From Waste to Resource: Reforming End-of-Waste Criteria through Standards

Current situation

End-of-Waste (EoW) is a regulatory status under the EU **Waste Framework Directive (2008/98/EC)**[1] that determines when a material ceases to be considered waste and becomes a product or resource again. For a material to achieve EoW status, it must have undergone a recovery operation and comply with a set of specific criteria that ensure it can be safely used without harming human health or the environment.

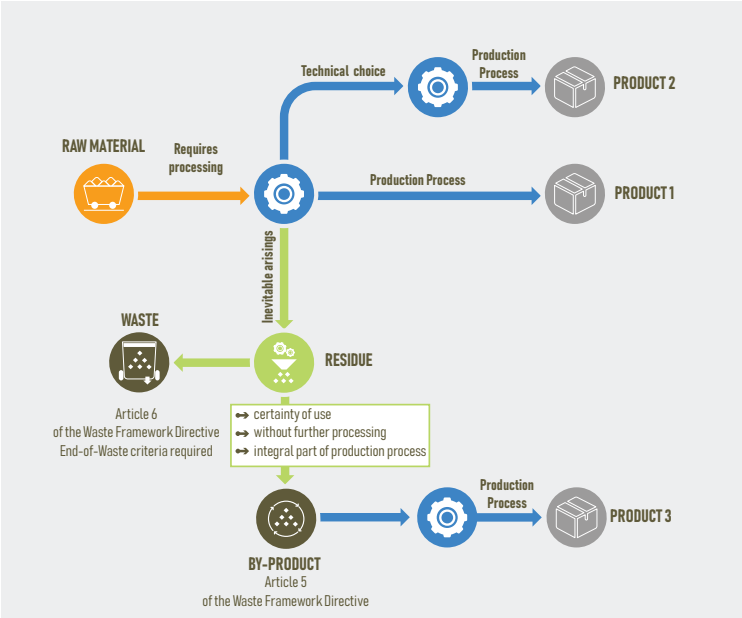

Figure 1: Current delineation between product, by-product and waste as defined in the Waste Framework Directive

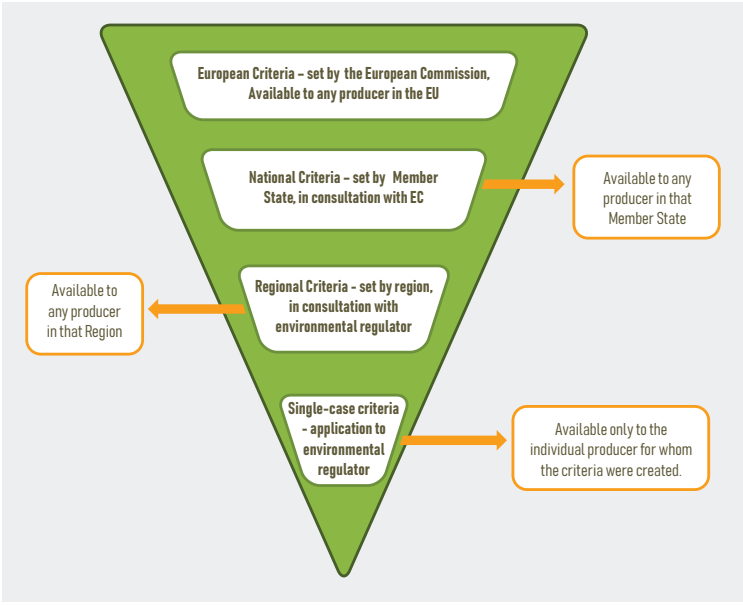

Figure 2: Illustration of different levels that EoW criteria can be applied

The general process for companies to achieve EoW status typically begins with demonstrating that their recovered material consistently meets the criteria through quality assurance systems, testing, and documentation. EU-wide EoW criteria already exist for iron, steel and aluminium scrap, glass cullet, and copper scrap. If there is no applicable EoW for a material, companies must apply for national-level approval with their environmental regulator, providing evidence that their material meets the conditions for ceasing to be waste. If granted, the material can be marketed as a product rather than a waste stream, allowing companies to potentially reduce disposal costs, create new revenue streams, and contribute to a circular economy.

Legal Requirements

For materials to formally gain EoW status, strict conditions must all be met:

1. It has undergone a recovery, including recycling, operation and complies with specific criteria
2. Commonly used for a specific purpose
3. Market or demand exists for such substance or object
4. The use is legal - The substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products; and
5. The use of the substance or object will not lead to overall adverse environmental or human health impacts

1 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02008L0098-20180705

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Issues

While EoW can offer opportunities for circular economy growth, the pathway to achieving and maintaining it is often complex, fragmented, and risky. The main issues include:

- **Fragmented rules** - EU-wide criteria exist for only a few materials; most depend on national approvals, the procedures for which can differ significantly from one Member State to another, creating barriers to cross-border trade and uncertainty for companies looking to scale their recovery operations.
- **Burden of Proof** - Quality management, testing, and certification can be resource-intensive and costly, especially for SMEs.
- **Regulatory uncertainty** - Long approval processes, inconsistent interpretations, and possible refusals discourage investment.
- **Market perception**: Even with EoW status, some buyers remain hesitant to use "waste-derived" products.
- **Ongoing obligations**: Companies must maintain strict monitoring and documentation, with the risk of losing EoW status if standards slip.

The quotes below* highlight the challenges in harmonizing the End-of-Waste process across the EU, including fragmentation, lack of coordination, and barriers to cross-border waste management.

A limited development of EU-wide end-of-waste criteria and by-product status..... has led to the fragmentation of the Single Market for waste, secondary materials and by-products

A lack of harmonised EU definition of by-products.... impedes the circularity of production processes

National or regional end-of-waste criteria have been adopted by Member States in an uncoordinated manner and are not easily recognised between Member States

*All taken from page 11 of: The Single Market: Our European Home Market in an Uncertain World - European Commission

Case Study 1: Regional Path from Waste to By-product Status in Emilia Romagna, Italy

Background

Emilia Romagna was the first Italian region to formally embed Circular Economy principles into law with Law No. 16 (October 2015[2]). A key feature of this law was the creation of a **Permanent Coordination for By-products**, a body composed of trade associations and other stakeholders. Its role is to identify materials that may qualify as "by-products" under national regulations, thereby reducing waste generation.

Procedure for Recognition

Companies can apply to have their materials listed as "regional by-products." The process requires:

- Documenting the production process and characteristics of the derived materials.
- Submitting an application for inclusion in the **List of Regional By-products** if the process and material meet predefined criteria.
- Producing a technical data sheet for each proposed by-product, covering:
  - Description and characteristics
  - Uses
  - Treatments
  - Standards (EN, etc.)
  - Management aspects

Currently, **thirteen materials** have achieved this recognition – among them apricot pits, peach pits, and salt from meat salting. Meeting the necessary legal requirements, along with overcoming complexities such as the high documentation burden, highlights the difficulties involved in attaining EoW status.

Conclusion

Emilia Romagna's pioneering approach illustrates both **the potential of regional initiatives in supporting circular economy goals and the legal and procedural hurdles of the EoW process that slow progress.** Despite an enabling framework, the combination of strict criteria, administrative burden, and regulatory overlap means that only a few materials achieve By-product or EoW status through this method—leaving significant circular opportunities untapped.

2 https://demetra.regione.emilia-romagna.it/al/articolo?urn=er%3Aassemblealegislativa%3Alegge%3A2015%3B16

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Case Study 2: Connecting Standards to EoW for Pulverised Fuel Ash in Ireland

In Ireland, the Electrical Supply Board (ESB) achieved a "Single Case Decision" for an EoW classification for their Pulverised Fuel Ash (PFA)[4].

This case study demonstrates how waste materials, such as PFA and Furnace Bottom Ash (FBA), can be repurposed into valuable products by meeting specific regulatory and quality standards. The Environmental Protection Agency (EPA) established EoW criteria for these materials, allowing them to be used as secondary raw materials in bound applications (e.g., construction products) without being classified as waste.

Key points from the case study include:

1. **Compliance with Standards**: PFA and FBA must meet relevant product standards (e.g., IS EN 13242, IS EN 450-1) and customer specifications to ensure quality and safety. These standards ensure the materials are suitable for use in construction and other applications.

Material	Product Standard
Pulverised Fuel Ash and Furnace Bottom Ash	IS EN 13242: Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction.
Pulverised Fuel Ash and Furnace Bottom Ash	IS EN 13055-1: Lightweight aggregates. Lightweight aggregates for concrete, mortar and grout.
Pulverised Fuel Ash and Furnace Bottom Ash	IS EN 13055-2: Lightweight aggregates. Lightweight aggregates for bituminous mixtures and surface treatments and for unbound and bound applications.
Pulverised Fuel Ash	IS EN 13043: Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas.
Pulverised Fuel Ash	IS EN 450-1: Fly ash for concrete. Definition, specifications and conformity criteria.
Pulverised Fuel Ash	IS EN 12620: Aggregates for concrete.
Pulverised Fuel Ash	BS EN 197-1: Cement. Composition, specifications and conformity criteria for common cements.

Table 1: Approved standards and specifications for etermining the quality of PFA and FBA in Bound applications

2. **Environmental and Health Safeguards**: The materials must comply with regulations such as CLP (Classification, Labelling, and Packaging), REACH (Registration, Evaluation, Authorisation, and Restriction of Chemicals), and POPs (Persistent Organic Pollutants) to prevent risks to human health and the environment.
3. **Controlled Processes**: The materials undergo strict handling, treatment, and quality assurance processes, including testing for contaminants, maintaining records, and issuing declarations of conformity for each batch.
4. **Bound Applications**: The use of PFA and FBA is restricted to bound applications, where they are fully integrated into products like concrete or lightweight aggregates, ensuring they do not pose environmental risks.
5. **Documentation and Traceability**: Producers must maintain detailed records of production, testing, and compliance for at least five years, ensuring traceability and accountability.

This case study highlights that by **adhering to established standards and regulatory frameworks, waste materials can be transformed into valuable resources**, reducing the need for virgin materials and minimizing environmental impact. It provides a practical example of how waste can be repurposed effectively without undergoing the full EoW process, as long as full compliance with all relevant standards is demonstrated.

4 https://www.epa.ie/publications/compliance--enforcement/waste/ART28-0014-FINAL-DECISION-EoW-Criteria-for-Ash---ESB.pdf

Using Standards to Replace EoW Criteria to Stimulate Industrial Symbiosis while Ensuring Quality and Safety

The upcoming Circular Economy Act[3] aims to increase circularity in the single market. It seeks to remove barriers to circularity in the single market and to help create "sufficient supply and demand for secondary raw materials (including critical ones) and a true single market for waste and secondary raw materials."

A mix of interventions will be considered to enable this, including a reform of the end of waste criteria.

The RISERS project, as part of their Roadmap for Industrial Symbiosis Standardisation, goes one step further with its proposal to replace EoW criteria with standards. A key aspect we are exploring is how to expedite the transition from waste to reusable resources at EU, national, and local levels through the use of existing input standards where available. Our approach proposes a horizontal standard that details the requirements (such as the standards that the treated waste must meet (ISO, POPs, etc), treatment processes, regulatory compliance, quality assurance, potential applications), linked to vertical standards for specific waste types which will detail the specifics for each of these wastes. By referring to existing standards, the acceptance process is expected to be far quicker than the current process.

This system, outlined in the figure below, would enable waste to be repurposed through licenced waste treatment processes treating the waste to a level where it can meet production input standards. This would result in lessening the regulatory burden on industrial symbiosis and accelerating the circular economy through standards.

3 https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14812-Circular-Economy-Act_en

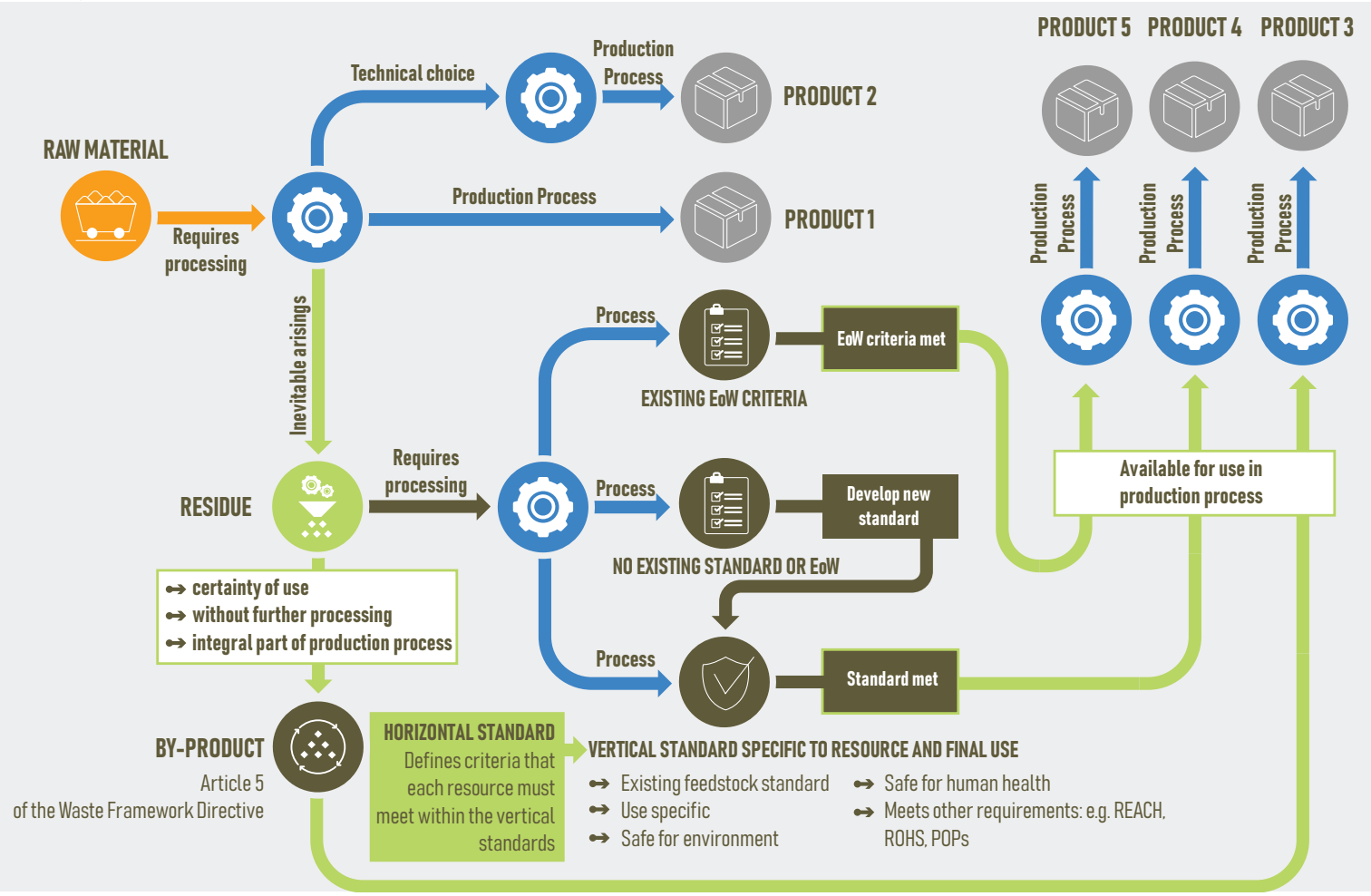

Figure 3: RISERS proposal for using standards to control the quality requirements for treating waste, replacing the current EoW criteria.

About the RISERS project

RISERS is a Horizon Europe project aimed at developing an Industrial Symbiosis Standardisation Roadmap supporting the uptake of high impact synergies and resources considering:

- identification of the needs, gaps and opportunities,
- revision of current standards and standardisation efforts relevant for CE and the priority synergies and resources,
- initiating the process of new standards development (especially for newer technologies and pilot-scale synergies).

The RISERS project was launched in January 2024 with a duration of 3 years.

For more information visit: https://risers-project.eu

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