strong emphasis on recovering recoverable resources in a reverse supply chain based on life cycle and social assessments. The orientation of the two standards is rather different. For this difference in the orientation, BSI 8001:2017 was excluded from the comparison.

The **EN 45555:2019** standard is a method-oriented standard which is addressing energy related products. It therefore covers a small spectrum and cannot be compared with the holistic claim of ISO 59014.

The e-Stewards Repair Standard **E-stewards:2023** is closely related to the one considered in the study. The e-Stewards Repair standard is specifically designed for the subset of the ITAD (IT assets disposition) industry that does not engage themselves in the recycling or materials recovery of electronic equipment but is rather focused on repair, refurbishing, and resale/donation of IT equipment. With a similar reasoning as with BS 8001, we concluded that the e-Stewards Repair Standard is too specific and can be excluded from the comparison given that the main e-Steward Standard is considered.

Table 1: Overview on the international WEEE standards compared

Standard	Title	Publisher	Product scope	Geographical scope	No. of certified companies
ISO 59014: 2024 (in the text: ISO 59014)	Environmental management and circular economy – Sustainability and traceability of the recovery of secondary materials – Principles, requirements and guidance	International Standardization Organization (ISO)	Recoverable resources	Global	N/A
CEN 50625 series (in the text: CEN 50625)	CEN 50625-1:2014: Collection, logistics and Treatment requirements for WEEE - General treatment requirements CLC/TS 50625-4:2017: Specification for the collection and logistics associated with WEEE	European Committee for Standardization (CEN)	WEEE	Europe	437* (March 25)
R2v3:2020 (in the text: R2)	The Sustainable Electronics Reuse and Recycling (R2) Standard	Sustainable Electronics International (SERI)	WEEE	Global	1'245** (Dec 24)
e-stewards_v4.1:2022 (in the text: e-stewards)	The e-stewards Standard for Ethical and Responsible Reuse, Recycling of Electronic Equipment and Information Technology	Basel Action Network (BAN)	WEEE	United States	110*** (March 25)

* WEEELABEX certified operators (see: www.WEEELabex.org); ** source: IERC25 Salzburg: Presentation Mike Easterbrook; *** excl. drop-off sites (out of 110, 107 sites are in the U.S.A.)

2) Recoverable resource – resource that can be recovered and used again after it has already been processed or used (ISO 59014:2024)

2 ISO 59014

2.1 History and context

In May 2021, initiated by the Swiss funded Sustainable Recycling Industries (SRI) program, the Joint ISO/TC 323 on Circular Economy and TC207/SC5 on Environmental Management / Life Cycle Assessment working group 14 (JWG 14) started the development of the ISO 59014 standard “Sustainability and traceability of the recovery of secondary materials — Principles, requirements and guidance” as part of the ISO circular economy family of standards. The coconvenors were Dr. Sonia Valdivia from the World Resources Forum Association (WRFA) Switzerland and Berty Malabar from B.E.M. Recycling Mauritius. After a 3 years and 4 months process, the standard was published on October 1, 2024.

The standard builds upon the ISO International Workshop Agreement (IWA) No. 19 “Guidance principles for the sustainable management of secondary metals”, published in April 2017. For the first time in history, ISO included aspects of subsistence activities in both, ISO/IWA 19 and ISO 59014. ISO 59014 expands the scope to secondary materials in general and emphasises on the importance of maintaining the functional value of objects, devices and components through the application of non-destructive processes.

2.2 Scope and objectives

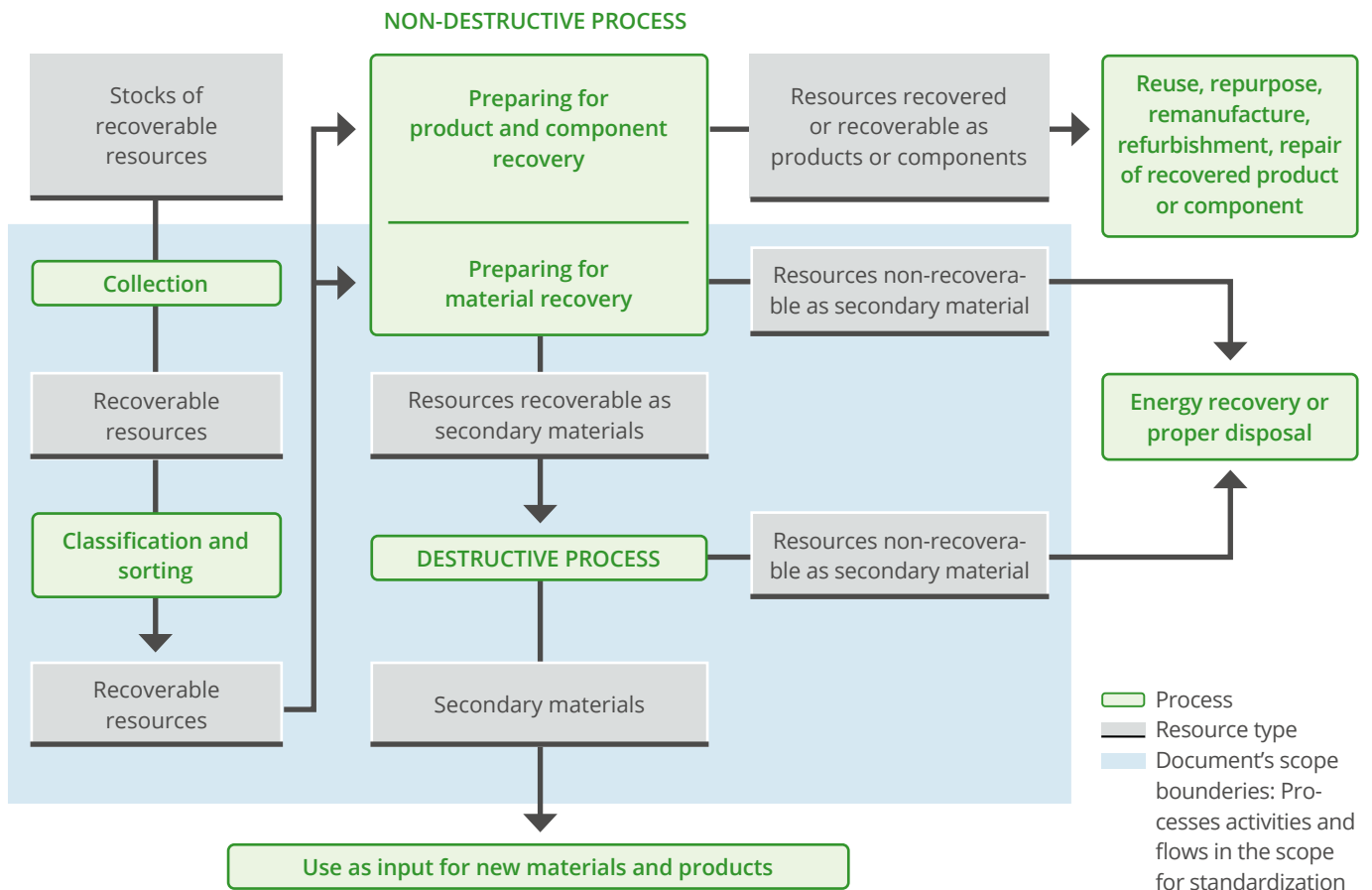
ISO 59014 provides principles, requirements and guidance for organizations in fostering the sustainability and traceability of activities and processes for the recovery of secondary materials. It specifies requirements and provides guidance for organizations that engage with individuals involved in subsistence activities (SAs) as part of their activities and processes for the recovery of secondary materials, with the aim of ensuring safe and healthy working conditions and the continual improvement of the well-being and professional practices of those individuals.

The preparation and processing of products or components for their reuse or reprocessing (e.g. for repurposing, remanufacturing, refurbishment and repair), and the energy recovery and disposal are outside the scope of ISO 59014. However, sorting and classification for sending the products, components or materials to these mentioned processes is within the scope. ISO 59014 is – in contrast to the WEEE standards in comparison – not a technical standard. It does not define technical criteria and quantitative targets along the value chain, as for example collection, recycling and recovery targets or limit values in target fractions. It emphasizes on the organizational and operational sphere of influence on the sustainable management of secondary materials.

2.3 Structure

ISO 59014 covers activities and processes related to the recovery of secondary materials which includes the collection of recoverable resources, classification, sorting, and non-destructive and destructive processes as illustrated in Figure 1.

Figure 1: Activities and processes for recovering secondary materials – simplified (Source: ISO 59014:2024)



2.4 Requirements

ISO 59014 distinguishes operational (chapter 6), organizational (chapter 7) and traceability requirements (chapter 8).

2.4.1 Operational requirements

General (subclause 6.1)

A fundamental requirement is that organizations shall identify criteria for secondary materials to be recovered following aspects of quality and function with the best environmental and social outcome. This shall be referred from documented studies which follow a life cycle perspective which at least include energy consumption and resource scarcity aspects. If such studies do not provide the desired information, own Life Cycle Assessment (LCA) studies based on ISO standards shall be considered. Considering continual improvement, quantitative and qualitative targets for secondary materials to be recovered shall be identified.

Classification and determination of recovery pathways (subclause 6.2)

Based on an established, documented and maintained list of attributes relevant to recoverable resources, organizations shall determine recovery pathways and processes based on methodology provided in the standard (Annex B) or alternatively using one based on a life cycle perspective or LCA studies in accordance with the ISO standards. Decisions on the selected recovery pathway need to be documented as well as a list of any relevant changes to the recoverable resources handled and the activities and processes applied.

Collection (subclause 6.3)

Organizations shall support the separate collection of recoverable resources and

support measures to facilitate the return or collection of recoverable resources.

According to the standard this requirement only applies if the organization operates a collection system or is part of such a system³.

Sorting (subclause 6.4)

The standard distinguishes between recoverable resources and those non-recoverable as secondary materials. Organizations shall recover resources based on identified attributes and available traceability data. The subclause also outlines aspects regarding sorting technologies and practices, along with the subsequent treatment steps.

Recoverable resources as products, components or materials should be directed to non-destructive processing or to organizations which handle these resources for reuse, repairing, refurbishing or remanufacturing.

Resources non-recoverable as secondary materials shall be sent to energy recovery or proper disposal at authorized organizations.

Material recovery processes (subclause 6.5)

The processes applied for the recovery of secondary materials shall be done by operating an adequate infrastructure, technology and processes. The selection between non-destructive and destructive processes shall focus on maximizing the quantity and fulfilling the defined quality criteria of the material recovered with the best environmental and social outcome. The latter should be based upon publicly available studies applying a life cycle perspective or on an LCA done by the organization.

Depollution processes shall be done in a way that the release of substances or mixtures to the environment are prevented without applying the concept of dilution.

Logistics (subclause 6.6)

Handling, transport and storage of recoverable resources shall be done in a way that facilitates the recovery as product, component or material ensuring a best environmental outcome using adequate transport, storage, packaging methods and packaging materials.

2.4.2 Organizational requirements

Monitoring and evaluation (subclause 7.1)

A monitoring and evaluation plan shall be established, maintained and implemented regarding among others:

- » Issues and risks relevant to the recovery of secondary materials based upon fulfilling the requirements of the standard,
- » the application of the code of conduct agreed upon between the organization and its suppliers,
- » information about interested parties and their relevant requirements,
- » performance against targets, and
- » traceability data.

Interested party engagement (subclause 7.2)

Cooperation and communication with interested parties which are affected

3) This might include pick-up of materials.

by or can potentially influence its operations are key requirements in the standard. A continuously monitored collaborative structure should facilitate the inclusion of supplier(s), customer(s) and other organizations involved in the collection, classification, sorting, processing, transport and logistics (including business-to-consumers, business-to-business and individuals in subsistence activities) and other interested parties.

Responsibility towards the value chain (subclause 7.3)

Organizations "...shall develop or adhere to a value chain code of conduct..." which includes ethical behavior, traceability aspects and responsible practices for achieving the quality and targets expected of the secondary material to be recovered. The considerations of the code of conduct (CoC) shall be incorporated in any type of agreement with value chain partners.

The CoC should set among other priorities for reuse before secondary material recovery and emphasize labour practices and standards e.g. on child labour laws, anti-discrimination practices, health and safety standards, working conditions, working hours, compensation, right to association and freely chosen employment, climate change mitigation measures, anti-corruption measures and fair business practices.

Responsibility towards individuals engaged in subsistence activities (subclause 7.4)

Organizations engaging or intending to engage with individuals working in subsistence activities (SA) shall create an enabling environment for collaborative work addressing their specific needs and interests regarding their well-being and livelihoods and their continuous improvement. **This requirement only applies if the organization is engaged or intends to engage with individuals working in subsistence activities.**

Equitable working conditions (subclause 7.5)

Organizations shall establish decent working conditions, prevent child labour, forced labour harassment and any form of discrimination with a specific focus on vulnerable and disadvantaged workers, women and individuals involved in SA. Freedom of association and the right to collective bargaining shall be ensured in any case. Safety and occupational health aspects shall encompass free provision of personal protective equipment, toilets and sanitary facilities and specific safety and health measures and infrastructure for pregnant workers and workers who have recently given birth or are breastfeeding.

Environmental and social risks (sub sub-7.6.1)

Organisations shall identify social and environmental risks and impacts and address them by developing protocols to prevent, reduce or control them. A communication plan addressing interests and concerns of interested parties shall be put in place

Harmful substances or harmful practices are to be removed if these cannot be properly managed. Otherwise, practices shall be improved to make them safer. Activities and processes for recovering secondary materials should not increase risks of environmental harm arising from the release of hazardous substances.

Health and safety risks of workers and individuals involved in SA (sub subclause 7.6.2)

The organization shall consider and communicate of health and safety risks, develop protocols for prevention, reduction and control risks. **This requirement applies for own workers and if the organization is engaged or intends to engage with individuals working in subsistence activities.**

Resource use (subclause 7.7)

The organisation shall identify opportunities to minimize resource use and implement corresponding measures, e.g. considering replacement and substitution of scarce materials, non-renewable with renewable resources, minimizing energy and fuel use etc. based on a life cycle perspective.

Operational and managerial competences (sub subclause 7.8.1)

The organisation shall determine and assess the necessary managerial and operational competences of individuals for work under its control that affects the performance and effectiveness of its activities and processes. Training needs to be provided where needed.

Training needs (sub subclause 7.8.2)

The organisation shall identify of training needs for anyone with whom it engages – including individuals engaged in SA – and plan and conduct training in the areas of need.

2.4.3 Traceability requirements**General (subclause 8.1)**

The organization shall develop and implement a traceability system on products, components and materials handled and make publicly available a relevant policy.

Collection of upstream data (subclause 8.2)

Upstream data shall include among others confirmation of compliance with CoC from the organizations in its value chain, the sorting attributes and indication of recoverable resources that have completed the appropriate stage identified for non-destructive or destructive processes.

Collection of processing data (subclause 8.3)

Processing data shall be preferably categorized by input and output data, and percentage of input routed towards different recovery pathways and shall include information on activities and processes applied including depollution.

Collection of downstream data (subclause 8.4)

The percentage of the total amount of outputs routed towards different clients and recovery pathways or energy recovery or proper disposal shall be retrieved, classifying types of products, components or materials according to a classification system (e.g. United Nations University (UNU) key code for electronic waste).

Collection of depollution data (subclause 8.5)

Recoverable resources shall be accompanied by information on removed materials, substances or mixtures, presence of declared hazardous substances when receiving from upstream or delivering downstream. Related information forwarded with the recoverable resources downstream shall document the removed components, materials, substances and mixtures and the routing for proper treatment for recovery, energy recovery or disposal.

Communication (subclause 8.6)

Relevant requirements for implementation of the traceability system applied shall be made available effectively across all relevant interested parties, including workers and suppliers with whom the organization has contractual relationships.

Traceability data shall be made available to the organization's immediate downstream and upstream organizations who can require it whereby collaboration with all direct suppliers and other organizations involved in collection, processing and delivery of the materials, components or products is needed.

Continual improvement (chapter 8.7)

Regular reviews of the effectiveness of the traceability system shall be conducted by the organizations, any aspect revised if found to be ineffective, and enhancements towards continual improvement implemented.

2.5 Key features of the ISO 59014 standard

2.5.1 Early-stage decisions based on best social and environmental outcome

Classification and sorting of resources, and determination of best recovery pathway

A major focus of ISO 59014 is on the environmentally and socially responsible handling of recoverable resources, which need to be collected, sorted and channeled into appropriate recovery and disposal routes. The determination of environmentally and socially responsible handling shall be based on criteria that follow quality and functional aspects and that are based on documented studies which apply a lifecycle perspective. Where these are lacking, efforts must be made to conduct investigations based on the requirements of the standard or on the company's own life cycle assessments.

With this approach, the standard places a strong emphasis on the collection system, where decisions for a certain recovery pathway are made, strongly influencing the likelihood (strong or weak) of recovering product, components or materials and the corresponding environmental and social impact.

Non-destructive processes over destructive processes for increasing recovery potential

Based on defined quality and quantity criteria, decisions about the processes to be applied shall also be based on the best social and environmental outcome. When it comes to managing recoverable resources, non-destructive processes shall have priority over destructive processes which increases the potential to prioritise product or component recovery (e.g. reuse), followed by material recycling. Here, too, the decision shall be based on publicly available studies or the organization's own LCA-based research.

2.5.2 Common values and inclusive engagement along the value chain

Interested party engagement and code of conduct along the value chain

Collaboration is a common goal for all players along the value chain are another important focus of the standard. A code of conduct with all organizations along the value chain should ensure inclusivity. It should, for example, prioritize reuse over recycling, ensure healthy and safe working conditions and rights of employees, include climate change mitigation measures, fair business practices and prevent child labor and discrimination.

Value recognition of labourers involved in subsistence activities

Organizations that work or aim to engage in the future with individuals in the field of subsistence activities shall provide an enabling environment for them and while working together with them, consider their needs and interests in relation to their well-being and livelihoods. This is a strong aspect in the standard and the first time that it is considered in an ISO standard.

2.5.3 Policy on traceability system

Upstream processing and depollution as well as downstream data collection is a basic requirement in all international WEEE standards. The ISO standard demands that the relevant requirements of the traceability system be made available to all interested parties, including employees and suppliers with whom the organization has a contractual relationship along the value chain.

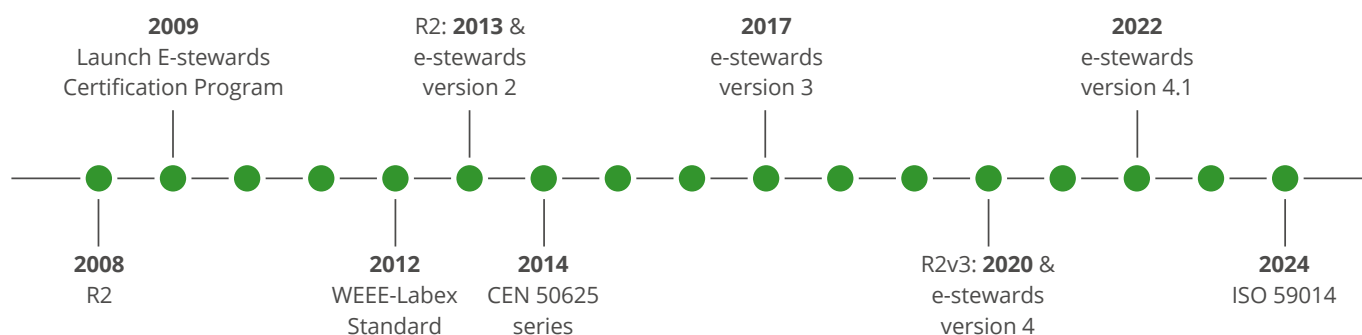
3 International WEEE standards

3.1 International WEEE standard development

Over the past 17 years, three different standards for the treatment of WEEE have been developed at an international level: CEN 50625, R2 and e-stewards (see Figure 2). These standards have been further developed over time and new versions have been published. Common to all standards is the optimization of the resource use of WEEE combined with the environmentally sound and safe handling of the hazardous components contained in WEEE. The main differences lie in the scope and depth of regulation when it comes to these hazardous substances. Out of the three standards included in the comparison, the e-stewards standard also focuses on the control of transboundary movement of WEEE.

Figure 2: Chronological development of the three international WEEE standards

For comparison with ISO 59014, the three standards are outlined below, along with their basic features and core requirements.



3.2 CEN 50625 series

3.2.1 History and context

Launched in 2009, coordinated by the European WEEE Forum and co-funded by the EU's LIFE+ program, the WEEELABEX⁴ Project was created to harmonize standards for the collection, storage, logistics, and treatment of WEEE, based on industry best practices. The project aimed at setting rules for a consistent and environmentally sound treatment of electronic waste across Europe. It emerged in response to the WEEE Directive (2002), which revealed significant disparities in waste treatment practices among EU member states.

By 2012, the project had produced a comprehensive set of requirements focused on environmental compliance, safe depollution, and traceability. To manage implementation, the WEEELABEX Organization was founded in 2011 as an independent, non-profit body responsible for certification and auditing. WEEELABEX laid the groundwork for the CEN 50625 series of standards which was published in 2014 and is since widely recognized as the state-of-the-art in WEEE management across Europe. Many compliance schemes require certification under CEN 50625, helping to professionalize the sector and ensure high-quality WEEE management. It is comprised as a series of standards and technical specifications (see Table 2).

4) WEEELABEX stands for WEEE Label of Excellence

3.2.2 Scope and objectives

CEN 50625 has the following objectives:

- » **Standardization of procedures and processes:** Definition on how electrical appliances should be treated in terms of their disposal and recycling to maximize material efficiency and environmental friendliness.
- » **Promoting a circular economy:** Promotion of practices that make it possible to recover secondary materials from old appliances and reduce the consumption of resources.
- » **Ensuring quality and safety:** Assurance that the disposal and recycling of electrical appliances is carried out in a way that protects human health and the environment.
- » **Adapting to new technologies:** Consideration of new technologies and methods in the recycling process.

3.2.3 Structure

CEN 50625 includes various standards and supplementary technical specifications that address various aspects of the collection, processing and disposal of electrical appliances, such as the definition of procedures for disassembly, the treatment of hazardous substances and the recovery of materials. These standards and specifications were issued in different years (see Table 2).

*Table 2: Overview on CEN 50625 series of standards
* Considered in this study*

Number	Title
CEN 50625-1:2014* (main standard)	Collection, logistics and treatment of waste electrical and electronic equipment (WEEE) – Part 1: General requirements for treatment
CEN 50625-2-1:2014	Requirements for the treatment of waste electrical and electronic equipment (WEEE) – Part 2-1: Requirements for the treatment of lamps
CEN 50625-2-2:2015	Collection, logistics and treatment of waste electrical and electronic equipment (WEEE) – Part 2-2: Requirements for the treatment of WEEE containing CRT and flat panel display modules
CEN 50625-2-3:2017	Collection, logistics and treatment of waste electrical and electronic equipment (WEEE) – Part 2-3: Requirements for the treatment of heat carriers and other waste electrical and electronic equipment containing VFC and/or VHC
CEN 50625-2-4:2017	Collection, logistics and treatment requirement for WEEE – Part 2-4: Treatment requirement for photovoltaic panels
CLC/TS 50625-3-1:2016	Collection, logistics and treatment requirement for WEEE – Part 3-1: Specification for depollution. General
CLC/TS 50625-3-2:2016	Collection, logistics and treatment requirement for WEEE – Part 3-2: Technical specification for depollution – Lamps
CLC/TS 50625-3-3:2017	Collection, logistics and treatment requirement for WEEE – Part 3-3: Technical specification for depollution. WEEE containing CRTs and FPDs
CLC/TS 50625-3-4:2017	Collection, logistics and treatment requirement for WEEE – Part 3-4: Technical specification for depollution. Temperature exchange equipment
CLC/TS 50625-3-5:2017	Collection, logistics and treatment requirement for WEEE – Part 3-4: Technical specification for depollution. Photovoltaic panels
CLC/TS 50625-4:2017*	Specification for the collection and logistics associated with WEEE
CLC/TS 50625-5:2017	Requirements for the collection, logistics and treatment of waste electrical and electronic equipment (WEEE) – Part 5: Specification for the final treatment of the fractions of waste electrical and electronic equipment

The standard CEN 50625-1:2014 and the technical specification CLC/TS 50625-4:2017 are considered the most relevant standards to reflect upon in a compar-

ison with ISO 59014. The other standards and technical specifications refer to specific electronic devices and are therefore not considered.

3.2.4 Requirements

CEN 50625-1:2014 defines administrative and organizational requirements (Chapter 4), technical requirements (Chapter 5) and documentation requirements (Chapter 6).

3.2.4.1 Administrative and organizational requirements

As a management principle the existence of a management system (not necessarily certified) that includes continuous improvement and identification of legal requirements is pivotal. The suitability of infrastructure and technology must be assessed through a risk analysis.

Monitoring includes input registration of all consignments and the downstream treatment of all WEEE and fractions thereof until end-of-waste status is achieved or until the WEEE is prepared for reuse, recycled, recovered, or disposed of. For hazardous fractions the whole treatment chain until the final technology (recovery or disposal) needs to be monitored. All shipments of WEEE or fractions thereof must go to a downstream partner who is compliant with the CEN 50625 series of standards.

3.2.4.2 Technical requirements

The following WEEE needs special handling and storage for which requirements are established: Temperature exchange equipment, Cathode Ray Tubes (CRT), gas discharge lamps and appliances which include such lamps, appliances containing mercury switches, smoke detectors, appliances containing oil and other fluids or oil-containing capacitors, appliances with asbestos or ceramic fibres and photovoltaic panels.

The standard sets out requirements for depollution, which are specified in more details in Annexes A, B and F. It is important to control the pollutants throughout the entire process to avoid exposing people and the environment. Substances, mixtures, and components must be removed in a manner that ensures they remain part of a distinct and identifiable stream throughout the treatment process. A substance, mixture, or component is considered identifiable if it can be monitored to verify its environmentally safe treatment. The depollution process must be monitored and documented in detail following standardized methodologies.

A key aspect is that the standard stipulates that the efficiency of material and energy recovery must be assessed via recycling and recovery rates, with minimum quantitative target values prescribed for various WEEE categories. The same holds true for the efficiency in decontamination where threshold values in fractions for material recycling are defined as well as reference values for decontamination e.g. for batteries and capacitors for certain WEEE categories.

3.2.4.3 Documentation requirements

Detailed requirements exist for the documentation of legal compliance, the individual process steps, the management review, data destruction, employee health and safety of the plant and training. In addition, the operator must maintain at least annual mass balances that provide information on input, storage and output.

In a similar way as in CEN 50625-1:2014 for treatment operators, the technical specification CLC/TS 50625-4:2017 prescribes handling and storage of WEEE for transport and collection operators.

3.2.5 Key features of CEN 50625 series

3.2.5.1 Optimization of material recovery

By setting recycling and recovery targets, the standard aims to maximize the recovery of raw materials and energy. The achievement of the target values for each treatment stream is to be verified at least every 2 years.

3.2.5.2 Depollution and pollution prevention

Controlling of components containing pollutants and mixtures of pollutants in manual and mechanical processing and the prevention of the transfer of pollutants to clean fractions, form an essential basis of the standard. The setting of limit values in the output fractions and their regular monitoring prescribed in a series of technical specifications is intended to ensure that pollutants are properly separated and disposed of in a controlled manner.

3.2.5.3 Traceability along the value chain downstream

By recording and documenting the input fractions and tracking the further treatment of the fractions generated by the downstream partners until the waste has reached final status, or until the WEEE is prepared for reuse, recycled, recovered, or disposed of, it is ensured that the treatment partners make their material flows transparent and controllable.

3.2.5.4 Prescriptions for collection

With the standard CEN 50625-1:2014 and the technical specification for collection CLC/TS 50625-4:2017, the series of standards provides guidelines for handling equipment to prevent negative effects on health and the environment and to ensure that during their collection, handling and transportation appliances suitable for reuse are not damaged to such an extent that their reuse would be difficult or even impossible.

3.3 R2

3.3.1 History and context

In the mid-2000s, the U.S. Environmental Protection Agency (EPA) initiated a collaborative process to develop responsible recycling guidelines. This initiative brought together a diverse group of stakeholders, including industry leaders, non-governmental organizations (NGOs), government agencies, and certification bodies. The result was the creation of a practical and enforceable standard for managing used electronics in an environmentally and socially responsible manner.

The initial version, R2:2008, was launched in 2008 under the stewardship of SERI (Sustainable Electronics Recycling International), a non-profit organization. The standard quickly gained traction, especially in the United States, where businesses and recyclers adopted it as a mark of trustworthy and compliant e-waste management. In 2013, the standard was updated and reissued as R2:2013, incorporating feedback from early adopters and reflecting challenges for real-world implementation.

The most recent revision, R2v3, was released in 2020 and became mandatory for all certified facilities by July 2023. This version introduced a modular structure, enabling facilities to certify for specific activities such as reuse, recycling, or specialty processing.

3.3.2 Scope and objectives

The R2v3 standard was developed to better meet new requirements and technologies. The key innovations of R2v3 according to SERI are related to:

» **Modular system:** Companies can customize their certification to their specific activities (e.g. reuse, recycling, repair).

- » **Stricter requirements for data destruction:** To meet increasing data protection requirements, the rules for data deletion have been updated.
- » **Transparency and traceability:** Higher standards for tracking material flows along the entire recycling chain are fixed.
- » **Sustainability and reuse:** Greater emphasis is given on reuse over recycling.
- » **Occupational health, safety and environmental protection:** Stricter requirements for working conditions and environmental protection are defined.

3.3.3 Structure

R2 defines nine core requirements (see the following chapter), and in the Annex, specifies process requirements for six different activities: (1) downstream recycling chain, (2) data sanitization, (3) test and repair, (4) specialty electronics reuse, (5) materials recovery and (6) brokering.

The scope stipulates that an R2 audited and certified company shall meet the core requirements and the process requirements applicable for the specific operations.

Furthermore, any sites owned and/or operated by the R2 facility operator that are used to manage end-of-life electronic equipment, components, or materials and are not R2 certified shall be publicly disclosed.

3.3.4 Requirements

3.3.4.1 Hierarchy of responsible management strategies

An R2 facility operator shall create and follow a written policy detailing how it manages used and end-of-life electronic equipment, components, and materials. This policy shall guide both on-site and off-site activities, including the selection of downstream vendors, and must align with a hierarchy of responsible management strategies.

An R2 facility operator shall evaluate and sort equipment, components, and materials in accordance with the policy and core requirement on sorting, categorization, and processing (see 3.3.5.5), and take all practical steps to direct items for processing in the following hierarchical order:

- » **Reuse:** Equipment and components suitable for reuse shall be directed to a process that meets R2 requirements. Items that are not legal to sell (e.g., stolen, counterfeit, or recalled) shall not be reused and instead be directed to materials recovery.
- » **Materials Recovery:** Items not suitable for reuse should be processed through recycling methods that meet the R2 requirements.
- » **Disposal:**
 - **Focus materials:** Incineration, energy recovery, or land disposal is prohibited unless mandated by law (e.g., for hazardous waste). Under rare, uncontrollable circumstances, these methods can be used temporarily in compliance with legal allowances.
 - **Non-Focus Materials:** These can only be disposed of through energy recovery, incineration, or land disposal when no reuse or recycling options are viable, and the most environmentally beneficial method must be chosen.

This framework should ensure environmentally responsible handling of electronic waste while prioritizing reuse and recycling.

3.3.4.2 EHS management system

An R2 facility operator shall have a certified management system for environment, health and safety (EHS) in its operations that is recognized by SERI. The requirements of R2 must be fully incorporated into the EHS management system.

tem. The facility shall demonstrate that it identifies, analyses and monitors the effectiveness of controls for both internal and external environmental impacts and health and safety risks which are under their scope of influence.

The risks of exposure to hazardous substances are to be periodically monitored by an internal process. Good housekeeping standards, the provision of sanitary facilities, care to workers of all kind and workers health are among other important cornerstones of R2.

3.3.4.3 Legal and other requirements

A compliance plan shall ensure full compliance with all environmental, health, safety, and data security legal, as well as any other requirements applicable to the facility's operations. The plan shall also identify and document the applicable legal requirements of the exporting, transit, and importing countries to demonstrate compliance for all international shipments of input and output streams.

Child labor is not permitted in an R2 facility. Prison labor is only allowed if it is voluntary and reasonably compensated. Additionally, an R2 facility operator must document a non-discrimination policy.

3.3.4.4 Tracking throughput

An R2 facility operator shall track and manage the throughput of all electronic equipment, components, and materials, and maintain sufficient records to document their flow throughout the facility. Sorting, categorization and processing

An R2 facility operator shall evaluate, sort, and categorize all equipment, components, and materials in accordance with the "R2 Equipment Categorization" (REC) document⁵. This document is designed to complement the R2 standard by providing a framework for assessing electronic equipment, components, and materials, and for categorizing their R2 condition at each stage of the process. This ensures that applicable R2 requirements are met throughout processing and outbound through the downstream recycling chain. Equipment and components may change categorization through stages of processing.

The R2 facility operator shall evaluate all equipment and components in accordance with the defined process to determine the suitability of their reuse and direct evaluated equipment, components, and materials to the appropriate next process. Equipment and components not suitable for reuse and materials unsuitable for recovery shall be processed by the R2 facility operator in accordance with Appendix E – Materials Recovery or transferred to a downstream vendor qualified in accordance with Appendix A – Downstream Recycling Chain.

3.3.4.5 Data security

In a data sanitization plan to be developed by a R2 facility operator, all requirements for handling devices containing data shall be detailed and documented. In a data security policy clear procedures and responsibilities shall be assigned.

A security program is designed to ensure that no data can fall into the hands of unauthorized persons in the internal processes.

5) R2 Equipment categorization – The framework for evaluating electronic equipment, components, and materials, and categorizing their R2 status throughout each step of the R² process; Sustainable Electronics International (SERI); Version 2.1

3.3.4.6 Focus materials (FMs)

Focus materials are materials in electronic equipment that warrant greater care during recycling, refurbishing, materials recovery, energy recovery, incineration, and/or disposal due to their toxicity or other potential adverse health and safety impacts on workers, the public and the environment. The list of focus materials includes PCB containing components, mercury, CRT glass, batteries and circuit boards.

An R2 facility operator shall analyse, plan, regularly review, and update as necessary how the FMs that pass through its facility or control will be properly managed both on-site and down the recycling chain. The FM Management Plan needs to state how the R2 facility operator and its downstream vendors shall conform to the applicable requirements of R2.

3.3.4.7 R2 facility requirements

R2 facility requirements include provisions for indoor and outdoor operations and storage, insurance coverage for potential risks and liabilities related to the operations, and legal and financial assurances to ensure the proper closure of the facility.

3.3.4.8 Transport

Transport requirements include the condition to engage only entities that meet the applicable legal requirements for the transportation of electronic equipment, components, and materials, and which protect physical and data security, health, safety, and the environment.

3.3.5 Key features of the R2 standard

3.3.5.1 Integrated approach to WEEE management

The R2 standard follows an integrated approach with clearly defined priorities. In the second core requirement, which defines the hierarchy of responsible management strategies, reuse is prioritized followed by material recycling into new products. For all equipment and components capable for reuse, the R2 facility operator shall direct them to a reuse process.

The categories outlined in the “R2 Equipment Categorization” (REC) document must be integrated into the R2 facility’s categorization procedures or cross-referenced in writing with the facility’s existing internal categories.

The processing categories define the categories which are controlled under R2 and their respective data sanitization status. The functioning product categories define categories along their optical appearance description and their functionality.

3.3.5.2 Data sanitization

The provision of security and sanitization of data is a core element of R2. All equipment, components, and materials entering a facility need to be categorized to the aforementioned R2 REC document. Appendix B of the standard defines the approved physical destruction methods, the criteria applied for achieving complete data destruction and the requirements for on-site data sanitization through erasure.

3.4 e-stewards

3.4.1 History and context

By the early 2000s, it became clear that standards were needed to address WEEE recycling responsibly and transparently, ensuring compliance with international laws like the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, adopted in 1989 and holding recyclers accountable.

The e-Stewards Certification Program, developed by the Basel Action Network (BAN), has evolved significantly since its inception. It began in 2003 with the e-Stewards Pledge, a voluntary commitment by electronics recyclers to uphold responsible WEEE management practices, including a ban on exporting hazardous waste to developing countries. In 2008, BAN developed the formal e-Stewards Standard to provide a certifiable framework grounded in the principles of the Basel Convention and ISO 14001. The certification program officially launched in 2009 with accredited third-party audits. Subsequent updates have strengthened the standard: Version 2.0 in 2013 introduced enhanced requirements for data security and social accountability; Version 3.0 in 2017 aligned with ISO 14001:2015 reinforced health, safety, and downstream accountability; and Version 4.0, released in 2020, emphasized reuse, circular economy practices, and stricter data destruction controls. In recent years, e-Stewards has also embraced digital tracking and transparency tools to further ensure compliance and traceability throughout the electronics recycling chain.

3.4.2 Scope

The standard for “Ethical and Responsible Reuse, Recycling, and Disposition of Electronic Equipment and Information Technology” (e-Stewards) aims at addressing the ethical, environmental, and social challenges associated with the management of WEEE. The standard focuses on ensuring responsible recycling, reuse, and disposal of electronics while safeguarding data security, worker safety, and environmental health.

3.4.3 Structure

E-stewards describes core requirements in seven management areas (see following requirements) which are complemented and further detailed in four appendices.

3.4.4 Requirements

3.4.4.1 Context of the organization

E-stewards requires the organization to have a continually improved stewardship management system, which takes into consideration the precautionary principle, waste hierarchy, life cycle perspective, the appropriate and transparent management of materials of concern, the concern of interested parties, and the welfare of the affected environment among others.

3.4.4.2 Leadership

The stewardship policy of the organization shall include a range of obligations for the protection of workers from harmful substances, harassment and discrimination, and prohibits the use of forced and child labour, and restricts the use of prison operations.

3.4.4.3 Planning

The planning requirements include the preparation of a comprehensive risk analysis of all operations at the site and at ancillary sites.

The aspects to be considered include, but are not limited to, environmental impacts, physical, chemical and biological risks, operational risks, downstream risks, Potentially Hazardous Processing Technologies (PHPTs) used to process electronic equipment, and other hazards including hazardous substances that may be present in other products or processes used in operations, and/or in materials not accepted by the organization but present at their facilities.

The organization shall determine, document, and periodically review those legal and other compliance obligations relevant to its operations, whether mandatory or voluntary. The organization shall retain documented information providing evidence of its compliance with these obligations. These obligations include international waste trade agreements in particular the Basel Convention and the Ban Amendment, national laws as well as extended producer responsibility programs.

Furthermore, the organization shall ensure that the performance verification program of the e-Stewards administration utilizing unannounced inspections and unannounced use of GPS tracking is supported by the creation, implementation and maintenance of a documented plan.

The emergency plan includes aspects of the closure of operations and securing all necessary financial obligations, as well as the proper treatment of the remaining WEEE. This also includes a comprehensive investigation and, if necessary, remediation by an authorized qualified and specialized company.

3.4.4.4 Support

E-stewards requires the necessary resources, competencies, and awareness for the implementation of the e-Stewardship Management Systems at all levels of the company.

The organization shall develop topics and methods for proper communication with internal and external interested parties. Internal communication between management and employees shall be possible without fear of consequences. In the external communication with contractual partners and visitors, the control and EHS requirements shall be considered.

The organization shall have documentation covering all aspects required by the standard, with individual documents required for closure plan(s), emergency preparedness, response plan, and a downstream disposition chart.

3.4.4.5 Operation

In the area of operations, e-stewards sets out comprehensive and detailed requirements including how to deal with emergencies and industrial hygiene with additional requirements for organizations that use potentially hazardous processing technologies.

The essential elements of the operation are outlined as follows:

- » A hierarchy of pollution and hazards controls: Elimination, substitution, engineering, administrative and personal protective equipment
- » The creation and documentation of an emergency preparedness and response plan
- » An industrial hygiene program which defines potentially hazardous processing technologies and hazardous testing frequencies
- » Restrictions of 10 items for mechanical processing which include potentially hazardous materials
- » Reuse and refurbishment requirements.
- » Prohibition of prison labor with the exemption of written agreement by the e-Stewards program administrator
- » Restrictions on material recovery and final disposal of materials of concern; detailed requirements and acceptable and unacceptable operations are defined for 20 materials of concern⁶
- » Control of transboundary movements
- » Downstream accountability
- » Data security

The responsible handling of WEEE includes the detailed recording of incoming devices, in particular the determination of the hazardous substances they con-

6) See: "A.8.6.1 – Materials Recovery and Final Disposition Table" in the e-stewards standard

tain and their control in the processes. In doing so, certain devices and components containing hazardous substances are explicitly excluded from mechanical processing. The standard also requires labelling and packaging, storage and transport regulations.

In the area of reuse and refurbishment of electronic and electrical appliances, detailed requirements for the functional test are specified. The devices intended for this purpose must be provided with detailed information. In addition, it shall be ensured that the devices are reused and not intended for processing and final disposal.

When recovering raw materials and disposing of materials of concern, it shall be ensured that the receiving facilities are appropriately equipped and licensed, and that there will be no adverse environmental impacts. In appendix A, the acceptable and unacceptable operations for materials of concern are defined in detail.

Cross-border shipments shall be carried out in accordance with the requirements of the Basel Convention.

The organization shall create and keep a current downstream disposition chart documenting the recycling chain for all materials of concern that move through the organization's control and ensure that its materials of concern are managed only by approved downstream operators and intermediaries throughout the recycling chain. Documentation supporting downstream provider approval shall be retained.

Ensuring data security is an important part of the organizational requirements.

3.4.4.6 Performance evaluation

E-stewards requires that the organization effectively monitors, measures, analyses, and evaluates the performance of its Stewardship Management System (SMS) and its operations that can have a significant impact on their performance. This includes a continuous compliance verification, the corresponding inspections and control of material flows as well as internal audits and management reviews.

3.4.4.7 Improvement

E-stewards requires continuous review and improvement of the SMS and timely action in the event of non-conformity. These must be properly documented and accessible.

3.4.5 Key features of the e-stewards standard

3.4.5.1 Control of hazardous materials

E-stewards defines twenty materials of concern which include hazardous electronic wastes and problematic components and materials (Appendix A 8.6.1). Hazardous electronic waste covers seven materials or components (3.21). Additionally, five problematic components or materials are specifically stated (3.35). The requirements for the operation and the professional and environmentally sound handling of such materials represent an outstanding part of the standard. The requirements in this regard are very stringent and are significantly higher than the requirements of R2 for example. This is largely due to the history of the standard and the resulting patronage. The specification of test frequencies and the restriction of mechanical processing of components are operational specifications that support these objectives.

3.4.5.2 Control of transboundary movement

The control of transboundary movements of materials of concern is considered one of the key elements of the standard. Relevant laws, treaties agreement and the regulations of e-stewards itself serve as a guidance.

Electronic Equipment entering the organization's control is considered hazardous until determined otherwise. The organization shall ensure each transboundary shipment throughout the recycling chain meets all applicable requirements of the standard. The organization also shall retain responsibility for conformity with the requirements of reuse and refurbishment of electrical and electronic equipment. Strict and detailed test procedures of the functionality of devices shall assure that clear distinction can be made between WEEE and devices going into refurbishment and reuse operations.

3.4.5.3 Inclusion of interested parties

In various parts of the standard, the concerns and requirements of interested parties are stipulated, for example:

- » Within the SMS internal and external issues affecting their SMS positively or negatively shall be determined by considering the concerns and requirements of interested parties interacting with the SMS.
- » If the organization participates in Extended Producer Responsibility programs, documented information demonstrating conformity with all program requirements shall be retained and made available to interested parties (e.g., OEMs, auditors, governments) upon request.

4 Comparison

4.1 Nature of the compared standards

The three international standards are technical standards for the management of WEEE. They regulate administrative, technical and environmental aspects and in some cases set limit values for pollutants in the target fractions of processing. The resource efficiency aspect is occasionally considered by setting targets for the degree of recovery of mass materials and substances. The processing chain should be transparent and follow the guidelines of the relevant standard, and the mass flows must be monitored and documented. The processing of WEEE should not harm employees or the environment. The main target group of all three standards are WEEE processing companies that operate along the reverse supply chain.

The ISO 59014 standard provides principles and specifications for collection, handling and processing of recoverable resources. It aims at a broader spectrum on secondary resources and gives guidance for organizations in fostering the sustainability and traceability of activities and processes along the whole value chain from collection until recycling and recovery. The character is oriented towards technical consideration and organizational aspects. It furthermore specifies requirements and provides guidance for organizations that engage with individuals involved in subsistence activities (SA).

4.2 Methodology

As a basis for comparing the ISO 59014 standard with the three international WEEE standards, **36 principal requirements clustered in 14 subchapters** were identified from the three main chapters (operational, organizational and traceability) of the ISO 59014 standard. These were selected based on their comprehensiveness and relevance (their non-compliance can lead to major negative impacts). These were individually compared with the corresponding requirements of the three international WEEE standards. In case of complete agreement with ISO 59014, the degree of coverage was set at 100%. In case of no corresponding provision in the WEEE standard, this was assessed as 0%. If the requirements were partially fulfilled, there was a 50% match. A more precise allocation of the coverage was not carried out because the textual interpretation and comparison did not allow for a more finely graded subdivision.

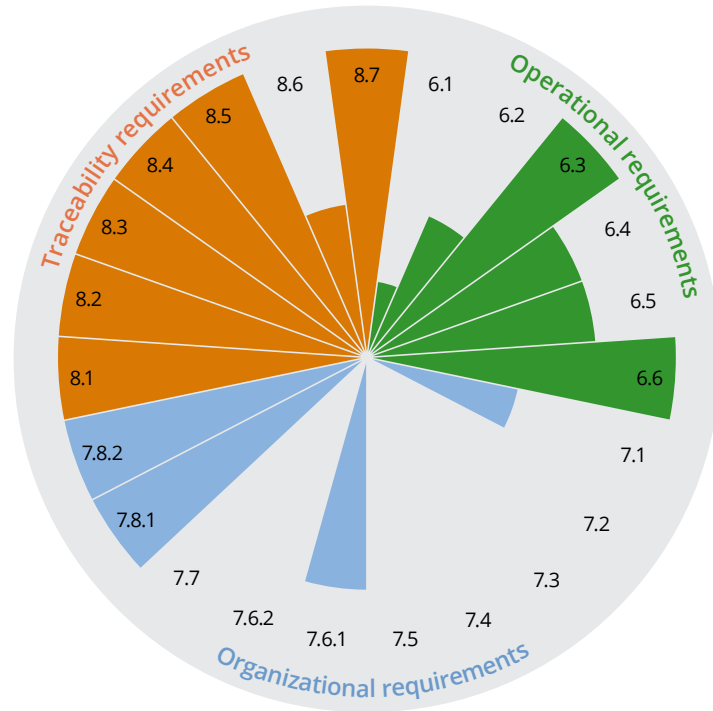
The comparison was carried out in **three stages**:

- » In a first stage, all 36 principal requirements were individually examined and the three international WEEE standards compared concerning the level of compliance with ISO 59014 (see results in chapter 4.3)
- » In a second stage, the level of compliance for the 14 subchapters was consolidated. In case of several main requirements within a subchapter, their average was calculated based on the individual requirements' values (see chapter 4.4).
- » In a third comparison, the degree of alignment was determined across the entire standard and at the level of the individual main chapters (operational, organizational and traceability). This provided a comprehensive assessment of how well each standard covers the requirements of the ISO 59014 standard (see results in chapter 4.4).

4.3 Comparison of the ISO 59014 standard with CEN 50625 standards

4.3.1 Overview Figure 3 shows a graphical comparison of the ISO 59014 standard with CEN 50625 standards.

Figure 3: Level of coverage of CEN 50625 compared with ISO 59014



- | | | | |
|-------|--|-------|--|
| 6.1 | General | 7.6.2 | Health and safety risks of workers and individuals involved in SAs |
| 6.2 | Classification and determination of recovery pathways | 7.7 | Resource use |
| 6.3 | Collection | 7.8.1 | Operational and managerial competences |
| 6.4 | Sorting | 7.8.2 | Training needs |
| 6.5 | Material recovery Processes | 8.1 | General |
| 6.6 | Logistics | 8.2 | Collection of upstream data |
| 7.1 | Monitoring and Evaluation | 8.3 | Collection of processing data |
| 7.2 | Interested party engagement | 8.4 | Collection of downstream data |
| 7.3 | Responsibility towards the value chain | 8.5 | Collection of depollution data |
| 7.4 | Responsibility towards individuals engaged in subsistence activities | 8.6 | Communication |
| 7.5 | Equitable working conditions | 8.7 | Continual improvement |
| 7.6.1 | Environmental and social risks | | |

4.3.2 Operational requirements

Table 3 shows the operational requirements of the ISO 59014 standard compared with the CEN 50625 standards.

Table 3: Operational requirements of the ISO 59014 standard compared with the CEN 50625 standards

ISO 59014		CEN 50625	
Subclause	Rephrased requirement	Assessment	Level of coverage
General (6.1)	Requirement 1: Organizations shall establish criteria and a methodology for secondary materials to be recovered following an LCA/s-LCA approach.	Requirement 1: There is no prescription about which secondary materials need to be recovered. The recycling companies follow a purely economic approach.	0%
	Requirement 2: Organizations shall identify quantitative and qualitative targets for the recovery of secondary materials based on the characteristics of the incoming recoverable.	Requirement 2: Recycling and recovery rates must be determined annually. There are no qualitative targets. According to Annex C. Ref.: CEN 50625-1/5.9	50%
Classification and determination of recovery pathways (6.2)	Requirement 3: Organizations shall apply criteria for the determination of recovery pathways of secondary materials to be recovered for reaching the best social and environmental outcome based on documented studies which apply a life cycle perspective with the consideration of at least energy consumption and resource scarcity.	Requirement 3: CEN 50625 does not consider life cycle considerations for classification and determination of recovery pathways. Reuse is prioritized over recycling. Nevertheless, this is not strictly anchored in the standard. Ref.: CEN 50625-1/5.3	50%
Collection (6.3)	Requirement 4: Organizations shall support the separate collection of recoverable resources and facilitate their return in their sphere of influence. Collection can also occur after dismantling or demolition.	Requirement 4: CEN 50625 requires a strict separation between WEEE and non-WEEE. Collection operators and logistics operators shall adopt measures to achieve a high level of separate collection of WEEE and provide sufficient space for separate collection Ref.: CEN 50625-1/5.9/5.2 CLC/TS 50625-4/5.1.1 & 5.1.2	100%
Sorting (6.4)	Requirement 5: Organizations shall apply a consistent sorting according to identified attributes with appropriate sorting technologies for reuse, repair and refurbishment of recoverable products or components.	Requirement 5: CEN 50625 requires the avoidance of damage to keep potential for reuse. Priority is set for separating WEEE from other waste, attributes mainly are on hazardousness and reusability. Ref.: CEN 50625-1/5.9/5.3 CLC/TS 50625-4/5.1.1	100%
	Requirement 6: After sorting, recoverable resources as products, components or materials are to be sent to non-destructive processes (prioritization of non-destructive vs. destructive processes).	Requirement 6: CEN 50625 requires procedures for identifying WEEE with hazardous substances; depollution should be done without damage and release of hazardous substances to the environment; Manual depollution should be done prior to size reduction for some components (Annex A). CEN 50625 does not include requirements for the retention of the functionality of products and components with the aim of reuse. Ref.: CEN 50625-1/5.9/5.3 CLC/TS 50625-4/5.1.1 CEN 50625-1/5.5; Annex A	50%

ISO 59014		CEN 50625	
Subclause	Rephrased requirement	Assessment	Level of coverage
Material recovery processes (6.5)	Requirement 7: Organizations shall operate and maintain adequate infrastructure, technology and practices to facilitate achieving criteria for secondary resources to be recovered. The selection of non-destructive and destructive processes shall be based on publicly available or own LCA.	Requirement 7: CEN 50625 requires adequate infrastructure, but the selection of processes is not based on LCA. Ref.: CEN 50625-1/4.2	50%
	Requirement 8: Organizations shall undertake depollution processes without dilution and prevent the release of hazardous substances to the environment. The resulting hazardous substances shall be routed.	Requirement 8: Depollution shall not damage or destroy components in a way that hazardous substances are released to the environment or distributed to fractions, unless subsequent treatment to remove or render harmless the hazardous substances is carried out. Ref.: CEN 50625-1/4.2	100%
Logistics (6.6)	Requirement 9: Handling, transportation and storage of recoverable resources shall be done in a way that facilitates their subsequent recovery as whole products, components or materials, ensuring the best environmental outcome.	Requirement 9: All handling of WEEE, including the loading, unloading and transport, shall be carried out using appropriate tools, containers and fixings to avoid damage where there is the potential for preparation for reuse or the risk of hazardous substances being emitted. Ref.: CEN 50625-1/5.9/5.3	100%
	Requirement 10: Organization shall use adequate transport, storage and packaging methods and packaging materials to prevent environmental and health risks and damage of recoverable resources considering the reduction of resource use	Requirement 10: All handling of WEEE, including the loading, unloading and transport, shall be carried out using appropriate tools, containers and fixings to avoid damage where there is the potential for preparation for reuse or the risk of hazardous substances being emitted. No reduction of resource use. Ref.: CEN 50625-1/5.9/5.3	100%

4.3.3 Organizational requirements

Table 4 shows the organizational requirements of the ISO 59014:2024 standard compared with the CEN 50625 series.

Table 4: Organizational requirements of the ISO 59014 standard compared with the CEN 50625 standards

ISO 59014		CEN 50625	
Subclause	Rephrased requirement	Assessment	Level of coverage
Monitoring and evaluation (7.1)	Requirement 11: Organizations shall establish, implement and maintain a monitoring and evaluation plan that encompasses risks, application of the code of conduct, information about interested parties and their requirements, evidence of competences, performance against targets and traceability among others.	Requirement 11: CEN 50625 includes all activities in the fields of health, safety, environment and quality and the risk management process for all tasks performed. It does whether cover application of a code of conduct nor information about interested parties and their requirements. Ref.: CEN 50625-1/4.1&4.2	50%

ISO 59014		CEN 50625	
Subclause	Rephrased requirement	Assessment	Level of coverage
Interested party engagement (7.2)	Requirements 12-15: Interested parties like local communities, workers, suppliers, individuals engaged in subsistence activities, consumers of secondary materials, components or products produced, local municipalities and others shall be considered, and a collaborative structure with two-way communication shall be implemented and maintained. The aim is to prevent conflicts with interested parties identified and have grievance mechanisms in place to resolve active ones. A collaborative structure should be implemented through the formation of a knowledge sharing committee that discusses among others technical challenges limiting the recovery of materials.	Requirements 12-15: Such provisions are not covered in CEN 50625.	0%
Responsibility towards the value chain (7.3)	Requirements 16-20: A value chain code of conduct (CoC) which refers, as a minimum, to ethical behavior, traceability aspects and responsible practices for achieving the qualitative and quantitative targets of the secondary material to be recovered shall be applied and be included in any type of agreement with organizations concerned along the value chain. The CoC shall consider the priority of reuse over recycling, labor practices, climate change mitigation and anti-corruption measures and fair business practices.	Requirements 16-20: Such provisions are not covered in CEN 50625.	0%
Responsibility towards individuals engaged in subsistence activities (7.4/7.6.2)	Requirements 21-22: An organization engaging or intending to engage with individuals involved in subsistence activities shall create an enabling environment to work collaboratively with these individuals and address their identified needs and interests regarding their well-being and livelihoods. Where applicable, organizations should develop mechanisms for supporting individuals involved in SAs who form part of the value chain, in the continual improvement of their well-being, livelihoods and professional practices.	Requirements 21-22: Such provisions are not covered in CEN 50625.	0%
Equitable working conditions (7.5)	Requirement 23: The organization is responsible for establishing decent working conditions, preventing child or forced labor, harassment and any form of discrimination with a specific focus on vulnerable and disadvantaged workers, women and individuals involved in SAs and ensuring freedom of association and the right to collective bargaining.	Requirements 23: Such provisions are not covered in CEN 50625.	0%

ISO 59014		CEN 50625	
Subclause	Rephrased requirement	Assessment	Level of coverage
Environmental and social risks (7.6.1)	Requirement 24: The organization shall undertake actions to address identified environmental and social risks that arise from its activities for the recovery of secondary materials and set up a communication plan addressing interests and concerns of interested parties covering risks and emergency protocols.	Requirement 24: An environmental risk assessment is included in CEN 50625, but social risks are not covered. Nor requirement for a communication plan. Ref.: CEN 50625-1/4.1&4.2&5.5	50%
	Requirement 25: The organization shall remove harmful substances from the activities and processes or improve practices and make them safer. Activities and processes for recovering secondary materials should not increase risks of environmental harm.	Requirement 25: Depollution shall not damage or destroy components in a way that hazardous substances are released to the environment or distributed to fractions, unless subsequent treatment to remove or render harmless the hazardous substances is carried out. Ref.: CEN 50625-5.5	100%
Health and safety risks of workers and individuals involved in SAs (7.6.2)	Requirement 26: The organization shall consider and communicate for their workers and individuals engaged in SAs health and safety risks, protocols for prevention, reduction and control risks and adverse health and safety impacts.	Requirement 26: Such provisions are not covered in CEN 50625.	0%
Resource use (7.7)	Requirement 27: The organization shall identify opportunities to minimize resource use and implement corresponding measures. Where applicable and environmentally beneficial, this includes replacing materials made from primary resources with secondary materials, reducing or substituting the use of resources, replacing non-renewable resources with renewable resources, avoiding, reducing or substituting the use of resources which pose a risk to the environment and human health and minimizing energy or fuel use.	Requirement 27: Such provisions are not covered in CEN 50625.	0%
Operational and managerial competences (7.8.1)	Requirement 28: The organization shall determine and assess the necessary managerial and operational competences of individuals and provide education, training or mentoring if needed and evaluate the effectiveness of the actions taken.	Requirement 28: The treatment operator shall ensure that a management system is in place for all activities in the fields of health, safety, environment and quality. Ref.: CEN 50625-1/4.1&4.2	100%
Training needs (7.8.2)	Requirement 29: The organization shall identify training needs with whom the organization engages and plan and conduct training in the areas of need.	Requirement 29: Employees and contractors involved in operations shall be instructed and trained to perform the tasks assigned to them. Ref.: CEN 50625-1/4.3	100%

4.3.5 Traceability requirements

Table 5 shows the traceability requirements of the ISO 59014 standard compared with the CEN 50625 standards.

Table 5: Traceability requirements of the ISO 59014:2024 standard compared with the CEN 50625 standards

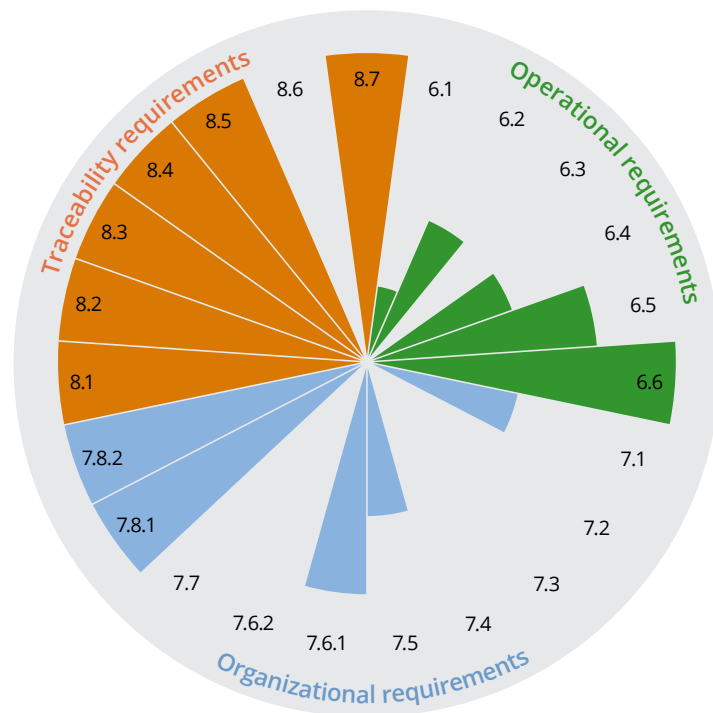
ISO 59014		CEN 50625	
Subclause	Rephrased requirement	Assessment	Level of coverage
General (8.1)	Requirement 30: The organization shall develop and implement a traceability system on products, components and materials handled and a relevant publicly available policy	Requirement 30: The treatment operator shall record the downstream treatment of WEEE and fractions thereof until end-of-waste status is reached or until the WEEE is prepared for reuse, recycled, recovered, or disposed of. Ref.: CEN 50625-1/4.4	100%
Collection of upstream data (8.2)	Requirement 31: The organization shall collect data that includes, among others, confirmation of compliance with CoC from the organization in its value chain, the assignation of sorting attributes and indication of recoverable resources.	Requirement 31: The treatment operator shall record the downstream treatment of WEEE and fractions thereof until end-of-waste status is reached or until the WEEE is prepared for reuse, recycled, recovered, or disposed of. Ref.: CEN 50625-1/4.4	100%
Collection of processing date (8.3)	Requirement 32: The organization shall collect input and output data preferably categorized by product, component and percentage of input routed towards different recovery pathways.	Requirement 32: The treatment operator shall maintain records of each mass balance conducted. Each mass balance calculation shall be supported by documentation of all material flows (summaries of incoming and outgoing deliveries and all stored quantities of WEEE and WEEE fractions). An overall mass balance describing the material flow through the facility shall be prepared at least on an annual basis. Ref.: CEN 50625-1/6	100%
Collection of downstream data (8.4)	Requirement 33: The organization shall collect data on the percentage of the total amount of outputs routed towards different clients and for types of products, components or materials the recovery pathways or energy recovery or proper disposal.	Requirement 33: The treatment operator shall maintain records of each mass balance conducted. Each mass balance calculation shall be supported by documentation of all material flows (summaries of incoming and outgoing deliveries and all stored quantities of WEEE and WEEE fractions). An overall mass balance describing the material flow through the facility shall be prepared at least on an annual basis. Ref.: CEN 50625-1/6	100%
Collection of depollution data (8.5)	Requirement 34: The organization shall collect data on the depolluted recoverable resources accompanied by information on removed materials, substances or mixtures, the presence of declared hazardous substances when receiving from upstream or delivering downstream and maintain a documentation that demonstrates the activities.	Requirement 34: The treatment process to separate material streams shall be documented. Removed substances, mixtures and components (and fractions containing those substances, mixtures and components) shall be kept separate and shall be clearly labelled.	100%
Communication (8.6)	Requirement 35: In case that the organization intends to communicate about the traceability of materials it should use a recognized model and make traceability data available to the organization's immediate downstream and upstream organizations who can require it. It shall cooperate with all direct suppliers and other organizations involved.	Requirement 35: If non-depolluted WEEE and fractions are treated by a downstream treatment operator, this treatment operator shall be informed in accompanying documents of the potential presence of hazardous material. The downstream treatment operator shall be informed of the need for the non-depolluted WEEE or fractions to be depolluted.	100%

ISO 59014		CEN 50625	
Subclause	Rephrased requirement	Assessment	Level of coverage
Continual improvement (8.7)	Requirement 36: The organization shall conduct regular evaluations of the traceability system's effectiveness, address any identified deficiencies, and implement improvements to ensure ongoing enhancement.	Requirement 36: The treatment operator shall demonstrate continuous improvement of their activities by a review and management process. This management process shall be updated or revised as changes occur to the activities of the treatment operator and evaluated to monitor its effectiveness. Ref.: CEN 50625-1/4.1	100%

4.4 Comparison of the ISO 59014 standard with the R2 standard

4.4.1 Overview Figure 4 shows a graphical comparison of the ISO 59014 standard with R2.

Figure 4: Level of coverage of R2 compared with ISO 59014



- | | | | |
|-------|--|-------|--|
| 6.1 | General | 7.6.2 | Health and safety risks of workers and individuals involved in SAs |
| 6.2 | Classification and determination of recovery pathways | 7.7 | Resource use |
| 6.3 | Collection | 7.8.1 | Operational and managerial competences |
| 6.4 | Sorting | 7.8.2 | Training needs |
| 6.5 | Material recovery Processes | 8.1 | General |
| 6.6 | Logistics | 8.2 | Collection of upstream data |
| 7.1 | Monitoring and Evaluation | 8.3 | Collection of processing data |
| 7.2 | Interested party engagement | 8.4 | Collection of downstream data |
| 7.3 | Responsibility towards the value chain | 8.5 | Collection of depollution data |
| 7.4 | Responsibility towards individuals engaged in subsistence activities | 8.6 | Communication |
| 7.5 | Equitable working conditions | 8.7 | Continual improvement |
| 7.6.1 | Environmental and social risks | | |

4.4.2 Operational requirements

Table 6 shows the operational requirements of ISO 59014 compared with R2.

Table 6: Operational requirements of ISO 59014 which are supplementary to R2

ISO 59014		R2	
Subclause	Rephrased requirement	Assessment	Level of coverage
General (6.1)	Requirement 1: Organizations shall establish criteria and a methodology for secondary materials to be recovered following an LCA/s-LCA approach.	Requirement 1: To develop and adhere to a policy for managing used and end-of-life electronic equipment, components, and materials that is based on a hierarchy of responsible management strategies prioritizing reuse first, followed by materials recovery for recycling into new products. No LCA/s-LCA requirements. Ref.: R2v3/section 1.2	50%
	Requirement 2: Organizations shall identify quantitative and qualitative targets for the recovery of secondary materials based on the characteristics of the incoming recoverable	Requirement 2: Such provisions are not covered in R2.	0%
Classification and determination of recovery pathways (6.2)	Requirement 3: Organizations shall apply criteria for the determination of recovery pathways of secondary materials to be recovered for reaching the best social and environmental outcome based on documented studies which apply a life cycle perspective with the consideration of at least energy consumption and resource scarcity.	Requirement 3: An R2 facility shall evaluate all equipment and components in accordance with the defined process to determine the capability of reuse and direct evaluated equipment, components, and materials to the appropriate next process. No consideration of energy consumption and resource scarcity. Ref.: R2v3/section 1.6c	50%
Collection (6.3)	Requirement 4: Organizations shall support the separate collection of recoverable resources and facilitate their return in their sphere of influence. Collection can also occur after dismantling or demolition.	Requirement 4: Such provisions are not covered in R2.	0%
Sorting (6.4)	Requirement 5: Organizations shall apply a consistent sorting according to identified attributes with appropriate sorting technologies for reuse, repair and refurbishment of recoverable products or components.	Requirement 5: An R2 facility shall develop and maintain a documented process to evaluate, sort, and categorize electronic equipment, components, and materials controlled and processed. Ref.: R2v3/section 1.6a	100%
	Requirement 6: After sorting, recoverable resources as products, components or materials are to be sent to non-destructive processes (prioritization of non-destructive vs. destructive processes).	Requirement 6: Such provisions are not covered in R2.	0%

ISO 59014		R2	
Subclause	Rephrased requirement	Assessment	Level of coverage
Material recovery processes (6.5)	Requirement 7: Organizations shall operate and maintain adequate infrastructure, technology and practices to facilitate achieving criteria for secondary resources to be recovered. The selection of non-destructive and destructive processes shall be based on publicly available or own LCA.	Requirement 7: An R2 facility shall conduct all processing operations indoors unless the risks of the outdoor operations have been assessed and controls established to prevent uncontrolled releases to the environment; no relation to LCA. Ref.: R2v3/section 9a	50%
	Requirement 8: Organizations shall undertake depollution processes without dilution and prevent the release of hazardous substances to the environment. The resulting hazardous substances shall be routed.	Requirement 8: An R2 facility shall conduct on a regular basis (e.g., as new types of materials are processed, or new processes or equipment are used) a hazards identification and assessment of occupational health and safety, and environmental risks that exist or could reasonably be expected to develop at the facility. Ref.: R2v3/app. E	100%
Logistics (6.6)	Requirement 9: Handling, transportation and storage of recoverable resources shall be done in a way that facilitates their subsequent recovery as whole products, components or materials, ensuring the best environmental outcome.	Requirement 9: All electronic equipment, components, and materials to be transported are packed appropriately considering the risk they could pose during transportation to data security, health, safety or the environment, and to the level of care warranted by its intended use. Ref.: R2v3/section 1.10	100%
	Requirement 10: Organization shall use adequate transport, storage and packaging methods and packaging materials to prevent environmental and health risks and damage of recoverable resources considering the reduction of resource use	Requirement 10: All electronic equipment, components, and materials to be transported are packed appropriately considering the risk they could pose during transportation to data security, health, safety or the environment, and to the level of care warranted by its intended use. Ref.: R2v3/section 1.10	100%

4.4.3 Organizational requirements

Table 7 shows the organizational requirements of ISO 59014 compared with R2.

Table 7: Organizational requirements of ISO 59014 compared with R2

ISO 59014		R2	
Subclause	Rephrased requirement	Assessment	Level of coverage
Monitoring and evaluation (7.1)	Requirement 11: Organizations shall establish, implement and maintain a monitoring and evaluation plan that encompasses risks, application of the code of conduct, information about interested parties and their requirements, evidence of competences, performance against targets and traceability among others.	Requirement 11: The R2 facility shall demonstrate that it has evaluated the risks related to the scope of its operations, including any changes in operations and volume of material processed. No code of conduct Ref.: R2v3/section 1.9	50%

ISO 59014		R2	
Subclause	Rephrased requirement	Assessment	Level of coverage
Interested party engagement (7.2)	Requirements 12-15: Interested parties like local communities, workers, suppliers, individuals engaged in subsistence activities, consumers of secondary materials, components or products produced, local municipalities and others shall be considered, and a collaborative structure with a two-way communication shall be implemented and maintained. The aim is to prevent conflicts with interested parties identified and have grievance mechanisms in place to resolve active ones. A collaborative structure should be implemented through the formation of a knowledge sharing committee that discusses among others technical challenges limiting the recovery of materials.	Requirement 12-15: Such provisions are not covered in R2.	0%
Responsibility towards the value chain (7.3)	Requirements 16-20: A value chain code of conduct (CoC) which refers, as a minimum, to ethical behavior, traceability aspects and responsible practices for achieving the qualitative and quantitative targets of the secondary material to be recovered shall be applied and be included in any type of agreement with organizations concerned along the value chain. The CoC shall consider the priority of reuse over recycling, labor practices, climate change mitigation and anti-corruption measures and fair business practices.	Requirement 16-20: Such provisions are not covered in R2.	0%
Responsibility towards individuals engaged in subsistence activities (7.4/7.6.2)	Requirements 21-22: An organization engaging or intending to engage with individuals involved in subsistence activities shall create an enabling environment to work collaboratively with these individuals and address their identified needs and interests regarding their well-being and livelihoods. Where applicable, organizations should develop mechanisms for supporting individuals involved in SAs who form part of the value chain, in the continual improvement of their well-being, livelihoods and professional practices.	Requirement 21-22: Such provisions are not covered in R2.	0%
Equitable working conditions (7.5)	Requirement 23: The organization is responsible for establishing decent working conditions, preventing child or forced labor, harassment and any form of discrimination with a specific focus on vulnerable and disadvantaged workers, women and individuals involved in SAs and ensuring freedom of association and the right to collective bargaining.	Requirement 23: An R2 facility shall not use child labor, as defined by the International Labor Organization (ILO) or forced labor, where the worker cannot leave or terminate employment freely. Ref.: R2v3/1.4e	100%

ISO 59014		R2	
Subclause	Rephrased requirement	Assessment	Level of coverage
Environmental and social risks (7.6.1)	Requirement 24: The organization shall undertake actions to address identified environmental and social risks that arise from its activities for the recovery of secondary materials and set up a communication plan addressing interests and concerns of interested parties covering risks and emergency protocols.	Requirement 24: Initially, and at least every three calendar years, the organization shall conduct documented risk assessments of all operations under its control, including Ancillary Sites. These shall include workplace hazard assessments with input from relevant workers for each job or area being evaluated, and address the following topics, if applicable: (..) Ref.: e-stewards 6.1.1	50%
	Requirement 25: The organization shall remove harmful substances from the activities and processes or improve practices and make them safer. Activities and processes for recovering secondary materials should not increase risks of environmental harm.	Requirement 25: As part of the approval request, the organization shall include any projected effects on relevant interested parties, potential life cycle risks and impacts, and associated compliance obligations, as well as demonstrate that the proposed alternative use or process meets all other applicable requirements of this standard, including those for Industrial Hygiene and downstream due diligence. Ref.: e-stewards 8.6.2	100%
Health and safety risks of workers and individuals involved in SAs (7.6.2)	Requirement 26: The organization shall consider and communicate for their workers and individuals engaged in SAs health and safety risks, protocols for prevention, reduction and control risks and adverse health and safety impacts.	Requirement 26: Such provisions are not covered in e-stewards.	0%
Resource use (7.7)	Requirement 27: The organization shall identify opportunities to minimize resource use and implement corresponding measures. Where applicable and environmentally beneficial, this includes replacing materials made from primary resources with secondary materials, reducing or substituting the use of resources, replacing non-renewable resources with renewable resources, avoiding, reducing or substituting the use of resources which pose a risk to the environment and human health and minimizing energy or fuel use.	Requirement 27: Such provisions are not covered in e-stewards.	0%
Operational and managerial competences (7.8.1)	Requirement 28: The organization shall determine and assess the necessary managerial and operational competences of individuals and provide education, training or mentoring if needed and evaluate the effectiveness of the actions taken.	Requirement 28: (Stewardship Management System) The organization's internal system for managing its plans and processes to achieve intended results and to foster Stewardship. The SMS is governed by the e-Stewards standard, including its documented scope [Section 4], and integrates NAID AAA, ISO 14001 or RIOS, and any other applicable standards to which the Organization is certified. Ref.: e-stewards 3.4.7	100%

ISO 59014		R2	
Subclause	Rephrased requirement	Assessment	Level of coverage
Training needs (7.8.2)	Requirement 29: The organization shall identify training needs with whom the organization engages and plan and conduct training in the areas of need.	Requirement 29: (Stewardship Management System) The organization's internal system for managing its plans and processes to achieve intended results and to foster Stewardship. The SMS is governed by the e-Stewards standard, including its documented scope [Section 4], and integrates NAID AAA, ISO 14001 or RIOS, and any other applicable standards to which the Organization is certified. Ref.: e-stewards 3.4.7	100%

4.4.4 Traceability requirements

Table 8 shows the traceability requirements of ISO 59014 compared with R2.

Table 8: Traceability requirements of ISO 59014 compared with R2

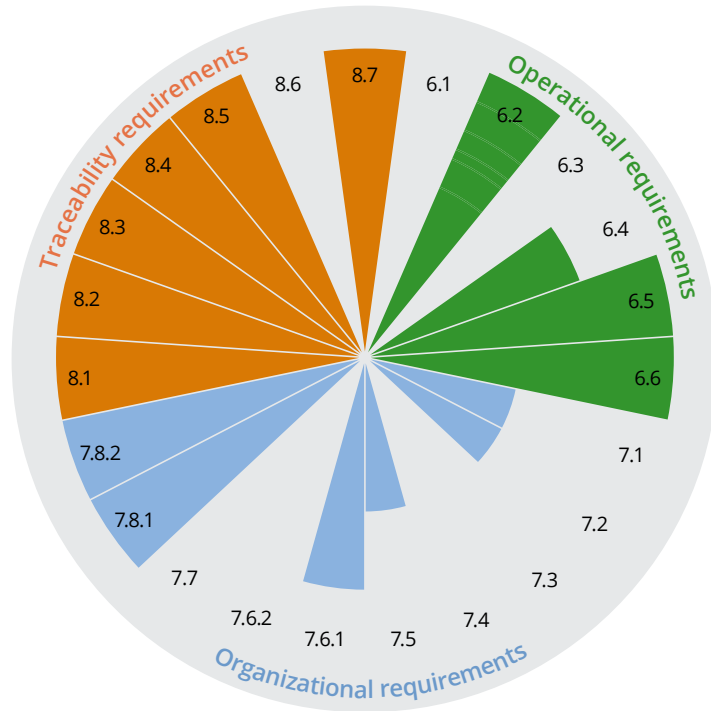
ISO 59014		R2	
Subclause	Rephrased requirement	Assessment	Level of coverage
General (8.1)	Requirement 30: The organization shall develop and implement a traceability system on products, components and materials handled, and a relevant publicly available policy.	Requirement 30: General Principle – To track and manage the throughput of all electronic equipment, components, and materials, and maintain sufficient records to document the flow of all electronic equipment, components, and materials. Ref.: R2v3/1.5	100%
Collection of upstream data (8.2)	Requirement 31: The organization shall collect data that includes, among others, confirmation of compliance with CoC from the organization in its value chain, the assignation of sorting attributes and indication of recoverable resources.	Requirement 31: For all inbound electronic equipment, components, and materials controlled by the R2 Facility through physical possession, title, or other contractual agreement, the R2 Facility shall: (1) Maintain bills of lading or other commercially accepted records, and (..) Ref.: R2v3/1.5a	100%
Collection of processing date (8.3)	Requirement 32: The organization shall collect input and output data preferably categorized by product, component and percentage of input routed towards different recovery pathways.	Requirement 32: General Principle – To track and manage the throughput of all electronic equipment, components, and materials, and maintain sufficient records to document the flow of all electronic equipment, components, and materials. Ref.: R2v3/1.5	100%
Collection of downstream data (8.4)	Requirement 33: The organization shall collect data on the percentage of the total amount of outputs routed towards different clients and for types of products, components or materials the recovery pathways or energy recovery or proper disposal.	Requirement 33: An R2 facility shall: (a) Track and demonstrate the complete downstream recycling chain of all R2 Controlled Streams to final disposition (..) Ref.: R2v3/app. A	100%

ISO 59014		R2	
Subclause	Rephrased requirement	Assessment	Level of coverage
Collection of depollution data (8.5)	Requirement 34: The organization shall collect data on the depolluted recoverable resources accompanied by information on removed materials, substances or mixtures, the presence of declared hazardous substances when receiving from upstream or delivering downstream and maintain a documentation that demonstrates the activities.	Requirement 34: For all inbound electronic equipment, components, and materials controlled by the R2 facility through physical possession, title, or other contractual agreement, the R2 facility shall: (1) Maintain bills of lading or other commercially accepted records, and (..) Ref.: R2v3/1.5a	100%
Communication (8.6)	Requirement 35: In case that the organization intends to communicate about the traceability of materials it should use a recognized model and make traceability data available to the organization's immediate downstream and upstream organizations who can require it. It shall cooperate with all direct suppliers and other organizations involved.	Requirement 35: Such provisions are not covered in R2.	0%
Continual improvement (8.7)		Requirement 36: For all inbound electronic equipment, components, and materials controlled by the R2 facility through physical possession, title, or other contractual agreement, the R2 Facility shall: (1) Maintain bills of lading or other commercially accepted records, and (..) Ref.: R2v3/1.5a	100%

4.5 Comparison of ISO 59014 with e-stewards

4.5.1 Overview Figure 5 shows a graphical comparison of the ISO 59014 with the e-stewards.

Figure 5: Level of coverage of e-stewards compared with ISO 59014



- | | | | |
|-------|--|-------|--|
| 6.1 | General | 7.6.2 | Health and safety risks of workers and individuals involved in SAs |
| 6.2 | Classification and determination of recovery pathways | 7.7 | Resource use |
| 6.3 | Collection | 7.8.1 | Operational and managerial competences |
| 6.4 | Sorting | 7.8.2 | Training needs |
| 6.5 | Material recovery Processes | 8.1 | General |
| 6.6 | Logistics | 8.2 | Collection of upstream data |
| 7.1 | Monitoring and Evaluation | 8.3 | Collection of processing data |
| 7.2 | Interested party engagement | 8.4 | Collection of downstream data |
| 7.3 | Responsibility towards the value chain | 8.5 | Collection of depollution data |
| 7.4 | Responsibility towards individuals engaged in subsistence activities | 8.6 | Communication |
| 7.5 | Equitable working conditions | 8.7 | Continual improvement |
| 7.6.1 | Environmental and social risks | | |

4.5.2 Operational requirements

Table 9 shows the operational requirements of ISO 59014 compared with e-stewards.

Table 9: Operational requirements of ISO 59014 compared with e-stewards

ISO 59014		e-stewards	
Subclause	Rephrased requirement	Assessment	Level of coverage
General (6.1)	Requirement 1: Organizations shall establish criteria and a methodology for secondary materials to be recovered following an LCA/s-LCA approach.	Requirement 1: Such provisions are not covered in e-stewards	0%
	Requirement 2: Organizations shall identify quantitative and qualitative targets for the recovery of secondary materials based on the characteristics of the incoming recoverable	Requirement 2: Such provisions are not covered in e-stewards.	0%
Classification and determination of recovery pathways (6.2)	Requirement 3: Organizations shall apply criteria for the determination of recovery pathways of secondary materials to be recovered for reaching the best social and environmental outcome based on documented studies which apply a life cycle perspective with the consideration of at least energy consumption and resource scarcity.	Requirement 3: Within its scope and taking consideration of the concerns and requirements identified above, the SMS shall: e) Apply the Precautionary Principle; and f) Seek to reduce the negative lifecycle impacts of Electronic Equipment; and g) Follow, where practicable, the Waste Management Hierarchy; and h) Manage Materials of Concern appropriately and transparently throughout the recycling chain. Ref.: e-stewards 4.1	100%
Collection (6.3)	Requirement 4: Organizations shall support the separate collection of recoverable resources and facilitate their return in their sphere of influence. Collection can also occur after dismantling or demolition.	Requirement 4: Such provisions are not covered in e-stewards.	0%
Sorting (6.4)	Requirement 5: Organizations shall apply a consistent sorting according to identified attributes with appropriate sorting technologies for reuse, repair and refurbishment of recoverable products or components.	Requirement 5: The organization shall identify and assess the Stewardship aspects and associated impacts of the organization, as well as prioritize significant aspects for action, taking into consideration: (c) The Waste Management Hierarchy; and (...) Ref.: e-stewards 6.1.2	100%
	Requirement 6: After sorting, recoverable resources as products, components or materials are to be sent to non-destructive processes (prioritization of non-destructive vs. destructive processes).	Requirement 6: The organization shall establish operational controls for Processing Electronic Equipment including MOCs as follows: (..) c) Safely remove, separate, and prevent mechanical processing (depollution) of items listed in Table 2, (..) Ref.: e-stewards 8.4.2	50%

ISO 59014		e-stewards	
Subclause	Rephrased requirement	Assessment	Level of coverage
Material recovery processes (6.5)	Requirement 7: Organizations shall operate and maintain adequate infrastructure, technology and practices to facilitate achieving criteria for secondary resources to be recovered. The selection of non-destructive and destructive processes shall be based on publicly available or own LCA.	Requirement 7: The organization shall identify and assess the Stewardship aspects and associated impacts of the organization, as well as prioritize significant aspects for action, taking into consideration: a) The Life-Cycle Perspective; and (..) Ref.: e-stewards 6.1.2	100%
	Requirement 8: Organizations shall undertake depollution processes without dilution and prevent the release to the environment hazardous substances. The resulting hazardous substances shall be routed.	Requirement 8: The organization shall establish operational controls for Processing Electronic Equipment including MOCs as follows: Safely remove, separate, and prevent mechanical Processing (depollution) of items listed in Table 2, unless using a closed-system processing technology specifically designed to effectively control any potentially hazardous releases and/or exposure. Ref.: e-stewards 8.4.2	100%
Logistics (6.6)	Requirement 9: Handling, transportation and storage of recoverable resources shall be done in a way that facilitates their subsequent recovery as whole products, components or materials, ensuring the best environmental outcome.	Requirement 9: Consistent with the risks and obligations identified in Section 6, the organization shall ensure EE under its Control is properly contained, stored, and transported, including: Packaging appropriate to protect from damage and/or any relevant potential hazards; and (..) Ref.: e-stewards 8.4.3	100%
	Requirement 10: Organization shall use adequate transport, storage and packaging methods and packaging materials to prevent environmental and health risks and damage of recoverable resources considering the reduction of resource use.	Requirement 10: Consistent with the risks and obligations identified in Section 6, the organization shall ensure EE under its Control is properly contained, stored, and transported, including: Packaging appropriate to protect from damage and/or any relevant potential hazards; and (..) Ref.: e-stewards 8.4.3	100%

4.5.3 Organizational requirements

Table 10 shows the organizational requirements of ISO 59014 compared with e-stewards.

Table 10: Organizational requirements of ISO 59014 compared with e-stewards

ISO 59014		e-stewards	
Subclause	Rephrased requirement	Assessment	Level of coverage
Monitoring and evaluation (7.1)	Requirement 11: Organizations shall establish, implement and maintain a monitoring and evaluation plan that encompasses risks, application of the code of conduct, information about interested parties and their requirements, evidence of competences, performance against targets and traceability among others.	Requirement 11: The organization shall identify and assess the Stewardship aspects and associated impacts of the organization, as well as prioritize significant aspects for action, taking into consideration: (..) h) Risk assessments and monitoring results; and (..) Ref.: e-stewards 6.1.2; 6.3, 6.4.1; 8.3.1	50%

ISO 59014		e-stewards	
Subclause	Rephrased requirement	Assessment	Level of coverage
Interested party engagement (7.2)	Requirement 12: Considering interests and concerns of affected or potentially affected interested parties	Requirement 12: The organization shall identify and assess the Stewardship aspects and associated impacts of the organization, as well as prioritize significant aspects for action, taking into consideration: i) The concerns of interested parties; and j) The welfare of the affected environment/ecosystem (..) Ref.: e-stewards 6.1.2	100%
	Requirement 13: Clear and accessible channels for two-way communications; measures to prevent conflicts and grievance mechanisms	Requirement 13: The organization shall determine topics and methods for communication with interested parties, both internal and external, and ensure that the information communicated is reliable, current, presented in a manner appropriate and accessible to its intended audience, and consistent with that produced by the SMS. Ref: e-stewards 7.4.1	100%
	Requirements 14: Collaborative structures to facilitate generation and sharing of ideas etc. to attain defined quality of secondary materials and targets Requirements 15: Inclusive participation and monitoring of effectiveness of the engagement and collaboration of all suppliers, consumers and other organizations involved in the value chain	Requirement 14-15: Such provisions are not covered in e-stewards.	0%
Responsibility towards the value chain (7.3)	Requirements 16-20: A value chain code of conduct (CoC) which refers, as a minimum, to ethical behavior, traceability aspects and responsible practices for achieving the qualitative and quantitative targets of the secondary material to be recovered shall be applied and be included in any type of agreement with organizations concerned along the value chain. The CoC shall consider the priority of reuse over recycling, labor practices, climate change mitigation and anti-corruption measures and fair business practices.	Requirement 16-20: Such provisions are not covered in e-stewards.	0%
Responsibility towards individuals engaged in subsistence activities (7.4/7.6.2)	Requirements 21-22: An organization engaging or intending to engage with individuals involved in subsistence activities shall create an enabling environment to work collaboratively with these individuals and address their identified needs and interests regarding their well-being and livelihoods. Where applicable, organizations should develop mechanisms for supporting individuals involved in SAs who form part of the value chain, in the continual improvement of their well-being, livelihoods and professional practices.	Requirement 21-22: Such provisions are not covered in e-stewards.	0%

ISO 59014		e-stewards	
Subclause	Rephrased requirement	Assessment	Level of coverage
Equitable working conditions (7.5)	Requirement 23: The organization is responsible for establishing decent working conditions, preventing child or forced labor, harassment and any form of discrimination with a specific focus on vulnerable and disadvantaged workers, women and individuals involved in SAs and ensuring freedom of association and the right to collective bargaining.	Requirement 23: Stewardship Policy: The organization's documented Stewardship policy shall include commitment throughout the Recycling Chain to: (..) e) Prohibit the use of forced and child labor; and (..) Ref.: e-stewards	100%
Environmental and social risks (7.6.1)	Requirement 24: The organization shall undertake actions to address identified environmental and social risks that arise from its activities for the recovery of secondary materials and set up a communication plan addressing interests and concerns of interested parties covering risks and emergency protocols.	Requirement 24: Initially, and at least every three calendar years, the organization shall conduct documented risk assessments of all operations under its control, including Ancillary Sites. These shall include workplace hazard assessments with input from relevant workers for each job or area being evaluated, and address the following topics, if applicable: (..) Ref.: e-stewards 6.1.1	50%
	Requirement 25: The organization shall remove harmful substances from the activities and processes or improve practices and make them safer. Activities and processes for recovering secondary materials should not increase risks of environmental harm.	Requirement 25: As part of the approval request, the organization shall include any projected effects on relevant interested parties, potential life cycle risks and impacts, and associated compliance obligations, as well as demonstrate that the proposed alternative use or process meets all other applicable requirements of this standard, including those for Industrial Hygiene and downstream due diligence. Ref.: e-stewards 8.6.2	100%
Health and safety risks of workers and individuals involved in SAs (7.6.2)	Requirement 26: The organization shall consider and communicate for their workers and individuals engaged in SAs health and safety risks, protocols for prevention, reduction and control risks and adverse health and safety impacts.	Requirement 26: Such provisions are not covered in e-stewards.	0%
Resource use (7.7)	Requirement 27: The organization shall identify opportunities to minimize resource use and implement corresponding measures. Where applicable and environmentally beneficial, this includes replacing materials made from primary resources with secondary materials, reducing or substituting the use of resources, replacing non-renewable resources with renewable resources, avoiding, reducing or substituting the use of resources which pose a risk to the environment and human health and minimizing energy or fuel use.	Requirement 27: Such provisions are not covered in e-stewards.	0%

ISO 59014		e-stewards	
Subclause	Rephrased requirement	Assessment	Level of coverage
Operational and managerial competences (7.8.1)	Requirement 28: The organization shall determine and assess the necessary managerial and operational competences of individuals and provide education, training or mentoring if needed and evaluate the effectiveness of the actions taken.	Requirement 28: (Stewardship Management System) The organization's internal system for managing its plans and processes to achieve intended results and to foster Stewardship. The SMS is governed by the e-Stewards standard, including its documented scope [Section 4], and integrates NAID AAA, ISO 14001 or RIOS, and any other applicable standards to which the Organization is certified. Ref.: e-stewards 3.4.7	100%
Training needs (7.8.2)	Requirement 29: The organization shall identify training needs with whom the organization engages and plan and conduct training in the areas of need.	Requirement 29: (Stewardship Management System) The organization's internal system for managing its plans and processes to achieve intended results and to foster Stewardship. The SMS is governed by the e-Stewards standard, including its documented scope [Section 4], and integrates NAID AAA, ISO 14001 or RIOS, and any other applicable standards to which the Organization is certified. Ref.: e-stewards 3.4.7	100%

4.5.4 Organizational requirements

Table 11 shows the traceability requirements of ISO 59014 compared with e-stewards.

Table 11: Traceability requirements of ISO 59014 compared with e-stewards

ISO 59014		e-stewards	
Subclause	Rephrased requirement	Assessment	Level of coverage
General (8.1)	Requirement 30: The organization shall develop and implement a traceability system on products, components and materials handled and a relevant publicly available policy.	Requirement 30: The organization shall, at least every six months, perform a documented material balance accounting (by weight and/or unit count) reconciling all incoming quantities with all outgoing quantities of Electronic Equipment moving through the Organization's Control during the MBA period, considering the amounts in inventory (processed and unprocessed). Ref.: e-stewards 9.1.4b	100%
Collection of upstream data (8.2)	Requirement 31: The organization shall collect data that include among others confirmation of compliance with CoC from the organization in its value chain, the assignment of sorting attributes and indication of recoverable resources.	Requirement 31: The organization shall, at least every six months, perform a documented material balance accounting (by weight and/or unit count) reconciling all incoming quantities with all outgoing quantities of Electronic Equipment moving through the Organization's Control during the MBA period, considering the amounts in inventory (processed and unprocessed). Ref.: e-stewards 9.1.4b	100%

ISO 59014		e-stewards	
Subclause	Rephrased requirement	Assessment	Level of coverage
Collection of processing date (8.3)	Requirement 32: The organization shall collect input and output data preferably categorized by product, component and percentage of input routed towards different recovery pathways.	Requirement 32: The organization shall, at least every six months, perform a documented material balance accounting (by weight and/or unit count) reconciling all incoming quantities with all outgoing quantities of electronic equipment moving through the organization's control during the MBA period, considering the amounts in inventory (processed and unprocessed). Ref.: e-stewards 9.1.4b	100%
Collection of downstream data (8.4)	Requirement 33: The organization shall collect data on the percentage of the total amount of outputs routed towards different clients and for types of products, components or materials the recovery pathways or energy recovery or proper disposal.	Requirement 33: The organization shall, at least every six months, perform a documented material balance accounting (by weight and/or unit count) reconciling all incoming quantities with all outgoing quantities of Electronic Equipment moving through the organization's control during the MBA period, considering the amounts in inventory (processed and unprocessed). Ref.: e-stewards 9.1.4b	100%
Collection of depollution data (8.5)	Requirement 34: The organization shall collect data on the depolluted recoverable resources accompanied by information on removed materials, substances or mixtures, the presence of declared hazardous substances when receiving from upstream or delivering downstream and maintain a documentation that demonstrates the activities.	Requirement 34: The organization shall, at least every six months, perform a documented material balance accounting (by weight and/or unit count) reconciling all incoming quantities with all outgoing quantities of Electronic Equipment moving through the organization's control during the MBA period, considering the amounts in inventory (processed and unprocessed). Ref.: e-stewards 9.1.4b	100%
Communication (8.6)	Requirement 35: In case that the organization intends to communicate about the traceability of materials it should use a recognized model and make traceability data available to the organization's immediate downstream and upstream organizations who can require it. It shall cooperate with all direct suppliers and other organizations involved.	Requirement 35: Such provisions are not covered in e-stewards.	0%
Continual improvement (8.7)	Requirement 36: The organization shall conduct regular evaluations of the traceability system's effectiveness, address any identified deficiencies, and implement improvements to ensure ongoing enhancement.	Requirement 36: The Organization shall create, maintain, implement, and continually improve a Stewardship Management System (SMS) that covers all the Organization's operations within each country in which the Organization exists. Ref.: e-stewards 4.1	100%

4.6 General level of similarity of the WEEE standards with ISO 59014

Table 12 gives an overview of the similarity of requirements of the three WEEE standards in comparison with ISO 59014.

Table 12: Level of similar requirements of the international WEEE standards with ISO 59014

	CEN 50625	R2	e-stewards
All requirements	61%	55%	61%
Operational	71%	50%	63%
Organizational	33%	38%	43%
Traceability	93%	86%	86%

In general terms, it can be concluded that CEN 50625 and e-stewards are closest to ISO 59014. However, all three WEEE standards show significant differences compared with ISO 59014, covering only about 50% to 60% its provisions overall. The largest gaps are in organizational requirements, with operational requirements showing slightly fewer differences. Traceability requirements are best covered in CEN 50625, though R2 and e-stewards also largely fulfill these aspects.

Table 13: Requirements of ISO 59014 covered by the international WEEE standards - Summary

100% = ■
 75% = ■
 50% = ■
 25% = ■
 0% = ■

Table 13 provides a more detail view of the level of coverage of relevant ISO 59014 aspects by the three international WEEE standards.

Requirement ISO 59014		Coverage		
		CEN 50625	R2	e-stewards
6	Operational requirements			
6.1	General	■	■	■
6.2	Classification and determination of recovery pathways	■	■	■
6.3	Collection	■	■	■
6.4	Sorting	■	■	■
6.5	Material recovery Processes	■	■	■
6.6	Logistics	■	■	■
7	Organizational requirements			
7.1	Monitoring and Evaluation	■	■	■
7.2	Interested party engagement	■	■	■
7.3	Responsibility towards the value chain	■	■	■
7.4	Responsibility towards individuals engaged in subsistence activities	■	■	■
7.5	Equitable working conditions	■	■	■
7.6.1	Environmental and social risks	■	■	■
7.6.2	Health and safety risks of workers and individuals involved in SAs	■	■	■
7.7	Resource use	■	■	■
7.8.1	Operational and managerial competences	■	■	■
7.8.2	Training needs	■	■	■

Requirement ISO 59014		Coverage		
		CEN 50625	R2	e-stewards
8.	Traceability requirements			
8.1	General	■	■	■
8.2	Collection of upstream data	■	■	■
8.3	Collection of processing data	■	■	■
8.4	Collection of downstream data	■	■	■
8.5	Collection of depollution data	■	■	■
8.6	Communication	■	■	■
8.7	Continual improvement	■	■	■

Total number of requirements by each respective color

100% = ■	10	9	11
75% = ■	3	2	2
50% = ■	3	4	3
25% = ■	1	1	0
0% = ■	6	7	7

5 Positioning of ISO 59014

5.1 Positioning in the WEEE landscape

The comparison shows that a good number of ISO 59014 requirements are not covered by the three international WEEE standards. Only between 50% to 60% of the requirements of ISO 59014 are covered by each of the three WEEE standards.

The main gaps in these three WEEE standards compared to ISO 59014 are the considerations of social and environmental aspects in the decision-making process along the reverse supply chain (e.g. in collection, sorting and treatment of collected appliances), the necessity of a code of conduct for suppliers as an instrumental tool for monitoring fair and responsible practices, and the involvement of interested parties along the value chain. The consideration of the concerns of stakeholders in the subsistence economy is an additional aspect of ISO 59014, which only applies when organizations are already engaging or intend to engage with individuals in subsistence activities. This is particularly relevant in the context of waste management systems in the Global South.

Determining the role ISO 59014 within the WEEE landscape leads to the following questions:

- 1. Could ISO 59014 play a competitive role against the three international WEEE standards?**
- 2. Could ISO 59014 be an add-on for companies that are already certified according to one of these three standards?**
- 3. Could ISO 59014 be interesting for WEEE processing companies that do not have such certification yet?**

There are reasonable doubts when answering the first question on the competitiveness of the ISO 59014 standard against the three WEEE standards. The international WEEE standards have been established over several years and, due to their predominantly technical orientation, are clearly geared towards WEEE processing companies, which must meet these requirements due to the economic necessities of their suppliers or due to official requirements. Certification to ISO 59014 cannot fully replace these requirements, in part due to the different nature and scope of the standards. This situation might change if comprehensive sustainability approaches in waste management, including value chain responsibility, become a legal requirement. Regarding the second question, there can be opportunities and benefits of implementing the ISO 59014 standard for companies that want to align their value chain more closely with environmental and social life cycle considerations or which work with individuals in the subsistence economy. Arguments for this positioning include extended material responsibility and greater involvement of all actors along the value chain in a similar way to the European supply chain act⁷. Such companies could differentiate themselves from the competitors in a positive sense and gain advantages in the long term. This is always subject to economic viability and the political and legislative framework conditions that create a suitable environment for sustainable value chain approaches.

⁷) DIRECTIVE (EU) 2024/1760 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on corpo-rate sustainability due diligence and amending Directive (EU) 2019/1937 and Regulation (EU) 2023/2859

The same considerations may apply when discussing the third question. Companies that do not yet have a certified system according to any of the international WEEE standards mentioned, could develop in a similar direction as offered by these WEEE standards but with a more comprehensive approach as established by the ISO 59014 standard. It is worth noting that getting certified in accordance with ISO 59014 would probably be more suitable for medium-sized companies with a corresponding market position. For small-scale processing operations, such certification is likely to be more difficult to achieve, as economic considerations will take precedence over the consequent integration of demanding and more visionary social and environmental requirements.

5.2 Positioning within the value chain

Within the value chain, the four standards are positioned differently, as illustrated in Table 14:

- » **ISO 59014** starts at the beginning of the chain – collection – and, with its stricter requirements, aims to create the optimal conditions for the continued use of the functionality of the devices and the subsequent pre-processing of the raw materials from an environmental and social perspective. The standard concludes with few further requirements for material recovery and no requirements for energy recovery and final disposal. The broad approach along the value chain means that various actors are addressed at the same time, making their cooperation and coordination a key element of the standard.
- » **CEN 50625** focuses on the optimal processing of the returned electronic devices with the aim of high resource efficiency, considering the separation and environmentally friendly treatment of components containing harmful substances. The preliminary stages of collection, classification and sorting, as well as ensuring maximum recovery of functions, are less of a focus. In a sense, CEN 50625 ties in with the requirements of ISO 59014. With a focus on the processing companies, CEN 50625 addresses a narrower section of the value chain.
- » **R2** has the narrowest value chain focus, which is clearly on processing companies, although, in contrast to CEN 50625, it also explicitly addresses companies in the refurbishment and reuse sector. In contrast, the subsequent processes in the value chain are addressed less prominently. For example, within material recovery, requirements for resource efficiency or for the quality of the fractions generated in the processes are missing.
- » **e-stewards** also has a broad value chain approach that starts early in the value chain. The clear goal is to control hazardous substances along the value chain. The requirements go well beyond those of R2 and are even stricter than CEN 50625 in certain areas, especially when it comes to the requirements for a suitable processing technology. In addition, the e-steward standard also sets strict requirements for transboundary movement of waste in line with the requirements of the Basel Convention.

Table 14: Positioning of ISO 59014 within the value chain

Focus = ■
 Partially covered = ■
 Not covered = □

Standard	Value chain						
	Collection	Classification and sorting	Recovery of function	Pre-processing*	Material recovery	Energy recovery	Final disposal
ISO 59014	■	■	■	■	■	□	□
CEN 50625	■	■	■	■	■	■	■
R2	□	■	■	■	■	□	□
E-stewards	□	■	■	■	■	■	□

5.3 Unique selling propositions of the ISO 59014 standard

5.3.1 Recognition of ISO standards

As an ISO standard, ISO 59014 has a much broader target group than a sectoral, technical standard that focuses on a specific economic sector. In addition, an ISO standard – being a global standard – is part of a family of countless other standards. This enables companies that are already ISO certified to benefit from synergies, both within their management system, as well as towards accredited national standardization bodies with their well-established procedures and availability of auditors. Furthermore, ISO standards are well-known and accepted and promoted by the international community (e.g. international funding organisations and intergovernmental agencies).

5.3.2 Collection schemes, take-back organizations and PROs

The broad approach of ISO 59014 within the value chain, as well as the fact that it addresses several actors who must align themselves with the same goals and requirements, particularly appeal to waste collection organizations and take-back systems. No other existing standard fulfills this objective. This gives ISO 59014 an interesting unique selling proposition.

Particularly interesting systems are those in which, in addition to material recovery, preparation for reuse is also envisaged. This can include, for example, electrical and electronic equipment, but also textiles, furniture, composite materials, other consumer goods or construction waste.

Producer Responsibility Organizations (PROs) which operate their own collection and take-back systems are potential target audience for the standard ISO 59014. In contrast to conventional systems, financial responsibility in this case lies with the producers, whereas municipal authorities or associations typically manage and fund other systems. Nevertheless, the methods of product collection and take-back remain largely the same.

5.3.3 Refurbishment and recycling companies

Refurbishment and recycling companies that collect and process recoverable resources and want to meet high social and environmental standards can pursue a differentiation strategy vis-à-vis their competitors with the step-by-step implementation and certification of ISO 59014. This is likely to appeal more to medium-sized (50-250 employees) and to large (over 250 employees) companies due to their economic capacity. Implementation could initially take place in only some areas of the value chain or in relation to the recoverable resources collected and processed and could be gradually expanded. As mentioned in the previous chapter, companies that in addition to material recovery foster preparation for reuse renewable resources and enable functional reuse are particularly suitable.

5.3.4 Companies in the global south

Companies in the global south that work together with actors in the subsistence economy are also particularly addressed. Such companies can also differentiate themselves from competitors and become frontrunners in their sector. The more companies that operate within a collection system based on ISO 59014, the greater the pressure on those that have not yet aligned themselves with the standard. It would also be conceivable for PROs to require their processing companies to develop in line with the requirements of ISO 59014.

Bibliography

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R2v3:2020: The Sustainable Electronics Reuse and Recycling (R2) Standard

e-stewards_v4.1:2022: The e-stewards Standard for Ethical and Responsible Reuse, Recycling of Electronic Equipment and Information Technology

ISO Workshop Agreement No. 19:2017: Guidance principles for the sustainable management of secondary met-als



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SRI builds capacity for sustainable recycling in developing countries. The programme is funded by the Swiss State Secretariat of Economic Affairs (SECO) and is implemented by the Institute for Materials Science & Technology (Empa) and the World Resources Forum (WRF). It builds on the success of implementing e-waste recycling systems together with various developing countries since more than ten years.