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Current Approaches and Challenges in Disclosing Environmental Product Information through EPDs

Addressing the complexities of comparing Environmental Product Declarations (EPDs) and creating awareness on setting common rules

Electro- und Digital Industry Association

1 Introduction

As industries transition toward more sustainability and lower environmental impacts such as fossilised decarbonization, access to reliable and standardized environmental data has become essential for sustainable product design, Impact accounting, and transparent environmental claims. This data provides insights into environmental hotspots, enabling manufacturers to optimize material choices and production processes, as well as supply chain stakeholders to reduce their environmental impacts. More precise product-level data enhances corporate carbon accounting, offering greater accuracy than traditional spend-based estimates and allowing businesses to make evidence-based environmental claims.

Given the increasing importance of product environmental data in this context, stakeholders—including customers, channel partners, investors, and regulatory bodies—are demanding evidence of products' environmental impacts. In response, various environmental declarations and labelling systems have emerged: The most differentiated declarations, to which this document is referring to, are the ISO (International Standardisation Organisation) Standards[1] as follows:

- **Type III Environmental Product Declarations (EPDs) (ISO 14025):** Standardized documents that provide quantified environmental data based on Life Cycle Assessment (LCA). They communicate a product's environmental impacts throughout its life cycle and are classified as:
  - **Externally Verified EPDs:** Verified by an independent third party.
  - **Internally Verified EPDs:** Verified by an accredited individual within the manufacturer’s organization.
- **Type II Self-Declared Environmental Claims (ISO 14021):** Manufacturer-issued claims regarding environmental attributes without third-party verification.
- **Type I Ecolabels (ISO 14024):** Independent third-party certifications based on multiple environmental criteria, considering a product’s entire lifecycle.

EPDs, manufacturer LCA declarations, and certain ecolabels are crucial for companies to analyse their products' environmental burdens—from raw material extraction and production to the use phase, end-of-life disposal, and potential recycling or reuse. They help identify areas for improvement to foster ecodesign innovation and provide customers with transparent environmental information, aiding in project impact estimations and corporate ESG reporting.

In the construction sector, EPDs are vital for promoting sustainable practices for building. Systemic Life Cycle Assessments (LCAs), which aggregate multiple EPDs, can evaluate the total environmental footprint of an entire building. This method allows architects and engineers to identify environmental hotspots and make informed ecodesign choices at the project level. However, ensuring comparability when selecting construction materials based on EPD results is essential to avoid misleading purchasing decisions. Consequently, several European countries, including France and the Netherlands, have integrated EPD requirements into building regulations, promoting standardized and reliable application of environmental data in construction.

The demand for standardized, verifiable environmental data has intensified due to strengthening regulations, such as the Ecodesign for Sustainable Products Regulation (ESPR), which are driving industries toward greater transparency and accountability and reinforce the significance of EPDs and similar declarations in shaping a more sustainable market landscape.
However, fulfilling these demands causes challenges for the Electrical and Electronic Products and Systems (EEPS) industry, which originate from the industry’s extensive reach across multiple sectors, vast product portfolios, and established LCA methodologies, which can differ from those used in other industries. A lack of harmonization among different company practices can lead to inconsistencies in measuring, reporting, and communicating environmental impacts and hinders effective comparisons and decision-making for stakeholders seeking to understand the environmental performance of products in this diverse industry.

This paper has been developed by the ZVEI Automation Division. It addresses the current approaches and challenges faced by the industry sector in disclosing Environmental Product Declarations (EPDs). The aim is to provide valuable insights for rule-setters and users of EPDs, including program operators, standardization bodies, end customers, and distributors.

[1] The ISO 14020 family of standards (Environmental statements and programmes for products — Principles and general requirements) is currently undergoing revision by ISO/TC 207/SC 3. This position paper is intended to contribute to the ongoing international standardization discussion.

2 Challenges of EPD Comparability and Decision Framework

2.1 Challenges of EPD Comparability

Environmental Product Declarations (EPDs) provide transparency on the environmental impact of products. However, comparability remains a significant challenge due to differences in methodological choices, data sources, and verification approaches.

Methodological Challenges
EPDs rely on Life Cycle Assessments (LCA) methodologies, which cover various life cycle phases of a product. For an effective comparison of different declarations, it is crucial that these phases are consistently defined and reported.

Data Challenges
The accuracy and consistency of EPD results depend on the quality and transparency of the underlying data. Even when verification ensures compliance with Product Category Rules (PCR) and Product Specific Rules (PSR) requirements, it does not guarantee comparability between different manufacturers' EPDs. For instance, while final impact indicator values are provided for each life cycle phase, it is often not fully disclosed if primary or secondary data has been used, and if secondary data has been used the corresponding dataset names, database versions, and referenced assumptions, despite their significant influence on the results.

Communication Challenges
EPD users, ranging from procurement teams to regulatory bodies, often lack a clear understanding of how EPD data should be interpreted and used responsibly. While aggregating EPDs can support systemic LCA applications (e.g., calculating the environmental footprint of an entire building for ecodesign), choosing between competing products based solely on EPD values is problematic. Without standardized guidance, EPDs may be misused for competitive positioning rather than constructive sustainability improvements.

Awareness Challenges
Many industry players still struggle making informed decisions based on sustainability information. Regulatory advancements, such as EU's Ecodesign for Sustainable Products Regulation (ESPR) will push for better standardization. However, widespread adoption and alignment across industries require proactive engagement. Establishing fair comparability through stronger methodological frameworks could enhance transparency and credibility, positioning industries as leaders in sustainability innovation and setting benchmarks for other sectors and regulators.

Despite these challenges, improving comparability in LCA and EPD data is essential for driving meaningful impact reductions efforts such as fossilized decarbonization, while limiting burden shifting or trade-off effects. A harmonized approach over various sectors would not only support fair comparisons and data aggregation but also enable better sector-specific strategies to reduce environmental impacts and inspire regulatory and market transformations.

2.2 Way Forward: Decision Framework

We recognize that a harmonized framework for EPDs is essential to address the current industry challenges presented above and requires further industry alignment. To support the assessment of whether two EPDs are comparable or not, the development of a decision tree is proposed. This decision tree, shown in Figure 1, is not a standardized method but rather an output of the discussions among participating experts. It may be used as a first step to:

- understand the importance of EPD comparability,
- quickly identify to what extent a comparison between different EPDs is possible.

We are looking forward to sharing this preliminary work and invite stakeholders who feel addressed to join the group of experts to fine-tune and improve the decision tree/framework and its usability in the future.

If the criteria in List A of Table 1 are not met, the two EPDs cannot be compared. If all criteria from both List A and List B are satisfied, the two EPDs can be compared. If the criteria from List A are met but those from List B are not, the two EPDs can still be compared, provided the error bars do not overlap. Currently, a method for deriving the error bars is not yet available and therefore should be developed.

Today, only products from the same manufacturing line/company can fulfill both elements from Lists A and B, enabling conclusive comparisons. Conversely, the comparability of products from different manufacturers remains theoretical since the elements of both Lists A and B cannot be met under the current methodologies and tools.

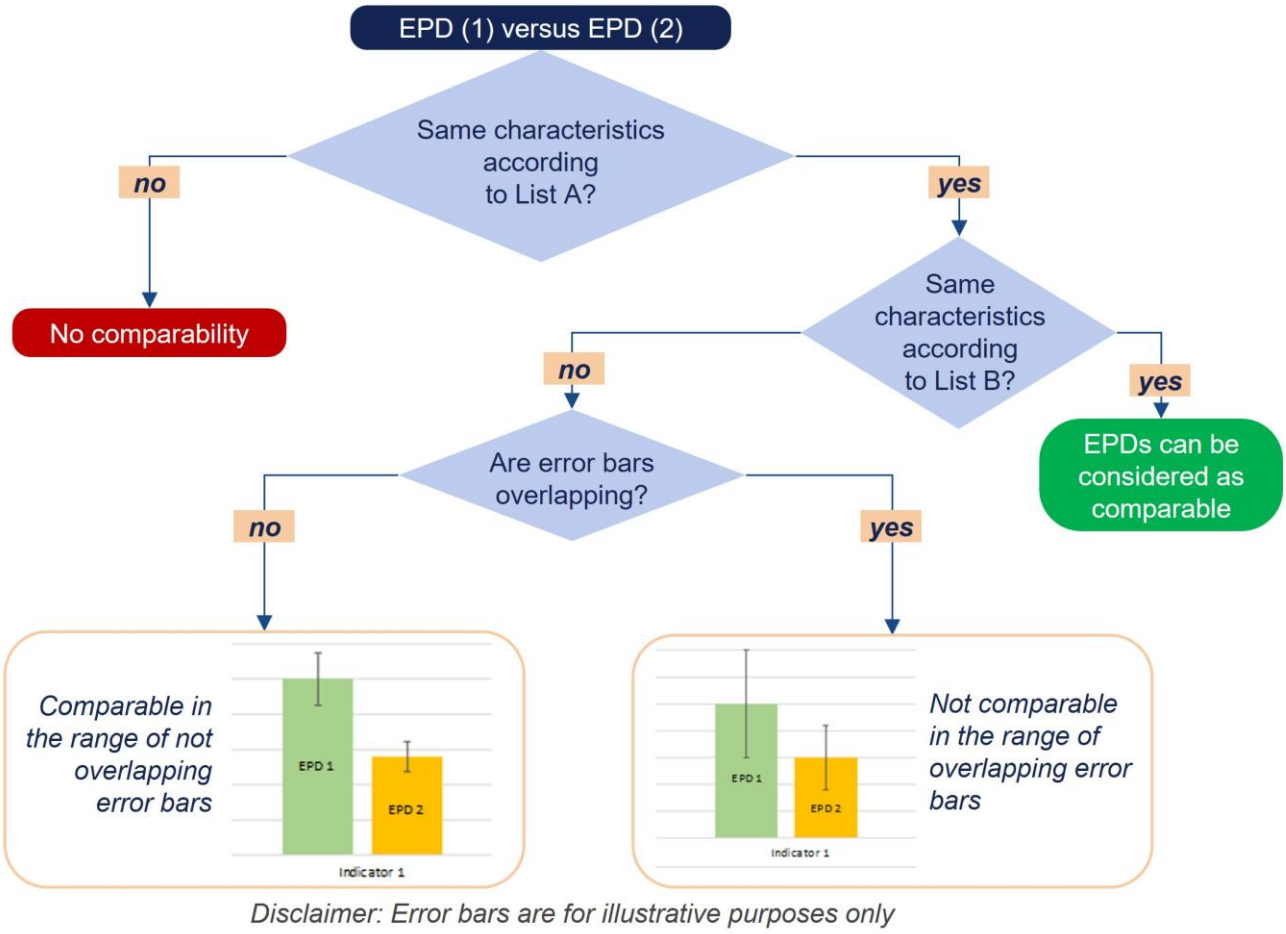

Figure 1: Draft of a decision tree to assess, if EPDs are comparable or not

The requirements for List A and List B, shown in Table 1, are derived from ISO 14025 Chapter 6.7.2 and have been paraphrased to facilitate their interpretation.

Table 1: Expected levels of deviation between EPDs based on supporting information

Do EPD1 and EPD2…	Supporting information	List A (Mandatory)	List B (Deviation)	Level of deviation
Have the same functional unit?	*If products are using the same PCR/PSR, it should help to have an aligned FU. Make sure the performance quantity, the reference service lifetime described in the FU are identical to ensure comparison*	X		
Include the same life cycle phase?	*Recommend working only on a Cradle-to-Gate scope, from raw material extraction up to gate of the manufacturer plants. The Cradle-to-Gate scope of both environmental assessments shall include the same upstream life cycle phase, it could be handled if both are using same PCR/PSR*	X		
Are based on the same database to source secondary data?	*For instance, emissions factors from GHG Protocol or ecoinvent or any other database source used in LCA. Please note that deviation may occur if both EPDs are using the same database but from different versions.*		X	High

Have the same cut off rules?	*Yes, if they are using same PCR/PSR*		X	Medium
Have the same allocation rules?	*Yes, if they are using same PCR/PSR. Please note that even for a Cradle-to-Gate comparison, different allocation for end of life (avoided impact vs. Stock method) would have an impact on upstream process as well*	X		High
Have the same split between specific (primary) and generic (secondary) data?	*It is achieved depending on PSR/PCR, PEFCR clarify that split as well*		X	Medium
Have identical way to collect primary data?	*It is achieved depending on PSR/PCR, PEFCR clarify that split as well*		X	Medium
Have identical way to assign secondary data?	*It is achieved depending on PSR/PCR, PEFCR clarify that split as well*		X	Medium
Have identical data quality?	*If reported, the DQR from PEF or Pedigree Matrix, ensure they are within the same range*		X	Medium
Use the same impact method and indicator?	*Easier when focus on global warming potential indicator only, ensure both systems rely on the same method (i.e. same IPCC report to source emission factors)*	X		
Have the same validity period	*if validity period is overlapping, select "Partially"*		X	Low

3 Challenges due to Heterogeneous Requirements from EPD Program Operators

While the previous chapter highlighted the key challenges around the current framework of EPDs and comparability, which are rooted in the complex nature of LCA methodologies and their underlying data, manufacturers also face significant difficulties in disclosing environmental product data on a large scale across diverse markets. This is due to the heterogeneous requirements imposed by the scattered landscape of EPD program operators. This chapter outlines these challenges and potential directions for streamlining current industry practices.

3.1 Limited Mutual Recognition Agreements between EPD Program Operators and Multiplication of PCRs

The value of mutual recognition agreements (MRAs) between EPD program operators is widely acknowledged, as outlined in ISO 14025 and ISO TS 14029. MRAs can add value in various instances and scopes among the contributing and participating EPD program operators. MRAs might:

1. relate to the alignment of PCR/PSR documents being mutually accepted by the participating partners.
2. support the mutual recognition of third-party verification of EPDs among EPD programs.
3. allow for the mutual recognition of tool and process verification among all participating EPD program operators.

However, the scope of existing MRAs between program operators remains limited. Additionally, multiple Product Category Rules (PCRs) for similar products have been developed across different program operators, some even in parallel to establish European standards such as the EN 50693. Due to varying regional acceptance of EPD program operators, manufacturers often need to create, verify, and publish multiple EPDs for the same product in different programs based on different rule sets to meet all market requirements. These circumstances pose significant challenges for manufacturers as they require redundant efforts and could cause confusion for interested parties such as customers, when various EPDs for one product show different results.

Expanding MRAs on PCR/PSR, EPD level, and tool verification level across EPD program operators could help address these challenges. At the PCR/PSR level, the MRA would allow one EPD program operator to adopt the PCR/PSR of another EPD program into its own program without the need to develop a new PCR/PSR. For existing PCRs/PSRs, mutual recognition should be fostered, and PCR/PSR adoption

systematically applied. At the EPD level, the MRA would ensure that an EPD issued and published by one EPD program operator is also acknowledged by other program operators without the need for additional verification. Same applies to the level of third party verified EPD creating tools, MRAs are a prerequisite to the acknowledgement of tool-verified created EPDs throughout different program operators. A tool-verification could decrease LCA-performing stakeholders 'expenditure and time-to-marked significantly and eliminates the need to perform the verification procedure multiple times in different EPD programs.

3.2 Tool Verification not Offered and Mutually Recognized by all EPD Program Operators

The current third-party verification process for individual EPDs is both time- and cost-intensive, as it cannot keep pace with the increasing automation of EPD generation and the growing volume of EPDs to be published. Additionally, the availability of independent third-party verifiers is scarce, leading to long waiting periods for verifying and publishing EPDs. Offering and mutually recognizing process and tool verification by all EPD program operators, as mentioned in section 3.1, would help overcome these challenges. Furthermore, it is suggested that EPDs created using a verified tool with internal review be recognized as equivalent to those verified by a third party.

3.3 Extrapolation based on Reference Products not Consistently Allowed

In horizontal PCRs for the electrical and electronic equipment industry, such as international standards like EN 50693:2019 and IEC 63366, it is explicitly allowed to extrapolate LCA results of a representative reference product to a "homogeneous product family." The extrapolation rule is based on a linear scaling function using a descriptive product parameter. However, extrapolation for homogeneous product families based on reference products is not consistently allowed across all program operators.
Additionally, it is unclear whether all extrapolated EPDs for products from a homogeneous product family are considered as EPD Type III if the EPD for the reference product and the provided extrapolation rule have been verified. For manufacturers to cover their large product portfolios with EPDs, extrapolation based on reference products is crucial. This would involve declaring the environmental claims of the reference product and providing the extrapolation rules in the body or annex of the EPD. Furthermore, it is recommended that EPDs for scaled products within the homogeneous product family, derived from a third-party verified EPD, be acknowledged as EPD Type III.

3.4 Lack of EPDs in Machine Readable Formats

Access to digital EPDs in bulk for distributors and customers is currently lacking, and there are no established processes at program operators for uploading and registering EPDs in bulk. Additionally, the absence of a standardized common digital data model for the exchange of EPD data hinders the efficient utilization of environmental product information. EPD program operators could establish streamlined processes for uploading and providing machine-readable EPDs, including batch uploading and bulk registration capabilities. Furthermore, program operators could define a common digital EPD data model based on existing formats such as ILCD (International Reference Life Cycle Data System) + EPD. Existing data formats like ECLASS and ETIM could be extended to include the necessary information for ensuring the comparability of EPD results across various products and manufacturers. These digital infrastructure improvements would greatly benefit EPD users by providing easier access to EPD data in a standardized, machine-readable format, especially in context of the DPP.

3.5 Barriers for Integrating Primary Data from Suppliers

There is a trend in product carbon accounting towards the inclusion of primary data to enhance the specificity and accuracy of environmental product data. This shift is expected to also affect EPDs, causing a re-evaluation of how such data is integrated into environmental assessments. Currently, the requirements outlined in PCRs do not align with current decarbonization practices within the industry and their matching accounting methods, such as guarantee of origin and chain of custody mechanisms. Such discrepancies between LCA/EPD methods and carbon accounting methods may eventually threaten the necessary acceleration of investments in the supply chain for advancing low-carbon and circular technologies. Additionally, manufacturers face limitations in making their efforts towards ecodesign, circularity, and decarbonization transparent.

EPD program operators could facilitate the integration of supplier-specific primary data into EPDs, enhancing the accuracy and relevance of environmental product data. Furthermore, industry requires greater flexibility and representation in how investments toward a low-carbon and circular economy are depicted. Aligning

PCRs with global carbon accounting methodologies, such as GHG Accounting, would ensure consistency and establish a framework for encouraging sustainable efforts across the value chain. This could also progressively and consistently integrate market-based and Chain of Custody mechanisms to reflect real-world practices and investments.

4 Conclusion

The provision of environmental information at product level is extremely valuable in today's drive towards sustainability. Detailed and standardized environmental data supports sustainable product design, accurate carbon accounting, and transparent environmental claims. By identifying environmental hotspots, manufacturers can optimize material choices, production processes, and supply chains to minimize environmental impacts. This precise product-level data enhances corporate carbon accounting, offering greater accuracy than traditional spend-based estimates, and enables businesses to make proportionate and evidence-based environmental claims.

Despite the growing importance of product environmental data, significant challenges remain, particularly concerning comparability as well as the heterogeneous requirements from EPD program operators. Variations in methodologies, data sources, and verification approaches can lead to inconsistencies in how environmental impacts are calculated, reported, and communicated, hindering comparability and decision-making at product level.

Regarding these challenges, we emphasize that a comparability of EPDs is generally not given, except to a certain extent under the conditions described above. Furthermore, there is a need to discuss the harmonization of EPD practices and establish mutual recognition agreements between EPD program operators. Such agreements would enhance the reliability and comparability of EPDs and reinforce the economic value of environmental data.

We invite industry stakeholders, regulators, standardization bodies, and EPD program operators to collaborate in discussing and developing solutions focused on harmonizing methodologies. The ambition is to ensure consistent and comparable EPD results by increasing data transparency to support accurate and credible environmental assessments, promoting mutual recognition to streamline verification processes, and reducing redundant efforts across different EPD programs.

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