European Commission

Joint Research Centre

Methodology for defining data requirements for the Digital Product Passport under the ESPR framework

Chawla, K., Chirvasuta, T., Wolf, M.-A., Wolf, K., Rongen, S., Rurup, R., Gonzalez Torres, M., Naumann, G., Arcipowska, A.

2026

Joint Research Centre
https://joint-research-centre.ec.europa.eu

JRC145830
EUR 40660

PDF ISBN 978-92-68-38389-6 ISSN 1831-9424 doi:10.2760/4511279 KJ-01-26-127-EN-N

Luxembourg: Publications Office of the European Union, 2026

How to cite this report: Chawla, K., Chirvasuta, T., Wolf, M.-A., Wolf, K., Rongen, S. et al., *Methodology for defining data requirements for the Digital Product Passport under the ESPR framework,* Publications Office of the European Union, Luxembourg, 2026, https://data.europa.eu/doi/10.2760/4511279, JRC145830.

Contents

Abstract

This report presents a practical, step-by-step methodology to define Digital Product Passports (DPPs) requirements under the Ecodesign for Sustainable Products Regulation (ESPR), and why it should be included. It complements and extends existing ESPR methodological work by focusing on the semantic definition and prioritisation of DPP information requirements. In addition, it systematically investigates current industry data collection and data-sharing practices across product value chains. The methodology translates policy objectives and use cases into structured data needs. It distinguishes essential, strongly recommended and voluntary elements through a transparent value–effort and feasibility assessment grounded in real-world practices. Technical aspects of the DPP system are addressed only to a limited extent, namely where necessary to inform decisions on data access rights, data governance and data granularity, while detailed system architecture and implementation remain outside the scope. While the approach is primarily designed to support ESPR delegated acts and impact assessments, the modular structure of the methodology allows it, where appropriate, to be applied beyond the ESPR framework, provided equivalent contextual and feasibility analyses are carried out, offering policymakers a consistent and scalable tool to design coherent, enforceable and future-proof DPPs.

Acknowledgements

The authors wish to thank the members of the Digital Product Passport Expert Group, in particular Wojciech Sitarz (DG ENV) and Alexandru Ion (DG GROW), for their valuable contributions and constructive feedback during the preparation of this report.

The authors also express their gratitude to Enrique García John, Sara Blanco Pérez and Alejandro López Olmedo (JRC) for their contribution to the review of the final version of the document.

Authors

- Kartik Chawla, Theodor Chirvasuta, Sjoerd Rongen, Rik Rurup - TNO
- Marc-Andree Wolf, Kirana (Chomkhamsri) Wolf - maki Consulting
- Maria Gonzalez Torres, Gabriel Naumann, Aleksandra Arcipowska - JRC

Executive summary

Policy context

This report supports the implementation of the Ecodesign for Sustainable Products Regulation (ESPR), which establishes a horizontal framework to improve the environmental sustainability and circularity of products placed on the EU market. It focuses on the Digital Product Passport (DPP) as a key ESPR instrument to enable transparency, traceability, market surveillance, and circular economy objectives. Developed under the coordination of the Joint Research Centre, the report introduces the DPP data specification methodology to support ESPR preparatory studies and the preparation of delegated acts. The analytical work was carried out by external contractors. The methodology addresses the need for a consistent, proportionate and pragmatic approach to defining DPP information requirements. It reflects existing industry practices and delivers clear value for users. While primarily intended for ESPR implementation, the methodological insights are also relevant to related EU policies on sustainable products, industrial competitiveness and data governance.

Background

The DPP is a central pillar of the ESPR, intended to improve sustainability, transparency and circularity across product value chains. Achieving these objectives depends on the availability of reliable, interoperable and well-defined product information that can be consistently understood and used by different actors. This requires shared cross-sectoral and product-group-specific vocabularies and clear rules on what information should be made available, at what level of granularity and by whom. The DPP data specification methodology responds to this need by providing a structured, context-aware approach for defining DPP information requirements. The approach is aligned with ESPR objectives while remaining feasible for industry and fit for purpose for users. The methodology focuses on the semantic definition and classification of DPP data. Technical aspects of the DPP system are addressed only to a limited extent, when only necessary.

Method within the revised MEErP

The DPP data specification methodology provides a structured and pragmatic approach to defining proposals for the data and information to be included in DPPs under the ESPR. It is designed to support ESPR preparatory studies and the development of delegated acts by translating policy objectives, legal requirements and use cases into fit-for-purpose DPP information requirements. The methodology places strong emphasis on feasibility, proportionality and value for users. It is grounded in a sound understanding of existing industry data collection and data-sharing practices to facilitate integration and avoid an unnecessary administrative burden.

Within the context of the revised Methodology for Ecodesign of Energy-related Products (MEErP), the DPP data specification methodology assists study teams in developing a proposal for a DPP data specification by guiding the identification of the following:

(a) The information to be included in the product passport pursuant to Annex III to the Regulation.

(b) The appropriate level of product passport granularity (model, batch, or item level).

(c) The categories of actors that may introduce, update or access information in the product passport, including, where relevant, the creation of a new product passport and the allocation of data introduction and update rights. These actors may include, *inter alia*, manufacturers, importers, distributors, repairers, maintenance professionals, remanufacturers, recyclers, competent national authorities, the Commission and organisations acting on their behalf.

The methodology does not prescribe the implementation of a DPP system or its technical architecture. Technical aspects are considered only where necessary to inform policy choices related to data access rights, data governance and data granularity. Detailed system design and implementation remain outside the scope of this work and are addressed through standardisation and implementation processes.

High-level methodological structure

The DPP data specification methodology is organised into four main steps. These steps are closely aligned with the ESPR preparatory study process and integrated with the revised MEErP framework:

— *Step A – Scope and context:*
Establishes the product scope and policy context, identifies relevant stakeholders, reviews applicable legal requirements and analyses existing industry data practices to assess feasibility and proportionality.

— *Step B – Use cases and data needs:*
Identifies and validates policy-relevant and operational DPP use cases and translates them into conceptual data needs. These data needs are prioritised based on relevance, feasibility and value for users.

— *Step C – Design and development*:
Aligns identified data needs with existing vocabularies and ontologies, specifies data granularity, access rights and governance arrangements, and ensures semantic coherence and interoperability.

— *Step D – Validation and consultation:*
Validates and refines the proposed DPP data specification through internal consistency checks and consultation with relevant stakeholders.

It is important to note that both the impact assessment and the legal process of establishing DPP data specifications fall outside the scope of the preparatory study. However, the study supports policymaking by gathering evidence on existing industry practices, feasibility constraints and gaps in regulatory processes. Should modifications, additions or removals occur in the DPP data specification at later stages, a technical review and alignment will be essential to ensure continued coherence and functionality.

Finally, newly developed vocabularies and ontologies should be incorporated into the toolbox of common vocabularies. Over time, these cross-sectoral and product-group-specific resources should be reviewed and updated to maintain their relevance and effectiveness.

1. Introduction

The Ecodesign for Sustainable Products Regulation (ESPR) establishes a new horizontal framework for improving the environmental sustainability and circularity of products placed on the EU market. By extending ecodesign beyond energy-related products and energy efficiency, the ESPR enables the setting of performance requirements and information requirements covering a wide range of product aspects across the full life cycle. These include, *inter alia*, durability, reparability, recyclability, recycled content, the presence of substances of concern and environmental impacts.

This expanded scope represents a significant evolution compared to the former Ecodesign Directive. It requires a corresponding update of the methodological tools used to support preparatory studies, impact assessments and delegated acts. Existing methodologies, largely developed for energy-related products and focused on use-phase energy consumption, are not sufficient to address the broader range of sustainability aspects, product types and value chains now covered by the ESPR. In particular, the Regulation introduces new information obligations and data flows that cut across product groups and economic operators. This calls for greater consistency, interoperability and verifiability of product information.

Within this context, the Digital Product Passport (DPP) is introduced as a central instrument to operationalise ESPR information requirements and to enable the transparent exchange of product data along value chains. The DPP is intended to support multiple policy objectives simultaneously, including market surveillance, consumer information, circular economy strategies and industrial competitiveness. However, achieving these objectives requires more than the identification of data points. It necessitates a clear and context-aware methodology for defining DPP content, aligned with ESPR product requirements and compatible with a scalable, interoperable data ecosystem.

This report responds to that need by contributing to the ongoing methodological work supporting ESPR implementation. It focuses on the definition of requirements for inclusion of data and information in the DPP (hereafter referred to as the DPP data specification). The report builds on and complementing parallel methodologies addressing performance requirements, circularity aspects, substances of concern and verification approaches. By doing so, it supports a coherent and practical implementation of the DPP as an enabling mechanism for the broader ESPR policy framework.

This report forms part of a broader series of methodological studies supporting the implementation of the ESPR, coordinated by the Joint Research Centre (JRC), as listed in Annex 1. While the analytical work underpinning this report was carried out by external consultants under a service contract, the JRC led the methodological framing and ensured consistency with parallel methodological developments.

1.1. Context and principles

The methodology proposed in this document follows Design Science Research principles (Holmström et al., 2009; Kundisch et al., 2021; Peffers et al., 2008; Wieringa, 2014), which emphasise the development of problem-oriented, usable and context-aware artefacts. It also draws on lessons learned from policy-driven developments related to the DPP, in particular the implementation of the digital battery passport under the Battery Regulation.

The design of the DPP data specification methodology further builds on a broad body of analytical and technical work. This includes research conducted by the JRC in support of ESPR implementation

(Perez Camacho et al., 2025; Rodríguez-Manotas et al., 2025), ongoing European and international standardisation activities, and academic and applied research on product data models, semantic interoperability and use-case-driven specification design (Deich et al., 2025; GitHub - Washingtonwei, 2025; Gotz et al., 2022; Jacobson et al., 2023; Jansen et al., 2024; ONTO-DESIDE, 2023; Pellegrini et al., 2023). The methodology also draws on approaches developed in the context of DPP-related research and coordination activities, such as the CIRPASS project (van Nieuwenhuijze et al., 2024; Wautelet et al., 2024).

Taken together, these sources informed both the overall structure of the methodology and the selection of its key analytical steps. They also highlight the importance of clearly distinguishing between regulatory specification, standardisation activities and technical implementation.

Against this background, two guiding principles underpin the design of the methodology. The first is alignment with the ESPR preparatory study process, most notably through integration with the Methodology for Ecodesign of Energy-related Products (MEErP). The second is the avoidance of duplication or overlap with standardisation and technical implementation work. Together, these principles ensure that the methodology supports coherent, proportionate and implementable DPP information requirements, while remaining compatible with evolving standardisation outcomes and technical solutions developed outside the regulatory process.

1.1.1. Building on the MEErP process

The DPP data specification methodology is primarily intended for use within the ESPR framework and is aligned with the MEErP, which underpins preparatory studies under both ecodesign and the ESPR. It is designed to integrate DPP-related considerations into the existing preparatory study workflow, rather than creating a parallel or standalone process or repeating well-defined steps in the MEErP. While a stepwise approach is proposed, the methodology is modular, allowing individual steps to be adapted, refined or omitted depending on the characteristics of the product group, the maturity of existing standards or the availability and quality of relevant data.

While the methodology can in principle be applied beyond the ESPR framework, its design is closely aligned with the preparatory study process underpinning ESPR delegated acts, including the use of the MEErP. Applying the approach in other regulatory contexts may therefore require additional analytical steps. These would replicate the methodological groundwork normally provided by the ESPR preparatory process, including the environmental and economic assessment of base cases to identify the hotspots to be addressed through requirements. The DPP data specification methodology should thus be understood as a foundational and repeatable process, intended to be further validated and refined through its application to additional product groups and through broader stakeholder engagement over time.

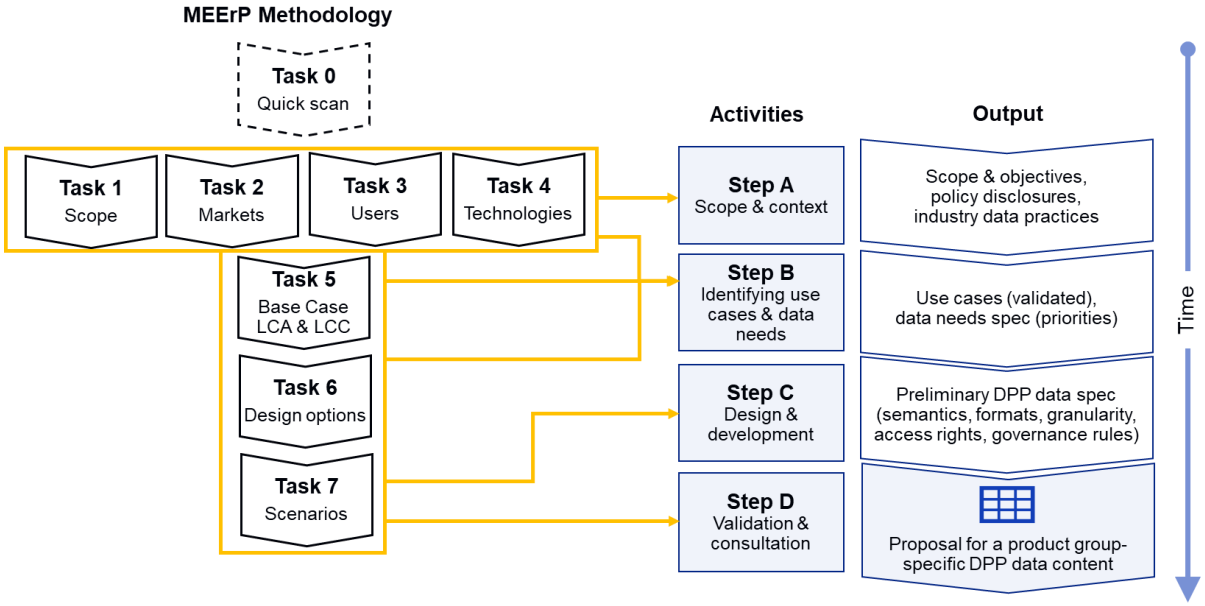
The specification of DPP information requirements necessarily builds on, and integrates with, the MEErP process, which is being updated to provide inputs for ESPR implementation[1]. In particular, the MEErP process supports the identification of product scope, relevant product aspects and hotspots, and the assessment of technical and economic feasibility. These inputs are essential for identifying product-specific DPP information requirements that are both meaningful in policy terms and

[1] All mentions of the 'MEErP' should be taken to also refer to the 'ESPR Methodology.'

feasible for economic operators. They can subsequently be examined in the impact assessment in terms of costs and benefits.

Annex 1 to this report presents an introduction to the MEErP. Figure 1 provides a high-level overview of how the methodology described in this report interfaces with the MEErP process. While the DPP data specification methodology is designed to be sufficiently flexible to be applied in regulatory contexts beyond the ESPR, it makes use of MEErP-type analytical inputs, in particular for the definition of product scope and the identification of data needs. The specific nature of these linkages, and the points at which MEErP-related inputs are used, are described in more detail in Chapter 3, which sets out the individual steps of the methodology and their respective inputs and outputs.

Figure 1. Mapping the interaction between the MEErP and the methodology presented in this document



Source: own elaboration

1.1.2. Building on standardisation

The second guiding principle underpinning the methodology is the deliberate avoidance of duplication or overlap with standardisation and technical implementation work. In the context of the DPP, this requires a clear methodological distinction between elements of DPP requirements that can be defined and justified within the ESPR preparatory study process and elements that are to be addressed through standardisation activities or other technical implementation processes.

ESPR delegated acts may specify the content of DPP information requirements, including the types of information to be made available for specific product groups. However, the detailed technical specifications necessary to ensure interoperability, security, and technical feasibility fall outside the scope of the preparatory study process. These aspects are expected to be addressed through standardisation processes, which translate regulatory needs into implementable technical solutions and evolve in parallel with the regulatory framework. An overview of this standardisation work is provided in Section 2.3.

This approach allows the methodology to focus on the semantic definition of DPP information requirements that fall within the scope of ESPR delegated acts, while explicitly relying on standardisation for aspects related to technical infrastructure, data structures, interfaces, implementation guidance and system architecture. By doing so, the DPP data specification methodology avoids duplication of work already mandated or undertaken in the standardisation context, while providing clear and structured regulatory input to those processes.

1.2. Objectives

This report presents a methodology for defining requirements for the inclusion of data and information in the DPP under the ESPR. Its primary objective is to support ESPR preparatory study teams in developing well-founded proposals for DPP content that can be used in the preparation of delegated acts and, where relevant, contribute to the accompanying impact assessment.

The methodology focuses exclusively on the semantic definition of DPP information requirements, i.e. *what information should be included in the DPP and why*. It establishes a clear analytical boundary between:

- elements that can be identified, assessed and substantiated within the preparatory study process, such as information needs, use cases, data types and access categories, data acquisition and update; and
- elements that must be addressed through standardisation or technical implementation work, such as system architecture, data exchange mechanisms, technical interfaces, visual presentation, and placement of the DPP.

Accordingly, aspects related to technical infrastructure, implementation guidance and IT system design fall outside the scope of this methodology.

1.3. Limitations

The DPP data specification methodology represents a first, implementation-oriented approach to defining DPP content under the ESPR. Its application is subject to several limitations.

First, the scope and ambition of the DPP itself are still evolving. The shift from an initially narrow conception of the DPP as a digital information carrier towards a more comprehensive data passport supporting traceability, compliance, circularity and market surveillance introduces a trade-off between functionality and complexity. While expanded functionality may enhance policy relevance, it also increases implementation challenges and risks slower uptake.

Second, the current DPP ecosystem is still at an early stage of maturity. To date, pilot implementations and research projects have been largely sector-specific and limited in scale. As a result, issues related to scalability, cross-sector interoperability and cumulative administrative burden across product groups remain only partially analysed.

For these reasons, the methodology is intended to be iterative and adaptable. As experience is gained through its application in preparatory studies and delegated acts, revisions are foreseen to reflect practical lessons learned, evolving standardisation outcomes and technological developments.

1.4. Structure of the report

This report is structured to guide the reader from the policy and methodological context of the DPP under the ESPR to the practical application of the proposed data specification methodology.

— **Chapter 2** presents the policy framework for DPP information requirements under the ESPR and situates the methodology in relation to parallel and ongoing work on DPPs at EU level.

— **Chapter 3** sets out the methodology itself by describing its main steps.

— **Chapter 4** summarises key conclusions and identifies areas for future refinement.

A set of annexes complements the main body of the report. These annexes are an integral part of the methodology and provide detailed guidance, templates, and examples to support its practical implementation by preparatory study teams.

— **Annex 1** presents an introduction to the Methodology for the Ecodesign of Energy-using Products.

— **Annex 2** provides a summary of the information requirements laid down in the Ecodesign for Sustainable Products Regulation.

— **Annex 3** provides guidance on formulating use cases for DPPs.

— **Annex 4** sets out the criteria used to determine data needs on the basis of use cases.

— **Annex 5** provides a reference overview of performance-related common vocabulary terms relevant to the digital product passport.

— **Annex 6** gives guidance for identifying, reusing and merging existing product classification vocabularies.

— **Annex 7** offers instructions on determining appropriate data granularity levels.

— **Annex 8** gives guidance on setting data access rights.

— **Annex 9** provides guidance on the introduction, editing and sharing of digital product passport data throughout the product life cycle.

2. Context and legal basis

The DPP is anchored in the ESPR, which entered into force on 18 July 2024 and establishes a horizontal framework for sustainability, circularity and information obligations for products placed on the EU market. The ESPR applies, in principle, to almost all physical goods placed on the Union market, with specific exclusions, such as food and feed, medicinal products for human and veterinary use, living plants and animals, products of human origin, and products of defence or national security interest, as well as certain other categories as defined in the Regulation. Within its scope, the ESPR introduces both performance and information requirements to be specified through product-specific delegated acts.

The ESPR applies to products placed on the Union market, irrespective of whether they are manufactured within the Union or imported from third countries. Accordingly, DPP requirements defined under the ESPR apply to all products placed on the EU market that fall within the scope of a relevant delegated act.

Under Article 4 and Article 9 of, and Annex III to, the ESPR, the Commission is empowered to adopt delegated acts setting out product-specific information requirements. Thes may include, where relevant, the obligation to make such information available through a DPP. The DPP thus constitutes the primary mechanism for implementing and operationalising ESPR information requirements in a digital, structured and accessible manner. Annex 2 provides a summary of the information requirements laid down in the ESPR, which are discussed in more detail in Section 2.2.

Traditionally, under the Ecodesign Directive, information requirements were largely fulfilled through technical documentation and other non-digital means. The introduction of the DPP enables a transition towards the digitalisation of product information, improving the accessibility, consistency and traceability of existing information requirements. Over time, the role of the DPP has evolved and is increasingly envisaged as a broader digital infrastructure enabling the structured storage, controlled accessibility, and reuse of product information along the value chain. Its principal innovation lies not only in digitalisation, but also in the harmonised structuring of information and the definition of differentiated access rights for various user groups, including consumers, market surveillance authorities, economic operators and other stakeholders.

At the same time, it is important to clarify the limits of the ESPR's regulatory ambition. The ESPR does not seek to regulate data collection and data sharing across the entire supply chain as such. Rather, the DPP is intended to provide product identification and structured access to defined sets of product information, thereby enabling traceability and information exchange where relevant. Economic operators and other actors along the value chain may choose to align with the semantic and technical infrastructure of the DPP to facilitate the circulation of product-related information. However, such alignment is not mandated beyond the requirements set out in the Regulation and the relevant delegated acts.

Moreover, the DPP may function as a form of digital product identity in the future, capable of linking information required under different pieces of EU legislation, as well as voluntary data provided by manufacturers or other actors. In this way, the DPP has the potential to support multiple policy objectives simultaneously, including market surveillance, consumer information, circular economy strategies and industrial competitiveness. It may also help to reduce duplication of reporting obligations over time.

2.1. Scope of application of the DPP

2.1.1. ESPR application

Within the ESPR framework, the obligation to implement a DPP applies only where required by a product-group delegated act adopted pursuant to the Regulation. The DPP is therefore introduced progressively, on a product-group basis, alongside other ecodesign requirements, reflecting the horizontal and framework nature of the ESPR.

The ESPR Working Plan constitutes a strategic document adopted by the European Commission that identifies priority product groups for which ecodesign requirements, including information requirements and the possible use of a DPP, may be developed. The Working Plan is not a one-time list: it covers a multi-year period (at least 3 years; the first plan covers 5 years) and is intended to be updated regularly to bring additional product groups into scope over time.

The first ESPR Working Plan adopted under the Regulation was published in April 2025 and identified an initial set of priority product groups to be considered for regulation under the ESPR. Following the adoption of the Working Plan, the Commission has begun preparing product-specific delegated acts for these product groups. These delegated acts will define, *inter alia*, whether a DPP is required, the content of the DPP and the applicable implementation timelines.

Based on the first ESPR Working Plan, indicative timelines for the development of delegated acts for selected product groups include iron and steel (from 2026), textiles, tyres, aluminium and energy-related products (from 2027), furniture (from 2028), and mattresses and ICT products (from 2029). These timelines are indicative and subject to change depending on the adoption of the relevant delegated acts (see Table 1).

Table 1. Product groups for which a DPP is foreseen under the ESPR

Product group	Legal basis	Status of DPP obligation	Indicative timeline
Iron and steel	ESPR delegated act (DA) on iron and steel	Preparatory work ongoing	2026
Textiles	ESPR DA on textiles	Preparatory work ongoing	2027
Tyres	ESPR DA on tyres	Preparatory work ongoing	2027
Aluminium	ESPR DA on aluminium	Work not yet started	2027
Energy-related products (ErP)	ESPR DA on ErP	Work not yet started	2027
Furniture	ESPR DA on furniture	Work not yet started	2028
Mattresses	ESPR DA on mattresses	Work not yet started	2029
ICT	ESPR DA on ICT	Work not yet started	2029

Note: The table reflects the state of play at the time of drafting and should be understood as indicative, as timelines and scope may evolve through future delegated acts, implementing measures and working plans.

Source: own elaboration

2.1.2. Sector-specific legislation

In addition to the ESPR framework, the DPP concept is referenced in several sector-specific EU legislative acts, which are independent of the ESPR and may establish DPP obligations or functionally equivalent digital product information systems with different scopes, content requirements and implementation timelines. As a result, the DPP may progressively be applied to a

broader range of products placed on the Union market, beyond those directly regulated under the ESPR.

To illustrate the current and emerging scope of application of the DPP, Table 2 provides an overview of product groups for which a DPP, or a comparable digital product information system, is already established in EU legislation or explicitly foreseen in ongoing regulatory initiatives. The table reflects the state of play at the time of drafting and should be understood as indicative, as scope and timelines may evolve through delegated acts, implementing measures and future legislative revisions.

Table 2. Product groups for which a DPP is foreseen beyond the ESPR

Product group	Legal basis	Status of DPP obligation	Indicative timeline
Batteries (certain large batteries)	Batteries Regulation	Mandatory DPP explicitly defined	First rules apply from early 2027
Toys	Toy Safety Regulation	DPP foreseen; Commission empowered to define DPP technical requirements via delegated acts (Article 47)	Delegated acts may be adopted within 12 months of entry into force of the Regulation
Detergents and surfactants	Detergents and Surfactants Regulation	Digital product information foreseen (DPP or equivalent)	Applicable 30 months after entry into force of the Regulation
Packaging	Packaging and Packaging Waste Regulation	Harmonised digital labelling system aligned with DPP concept	From 12 August 2028, or 24 months after entry into force of implementing acts, whichever is later
Construction products	Construction Products Regulation	DPP system established under Article 75; DPP obligation for manufacturers under Article 80	Regulation applies from 8 January 2026; DPP required 18 months after entry into force of relevant delegated act (delegated acts to be adopted within 5 years from 7 January 2025)
Products containing critical raw materials	European Critical Raw Materials Act	Data carrier required (functionally aligned with DPP concept)	Implementing act by 24 November 2026; obligation applies 2 years after its entry into force

Note: The table reflects the state of play at the time of drafting and should be understood as indicative, as timelines and scope may evolve through future delegated acts, implementing measures and working plans.

Source: own elaboration

2.2. Legal requirements under the ESPR

2.2.1. Roles and responsibilities

Under the ESPR, compliance with product-specific ecodesign requirements, including information requirements implemented through the DPP, is ensured through obligations placed on economic operators in accordance with their role in the supply chain, as defined in the Regulation (see Table 3). In line with the standard allocation of responsibilities used in EU product legislation, primary

responsibility lies with the manufacturer, or, where the manufacturer is not established in the Union, with the importer.

For product groups subject to DPP requirements under a delegated act, the economic operator responsible for compliance with the applicable performance and information requirements must ensure compliance with the corresponding DPP obligations as set out in that act. This includes ensuring that the information required to be made available through the DPP is provided in accordance with the conditions specified in the ESPR and the relevant delegated act.

Where a product is manufactured outside the Union and placed on the EU market, the importer assumes the obligations of the manufacturer with regard to compliance with ESPR requirements, including those related to information requirements and, where applicable, the DPP. Where an authorised representative has been designated in accordance with the Regulation, that representative may perform specific tasks on behalf of the manufacturer within the limits of the mandate conferred, without assuming overall responsibility for product compliance unless explicitly provided for in the Regulation.

Distributors have a more limited role under the ESPR. Before making a product available on the market, distributors must verify that the product complies with the applicable requirements, including the presence of required information and, where applicable, access to a DPP as required by a delegated act. Distributors must not make products available on the market if they know, or have reason to believe, that the product does not comply with the applicable ESPR requirements.

The ESPR further requires that information made available through the DPP be accurate and consistent with the product placed on the market, and that it be made available in the manner and at the time specified in the relevant delegated act. Detailed obligations regarding the content, timing, accessibility and updating of DPP information are to be defined at product-group level through delegated acts.

Table 3. Indicative allocation of responsibilities among economic operators under the ESPR

Economic operator	Level of responsibility	Indicative responsibilities under the ESPR (including DPP, where applicable)
Manufacturer Designs and manufactures the product; places it on the Union market or puts it into service	Primary responsibility	Ensures that the product complies with all applicable ecodesign requirements before being placed on the market or put into service. Ensures that required documentation and information obligations are fulfilled. Where a DPP is required under a product-specific delegated act, ensures compliance with DPP obligations defined in the relevant product-specific delegated act.
Importer Places a product manufactured in a third country on the Union market	Primary responsibility (where manufacturer is not established in the Union)	Ensures that products placed on the Union market comply with applicable ESPR requirements. Where the manufacturer is not established in the Union, assumes manufacturer-equivalent obligations, including those related to information requirements and the DPP, as defined in the Regulation and relevant delegated acts.

Authorised representative Acts on behalf of the manufacturer under a written mandate	Delegated, task-specific responsibility	Performs specific tasks on behalf of the manufacturer within the limits of the mandate. Does not assume overall responsibility for product compliance unless explicitly provided for in the Regulation.
Distributor Makes a product available on the market	Verification and due-care responsibility	Verifies that required information and identifiers are present before making a product available on the market, including the presence of access to a DPP where required by a delegated act. Refrains from making products available if they know, or have reason to believe, that the product does not comply with applicable ESPR requirements.
Other actors (e.g. online marketplaces, fulfilment centre) Facilitate placing products on the market	Role-specific facilitation responsibilities	Subject to specific obligations applicable to their role under the ESPR. Do not assume primary responsibility for product compliance or DPP content, which remains with manufacturers or importers, unless explicitly provided for in the Regulation.

Source: Own elaboration, based on the Ecodesign for Sustainable Products Regulation (ESPR) and the standard allocation of responsibilities under the EU New Legislative Framework.

Article 2 of the ESPR defines the term 'digital product passport service provider' as a natural or legal person that is an independent third party authorised by the economic operator placing the product on the market or putting it into service, and that processes the digital product passport data for the purpose of making those data available to economic operators and other relevant actors entitled to access them under this Regulation or other Union law.

2.2.2. DPP content requirements

The scope of data disclosures addressed by this methodology is grounded in the ESPR provisions on the DPP, notably Article 9, which establishes the DPP framework and sets out the types of requirements that may be defined through delegated acts. These provisions are complemented by Annex III, which enumerates the categories of information that may be required to be made available through the DPP pursuant to Article 9(2)(a), including:

- *product and producer identification and information*, Annex III(b-d), (g-k), see Section 2.2.2.1;
- *product-specific information parameters*, Article 7(2) (b), see Section 2.2.2.2;
- *information requirements on substances of concern*, Article 7(5), see Section 2.2.2.3; and
- *information requirements under other Union law applicable to the relevant product group,* Annex III(a), (e), (f), see Section 2.2.2.4.

References to the relevant ESPR legal provisions are listed in Annex 2.

2.2.2.1. Product and producer identification

Unique identifiers

This category covers information elements that enable the unambiguous identification of a product and its association with the relevant actors and locations through the DPP. Product identification constitutes a foundational element of the DPP under the ESPR, as it allows product-related information to be reliably linked, accessed and reused in a digital and interoperable manner.

The ESPR establishes overarching requirements for the use of three types of unique identifiers, which function as technical and semantic references linking DPP data to the relevant entities:

- *Unique product identifier (UPI):* a unique string of characters used to identify a product and to enable a digital link to the corresponding DPP. The UPI serves as the primary reference point for associating all DPP-related information with a specific product.
- *Unique operator identifier (UOI)*: a unique string of characters used to identify an economic operator involved in the product's value chain, supporting the attribution of responsibilities and the linking of product information to the relevant actor.
- *Unique facility identifier (UFI):* a unique string of characters used to identify locations or facilities involved in the product's value chain, where such identification is relevant to the information requirements defined in a delegated act.

These identifiers are enabling elements: their purpose is to ensure consistency, interoperability and traceability of information, without imposing comprehensive supply-chain tracking or data-sharing obligations.

Given their cross-sectoral relevance, these identification elements are subject to substantial standardisation input, notably through the work of CEN/CENELEC/JTC 24, which develops horizontal standards for identifiers, data structures and digital interoperability (see Section 2.3.1).

Box 1. Definition of "unique product identifier" following Art. 2 of the ESPR

> 'Unique product identifier' means a unique string of characters for the identification of a product that also enables a web link to the digital product passport.

Product and producer information

This category covers descriptive information about the product and the economic operators responsible for it. It complements the product identification by supplying the substantive attributes needed to describe what the product is and who is responsible for placing it on the Union market.

Depending on the product group and the requirements laid down in the relevant delegated act, this category may include, *inter alia*:

- the product name, model designation and version, enabling clear differentiation between product variants;
- the identity and contact details of the manufacturer or other economic operator responsible, in line with the allocation of responsibilities under the ESPR;

- information on the manufacturing site or other relevant facilities, where such information is required to support compliance or enforcement;
- other descriptive attributes necessary to distinguish between configurations, batches or versions of a product.

Unlike product identification, which relies on unique identifiers serving as references, product and producer information consists of descriptive, human-readable and machine-readable attributes that provide context and meaning to the identifiers used in the DPP. The precise scope, level of detail and presentation of this information are to be determined at product-group level through delegated acts, taking into account existing information requirements under Union law and the need to avoid unnecessary duplication of disclosures.

2.2.2.2. Product-specific parameters and information

The ESPR provides the legal basis for defining product-specific information requirements that may be made available through the DPP via product-specific delegated acts. These information requirements are intended to support the sustainability, circularity and effective use of products, while considering the diversity of product groups covered by the Regulation.

In particular, Article 7(2)(b) allows delegated acts to require the provision of the following types of information, where relevant for the product group concerned:

(d) Information relating to product parameters referred to in Annex I

This includes information on product parameters relevant to sustainability and circularity aspects listed in Annex I to the ESPR, such as durability, reparability, reusability, upgradability, energy and resource efficiency, or other product-specific parameters.

(e) Information for users and other actors on installation, use, maintenance and repair

This category covers information intended to support correct installation, use, maintenance and repair of the product. Where relevant, it may also include information on the installation of third-party operating systems, as well as guidance supporting refurbishment, remanufacturing or other life-extension strategies. Such information contributes to extending product lifetime and reducing environmental impacts during the use phase.

(f) *Information for treatment facilities*

Article 7(2)(b) further enables the inclusion of information addressed to operators involved in end-of-life treatment, including disassembly, reuse, refurbishment, recycling or disposal. This information may support safe handling, component separation and material recovery, thereby contributing to high-quality recycling and alignment with waste management objectives.

(g) Other information influencing sustainable product choices and handling

This residual category allows for the inclusion of additional information that may influence sustainable purchasing decisions by customers or the handling of products by actors other than the manufacturer. The relevance and scope of such information are to be assessed on a case-by-case basis for each product group.

The relevance, scope and level of detail of product-specific parameters and information vary significantly across product groups. These parameters may be identified and justified through the MEErP-based preparatory studies supporting each delegated act, which assess product characteristics, environmental and socio-economic impacts, technical feasibility and policy priorities. Further methodological guidance on the identification and assessment of product-specific parameters under the ESPR is provided in the JRC science-for-policy reports Rodríguez-Manotas et al., 2025) and Magrini et al., 2025).

2.2.2.3. Information on substances of concern

Where relevant for a given product group, information on substances of concern (SoC), as defined in Article 2(27) of the ESPR, may be required to be disclosed through the DPP. SoC include substances that adversely affect human health or the environment, or that hinder reuse, refurbishment or high-quality recycling.

The legal basis for such disclosures is provided by Article 7(5) of the ESPR, which empowers the Commission to establish, through delegated acts, information requirements on SoC present in products. In accordance with Article 9 and Annex III, such information may be made available through the DPP where specified in a product-specific delegated act.

Delegated acts may require the disclosure, where proportionate and relevant, of information such as:

- the identification of SoC present in the product;
- information on their presence or location within the product, where necessary to support safe use, repair, refurbishment or end-of-life treatment; and
- information relevant for treatment operators, including recyclers, to enable appropriate handling or separation.

The scope, level of detail and format of SoC-related disclosures are to be determined at product-group level, taking into account existing obligations under Union chemicals and waste legislation, the availability of data, and the intended use of the information. The ESPR approach aims to complement existing disclosure requirements and to provide targeted, actionable information, rather than comprehensive chemical inventories.

Further methodological and analytical considerations related to SoC in the context of the ESPR are discussed in the relevant JRC science-for-policy report (Perez Camacho et al., 2025).

2.2.2.4. Information required under other Union law

Annex III to the ESPR provides the legal basis for integrating, where appropriate, information requirements arising under other Union law into the DPP. In particular, Annex III(a) allows delegated acts adopted pursuant to Article 9 to require that information already mandated under other applicable Union legislation for a given product group be made available through the DPP. This inclusion is optional and must be explicitly defined in the relevant product-specific delegated act.

In addition, Annex III(e) and Annex III(f) enable the inclusion in the DPP of:

- compliance documentation, such as declarations of conformity or elements of technical documentation required under other Union legislation; and

- user-facing information, including manuals, instructions for use, warnings or safety information that manufacturers are required to provide under other applicable Union acts.

Taken together, these provisions allow the DPP to function, where appropriate, as a digital access point for information already required under Union law, without creating new substantive information obligations. The ESPR does not mandate the systematic inclusion of all such information in the DPP. Rather, it provides a legal option for consolidating existing disclosures where this supports policy objectives such as transparency, market surveillance, consumer information or enforcement efficiency.

The inclusion of information required under other Union law should be assessed on a product-group-specific basis in the preparatory phase and defined explicitly in the relevant delegated act, taking into account the relevance of the information for DPP use cases and the need to avoid duplication of existing disclosure mechanisms.

This assessment is already undertaken as part of the MEErP-based preparatory study process, which includes a systematic review of existing and forthcoming Union legislation applicable to the product group.

Box 2. Relationship between DPP and European Product Registry for Energy Labelling (EPREL)

A key example where product disclosures are mandated is the energy labelling framework and the EPREL database. The DPP established under the ESPR does not replace the Energy Label or the EPREL database under the Energy Labelling framework. Obligations to display an Energy Label and to register product information in EPREL remain governed by Regulation (EU) 2017/1369.

The ESPR enables the Commission to exempt product groups from the requirement to have a digital product passport where other Union law includes a system for the digital provision of information related to a product group which the Commission considers achieves the DPP's objectives. This is intended to avoid duplicative reporting obligations for economic operators in cases where a product has an Energy Label and is registered in EPREL, and where this is sufficient to achieve the DPP's objectives.

An evaluation must be conducted to determine whether the EPREL is sufficient to adequately support the objectives of the ESPR and DPP use cases, or whether a dedicated DPP is required. When the requirements need to accommodate updates over time or provide life-cycle-related information, it may be necessary to extract and make this data accessible and modifiable via the DPP. Further details on how to assess this can be found in Step A.3 of the methodology outlined in Section 3.2.3 of this report.

2.2.3. Non-functional requirements

In addition to specifying the categories of information to be made available through the DPP, the ESPR establishes a set of non-functional requirements that apply to the specification and provision of DPP data. These requirements do not concern the substantive content of the information as such, but rather the qualities that DPP data must exhibit in order to ensure:

— clarity, accessibility and purpose-oriented usability, Art.7(2)(b)-(c) and Art. 9(1) and 9(3), see Section 2.2.3.1;

— interoperability and format requirements, Art. 10(1)d, see Section 2.2.3.2;

— data retention, Art. 9(2)l, see Section 2.2.3.3.

References to the relevant ESPR legal provisions are listed in Annex 2 to this document.

2.2.3.1. Clarity, accessibility and purpose-oriented usability

The ESPR requires that information requirements specified under delegated acts, including those implemented through the DPP, be clear, easily understandable and appropriately tailored. Article 7(2)(c)(i)–(ii) requires that information requirements be formulated in a clear and easily understandable manner, while Article 7(2)(c)(iii)–(iv) requires that they be adapted both to the characteristics of the product group concerned and to the intended recipients of the information.

These requirements imply that, when defining DPP content in delegated acts, the Commission must ensure that information obligations reflect differences in product complexity, use patterns and value chains, as well as the needs of different user groups, such as consumers, professional users, market surveillance authorities, and other economic operators.

In addition, Article 7(2)(b)(ii) and (iv) establishes purpose-oriented usability requirements. Where relevant, delegated acts must require information on installation, use, maintenance and repair in order to minimise environmental impacts and maximise product durability. Information should also be made available to customers and other parties to facilitate appropriate use, value-retaining operations and correct treatment at end of life. These usability considerations must be taken into account when specifying DPP information requirements at product-group level.

In addition, the ESPR requires that DPP data specifications ensure accessibility, verification and traceability along the value chain. In particular, DPP requirements defined through delegated acts must ensure that:

- relevant actors along the value chain can easily access and understand the information made available (Article 9(3)(a));
- the information provided through the DPP supports the verification of compliance with applicable product requirements (Article 9(3)(b));
- the DPP contributes to improved traceability of products along the supply chain (Article 9(3)(c)); and
- the data in the digital product passport is accurate, complete and up to date (Article 9(1)).

These requirements apply horizontally but may require product-specific specification through delegated acts in order to reflect differences in value chains, compliance needs and traceability practices.

2.2.3.2. Interoperability and format requirements

The ESPR establishes interoperability and format requirements, mandating that DPP data be based on open standards, use interoperable and machine-readable formats, be structured and searchable as appropriate, and be transferable through open and interoperable data exchange networks without vendor lock-in (Article 10(1)(d)). Interoperability aspects (technical, semantic, organisational) are covered under the standardisation work (see Section 2.3.1).

2.2.3.3. Data retention

The ESPR requires that DPP information remain available over time, at least for the expected lifetime of the product, in order to support long-term objectives such as repair, reuse, recycling and

market surveillance (Article 9(2)(i)). Following Art. 11(e) of the ESPR, the period for which DPP should be available is to be specified in delegated acts.

2.2.4. DPP data system information

DPP data system information (DSI) refers to system-level requirements governing the functioning of the DPP, independently of the product-specific information content defined in product-group delegated acts. DSI requirements concern how the DPP operates as a digital system rather than what information it contains.

DSI requirements include, *inter alia*, provisions on access rights and role-based visibility of information, rules for updating and maintaining DPP data throughout the product life cycle, granularity levels, and long-term data availability, with the aim of ensuring continued access to information relevant for compliance verification, repair, reuse and recycling.

Determining detailed DSI requirements involves a combination of analysis of existing data-sharing practices within relevant value chains and assessment of comparable digital systems, in order to ensure that the DPP system addresses practical needs and constraints while remaining technically feasible, proportionate and respecting the confidentiality of sensitive information.

The ESPR establishes a set of horizontal, system-level requirements for the functioning of DPPs. These requirements — set out primarily in Article 9(2) and Article 10 — apply across product groups and define how the DPP system must operate, irrespective of the specific information requirements introduced through product-group delegated acts.

The ESPR does not prescribe the technical design of the DPP system. Instead, it relies on standardisation and technical implementation to operationalise requirements such as role-based access models, data exchange mechanisms, data structure and semantic interoperability, machine-readable formats and cross-sector compatibility. These standards are expected to form the technical foundation for compliance with the ESPR requirements.

The main DSI elements addressed in this section are:

- *access rights and role-based data visibility,* Art. 9(2)(f), see Section 2.2.4.1;
- *granularity levels of the DPP,* Art. 9(2)(d), see Section 2.2.4.2;
- *rules on governance*, Art. 9(2)(g-h), see Section 2.2.4.3; and
- *DPP registry and web portal,* Art. 13 and Art. 14, see Section 2.2.4.4.

References to the relevant ESPR legal provisions are listed in Annex 2.

While the ESPR sets the legal and functional framework for the use of data carriers, the detailed technical implementation — including the choice of specific technologies and formats — is expected to be addressed through standardisation and technical implementation, in line with the essential requirements set out in the ESPR.

2.2.4.1. Access rights and role-based data visibility

Article 9(2)(f-g) of the ESPR allows product-specific delegated acts to specify which actors may access which categories of information made available through the DPP. This enables the implementation of role-based data visibility, whereby access to certain data fields may be restricted

to authorised actors depending on their role in the value chain and the intended use of the information.

Such differentiation of access rights supports the objectives of the ESPR by balancing transparency, effective enforcement and the protection of confidential business information. The Regulation itself does not define access categories or access levels, nor does it prescribe a fixed access model. Instead, the allocation of access rights — including the distinction between information that is publicly accessible and information subject to restricted access — is to be determined at product-group level through delegated acts, taking into account proportionality, data protection requirements, and the protection of trade secrets.

The Regulation explicitly refers to a broad range of actors, including customers, manufacturers, importers, distributors, dealers, professional repairers, independent operators, refurbishers, remanufacturers, recyclers, market surveillance authorities, customs authorities, civil society organisations, trade unions and other relevant actors, who shall have free-of-charge and easy access to the DPP in accordance with the access rights defined in the applicable delegated act.

While the ESPR establishes the legal possibility and general principles for differentiated access, it does not prescribe how access rights should be implemented technically. The operationalisation of role-based access control is therefore expected to be addressed through standardisation and technical implementation, informed by the requirements set out in delegated acts.

In this respect, existing sector-specific legislation provides useful implementation experience. In particular, the Batteries Regulation offers a concrete example (Box 3) of how differentiated access to DPP data can be structured in practice. This example is presented below as an analytical reference to support methodological reflection under the ESPR, without prejudging the content or scope of future ESPR delegated acts.

Box 3. Role-based access to DPP data under the Batteries Regulation

The Batteries Regulation establishes differentiated, role-based access rights to data contained in the Digital Battery Passport. While the Regulation does not formally define access "levels", its provisions allow such access rights to be described, for analytical purposes, as a tiered structure:

- **Public access:** A limited set of non-confidential information is publicly accessible via a data carrier, supporting transparency and basic traceability.
- **Access for end users and professional users:** Additional information relevant for use, performance and sustainability may be accessible to end users and professional users, without disclosure of commercially sensitive data.
- **Access for economic operators in the value chain:** Economic operators such as manufacturers, repairers, recyclers and repurposers have access to technical and operational information necessary for the performance of their activities, subject to role-based conditions and the protection of confidential business information.
- **Full access for authorities:** Market surveillance authorities and the Commission have access to all information required to verify compliance with regulatory obligations.

2.2.4.2. Granularity of the DPP

Article 9(2)(d) of the ESPR allows product-specific delegated acts to specify the appropriate level of granularity at which a DPP is to be established. This should reflect the needs of market surveillance,

circular-economy-related use cases and traceability, while avoiding an unnecessary administrative or technical burden.

Depending on the product group and policy objectives, the DPP may be established at:

— product model level,

— batch or lot level, or

— individual item level.

Evidence from preparatory studies, sectoral pilots and related research indicates that granularity is a key cost driver in the implementation of digital product information systems[2]. Requirements that diverge from existing industry practices — such as moving from model-level to item-level granularity where such practices are not already in place — can significantly increase implementation complexity and compliance costs. These impacts may arise from additional data generation, more frequent updates, enhanced data governance requirements, and investments in identification or tracking infrastructure.

Accordingly, where possible, DPP granularity requirements should be aligned with established industrial traceability practices in the relevant value chain. Such alignment can facilitate implementation, reduce compliance costs and support interoperability, while still enabling the DPP to meet regulatory objectives. The appropriate level of granularity is therefore to be determined at product-group level through delegated acts, informed by preparatory studies and stakeholder input.

2.2.4.3. Rules on data governance

The ESPR enables product-group delegated acts to define rules governing the updating, maintenance and management of information made available through the DPP, with the objective of ensuring that DPP information remains accurate, relevant and reliable throughout the product life cycle.

In particular, delegated acts may specify, where relevant for a given product group:

— responsibility for updates, i.e. which economic operator(s) or other actor(s) are responsible for creating, validating and updating specific categories of DPP information;

— update triggers, i.e. the events or conditions that require an update (e.g. placing on the market, repair/refurbishment operations, component replacement, change of ownership, or end-of-life treatment, where relevant);

— timing and frequency, including deadlines for updating information after a triggering event, taking into account proportionality and the nature of the information concerned; and

— recording and traceability of changes including requirements to keep update logs, record timestamps and responsible actors, and — where necessary for enforcement or traceability — retain previous versions of specific data fields.

[2] Resulting from the series of interviews with industry under the ESPR preparatory study for iron and steel.

While the ESPR provides the legal basis for defining these rules at product-group level, it does not prescribe uniform technical solutions for version control, workflow management or data governance. The operationalisation of update mechanisms and maintenance processes is therefore expected to be supported by standardisation and technical implementation, ensuring compliance with the Regulation's horizontal requirements on system functionality (including access control, interoperability, integrity and availability of DPP data).

2.2.4.4. DPP registry and web portal

The ESPR establishes a centralised EU Digital Product Passport Registry[3], referred to in Article 13, which forms the backbone of the DPP system. Manufacturers and other responsible economic operators responsible must:

— register each DPP in the EU registry,

— ensure a verifiable link between the registry entry and the data carrier affixed to the product, and

— maintain the accuracy and accessibility of the registered data for the required retention period.

The DPP registry must be interoperable with the ESPR web portal (Art. 14), which will provide both public access to non-restricted information and role-based access to protected data fields according to the access rights defined in the relevant delegated acts.

The ESPR web portal will function as the central user interface for retrieving, searching and comparing DPP information across product groups, supporting transparency, market surveillance, and informed decision-making by users.

2.2.5. Data carrier

The ESPR defines functional requirements for the data carrier linking a product to its DPP but does not prescribe specific technologies. Instead, the Regulation establishes a framework within which standardisation activities — in particular those carried out by CEN/CENELEC/JTC 24 — are expected to develop technical standards supporting implementation, including standards for identifiers, data carriers and interoperability.

On this basis, product-group delegated acts may further specify requirements applicable to individual product groups, in accordance with Article 9(2). Delegated acts may specify one or more types of data carrier to be used for a given product group, provided that the data carrier enables a reliable and verifiable link to the DPP stored in the Union registry through a persistent unique product identifier. Such data carriers may include machine-readable technologies, without prejudice to technological neutrality.

---

[3] Refers to the digital ESPR registry that the Commission shall set up by 19 July 2026 and which shall store in a secure manner at least the unique identifiers and in the case of products intended to be to be placed under the customs procedure 'release for free circulation' also the commodity code. Additionally, the registry shall store the unique identifiers for batteries as referred to in Article 77(3) of Regulation (EU) 2023/1542. In relation to its responsibility to set up and manage the registry, the Commission shall be regarded as controller of the registry.

Depending on the product group, delegated acts may also specify where the data carrier must be located, for example directly on the product, on a nameplate, on the packaging or in accompanying documentation. These requirements are intended to ensure that the data carrier is visible, accessible and usable for relevant actors, including consumers, market surveillance authorities, professional repairers, and recyclers.

Where relevant, delegated acts may include durability and readability requirements for the data carrier, ensuring that it remains readable for at least the period during which the DPP must remain accessible. This may involve requirements related to resistance to mechanical stress, environmental exposure or other conditions associated with the product's normal use.

2.3. Harmonisation effort

The implementation of the DPP under the ESPR requires a coordinated harmonisation and standardisation effort to ensure that DPP systems are interoperable, secure and usable across product groups and sectors. This effort is essential to translate the legal requirements of the ESPR and its delegated acts into operational, technically consistent digital systems.

The different categories of information defined under the ESPR for DPPs — covering content requirements, non-functional requirements and data system information — interact closely and must be implemented in a coherent manner. Harmonisation therefore supports the development of a comprehensive, usable and legally coherent DPP specification, applicable both at cross-sectoral level and at product-group level.

Two complementary pillars underpin this harmonisation effort:

— *standardisation of the DPP digital infrastructure,* see Section 2.3.1, and

— *the development of common vocabularies*, see Section: 2.3.2

to ensure semantic interoperability.

2.3.1. Standardisation work of the DPP digital infrastructure

To ensure that the DPP system is secure and interoperable across the Union, European standardisation organisations are developing a set of core technical standards supporting the implementation of the ESPR DPP framework. This work is being undertaken by the CEN-CENELEC Joint Technical Committee 24 (JTC 24).

The methodology developed in this report is designed to integrate and align with the standards developed by JTC 24, which delivers on the European Commission's Standardisation Request M/604 (Commission Implementing Decision C(2024)5423) in support of Union policy on ecodesign requirements for sustainable products and on batteries and waste batteries.

JTC 24 was established with the purpose of standardising the digital infrastructure for the DPP, with the objective of reducing adoption costs and implementation complexity for businesses that, through delegated acts, will be required to provide DPPs for products placed on the Union market.

JTC 24 therefore develops horizontal standards addressing foundational technical aspects common to all DPP systems. The standardisation work is structured around the following technical modules:

— unique identifiers;

— data carriers and links between physical product and digital representation;

— access rights management, information, system security and business confidentiality;

— interoperability (technical, semantic, organisational);

— data processing, data exchange protocols and data formats;

— data storage, archiving and data persistence;

— data authentication, reliability and integrity;

— Application Programming Interfaces (APIs) for the product passport life-cycle management and searchability.

These elements constitute the technical baseline upon which all DPP systems are expected to be built, independently of product-specific content requirements. More information, including the list of standards that will be made available in early 2026, can be found in the standardisation request.

Table 4 highlights the complementary roles of standardisation and methodological guidance in operationalising the ESPR DPP framework. It maps DPP requirements set out in the ESPR to the respective scope of coverage provided by European standardisation and by the DPP methodology developed in this report. It illustrates how system-level requirements are primarily addressed through horizontal standards developed by CEN-CENELEC JTC 24, while this DPP methodology translates ESPR requirements into structured data specifications to be defined at product-group level through delegated acts. Note that additional DPP requirements that are out of the scope of the standardisation work are not included in the table. It is the case for instance of the information required under Article 7(2), point (b), and Article 7(5) or by other Union law applicable to the relevant product group, addressed solely in the DPP methodology (see Step B, Section 3.3), or other topics such as the positioning of DPP.

Table 4. Mapping ESPR DPP requirements to standardisation and DPP methodology

ESPR requirements	**Guidance provided by JTC 24 standards**	**DPP methodology**	**Additional guidance**
DSI[1]: 9(2)(b), (c) Data carrier & positioning	**Working Group 2, Module 2** *development of standards for data carriers*	Not covered	GS1 QR codes, GS1 DataMatrix Guideline, Library of Congress Linked Data Service, DDI Controlled Vocabularies ISO/IEC 15459-1:2014, ISO/IEC 15459-2:2015, ISO/IEC 15459-3:2014, ISO/IEC 15459-4:2014, ISO/IEC 15459-5:2014 and ISO/IEC 15459-6:2014.
DSI[1]: 9(2)(d) DPP granularity (model, item batch)	**Working Group 2, Module 1** *how identifiers are applied at different levels*	Step C.3	ISO 10303, IEC 62832, EN 17632, GS1 Digital Link

DSI[1]: 9(2)(e) DPP accessibility for end-users	**Working Group 3, Module 3** *accessibility of DPPs to end-users*	Step C.4	ISO/IEC 27001, ISO 20022, EN 17632, ISO 9241, ISO 25010, W3C WCAG
DSI[1]: 9(2)(f) DPP access rights	**Working Group 3, Module 3** *access rights management, maintaining data confidentiality and integrity*	Step C.4	ISO/IEC 27001, ISO/IEC 5230,
DSI[1]: 9(2)(g), (h) DPP creation and update rights	**Working Group 3, Module 3** *authentication mechanisms and role-based access controls to manage who can create or modify DPP data*	Step C.5	ISO/IEC 27001, ISO/IEC 38500, ISO 22745, ISO/IEC 29100, GS1 EPCIS
DSI[1]: 9(2)(i) Period of availability	**Working Group 4, Module 6** *data storage, archiving, and data persistence*	Not covered	ISO 14721 (OAIS), ISO/IEC 27040, GDPR
PPI[2]: Art. 9 read with Annex III(b-d, g-k) and DSI Annex III(l)	**Working Group 2, Module 1** *Unique Identifiers*	Step A.1-4	GTIN as provided in ISO/IEC 15459-6 ISO/IEC 15459 Legal Entity Identifiers (LEI) as in ISO 17442-1:2020 Decentralised Identifiers (DIDs) RFC 3986:2005, Uniform Resource Identifiers

1 Data system information
2 Product and producer information

Source: own elaboration

2.3.2. Common and product-specific vocabularies

The common vocabulary in the ESPR framework and the wider DPP ecosystem is intended to act as a shared semantic anchor from which all product groups inherit definitions and properties. Its purpose is to provide both a unified definition of DPP properties (i.e. metadata describing the properties) and a set of core concepts defining fundamental product information.

First, the common vocabulary defines what constitutes a DPP property, requiring any ontology implementing the conceptual vocabulary to follow a common structural model. The definition of a DPP property is provided by the CEN/CENELEC standardisation work carried out under JTC 24, in particular by Module 4 ("Interoperability Framework").[4]

4 Also related to the JTC 24 work on 'data dictionaries'.

Each DPP property is classified as either:

— a single-valued data element that includes an identifier, a reference to a dictionary explaining its semantic, the value itself, the data type and optionally a name and language; or

— a multi-valued data element (i.e. a collection of data elements) that includes an identifier, a dictionary reference, an optional name and a list of values.

In addition, JTC 24 Working Group 4 specifies how these properties are handled at system level, including aspects related to system interoperability and reusability of data artefacts, data exchange protocols, data storage, archiving and persistence, and APIs supporting DPP life-cycle management and searchability.

Second, the common vocabulary defines the semantics of fundamental product information, corresponding to ESPR Annex III information requirements excluding point (a), i.e. excluding performance metrics. For each information requirement, a representative semantic element is identified from the most widely adopted vocabularies and ontologies used across industries. As a result, each Annex III information requirement (excluding point (a)) is assigned a prescriptive definition inherited from commonly used vocabularies, such as the GS1 web vocabulary[5] or Schema.org[6]. Taken together, these definitions constitute the common vocabulary from a semantic structuring perspective and could apply for all product groups.

Third, the interpretations and implementations of specific performance concepts (e.g. durability or recyclability) may differ at the product-group level. Therefore, while generic definitions of the performance concepts may provide a starting point for scope indication, product-specific ontologies address how the performance concepts are quantified for the respective industry. Initially, all performance concepts' definitions are inherited first from the ESPR and the guidance report by Rodríguez-Manotas et al., 2025) (for circularity aspects only), and then from the industry standards and commonly used ontologies. A summary overview is provided in Annex 5, further introduced in Section 3.4 (Step C.1 of the proposed methodology).

From a technical perspective, the product-specific ontologies extend the concepts of the common vocabulary, introducing the product group definitions that clarify the generic definitions of the common vocabulary. They inherit all the applicable terms from the common vocabulary (ensuring they include the core definitions everyone shares) and then extend it by specialising the applicable terms with the description of that particular product domain. These specialisations are the independent elements that go beyond the common vocabulary, providing product-group-specific details that reflect the regulatory or functional needs of that sector.

Fourth, to ensure wide adoption and provide a reliable basis for legal compliance and enforcement, all DPP properties should be linked to publicly and freely available dictionaries in which their

---

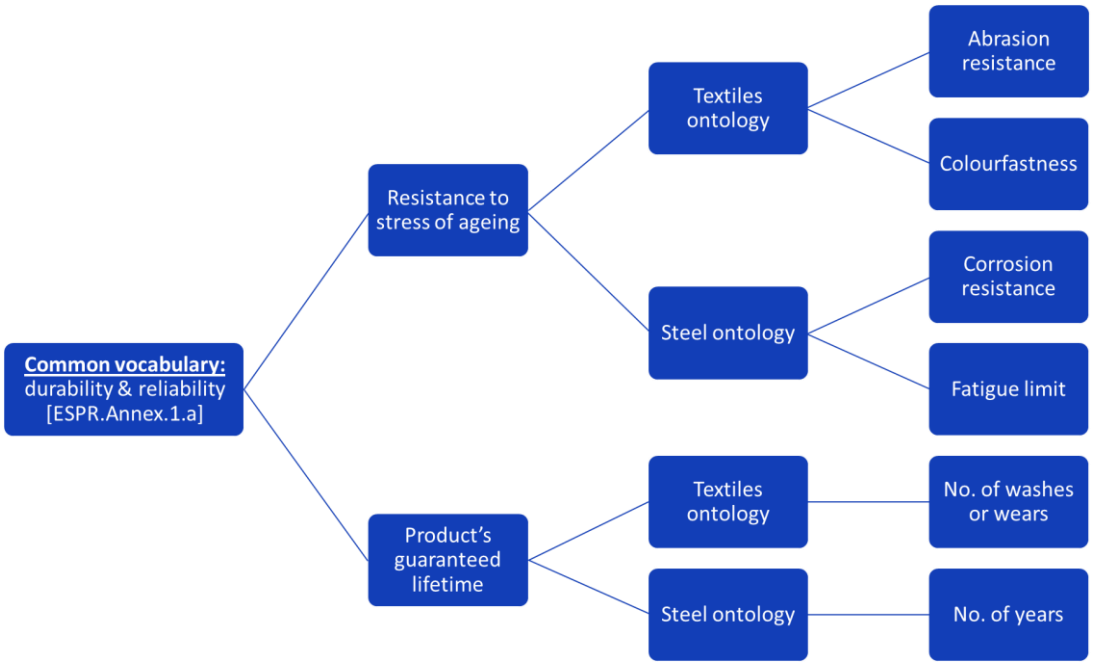
[5] The GS1 web vocabulary provides a set of standardised semantic definitions to represent product-related information in a machine-readable and interoperable way across digital systems. GS1 is an international not-for-profit organisation that develops and maintains global standards for identifying, capturing and sharing product and supply chain information.

[6] Schema.org is an open, community-driven initiative that develops and maintains a shared vocabulary for structured data on the web. It is widely used to describe products, organisations and other entities in a consistent and interoperable manner across digital platforms.

definitions are explained. The visibility and accessibility of these definitions establish a shared reference point for future interpretation, both for compliance assessment and sustainability reporting. This approach is aligned with community-driven efforts in vocabulary development addressing broader challenges in data stewardship across disciplines (Wilkinson et al., 2016).

For example, as illustrated in Figure 2, where the vocabulary requires information on "Resistance to stress of ageing mechanisms" under Durability and Reliability (ESPR Annex I(a)), a product-group-specific vocabulary for textiles may hypothetically introduce properties such as abrasion resistance and colourfastness, while a product-group-specific vocabulary for steel may introduce corrosion resistance and fatigue limit. By contrast, properties such as manufacturer information (ESPR Annex III(g)), unique product identifiers (ESPR Annex III(b)) or weight and volume (ESPR Annex I(j)) can be specified consistently across product groups.

Figure 2. An example of interaction between the common vocabulary and the product group ontologies (terms used are strictly for illustrative purposes)



Source: own elaboration

This interaction between the common vocabulary and product-group-specific ontologies enables the ESPR data ecosystem to rely on:

- a unified conceptual basis, grounded in product capabilities addressed by the ESPR;
- a shared syntactic[7] basis, drawing on widely adopted practices from the information systems domain; and
- an adaptable semantic layer, allowing interoperability through controlled resolution.

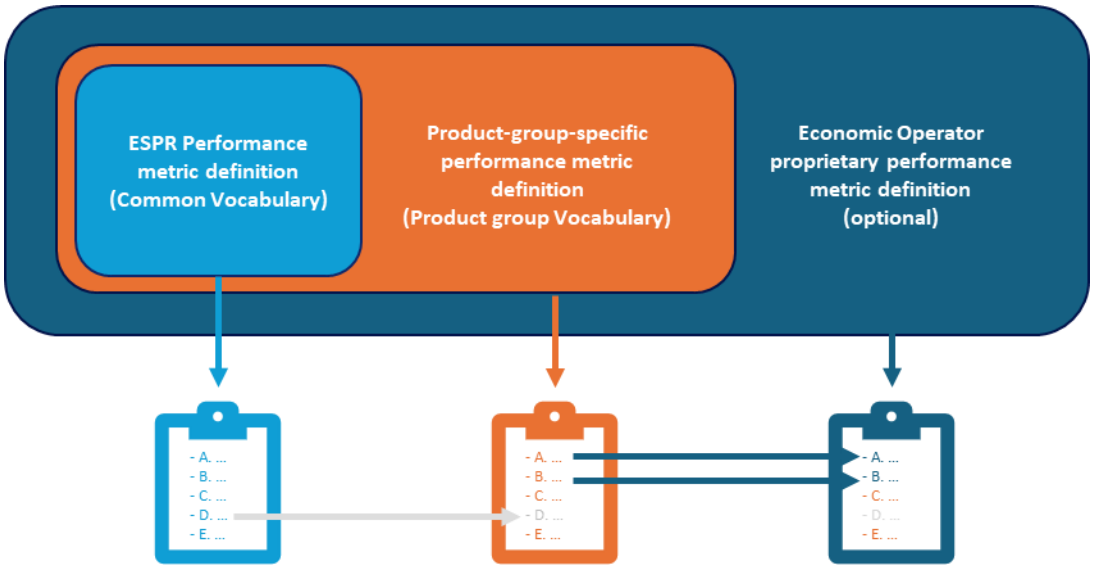
[7] 'Syntactic' here refers to the representation format or formal language used to encode the ontology (RDF/OWL/XML).

In practical terms, the common vocabulary functions as the backbone that ensures consistent data exchange, while each product-group-specific vocabulary acts as a custom layer tailored to the needs of the sector without compromising overall coherence. This ensures that a DPP for a jacket and a DPP for a battery can differ where necessary, while still sharing a reliable and consistent core structure that regulators and stakeholders can trust.

The interplay between common and product-group-specific vocabularies is further illustrated in Figure 3, which presents a simplified example of vocabulary layering based on a DPP specification exercise. In the example shown, a set of performance metrics (A, B, C, D and E) is initially defined at ESPR level using the common DPP vocabulary, which provides generic semantic definitions applicable across product groups. When a product-group delegated act is developed, these generic definitions are then assessed for relevance and applicability. In the example, four performance metrics are selected to reflect product-group-specific requirements, while one metric (e.g. D) is identified as not relevant for that product group and therefore excluded from the product-group vocabulary.

The resulting product-group-specific vocabulary extends the common vocabulary by introducing industry-specific quantification and interpretation of the relevant performance metrics. As further illustrated in Figure 3, selected performance metrics (e.g. A and B) may undergo an additional, optional level of specialisation by economic operators, allowing them to introduce more granular metrics that support internal traceability or transparency objectives, while remaining anchored to the product-group vocabulary and the common vocabulary.

Figure 3. Vocabulary layering for ESPR performance metrics definitions



Source: own elaboration, based on CIRPASS project methodology

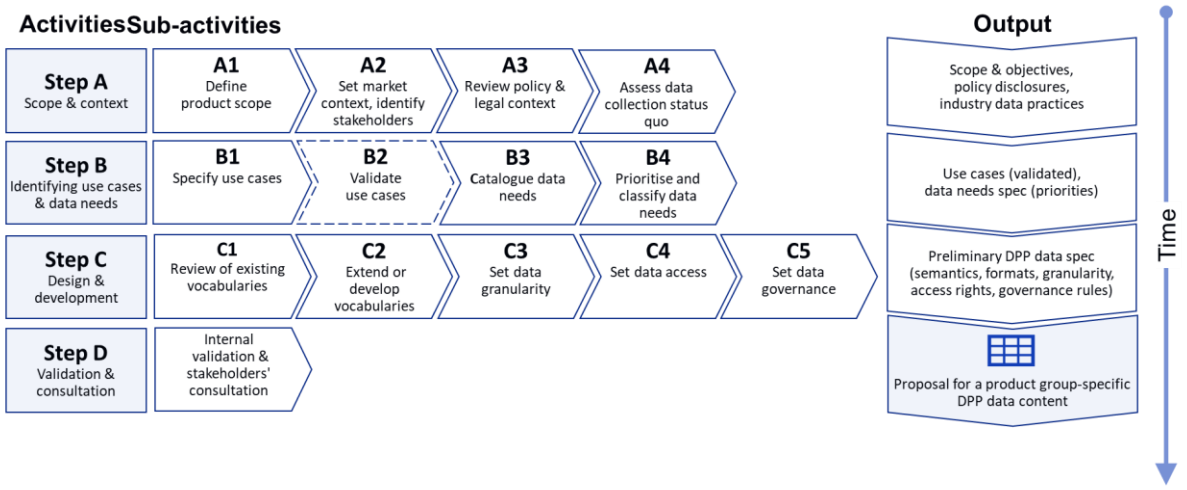
Finally, a key risk relates to ensuring open, clear and stable visibility of semantic definitions associated with DPP data. Because semantic data requires constant access to the definitions of data points, this introduces additional governance and hosting challenges that may need to be addressed through continued coordination and, where appropriate, industry-specific standardisation initiatives.

3. Digital Product Passport data specification methodology

3.1. Overview of the methodology workflow

This section outlines the core workflow of the methodology, presenting the standard step-by-step process from scope definition to an implementable DPP data specification. The workflow is shown in Figure 4, and each step is detailed in the sections that follow.

Figure 4. DPP data specification methodology workflow



Source: own elaboration

The methodology is organised into four main steps (A–D), each consisting of sub-steps that progressively translate context and use cases into a structured DPP data specification and validate its feasibility.

1. **Step A: Scope & context (A.1-A.4)**

   Step A establishes the scope and contextual basis for applying the methodology and prepares the ground for subsequent steps by defining what is in scope, who is involved and what is already required and practised.

   — **A.1 Define the product scope:** delineate the product group (final or intermediate) or horizontal domain to which the DPP data specification will apply, aligned with the scope elaboration under Tasks 1–4 of the MEErP.

   — **A.2 Set the market context and identify stakeholders:** describe the value chain and identify key actors and data roles (who generates, controls, uses and exchanges data), including relevant standardisation actors and existing data exchange points.

   — **A.3 Review the policy and legal context:** map disclosures required under other Union law and relevant voluntary initiatives and identify opportunities to reuse existing reporting systems (e.g. via referencing rather than duplication), to minimise the administrative burden and ensure coherence.

— **A.4 Assess the data collection status quo:** assess current practices for collecting, verifying and sharing data across the value chain, including data quality, granularity, constraints and barriers, as a reality check for feasibility and proportionality.

Output of Step A: a clearly defined product scope and a baseline understanding of (i) the stakeholder landscape and data roles, (ii) existing disclosure obligations and related systems, and (iii) current industry data practices and constraints.

2. **Step B: Identifying use cases & data needs (B.1-B.4)**

Step B translates the scope and context into use-case-driven conceptual information requirements and organises these into a structured DPP data needs specification.

— **B.1 Specify use cases:** identify and describe policy-relevant and operational use cases across the life cycle that the DPP should enable, including actors, triggers, actions and conceptual information needs.

— **B.2 Validate use cases:** refine and validate use cases through stakeholder consultation to confirm completeness, realism and relevance across value-chain actors (including EU and third-country operators placing products on the EU market).

— **B.3 Catalogue data needs**: translate validated use cases, existing obligations (Step A.3) and current practices (Step A.4) into a conceptual list of data points and metadata requirements, including preliminary considerations on accuracy, update frequency, and responsibilities.

— **B.4 Prioritise and classify data needs:** prioritise and classify data points (e.g. proposed ESPR-required / voluntary / enabling), balancing use-case value, feasibility, data quality needs and barriers (including confidentiality and personal data).

Output of Step B: validated use cases and a structured, prioritised conceptual DPP data needs specification.

3. **Step C: Design & development**

Step C translates conceptual data needs into an implementable DPP specification by defining semantics (vocabularies/ontologies) and key implementation parameters (granularity, access and governance).

— **C.1 Review of existing vocabularies**: benchmark and map conceptual data needs against existing relevant vocabularies and identify semantic gaps, building on the common DPP vocabulary and supporting cross-sectoral consistency (with reference mappings where relevant).

— **C.2 Extend or develop vocabularies:** select the most suitable existing definitions where available and close identified gaps by extending vocabularies or developing new elements where necessary, maintaining alignment with the common cross-sectoral semantic framework.

— **C.3 Set data granularity:** specify the appropriate granularity (model, batch, item) per data property, considering industry practice, regulatory needs and use-case value, and supporting multi-level referencing where appropriate.

— **C.4 Set data access:** determine role-based access rights for each data property using a need-to-know logic, balancing usability for value-chain actors with protection of confidential business information, IP and personal data.

— **C.5 Set data governance:** define governed life-cycle data arrangements for introducing, registering, updating and maintaining DPP data across life-cycle stages and actors (who provides what, when updates occur and who maintains additions), including downstream life-cycle management updates.

Output of Step C: a preliminary DPP data specification, including semantic definitions, data formats, granularity recommendations, access-rights logic and life-cycle data governance rules.

4. **Step D: Validation & consultation**

   Step D verifies (internally by the preparatory team and externally with stakeholders) the proposed DPP data specification developed in Steps A–C through technical checks and consultation, focusing on completeness, coherence, feasibility, proportionality and consistency with ESPR requirements.

   Output of Step D: a proposal for a product-group-specific DPP data content, supported by documented stakeholder input and technical verification findings.

3.2. Step A: Scope & context

Step A establishes the scope and contextual basis for applying the DPP data specification methodology and prepares the ground for the subsequent steps. The sub-steps in Step A cover:

— defining the scope of the product group or horizontal domain to be addressed;

— reviewing the relevant market and policy context and identifying key stakeholders and data roles across the value chain;

— cataloguing disclosures required for the product group under other Union law and relevant voluntary initiatives, with a view to reusing existing reporting systems and avoiding duplication; and

— assessing the current state of data collection, verification and data-sharing practices in the value chain, including key constraints and barriers.

Step A aligns with the selection and elaboration of the product scope under Tasks 1–4 of the MEErP. When the methodology is applied inside the MEErP framework, it should not aim to replace or repeat it but to complement it with the elements needed for the correct DPP data specification (see Annex 1). By the end of Step A, the product scope should be clearly defined and documented, and the preparatory study team should have a baseline understanding of the stakeholder landscape, existing disclosure obligations and systems, and current industry data practices that shape feasibility and proportionality.

3.2.1. Step A.1 Define the product scope

The application of this methodology starts with a precise definition of the scope for which the DPP data specification is to be proposed. This is achieved by answering the research questions listed in Table 5. The scope may refer either to:

— a product group (final or intermediate) for which a product-group-specific vocabulary will be developed under the ESPR or other Union legislation; or

— a horizontal domain addressing cross-sectoral product properties covered by horizontal ecodesign requirements (e.g. repairability, or standby or off-mode energy consumption)[8].

The scope of the ESPR is limited to products sold on the EU single market, i.e. products produced locally or imported from third countries.

Table 5. Research questions for Step A.1

Research questions
What is the relevant product scope for the analysis, and how should it be defined and categorised? [1]
What is the product group(s) for which the DPP data specification is to be made? [1]

[1] These research questions are already fully or partially addressed in Task 1 of the MEErP.

Source: own elaboration

Selecting an appropriate scope requires choosing a product group or technical domain that is sufficiently homogeneous and defined at an appropriate level of granularity. A clearly defined scope helps avoid overlap between product domains and ensures alignment with regulatory definitions and the preparatory study. Where a category is overly broad or contains heterogeneous subcategories, further subdivision may be required to allow for the development of targeted and meaningful DPP vocabularies.

Within the MEErP process, the product scope is typically defined in Task 1 and may be reviewed in Tasks 2–4, subject to stakeholder feedback and to the analysis of the market, user behaviour and technologies. When this DPP methodology is applied within a MEErP preparatory study, the product scope defined under MEErP should be used as the starting point. Stakeholder feedback on the scope should nevertheless be ensured, including where the methodology is applied outside the MEErP framework.

Table 6 presents an illustrative example of a product-group scope defined in the textile preparatory study.

[8] This horizonal nature of the requirements may require custom-made modification to the method that is primarily focused on the product-specific delegated acts.

Table 6. Exemplary textile apparel product-group scope as defined by the textile preparatory study

Products in scope	Products not in scope
T-shirts: Garment to cover the upper body to the elbow (e.g. singlets, vests, t-shirts, polo shirts, other short-sleeved shirts) Shirts and blouses: Garment to cover the upper body including the entire arm (e.g. long-sleeved shirts, blouses, base layers) Sweaters and midlayers: Garment to keep the upper body warm and covered (e.g. pullovers, cardigans, hoodies, jerseys, sweatshirts, sweaters) Jackets and coats: Garments to put on top of a shirt or sweater or to protect from the natural elements (e.g. blazers, suit jackets, overcoats, other light jackets, rain jackets, outdoor winter jackets, parkas, outdoor vests, anoraks) Pants and shorts Garment to cover the lower body, may protect from the elements (e.g. casual pants, outdoor pants, dress pants, jeans, sports pants, capri pants, shorts) Dresses, skirts and jumpsuits: One-piece garment that covers both the upper and lower body, or the lower body only, other than pants and shorts (e.g. short- and long-sleeved, strapless, wrap, long and short, one-piece suits) Leggings, stockings, tights and socks: Tight garment to cover the legs and/or feet. (e.g. opaque and sheer tights, pantyhose, fishnets, ankle socks, knee socks, low-cut socks) Underwear: Garment worn under clothes, often next to the skin of the upper or lower body (e.g. boxers, briefs, panties, bras, body-shaping suits) Swimwear: Garment worn for water-based or sun-based activities (e.g. bikinis, bathing suits, racing-style swimwear, board shorts) Apparel textiles accessories: — Hats – Garment to cover the head for warmth or as a fashion item (e.g. caps, flat caps, woollen hats/beanies, fedoras, panamas, bowlers, newsboys, berets); — Scarves and ties – Garment worn around the neck for warmth or as a fashion item (e.g. warm and light scarves, buffs, neckerchiefs, headscarves, shawls, bowties); — Belts – Flexible band or strap worn around the waist or over the shoulders used to secure or to hold up clothing such as pants (e.g. dress belts, casual belts, buckle belts, tie-up belts, suspenders); — Gloves and mittens – Articles of clothing that protect hands and wrists from the elements or as a fashion item. Used in pairs (e.g. fingerless gloves, fashion gloves, outdoor sports gloves, mittens).	Smart textiles: textiles able to sense and react to environmental conditions and external stimuli (e.g. mechanical, thermal, and chemical stimuli) thanks to a number of sensors incorporated in the textiles; Electronic textiles or e-textiles: which are textile-based systems that exhibit an intended and exploitable response as a reaction either to changes in their surroundings/environment or to an external signal/input; Apparel textiles identified as personal protective equipment (PPE) in accordance with Regulation (EU) 2016/425 (29); Apparel textiles identified as medical devices or as an accessory for a medical device in accordance with Regulation (EU) 2017/745 (30).

Source: Based on Task 1 of the draft preparatory study for textile and apparel (Delre et al., 2025)

3.2.2. Step A.2: Set the market context and identify stakeholders

Once the product scope has been defined, the next step is to review the relevant market context and identify the key stakeholders involved across the value chain. The research questions guiding this step are summarised in Table 7.

The purpose of this step is not only to describe the value chain, but to understand who generates data, who needs data, and for which actions or decisions. This information is essential for defining realistic and relevant DPP use cases in Step B. While the ESPR does **not** regulate all value-chain interactions, considering the full life cycle ensures that the proposed DPP data specification supports its intended functions and can be adopted in practice.

Table 7. Research questions for Step A.2

Research questions
Who are the main actors and stakeholders in the value chain for this product? [1]
Which actors and what is their role in data management and exchange at each life-cycle stage?
At which points in the value chain are data exchanges between actors required or expected to take place?
Which specific actors collect, process or rely on product data?
Which specific actors control product-related data?
Which standardisation organisations, if any, set relevant data standards, including up and down the value chain? If no standardisation organisation exists, how are the standards set for the product group? [1]

[1] These research questions are already fully or partially addressed in Tasks 1-4 of the MEErP.

Source: own elaboration

3.2.3. Step A.3: Review the policy and legal context

As mentioned earlier, Annex III(a) to the ESPR allows for "*information required … by other Union law applicable to the relevant product group*" to be included in the DPP data specification in a delegated act, and Annex III(e, f) allows the same for '*compliance documentation and information*' or '*user manuals, instructions, warnings or safety information*' required under other Union law respectively.

To minimise the administrative burden and facilitate adoption, the methodology prioritises alignment of new DPP disclosure requirements with existing legal obligations wherever possible. A core objective of this step is therefore to avoid redundant data collection by identifying data that is already required, collected or made available under existing regulatory frameworks and systems, and by ensuring that the DPP builds on it rather than duplicating.

A key example is the energy labelling framework and the EPREL database. Where performance or compliance data are already reported by economic operators through EPREL, the DPP data specification should, as a rule, reference or link to these data, rather than requiring the same information to be reported again. This may be achieved either by direct integration, by technical referencing, or by other mechanisms that allow the DPP to reuse authoritative data sources.

For product groups already covered by such systems, the preparatory study must explicitly assess whether the existing framework (e.g. energy labels and EPREL) is sufficient to meet the objectives of the ESPR and the identified DPP use cases, or whether a dedicated DPP is still required. This assessment requires the preparatory study team to:

— examine which data is already collected and made available, including its level of granularity, structure and update frequency;

— assess whether this data meet the requirements set out in the ESPR and the use cases identified in Step B;

— determine whether existing data can be reused as is, reused with adaptations, or need to be complemented by additional DPP-specific data elements.

Where existing systems do not allow data to be updated over time or do not support life-cycle-related information, the relevant data may need to be extracted and made available through the DPP in order to fulfil ESPR requirements. In such cases, the rationale for complementing existing systems with DPP data should be clearly documented.

Step A.3 therefore requires the preparatory study team to systematically review and catalogue disclosures required for the product group under existing or forthcoming Union law, as well as under relevant voluntary legal initiatives, both within the EU and internationally. This catalogue serves as a key input for later steps of the methodology, where decisions are taken on which data elements should form part of the DPP data specification.

The research questions guiding this review are listed in Table 8.

Table 8. Research questions for Step A.3

Research questions
Which EU, Member State and third-country legislation is relevant to the product scope, and how do these frameworks compare? [1]
What are the disclosures derived from relevant EU law and its transposition into national legislation (i.e. 'other Union law' under Annex III(a) to the ESPR)?
What is the minimum information required to be collected for a product placed on the EU market?
Are mandatory disclosures required by other policy instruments, or policy-referenced industry standards, for this product group (in EU or third countries)?
Are there any voluntary disclosures that are commonly used and adopted for this product group? What is the market uptake of these initiatives (in EU or third countries)? [1]
Are voluntary disclosures encouraged by other policy instruments, or policy-referenced industry standards, for this product group, e.g. the EU Ecolabel (in EU or third countries)? [1]
What data is already being collected through international frameworks?

[1] These research questions are (fully or partially) addressed in Tasks 1-4 of the MEErP.

Source: own elaboration

3.2.4. Step A.4: Assess data collection status quo

Step A.4 provides a reality check on current data collection and data-sharing practices in the product value chain, with the objective of understanding what information is available, at what level of quality and granularity, and under which legal, technical or organisational constraints, as a basis for designing a feasible and proportionate DPP data specification.

This step focuses on assessing the current state of the data ecosystem across the value chain of the product group under consideration. This includes identifying what data are currently collected, how they are collected and shared, and which barriers exist to data availability and exchange. As compared to the previous step which focused on (mandatory or voluntary) legal disclosures, the scope here is to collect the industry-driven practices.

In addition, this step allows the preparatory study team to assess whether any adjustments to the application of the methodology are required in the specific context, for example by adding product-specific questions, adapting the sequence of steps, or ensuring that appropriate inputs are available where the methodology is applied outside the MEErP framework[9].

This step requires the preparatory study team to review and address the research questions listed in Table 9.

Table 9. Research questions for Step A.4

Research questions
What information (about the product or its parts) is available to each actor in the product's value chain?
What are the industry practices regarding the collection of information about the product in the product's value chain?
What is the quality and granularity of this information? (e.g. how specific, how frequent, how much, how accurate, how precise, in what formats, with what metadata?)
How comprehensive, reliable, suitable and accessible are these existing sources of data?
Are there any commonly used definitions, standards or classification groups that are relevant to this product group, across different stages of the value chain? Do they provide a dictionary?
Which existing databases, certification scheme and/or labelling standards are currently relevant to the product group and its components?
What are the existing mechanisms for the verification of data disclosures in the supply chain? What are their pros and cons?
How are the product parameters referred to in Art. 7(2), Art. 7(5) or Annex I currently measured and communicated in the value chain, if at all? (e.g. SoC, durability, repairability)
What information is needed by each actor in the product's value chain to perform their respective actions?
Specifically, what data points are crucial for end-of-life management and circular economy goals?
What decisions could each actor make or which use cases could they serve if more information was available to them? What extra information would they need?
Are there any legal, economic or logistical constraints or barriers for collecting or sharing each data point (e.g. confidentiality, acquirability, privacy)?
Are there any technical constraints or barriers for collecting or sharing each data point (e.g. software and IT infrastructure or a dedicated provider needed, interoperability of format and of content, granularity)

Source: own elaboration

It is important to reiterate that data collection across the value chain is not regulated by the ESPR. Nevertheless, understanding the status of data collection practices is essential to determine what information is available, at what level of detail and quality, and under which constraints. This understanding enables the proposed DPP data specification to build on existing traceability schemes, avoid an unnecessary burden, and identify gaps that may be addressed through the DPP or through complementary instruments aimed at supporting systematic data collection across the supply chain.

[9] For instance, if the durability aspects are not relevant for the selected product-group scope due to its consumable nature, or if it is ascertained that it is an intermediate product and therefore does not require repair instructions, or if it is determined that the product does not contain any substances of concern, this aspect can be excluded from the analysis at an early stage.

3.3. Step B: Identifying use cases & data needs

Once the scope has been defined and the contextual baseline established under Step A, Step B focuses on identifying and validating DPP use cases and translating them into a structured, prioritised specification of DPP data needs. The sub-steps in Step B cover:

- specifying policy-relevant and operational DPP use cases across the product life cycle, including actors, triggers, actions and conceptual information needs;
- validating and refining these use cases through stakeholder consultation to confirm completeness, realism and relevance across value-chain actors (including EU and third-country operators placing products on the Union market);
- cataloguing the resulting conceptual data needs by translating validated use cases, existing legal disclosures and current data practices into a structured list of data points and associated requirements; and
- prioritising and classifying these data points (e.g. mandatory, strongly recommended, voluntary) based on policy relevance, perceived value, feasibility, data-sharing barriers and the risk of a disproportionate administrative burden.

By the end of Step B, the preparatory team should have a validated set of use cases and a structured DPP data needs specification that provides a clear link between intended DPP functions and the data elements needed to enable them. The following subsections offer a detailed explanation of how to execute this step, along with guidance on its interaction with MEErP tasks and optimal timing.

3.3.1. Step B.1: Specify use cases

Step B.1 involves identifying and defining the key use cases for the DPP in the context of the target product group. If carried out within the MEErP framework, this step should be performed at the beginning of Task 6, while defining design options. This way, in addition to the output of Step A of this DPP methodology, the practitioner would have analysed the market, users and technologies and identified the hotspots of the base cases.

In line with work carried out under CEN/CLC/JTC 24, DPP Use Cases (WG1 N 46), a use case is understood as a sequence of actions or events describing how an actor interacts with a system to achieve a specific goal. User stories, by contrast, provide informal, narrative descriptions from the perspective of an end user.

While both concepts are commonly used in system design, this methodology focuses exclusively on use cases as a structured and systematic way to describe interactions with Digital Product Passport (DPP) information in a policy and regulatory context. This approach supports clarity, consistency and traceability when assessing data needs, responsibilities and system functionalities across the value chain.

The research questions guiding Step B.1 are presented in Table 10**.**

Table 10. Research questions for Step B.1

Research questions
Which concrete use cases can be enabled for the product group through the DPP, in line with ESPR objectives?
Who are the actors involved in each use case, and what roles do they play?
What triggers the use case, and at which life-cycle stage does it occur?
What decisions or actions does each use case support?
Which data elements appear essential for the use case to function, and which are supportive or optional at this stage?
What data is required for this use case?
What level of detail or aggregation appears necessary for the data to be useful in this use case?
What is the necessary frequency of updates, so the information stays relevant and valuable?

Source: own elaboration

Within this methodology, a use case must clearly describe who is doing what, for what purpose and using which information. Each use case therefore includes, at a minimum, the identification of the primary and any secondary actors involved, a description of the scenario in which the use case takes place (including the current situation and the data gaps it presents), the goal to be achieved, the trigger that initiates the use case, and a step-by-step description of the actions required to reach the intended outcome. For each action, the information needed from the DPP is identified at a conceptual level.

The specification of use cases builds on the understanding of the product value chain, data availability and data-sharing practices established in Step A.4. In particular, it requires insight into which actors currently perform relevant actions, which actions could be improved or newly enabled through better access to data, and where information gaps or barriers to data sharing exist. The identification of use cases also takes into account mandatory actions arising from the ESPR and other Union law.

Use cases are formulated following the guidance provided in Annex 3, drawing where relevant on existing use cases and user stories developed under standardisation initiatives (such as JTC 24) and other relevant projects. Each use case should be aligned with the fundamental capabilities of the DPP system, including unique product identification and controlled access to data, and should be realistic in light of the diversity of users and operating conditions across the EU.

The use cases should represent typical and policy-relevant scenarios of DPP use across the product life cycle, for example supporting sustainable purchasing decisions, enabling compliance and market surveillance, facilitating repair and maintenance, supporting business-to-business data exchange, or improving end-of-life operations. The outcome of this step is a documented set of use case descriptions that directly inform the identification and prioritisation of DPP data needs in Step B.3. An illustrative example of a use case is provided in Table 11. Additional generic use cases relevant for the ESPR are presented in Annex 3, Section C.

Table 11. Illustrative use case for textile self-repair

Use case: Self-repair of worn apparel	
Primary actor: Consumer	**Secondary actors:** None
Scenario: A user notices a seam has come undone on their hoodie or a zipper no longer functions. Previously, they would have discarded the item. With access to the DPP, they consider repairing it themselves.	
Goal: Extend the lifespan of apparel by repairing it personally	**Trigger:** Consumer finds a garment that is damaged and considers how they can repair it.
Actions:	
1. Consumer inspects the damage. 2. Consumer scans a QR code or accesses the product's DPP using a smartphone. (JTC 24 UC PUB-05). 3. Optionally, the user scans this QR-code with an app integrated into an AI agent. 4. Consumer is provided with detailed information about the product, including the type/colour code of the dyestuff or the functionalisation chemical (e.g. ""Zipper type: YKK #5 nylon coil""), repair diagrams, and links to manufacturer's tutorial videos or manuals. (JTC 24 UC PUB-01). 5. In the optional AI-based agent scenario, the user may then take a picture of the damaged area and is then guided through the relevant information by the AI, which first assesses repairability. 6. For products composed of multiple parts/materials, there may be further instructions of how to redye/refunctionalise all parts. Or a message may be included saying 'unsuitable for redyeing or refunctionalisation'. 7. Consumer orders a compatible dye (or is informed it is a standard, widely available part). 8. Consumer follows step-by-step visual guidance to perform the repair. 9. Use case ends.	
Data required:	**Data update events:**
Product composition & List of spare parts Product durability (Optional) Information regarding repair services Step-by-step repair instructions (text and/or visual)	(Optional) Consumer can add a repair event to the DPP. Note that this may comprise personal data and therefore requires explicit consent.

Source: own elaboration

3.3.2. Step B.2: Validate the use cases

Once the use cases have been specified, they should be validated to assess their accuracy, completeness and practical relevance (see research questions in Table 12). This validation is carried out through stakeholder consultation and serves to verify and improve the theoretical use cases developed in Step B.1 based on feedback from relevant actors. Within the MEErP framework, this would then fit the stakeholder consultation to be performed after Task 6.

Stakeholder consultation should ensure balanced and representative participation across the product value chain, including upstream, manufacturing, distribution, use, repair and end-of-life actors. In addition, the consultation should cover both EU-based stakeholders and relevant third-country producers and economic operators placing products on the Union market, in order to capture potential differences.

Validation supports the identification of necessary corrections, clarifications or refinements to the use cases, including adjustments to actors, triggers, actions and assumed interactions with the DPP. It also helps assess whether the use cases reflect current or realistically achievable practices across the value chain, and whether they rely on data that can be easily generated, accessed and maintained by the actors involved.

The validation process may further reveal missing or underrepresented use cases, variations across market segments, or constraints related to data availability, data quality or data-sharing practices. The outcome of this step is a refined and validated set of use cases, which forms the basis for the subsequent prioritisation and specification of DPP data needs.

Stakeholder consultation also provides an opportunity to assess the perceived value of the data associated with each use case for industry stakeholders, including whether the availability of DPP data is expected to support operational efficiency, compliance processes, risk reduction, cost savings or new business opportunities. This input is critical for subsequent impact assessment activities.

Table 12. Research questions for Step B.2

Research questions
Are the specified use cases accurate and complete, based on stakeholder input?
Are corrections, clarifications or simplifications required?
Are the identified actors, triggers and actions realistic and correctly represented?
Do the use cases reflect current or credible future practices across the value chain?
Are additional use cases or relevant variations missing?
What is the perceived value of the data required for each use case for industry stakeholders, including EU-based and third-country producers, relative to the effort required to generate, maintain and share that data?

Source: own elaboration

3.3.3. Step B.3: Catalogue data needs

Step B.3 of the methodology requires the preparatory team to identify and specify the DPP data needs specification by answering the research questions listed in Table 13.

This step draws on the following inputs:

— the requirements identified under other Union law (within the EU and, where relevant, globally), compiled in Step A.3;

— the data currently collected by actors across the value chain, as identified in Step A.4;

— the use cases defined in Step B.1 and validated in Step B.2; and

— other sources, where deemed necessary.

The inputs from the MEErP process (mainly the design options defined and assessed in Task 6) are necessary for identifying potential DPP information requirements under Article 7(2)(b)(i) and Article 7(5) of the ESPR. In combination with the data collected in Step B.1 and the validated use cases from Step B.2, they also support the identification of potential DPP information requirements under Article 7(2)(b)(ii), (iii) and (iv). Alignment with the catalogue of requirements under other Union law ensures coherence and efficiency in data disclosure obligations. If this methodology was to be applied outside the ESPR and MEErP framework, then an equivalent hotspot analysis should be performed to complement this step and identify relevant requirements.

Table 13. Research questions for Step B.3

Research questions	Exemplary answers
Why is the data required? If not required, why it is collected?	e.g. due to a regulatory requirement or a functional use case like repair, recycling or consumer transparency
Is the data point required to enable the use case, and what is the perceived value for the user?	Yes/no answer High to low value
How accurate (representative, precise) does the data need to be?	e.g. error margin below X, deviation of at most 1 month in durability, 0.03% off in terms of material composition.
How recent does the data need to be?	e.g. cannot be older than 6 months
What is the required frequency of collection?	e.g. once every hour, once per year
What is the required degree of completeness?	e.g. 80% of data needs to be available
On what most detailed granularity level is the data required i.e. on model, batch or item level?	Facility, product (series, batch, unit)
What needs to be known about the data collection?	e.g. how was it measured, when was it entered
Does a harmonised definition of the data exist?	Yes/no answer
Does a harmonised methodology for the measurement and/or calculation of the data output exist?	Yes/no answer
Who is responsible for providing the data?	e.g. manufacturer, supplier, on-device automatic measurement devices for use-stage aspects, recycler
What are requirements on authentication & verification of the information?	e.g. reference to a qualified, independent external verifier
When must the data be provided or updated?	e.g. upstream or at final production, during use (and at which frequency or event-based), after repair, at end of life
How should the data be formatted?	e.g. units, taxonomy, data model
Where could and should the data be accessed from?	e.g. directly in the DPP or through references to existing systems like EPREL or third-party databases
Does the data contain, or could it reveal, personal data or commercially sensitive information, and what implications does this have for access control, data protection, or anonymisation?	Yes/no/other answer

Source: own elaboration

It should be noted that Step B.3 is limited to the conceptual identification and selection of data points. The formal specification of data structures and the selection or development of ontologies are addressed at a later stage, namely in Steps C.1 and C.2.

Step B.3 plays a critical role in mapping data needs by determining which data are useful for enabling the identified use cases and at which level of granularity (e.g. model, batch or item level), which is addressed in Step C.3. Step B.3 also provides a solid foundation for the development of the product-group-specific DPP data specification and data governance rules in later stages of the methodology. It provides a structured assessment of the relevance, scope and level of detail required for each data point, ensuring that data requirements are aligned with practical use and policy objectives.

In addition, this step serves as a cross-check of the status of data points, including whether they are already subject to common definitions, calculation rules or methodological approaches under existing legislation or standards. While the detailed assessment of methodologies and semantic alignment is carried out in Step C, Step B.3 helps identify at an early stage where such common approaches exist and where gaps may arise, including potential barriers to practical implementation.

3.3.4. Step B.4: Prioritise and classify data needs

Step B.4 builds on the data needs identified in Step B.3 and aims to prioritise, cluster and classify individual data points in order to support the development of policy proposals for the content of the DPP. In particular, this step supports the definition of alternative data scopes, including the distinction between mandatory and voluntary elements, and between baseline and more ambitious implementation options.

While previous steps focus on identifying which data may be relevant, Step B.4 goes beyond simple identification. It provides a structured analytical basis for comparing and classifying data points, with a specific focus on policy relevance and feasibility. This classification supports the identification of essential DPP data points, as well as strongly recommended ESPR-related voluntary requirements, and helps to assess different implementation approaches.

The prioritisation and classification exercise is guided by a set of evaluation criteria, which operationalise this assessment and provide a transparent basis for comparing data points. These criteria are expressed as research questions in Table 14, while Annex 4 provides further descriptions and guidance on their application.

Table 14. Research questions for Step B.4

Research questions
Use-case applicability and perceived value: Is the data point necessary to fulfil the use case, and does it deliver clear value for users?
Data acquisition capabilities: Can the data point be collected by manufacturers or other economic operators without requiring disproportionate system redesign or effort?
Data quality and granularity requirements: What level of accuracy, completeness and granularity is required for the data point to be relevant and reliable for the use case, and what effort is implied to meet these requirements?
Data-sharing barriers: Are there confidentiality, trade secret, personal data or other constraints on sharing the data point, or would its collection or disclosure impose an undue economic or administrative burden?

Source: own elaboration

The outcome of Step B.4 is summarised in the data needs classification matrix (Table 15). The matrix provides a transparent bridge between analytical findings and policy design, supporting the formulation of baseline and more ambitious policy options for the DPP.

The data needs classification matrix is used as an analytical support tool rather than as a rigid or exhaustive typology. It is applied at the level of individual data points, not at the level of full use cases. The categories presented in the matrix represent typical combinations of characteristics observed across data points and are intended to illustrate recurring patterns in terms of perceived value, implementation effort, market uptake and barriers. Data points are therefore not required to fit perfectly into a single category. Where a data point exhibits mixed characteristics—for example, high perceived value combined with high implementation or data-sharing barriers—it may be assessed by reference to multiple categories or assigned to the closest category with an explicit

qualitative justification. Such cases are particularly relevant for identifying candidates for phased implementation, aggregation, conditional requirements or voluntary treatment.

Table 15. Data needs classification matrix

	ESPR status	Perceived value	Data currently collected by industry	Value-effort balance	Key barriers	Policy relevance
A	Proposed ESPR-required	High	High (widely implemented)	High value / low effort	Low or none	Low implementation risk; suitable for baseline option
B	Proposed ESPR-required	High	Medium–low (early adopters only)	Moderate (high value / medium-high effort)	System adaptation, lack of harmonised methods	High policy impact; may require phased implementation
C	Proposed ESPR-required	Medium	Medium (fragmented practices)	Moderate (medium value / medium effort)	Data quality, consistency, granularity	Suitable for simplification or aggregation
D	Proposed ESPR-required	Medium–low	Low (no established practice)	Unfavourable (low-medium value / high effort)	Cost, feasibility, confidentiality	High risk; candidate for deferral or optional status
E	Voluntary / enabling	High	Medium–high	Favourable (high value / low-medium effort)	Low	Suitable for voluntary disclosure or best-practice guidance
F	Voluntary / enabling	Low	Low	Unfavourable (low value / high effort)	High	Low priority; limited justification for inclusion

Source: own elaboration

3.4. Step C: Design & development

Step C translates the conceptual DPP data needs identified and prioritised in Step B into a structured, implementable DPP data specification. While Step B focuses on what information is needed and why, Step C focuses on how this information is defined, structured and operationalised in a way that is interoperable, scalable and aligned with ESPR requirements.

Step C addresses two tightly linked design dimensions:

— the semantic definition of DPP data, through the review, selection and development of vocabularies and ontologies (see Box 4); and

— the specification of cross-cutting implementation parameters, including data granularity, access rights and downstream data governance.

Together, these elements ensure that DPP data are machine-readable, consistently interpreted across systems and product groups, and fit for use by different actors along the value chain, while remaining feasible for economic operators and proportionate to regulatory objectives.

Box 4. Defining DPP ontology vs. DPP vocabularies

DPP ontology

In the context of DPPs, an ontology provides a formal, structured representation of product-related knowledge. It defines the key concepts relevant to a product, their properties, and the relationships between them. DPP ontologies are typically machine-readable and designed to support semantic interoperability, enabling consistent interpretation, exchange and reuse of product data across IT systems, value-chain actors and regulatory contexts. They are the semantic backbone that allows DPP data to be linked, queried and combined across product groups and data sources.

DPP vocabulary

A vocabulary is a controlled set of agreed terms and definitions used to describe specific data elements in a consistent way. In a DPP context, vocabularies specify how individual properties (e.g. durability, repairability) are defined and, where relevant, classified or coded. Vocabularies may be general (cross-sectoral) or product-group-specific (see also Section 2.3.2 of this report) and can exist independently or as building blocks within an ontology.

While vocabularies ensure semantic clarity and consistency, ontologies go a step further by explicitly modelling relationships between concepts and enabling advanced data integration and automation.

3.4.1. Step C.1: Review of existing vocabularies

Step C.1 builds on the conceptual data needs identified in Step B and aims to review, benchmark and map these data needs against existing relevant vocabularies[10]. The objective of this step is to assess the extent to which existing, publicly available and freely accessible vocabularies can be used to define the terms and definitions required for the DPP, and to identify gaps where new vocabulary elements or clarifications may be required.

For each conceptual data need, whether corresponding to a regulatory requirement or a voluntary recommendation, the analysis examines whether an equivalent or suitable vocabulary term already exists in one or more candidate vocabularies. This analysis is guided by the research questions set out in Table 16 which frame the assessment of existing vocabulary definitions and support the identification of strengths and weaknesses where multiple definitions are available.

In this step, the cross-sectoral common vocabulary and other candidate vocabularies are reviewed, and gaps are identified by directly mapping them to the conceptual information requirements identified in Step B. For each regulatory requirement or voluntary recommendation (i.e. a data field or concept), it is assessed whether and how it is represented by one or more candidate vocabularies. The outcome of this exercise is a gap analysis indicating which requirements and recommendations

[10] Contextual information on the structure and role of the DPP cross-sectoral common vocabulary and product-group-specific vocabularies is provided in Section 2.3.2.

are covered and which are missing. This evaluation combines qualitative review with quantitative scoring for selected key metrics, where appropriate (see Annex 6).

Table 16. Research questions for Step C.1

Research questions
For each data point, is there any public, free-access ontology that provides a definition for it?
If there are multiple, what are the strengths and weaknesses of each ontology definition for said information requirement?
To what extent are the identified ontologies or vocabularies currently used in practice by industry or other relevant actors, and in which contexts (e.g. regulatory compliance, voluntary reporting, data exchange, internal information management)?

Source: own elaboration

Particular attention is given to the DPP common vocabulary for circularity-related aspects, which serves as a semantic anchor across product groups. A reference mapping of ESPR-related circularity concepts to harmonised definitions drawn from EU legislation, standards and widely used vocabularies is provided in Annex 5, which supports consistent interpretation and reuse of vocabulary terms across DPP implementations.

This step considers relevant sectoral or cross-sectoral vocabularies derived from existing standards, ontologies or data models. It supports semantic consistency and interoperability by promoting the reuse of existing, well-established vocabulary terms wherever possible. Annex 6.A provides guidance for reviewing existing vocabularies and performing the gap analysis against the identified information requirements, ensuring transparency and methodological consistency in the assessment.

From a strategic perspective, the results of Step C.1 can inform future product-group-specific DPP vocabulary standardisation initiatives. From an operational perspective, the analysis leads to the addition of new attributes, namely originating vocabulary and vocabulary definition, to the data catalogue created in Step B.

Where a conceptual information requirement is not identified in any of the reviewed vocabularies, the corresponding fields in these newly introduced columns are left empty and addressed in Step C.2. In addition, for each identified vocabulary term, a qualitative assessment is provided, highlighting its strengths (i.e. the degree to which the requirement is met) and weaknesses (e.g. potential ambiguity, misinterpretation or quality limitations).

3.4.2. Step C.2: Extending or developing vocabularies

Step C.2 builds on the results of Step C.1 and focuses on finalising the product-group-specific vocabularies for the DPP. The objective of this step is to ensure that each data need identified in the DPP data needs (resulting from Step B) is supported by a suitable vocabulary element, either through the reuse of existing vocabulary terms or, where necessary, through the extension of existing vocabularies or the development of new elements to address identified gaps.

In this step, the focus is on finalising the product-group-specific vocabularies for the DPP by selecting, for each data need, the most appropriate vocabulary element from among the candidates identified in Step C.1. In line with the research questions in Table 17, each data point is reviewed to verify whether at least one suitable vocabulary definition exists.

Table 17. Research questions for Step C.2

Research questions
Does each data point have at least one ontology definition? If not, would the creation of an ontology definition lead to a new ontology or just an extension to an existing one?
Where a data point has more than one ontology or vocabulary definition, which is the most suitable definition based on the qualitative assessment performed in Step C.1?

Source: own elaboration

The selection, extension or development of vocabulary elements in Step C.2 is guided by a set of decision criteria that combine qualitative assessment with practical implementation considerations, in order to support interoperability, regulatory alignment and feasibility in the DPP context. The detailed assessment methodology is provided in Annex 6.B, while the main decision logic is summarised below.

In principle, three decision pathways are distinguished:

— *Reuse an existing vocabulary as is,* where the common or candidate vocabulary provides adequate coverage of the required terms, shows strong consistency with ESPR and other regulatory definitions, ensures high interoperability, and demonstrates sufficient adoption by relevant stakeholders. Additional considerations include clear governance and maintenance arrangements, availability under an open or non-prohibitive licence, and reasonable implementation effort.

— *Adapt or extend an existing vocabulary*, where no single vocabulary fully satisfies the information requirements, but one or more candidates provide a strong basis. This pathway is applied where identified gaps are limited and can be addressed through extensions, refinements or mappings without undermining the overall structure of the vocabulary. Preference is given to vocabularies that are already used in practice or show strong potential for wider adoption, are permissively licensed, and can be extended at lower cost and effort than developing a new vocabulary.

— *Develop a new vocabulary,* as a last resort, where none of the reviewed vocabularies meets minimum thresholds in terms of coverage, consistency or interoperability, or where otherwise suitable vocabularies are proprietary or associated with prohibitive implementation costs. In such cases, the development of a new vocabulary builds on the common cross-sector DPP vocabulary and reuses elements from existing ontologies wherever feasible, in order to avoid unnecessary divergence from established terminology.

Where the decision is taken to develop a new ontology, the following three best practices are recommended:

— the use of competency questions, translating relevant use cases into natural-language questions that the ontology should be able to support;

— compliance with the FAIR principles (Findable, Accessible, Interoperable and Reusable) (Wilkinson et al., 2016);

— modular design based on the identification of key concepts, aligned where possible with ESPR performance criteria (e.g. durability, sustainability, resource-use efficiency).

Regardless of whether an existing ontology is extended or a new one is developed, alignment with the common cross-sector DPP ontology is maintained for each new term introduced. This ensures a

consistent machine-readable structure across product groups, while preserving the added value of a shared cross-sectoral semantic framework.

At the conclusion of Step C.2, the preparatory team produces a preliminary product-group-specific ontology specification, consisting of definitions, attributes and relationships tailored to the product group, together with specifications on data formatting and representation (e.g. units of measurement, associated documentation or certification, applicable data standards, and whether data are provided directly via the DPP or through an external system such as EPREL). This specification is used to structure all DPP data for the relevant product group.

3.4.3. Step C.3: Setting DPP data granularity

Step C.3 builds on the results of Steps B and C.1-C.2 and focuses on defining the appropriate level of granularity at which data should be provided in the DPP for a given product group. The objective of this step is to determine, for each DPP data point, whether information should be specified at model, batch or item level, taking into account existing industry data practices, regulatory disclosure requirements under the ESPR, and the needs of relevant use cases.

The assessment of data granularity is guided by the research questions set out in Table 18, which frame the analysis of current data collection practices, the variability of information across granularity levels, and the added value of supporting different levels of granularity within a product DPP.

Table 18. Research questions for Step C.3

Research questions
Are there relevant information points that vary between individual items or batches?
Are there use cases that explicitly require a specific level of granularity?
What is the expected information volume for products in the group, and how feasible is it, from a cost and operational perspective, to capture this information at finer levels of granularity?
Does the product accumulate or generate data over its life cycle (on which level is it useful)?

Source: own elaboration

In this step, the granularity specification process is applied to each property of the product-group-specific ontology, starting from a review of existing data reporting systems and traceability schemes used within the product group (such as chain-of-custody models, batch tracking systems, or serialisation practices). These existing industry practices constitute the starting point for assessing whether they are sufficient for DPP data reporting, both for mandatory regulatory disclosures and for voluntary recommendations. The assessment explicitly recognises that introducing finer levels of granularity — particularly item-level data — can significantly increase implementation and operational costs. For this reason, Step C.3 aims, wherever possible, to build on existing industry practices, extending them only where it is justified by regulatory requirements or by high-value use cases that cannot be supported at coarser levels of granularity.

Further guidance on determining appropriate DPP data granularity levels is provided in Annex 7, which sets out a structured decision-support framework aligned with ESPR provisions. This guidance supports the application of the research questions in Table 18 by outlining relevant criteria, trade-offs and examples to be considered when assessing whether existing data reporting granularity is sufficient to cover the identified information requirements. The resulting granularity specification is intended to meet both the ESPR's regulatory mandates and the practical needs of use cases.

It is important to distinguish data-point granularity from product identification granularity. Step C.3 specifies the level at which individual data properties should be provided and does not, in itself, prescribe the mandatory level at which products must be uniquely identified in the DPP. Different data points may therefore be associated with different levels of granularity within the same product group. For example, in the textile sector, a T-shirt may have a consistent fibre composition across all items within the same batch, based on a common design and production process. In such cases, the DPP may specify fibre composition at batch level, while other data points, such as repair history, may be specified at item level where required by the use case.

To support this flexibility, multi-level referencing between identifiers is recommended. While selecting an item-level granularity for specific data points does not in itself imply the mandatory use of separate model- or batch-level DPP entries, the ability to link identifiers across levels enables coherent navigation between model-, batch- and item-level information. This approach is consistent with the life-cycle management mechanisms proposed by JTC 24 and is also supported by the UN Transparency Protocol section on DPPs, which states that a passport *must* have a related model and *may* have a related batch and item, thereby enabling structured and scalable multi-level referencing within the DPP framework.

The outcome of Step C.3 is, for each data property, a documented recommendation of the associated level of granularity, as well as a corresponding recommendation on the appropriate level of product identification granularity, recorded in the DPP data needs specification. These recommendations inform the subsequent implementation and operational design of the DPP for economic operators participating in the relevant product group.

3.4.4. Step C.4: Setting DPP data access

Step C.4 builds on the results of Steps B and C.1-C.3 and focuses on defining appropriate access rights for DPP data, i.e. determining which actors are allowed to access which DPP data properties for a given product group. The objective of this step is to support a data access model that enables the effective use of DPP information for regulatory compliance and circularity-related activities, while safeguarding confidential business information, intellectual property, and data protection requirements in line with ESPR provisions.

The assessment of data access is guided by the research questions set out in Table 19, which frame the analysis of existing industry practices, stakeholder needs across the value chain, technical and organisational capabilities of economic operators, and the risks and benefits associated with different levels of data visibility.

In this step, the focus is on determining, for each DPP data property, who should be allowed to access its value. Access rights are therefore assessed at the level of individual data properties, recognising that different properties may legitimately require different access rules depending on their purpose, sensitivity and associated use cases.

The methodological starting point for this assessment is the guidance provided in Annex 8, which sets out a structured decision-support framework for DPP data access based on a role-based, need-to-know principle. Annex 8 provides the conceptual logic, key principles and illustrative access tiers that support consistent and transparent access-right decisions, without prescribing product-group-specific outcomes. In Step C.4, this guidance is applied and tailored to the product group by systematically addressing the research questions in Table 19.

Table 19. Research questions for Step C.4

Research questions
For each data point, what are common practices for data access in the current industry, within the EU and in third countries?
For each data point, which stakeholders across the supply chain would benefit from having access to that information?
What are economic operators' capabilities to make DPP data available at different levels of confidentiality? (e.g. for textiles, an SME might only have a single classification system interfacing with cloud architecture, without having different view rights based on the roles of actors accessing their system)
For a given DPP property, what is the business value considered by specific supply chain participants (e.g. for textiles it might be worth providing visibility to the weaving technique for a recycler so that they can recycle the textile product with no waste)
What are the risks associated with disclosing a DPP property to a wider set of actors? (e.g. for textiles, if the weaving technique is known by the public at large, possible intellectual property theft might occur)

Source: own elaboration

In determining access rights, the analysis considers existing research and standards on data access control systems, including examples such as the GS1 guidance on enabling the DPP (GS1, 2025). In line with these approaches, access control is defined by identifying relevant data producer and data consumer roles, mapping them to their position in the supply chain, and assessing whether access to a given data property is necessary to perform the activities associated with that role.

Access rights are thus assigned following a need-to-know pattern, whereby access is granted only where a clear functional or regulatory justification exists. This approach enables relevant actors (e.g. repairers, recyclers, authorities) to access the information they require, while avoiding unnecessary exposure of sensitive or commercially confidential data.

The outcome of Step C.4 is twofold. First, a classification system of need-to-know patterns is established, allowing consistent reference across product groups. Second, for each DPP data property, a corresponding recommended access-rights reference is recorded in the DPP data catalogue created in Step B, linking the property to the applicable need-to-know pattern. Together, these outputs provide a structured basis for implementing role-based data access controls in the operational DPP system.

3.4.5. Step C.5: Setting DPP data governance

Step C.5 builds on the results of Steps B and C.1-C.4 and focuses on defining data governance arrangements for the introduction, update and maintenance of DPP data throughout the product life cycle, in particular for downstream life-cycle management activities. The objective of this step is to determine, for each relevant use case and DPP data property, who is responsible for providing data, when data should be added or updated, and which actor is responsible for maintaining such additions.

The assessment of downstream data governance is guided by the research questions set out in Table 20 which frame the analysis of life-cycle events, actor responsibilities, and technical capabilities for updating and maintaining DPP data beyond the point of placing the product on the market.

Table 20. Research questions for Step C.5

Research questions
For each data point, what are the moments in the product life cycle when an update/addition to said data point would be required?
For each data point requiring updates or additions, which actor should be responsible for introducing the data?
For each data point requiring updates or additions, which actor should be responsible for maintaining and hosting the data over time?
What are the technical capabilities of the relevant actors (in particular SMEs) to collect, update, maintain and share the required data?

Source: own elaboration

In this step, the focus is on answering, for each use case, the guiding questions: "Who should provide DPP data, when should it be provided or updated, and who should maintain any additions?" The analysis starts from an assessment of the current industry status quo, informed by previous tasks and the identified use cases.

Further methodological guidance on how to operationalise this assessment is provided in Annex 9, which sets out a structured governance framework for life-cycle data and illustrates how it can be applied to typical life-cycle events.

Building on this baseline, industry capabilities are assessed against a set of *core governance principles for life-cycle data (see Annex 9.A)*, which provide a common logic for assigning responsibilities and rights across actors and life-cycle stages:

1. *Data segregation:* distinguishing between static data declared at the time of placing the product on the market (the "Core DPP") and dynamic life-cycle data generated after market placement (the "Life-cycle Log").
2. *Authenticated and role-based write permissions:* defining which actors are authorised to add data to the Life-cycle Log and under which conditions.
3. *Verifiability and attributability:* ensuring that every data addition is traceable to the actor that created it, through digital signatures or equivalent cryptographic means.
4. *Standardisation of life-cycle events*: requiring that additions to the Life-cycle Log follow standardised semantics and data structures to ensure interoperability.

In addition, the framework addresses the frequency and triggers of data updates. Annex 9.B identifies concrete trigger events (e.g. repair, firmware update, refurbishment, ownership transfer, end-of-life collection) that help determine when updates should occur and which actor should introduce them. The goal is to recognise that updates may occur at multiple points in the downstream life cycle, such as professional repair, software or firmware updates, refurbishment, component upgrades, ownership transfers, and end-of-life collection.

The framework thus determines who is responsible for providing or updating specific DPP data, when the responsible actor should provide or update the relevant data points, and how this relates to the relevant life-cycle moment, by mapping these responsibilities to the relevant life-cycle management use case.

The outcome of Step C.5 is an extension of the use cases dataset, specifying, for each life-cycle management use case and each associated information requirement, the roles of the actors

involved. Actors are classified as data originators (responsible for introducing new life-cycle data) or data maintainers (responsible for hosting and maintaining such data over time).

3.5. Step D: Internal validation and public consultation

Step D aims to verify and validate the proposed DPP data specification developed in Steps A-C through a structured stakeholder consultation and technical verification process. The purpose of this step is to assess whether the proposed DPP data content constitutes a complete, coherent and operational specification that is fit for its intended regulatory and practical uses under the ESPR.

This step complements, but does not duplicate, earlier stakeholder engagement activities carried out under the methodology. In particular, Step A.4 focuses on identifying existing industry practices and currently available data, while Step B.2 validates policy-relevant use cases and information needs. By contrast, Step D focuses on the assessment of the proposed solution itself, namely the concrete DPP data content, definitions and structure resulting from Steps A-C. The emphasis is therefore placed on verifying the appropriateness, feasibility and completeness of the proposed data specification, and on documenting stakeholders' views on its implementation implications.

The validation carried out in Step D combines two closely linked perspectives. First, the proposed DPP data specification is verified against the requirements of the ESPR, including both functional and non-functional requirements. This includes checking whether the proposed data elements collectively cover the intended DPP functions for the relevant product group, whether they are clearly defined and structured, and whether they meet requirements related to clarity, machine-readability, accessibility, interoperability and traceability. Particular attention is paid to the internal consistency and operational viability of the data specification, including the identification of interdependencies between data elements and the potential consequences of adding, modifying or removing individual elements.

Second, Step D relies on a targeted stakeholder consultation to assess whether the proposed DPP data content is fit for purpose in practice. Stakeholders are consulted with a view to understanding whether the proposed data elements are realistically available at the relevant points in the value chain, which elements are already collected by industry in the ordinary course of business or to comply with existing legislation, and which elements would require new data collection or system changes. This enables an assessment of the incremental implementation effort associated with the proposed DPP data content and supports the application of the proportionality principle.

An important objective of Step D is to systematically document stakeholder views on the proposed DPP data specification, including areas of broad support, implementation challenges, and divergent positions between stakeholder groups. Where controversies arise with respect to specific data elements or design choices, the positions of different stakeholder groups are explicitly recorded. Stakeholders are also invited to put forward concrete proposals to modify, simplify or extend specific data elements in order to improve the accuracy, usability, interoperability or regulatory coherence of the DPP.

The stakeholder consultation and technical verification activities under Step D are guided by a structured set of research questions, which are presented in Table 21. These research questions provide a transparent framework for assessing the proposed DPP data content and for documenting how stakeholder input has informed the final specification.

Table 21. Research questions for Step D

Research questions
Does the proposed DPP data content include all data elements required to fulfil the intended DPP functions for the product group?
Are all proposed DPP data elements relevant and necessary for their stated purpose, or can some be removed or simplified without loss of functionality?
Are the definitions, scopes and boundaries of individual DPP data elements sufficiently clear and unambiguous to ensure consistent data provision?
Is the proposed level of granularity for each DPP data element appropriate (e.g. product, batch, component or material level)?
Are the responsibilities for collecting, uploading, validating and updating each proposed DPP data element clearly defined along the value chain (e.g. manufacturer, importer, distributor, service provider, recycler)?
Do stakeholders agree with the allocation of data responsibilities for the proposed DPP data elements, or are alternative allocations suggested?
Are the timing and frequency of data updates for each DPP data element considered realistic and proportionate by the actors responsible?
Are the proposed DPP data elements available at the level and point in the value chain at which they are expected to be provided, and is the responsible data provider clearly identified?
Which of the proposed DPP data elements are already collected by industry in the ordinary course of business or to comply with existing legislation, and which would require new data collection or system changes?
Do any proposed DPP data elements duplicate, overlap with, or could be derived from information required under other Union legislation, and is the mapping between these datasets clearly defined?
Do the proposed DPP data elements comply with ESPR non-functional requirements in terms of clarity, machine-readability, accessibility and traceability?
Are the proposed vocabularies, units, identifiers and data structures coherent and interoperable with existing standards and systems?
Which specific DPP data elements or design choices are subject to divergent stakeholder views, and which stakeholder groups express support, concerns or opposition to these elements?
Are there concrete proposals to add, modify or restructure specific DPP data elements to improve accuracy, usability, interoperability or regulatory coherence?

Source: own elaboration

4. Summary and next steps

This report presents a structured methodology for defining the content of the DPP in the context of preparatory studies and impact assessments under the ESPR. The methodology should be understood as an integral contribution to the preparatory study process. In this context, the preparatory study serves primarily as a feasibility study to identify, analyse, and refine possible policy options prior to regulatory decision-making.

The DPP methodology presented in this report is designed with this broader legislative logic in mind and is firmly anchored in existing industry practices. Rather than treating the definition of DPP data requirements as a purely technical or standalone exercise, the methodology embeds the development of DPP content within a progressive evidence-gathering process. This process builds on current practices and systematically involves stakeholders at each step. In this sense, the DPP methodology contributes directly to the preparatory study's role as a bridge between technical analysis and subsequent policy evaluation.

A central feature of the methodology is its explicit focus on anticipating the information needs of the impact assessment from an early stage. The method does not rely solely on documenting existing industry practices but systematically distinguishes between data elements that are already collected in the ordinary course of business or to comply with existing legislation and data elements that would be newly required under a DPP obligation. This distinction is essential for enabling a more robust assessment of implementation costs, administrative burden, and proportionality in the impact assessment phase.

The methodology also places strong emphasis on structured stakeholder engagement throughout the process. Stakeholder consultation is used not only to identify current practices and validate use cases, but also to assess and refine the proposed DPP data specification itself. This allows stakeholders' views on feasibility, data availability and operational implications to be documented at each stage of the methodology. It also enables the identification of areas of support, concern and opposition across stakeholder groups. By explicitly capturing alternative proposals and points of disagreement, the methodology enhances transparency around the trade-offs that may need to be addressed in subsequent policy analysis.

In addition, the methodology contributes to regulatory coherence by systematically screening proposed DPP data elements against existing Union legislation, ensuring alignment with relevant standardisation requests, and identifying opportunities for data reuse, referencing or alignment. This supports the avoidance of unnecessary duplication and double reporting and strengthens the evidence base for assessing regulatory efficiency and consistency.

Where modifications are introduced during the impact assessment or legislative drafting process, it is necessary to verify the operational consistency of the final DPP data specification. Such verification requires a combination of domain expertise and data modelling or ontological expertise comparable to that of the preparatory study team. Where feasible, the use of a formal data model is recommended to support this verification and to ensure that any subsequent changes remain coherent, proportionate and technically implementable.

The methodology presented in this report represents a first structured approach to defining DPP data content in the context of the ESPR. As such, a number of limitations should be acknowledged, which also point to areas for future work.

First, the methodology has been developed as a first-time design and has not yet been fully tested in practice across multiple product groups. While it is grounded in existing industry practices and informed by stakeholder input at each step, its application in future preparatory studies will be essential to assess its robustness, scalability and adaptability to different sectoral contexts. Practical implementation may reveal the need for further refinements, simplifications or additional guidance.

Second, at the time of drafting, relevant standardisation requests related to the DPP are not yet publicly available. As a result, certain assumptions made in the methodology with regard to vocabularies, data structures and interoperability principles may need to be reviewed or complemented once the standardisation process is completed. Future applications of the methodology should therefore incorporate the outcomes of these standardisation activities to ensure full alignment and coherence.

Third, some aspects relevant to the implementation of the DPP fall outside the scope of this methodology. In particular, issues related to detailed IT architecture, system governance, data hosting solutions, or enforcement mechanisms are not addressed in detail. These may require complementary analyses or guidance. Similarly, product-group-specific considerations may necessitate additional methodological steps or adaptations beyond those described in this report.

Finally, as the regulatory and policy context evolves, including through the adoption of delegated acts and the refinement of ESPR implementation practices, the methodology may need to be updated to reflect new requirements, lessons learned and emerging best practices. Continued application and iterative refinement will therefore be important to ensure that the methodology remains relevant and effective over time.

References

Arcipowska, A. and Blanco-Perez, S. (2026), Method for the integration of the support to ESPR impact assessments within the evaluation process of products, including international trade aspects and impact of measures on third countries, EUR, Publications Office of the European Union, LU, https://data.europa.eu/doi/10.2760/1182290.

BIO Intelligence Service (2013), 'Material-efficiency Ecodesign Report and Module to the Methodology for the Ecodesign of Energy-related Products (MEErP), Part 1: Material Efficiency for Ecodesign – Final Report to the European Commission - DG Enterprise and Indust', https://op.europa.eu/en/publication-detail/-/publication/7c3d958d-42cc-4af7-985c-2a3347b66fa8.

Boston Consulting Group (2023), 'The EU Digital Product Passport shapes the future of value chains: What it is and how to prepare now', World Business Council for Sustainable Development (WBCSD), https://www.wbcsd.org/wp-content/uploads/2023/09/The-EU-DPP-shapes-the-future-of-value-chains_What-it-is-and-how-to-prepare-now.pdf.

Deich, J., Loeb, L., Meins-Becker, A., Meisen, T. and Pomp, A. (2025), 'Towards Connecting General DPP Ontology Frameworks with Domain-specific Information Sources', presented at the The 3nd International Workshop on Knowledge Graphs for Sustainability (KG4S2025), https://ceur-ws.org/Vol-4002/paper3.pdf.

Delre, A., Gonzalez Torres, M., Kouloumpis, V., Senatore, V., Perez Arribas, Z. et al. policy instruments - 3rd milestone', https://susproc.jrc.ec.europa.eu/product-bureau/sites/default/files/2025-12/Textile-Prep-Study_3rd-Milestone_20251212.pdf.

ECHA (2025), 'SCIP-Database', 16 July, accessed 16 July 2025, https://echa.europa.eu/scip-database.

Ellen MacArthur Foundation (2025), 'Circular design tools', Tools and resources to help transition to a circular economy website, Ellen MacArthur Foundation, 29 July, accessed 29 July 2025, https://www.ellenmacarthurfoundation.org/topics/circular-design/tools.

European Commission (2024a), 'Ecodesign for Sustainable Products Regulation (ESPR): Frequently Asked Questions (FAQ)', Ares(2024)6780548, 25 September, European Commission, https://circabc.europa.eu/ui/group/418195ae-4919-45fa-a959-3b695c9aab28/library/25c48e7c-9ce3-41cb-96ac-d2942a8a29d6/details?download=true.

European Commission (2024b), 'Green Public Procurement Criteria and Requirements', accessed 29 July 2025, https://green-forum.ec.europa.eu/green-business/green-public-procurement/gpp-criteria-and-requirements_en.

European Commission (2025), 'RMIS - Critical and strategic materials', RMIS - Raw Materials Information System website, 16 July, accessed 16 July 2025, https://rmis.jrc.ec.europa.eu/eu-critical-raw-materials.

European Commission. Joint Research Centre., Gama Caldas, M., Eynard, U., Spiliotopoulos, C., Blengini, G. et al. (2024), Review of the MEErP: methodology for ecodesign of energy related products., Publications Office, LU, https://data.europa.eu/doi/10.2760/24524.

European Committee for Standardisation (2019a), 'EN 45555:2019 - General methods for assessing the recyclability and recoverability of energy-related products',

https://standards.iteh.ai/catalog/standards/cen/a6432062-6e44-4011-9720-fcbc99e61feb/en-45555-2019.

European Committee for Standardisation (2019b), 'EN 45556:2019 - General method for assessing the proportion of reused components in energy-related', https://standards.iteh.ai/catalog/standards/clc/879b924a-913d-43e6-96d4-54a6f2e5e2ee/en-45556-2019.

European Committee for Standardisation (2019c), 'EN 45558:2019 - General method to declare the use of critical raw materials in energy-related products', https://standards.iteh.ai/catalog/standards/clc/51d267db-4eef-41b3-9c69-dad4f14fc711/en-45558-2019.

European Committee for Standardisation (2019d), 'EN 45559:2019 - Methods for providing information relating to material efficiency aspects of energy-related products', https://standards.iteh.ai/catalog/standards/clc/1e4f1096-d882-4e12-8754-12c9363dc472/en-45559-2019.

European Committee for Standardisation (2020a), 'EN 45552:2020 - General method for the assessment of the durability of energy-related products', https://standards.iteh.ai/catalog/standards/cen/ed936aa8-4368-4a13-bae1-93ec80357a95/en-45552-2020.

European Committee for Standardisation (2020b), 'EN 45553:2020 - General method for the assessment of the ability to remanufacture energy-related products', https://standards.iteh.ai/catalog/standards/clc/28889c43-449b-4b03-bc5f-41fd78eb82d3/en-45553-2020.

European Committee for Standardisation (2020c), 'EN 45554:2020 - General methods for the assessment of the ability to repair, reuse and upgrade energy-related products', https://standards.iteh.ai/catalog/standards/clc/ed9b48c0-a4a9-421a-a14f-4ff341199918/en-45554-2020.

European Committee for Standardisation (2020d), 'EN 45557:2020 - General method for assessing the proportion of recycled material content in energy-related products', https://standards.iteh.ai/catalog/standards/clc/46574006-a1ad-4611-a8a5-27516f814f5b/en-45557-2020.

GitHub - Washingtonwei (2025), 'A Practical Style Guide and Templates Repository for Writing Effective Use Cases', 27 August, accessed 27 August 2025, https://github.com/Washingtonwei/use-case-style-guide?tab=readme-ov-file.

Gómez-Pérez, A. (2004), 'Ontology Evaluation', in: Staab, S. and Studer, R. (eds), Handbook on Ontologies, Springer Berlin Heidelberg, Berlin, Heidelberg, pp. 251–273, https://doi.org/10.1007/978-3-540-24750-0_13.

Gonzalez Torres, M., Kouloumpis, V., Rodriguez Manotas, J., Magrini, C., Senatore, V. et al. (2025), Developing a method for the assessment of life cycle environmental impacts of products, and integration in or relation with the methodology for the ecodesign of energy related products, EUR, Publications Office of the European Union, LU, https://data.europa.eu/doi/10.2760/3515898.

Gotz, T., Berg, H., Jansen, M., Adisom, T., Cembrero, D. et al. (2022), 'Digital Product Passport: the ticket to achieving a climate neutral and circular European economy?', University of Cambridge

Institute for Sustainability Leadership (CISL) and the Wuppertal Institute, https://epub.wupperinst.org/frontdoor/deliver/index/docId/8049/file/8049_Digital_Product_Passport.pdf.

GS1 (2025), 'GS1 Standards enabling the EU digital product passport', January, GS1, https://gs1.eu/wp-content/uploads/2024/12/GS1-Standards-Enabling-DPP.pdf?utm_source=chatgpt.com\.

Holmström, J., Ketokivi, M. and Hameri, A.-P. (2009), 'Bridging Practice and Theory: A Design Science Approach', Decision Sciences, Vol. 40, Issue 1, John Wiley & Sons, Ltd, pp. 65–87, https://doi.org/10.1111/j.1540-5915.2008.00221.x.

International Organization for Standardization (2002), 'ISO 22628:2002 Road vehicles — Recyclability and recoverability — Calculation method', https://www.iso.org/standard/35061.html.

International Organization for Standardization (2006a), 'ISO 14040:2006 - Environmental management — Life cycle assessment — Principles and framework', https://www.iso.org/standard/37456.html.

International Organization for Standardization (2006b), 'ISO 14044:2006 - Environmental management — Life cycle assessment — Requirements and guidelines', https://www.iso.org/standard/38498.html.

International Organization for Standardization (2014), 'ISO 14046:2014 - Environmental management — Water footprint — Principles, requirements and guidelines', https://www.iso.org/standard/43263.html.

International Organization for Standardization (2016), 'ISO 14021:2016 - Environmental labels and declarations — Self-declared environmental claims (Type II environmental labelling)', https://www.iso.org/standard/66652.html.

International Organization for Standardization (2018), 'ISO 14067:2018 - Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification', https://www.iso.org/standard/71206.html.

International Organization for Standardization (2023), 'ISO 4484-2:2023 - Textiles and textile products — Microplastics from textile sources - Part 2: Qualitative and quantitative analysis of microplastics', https://www.iso.org/standard/80011.html.

Jacobson, I. and Cockburn, A. (2023), 'Use Cases are Essential: Use cases provide a proven method to capture and explain the requirements of a system in a concise and easily understood format.', Queue, Vol. 21, Issue 5, Association for Computing Machinery, New York, NY, USA, pp. 66–86, https://doi.org/10.1145/3631182.

Jansen, M., Blomqvist, E., Keskisärkkä, R., Li, H., Lindecrantz, M. et al. (2024), 'Modelling Digital Product Passports for the Circular Economy', presented at the The 2nd International Workshop on Knowledge Graphs for Sustainability (KG4S 2024) colocated with the 21st Extended Semantic Web Conference (ESWC 2024).

Kebede, R., Moscati, A., Tan, H. and Johansson, P. (2024), 'A modular ontology modeling approach to developing digital product passports to promote circular economy in the built environment', Sustainable Production and Consumption, Vol. 48, pp. 248–268, https://doi.org/10.1016/j.spc.2024.05.007.

Kundisch, D., Muntermann, J., Oberländer, A. M., Rau, D., Röglinger, M. et al. (2021), 'An Update for Taxonomy Designers', Business & Information Systems Engineering, https://doi.org/10.1007/s12599-021-00723-x.

Magrini, C., Rodriguez Manotas, J., Gonzalez Torres, M., Senatore, V., Gama Caldas, M. et al. (2025), Method for the ranking of potential requirements, based on expected impacts and costs, EUR, Publications Office of the European Union, LU, https://data.europa.eu/doi/10.2760/1478580.

Maury-Micolier, T., Matos, C. T., Lodato, C. and Mathieux, F. (2025), Method for the assessment of EU open strategic autonomy (EU OSA) aspects in the context of the ecodesign for sustainable products regulation (ESPR), EUR, Publications Office of the European Union, LU, https://data.europa.eu/doi/10.2760/8436163.

ONTO-DESIDE (2023), 'Circular Economy Ontology Network (CEON)', accessed 16 July 2025, https://liusemweb.github.io/CEON/.

Peffers, K., Tuunanen, T., Rothenberger, M. A. and Chatterjee, S. (2008), 'A Design Science Research Methodology for Information Systems Research', Journal of Management Information Systems, Vol. 24, Issue 3, pp. 45–77, https://doi.org/10.2753/MIS0742-1222240302.

Pellegrini, T., Neumaier, S., Havur, G., Mesbahi, Z., Wagner-Havlicek, C. et al. (2023), 'DPP4ALL – A Digital Product Passport for All', Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie, Wien, https://www.bmimi.gv.at/dam/jcr:6d70520a-3668-491f-a38e-876953bae6db/DPP4ALL%20Final%20Report%20BMK%20bf.pdf.

Perez Camacho, M. N., Cappucci, G. M., Faraca, G., Bracalente, G., Bennett, M. J. et al. (2025), Method for the identification and tracking of substances of concern in products and for the preparation of restriction measures on the use of substances in products, EUR, Publications Office of the European Union, LU, https://data.europa.eu/doi/10.2760/9706783.

ProductIP (2024), 'Digital Product Passport (DPP)', 22 November, accessed 29 July 2025, https://www.productip.com/kb/productipedia/compliance-resources/digital-product-passport-(dpp).

Psarommatis, F. and May, G. (2024), 'Digital Product Passport: A Pathway to Circularity and Sustainability in Modern Manufacturing', Sustainability, Vol. 16, Issue 1, https://doi.org/10.3390/su16010396.

Rodríguez-Manotas, J., González Torres, M., Magrini, C., Senatore, V., Spiliotopoulos, C. et al. (2025), Method for the assessment of circularity aspects and integration in or relation with the Methodology for the Ecodesign of Energy-related Products (MEErP), EUR, Publications Office of the European Union, LU, https://data.europa.eu/doi/10.2760/4572606.

Romagnoli, V., Berlinghof, T., Parchomenko, A., Weissenbacher, J., Fratini, L. et al. (2026), Study on the destruction of unsold products, EUR, Publications Office of the European Union, LU, https://data.europa.eu/doi/10.2760/3597352.

Senatore, V., Gonzalez Torres, M., Rodriguez Manotas, J., Magrini, C., Kouloumpis, V. et al. (2025), Methods for the definition of classes of performance and labels, EUR, Publications Office of the European Union, LU, https://data.europa.eu/doi/10.2760/2237742.

Spiliotopoulos, C. and González Torres, M. (2025), Method for the assessment of product aspects in view of setting horizontal requirements, EUR, Publications Office of the European Union, LU, https://data.europa.eu/doi/10.2760/1792220.

van Nieuwenhuijze, H., Smeets, N., Chawla, K., Rongen, S., Leon Visscher et al. (2024), 'DPP User Stories V3', 8 October, CIRPASS-2 Consortium, https://doi.org/10.5281/zenodo.13902463.

Wautelet, T. and Ayed, A.-C. (2024), 'Exploring possible Digital Product Passport (DPP) use cases in battery, electronics and textile value chains', Version 2.0, CIRPASS Consortium, https://doi.org/10.5281/ZENODO.10974901.

Wieringa, R. (2014), Design Science Methodology for Information Systems and Software Engineering, Springer, https://doi.org/10.1007/978-3-662-43839-8.

Wilkinson, M. D., Dumontier, M., Aalbersberg, Ij. J., Appleton, G., Axton, M. et al. (2016), 'The FAIR Guiding Principles for scientific data management and stewardship', Scientific Data, Vol. 3, Issue 1, p. 160018, https://doi.org/10.1038/sdata.2016.18.

List of abbreviations

Abbreviations	Definitions
CEN	European Committee for Standardization
CIRPASS / CIRPASS-2	Collaborative project on Digital Product Passports under Horizon Europe
DA	Delegated Act
DPP	Digital Product Passport
DSI	Data System Information
EC	European Commission
ECHA	European Chemicals Agency
EEA	European Economic Area
EN	European Standard
ErP	Energy-related Product
ESPR	Ecodesign for Sustainable Products Regulation
EU	European Union
FAIR	Findable, Accessible, Interoperable and Reusable (data principles)
GDPR	General Data Protection Regulation
IA	Impact Assessment
ISO	International Organization for Standardization
JRC	Joint Research Centre
JTC 24	CEN-CENELEC Joint Technical Committee 24 on Digital Product Passports
LCA	Life Cycle Assessment

Abbreviations	Definitions
MEErP	Methodology for the Ecodesign of Energy-related Products
MEEuP	Methodology for the Ecodesign of Energy-using Products
OUL	Other Union Law
PEF	Product Environmental Footprint
POP	Persistent Organic Pollutant
PPI	Product and Producer Information
PS	Preparatory Study
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RMIS	Raw Materials Information System
SCIP	Substances of Concern In articles as such or in complex objects (Products) database
SI	International System of Units
SVHC	Substances of Very High Concern

List of boxes

List of figures

List of tables

Annexes

Annex 1. Overview of the MEErP

The MEErP, developed under the Ecodesign Directive 2009/125/EC, consists of a techno-economic-environmental assessment of a specific product group. It evaluates whether and to what extent energy-related products (ErPs) fulfil certain criteria that make them eligible for ecodesign implementing measures and provides guidance for the identification and definition of the level of stringency of the (potential) requirements. The MEErP was originally published in 2011, as an adaptation of the previous Methodology for the Ecodesign of Energy-using Products (MEEuP) which supported the elaboration of implementing measures under the Ecodesign Directive 2005/32/EC. Since then, it has been revised in 2013 (BIO Intelligence Service, 2013) and 2024 (European Commission. Joint Research Centre. et al., 2024) and has been used in over 30 preparatory studies for Ecodesign of ErPs.

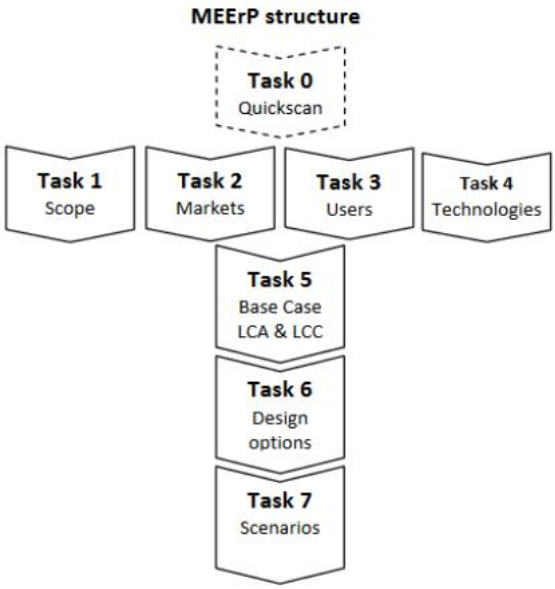
The MEErP focuses primarily on the energy consumption of products during the use stage, and is structured in tasks as presented below and in Figure 5:

- **Task 0 - Quick scan**: This is an optional task for the case of large or inhomogeneous product groups, where it is recommended to carry out a first product screening considering a preliminary assessment of the environmental impact and potential for improvement, with the purpose of regrouping or narrowing the product scope, as appropriate from an ecodesign point of view, for the subsequent analysis in Tasks 1-7.
- **Task 1 - Scope:** This task defines the methodology to identify the products to be included in the product group to which the ecodesign measures would apply.
- **Task 2 - Markets:** This task provides the market analysis of the product group under assessment, including the products' apparent consumption in the EU, market and cost inputs for the environmental impacts of the product group, and latest market trends in product design.
- **Task 3 - Users:** This task identifies barriers and restrictions to possible ecodesign measures due to social, cultural or infrastructural factors. It also quantifies relevant user-specific parameters that can influence the product's environmental impacts during use.
- **Task 4 - Technologies**: This task entails a general technical analysis of products on the EU market, including a description of the existing products up to Best Available Technologies and Best Not yet Available Technologies.
- **Task 5 - Environment & Economics (Base case LCA & LCC):** This task requires that one or more average EU product(s) are defined as "Base-case". This is subsequently used for the environmental and economic analyses that are also carried out within this task. For such assessments, the MEErP uses the EcoReport tool, which is a streamlined life-cycle-based tool that is publicly accessible and simple to use whilst being sufficiently complete to capture the main inputs and outputs at product-specific level.
- **Task 6 - Design options:** This task identifies possible design options, their monetary consequences in terms of Life Cycle Cost for consumers and their environmental costs and benefits using the EcoReport tool again. Design measures are addressed by the Least Life Cycle Costs (LLCC) and the Best Available Technology. In particular, the distance between

the LLCC and the Best Available Technology indicates – in the event that a LLCC solution is set as a minimum target - the remaining space for product differentiation (competition).

- **Task 7 - Scenarios**: This brings together the outcomes of all previous tasks. It looks at suitable policy measures to achieve the improvement potential of the product, e.g. implementing LLCC as a minimum mandatory requirement and Best Available Technologies as a target to be addressed via promotional measures, using legislation or voluntary agreements, labelling, benchmarks and possible incentives. It draws up scenarios quantifying the improvements that can be achieved with respect to a Business-as-Usual scenario and compares the outcomes with EU environmental targets. It estimates the impacts on consumers (purchasing power) and industry (employment, profitability, competitiveness, investment level, etc.) and includes a sensitivity analysis of the main parameters to study the robustness of the outcome, amongst others, regarding energy prices and societal costs.

Figure 5. Structure of the Methodology for the Ecodesign of Energy-related Products (MEErP)



Source: COWI and VHK, 2011.

In 2013, the MEErP was supplemented by a module (BIO Intelligence Service, 2013) to assess the possibility of enhancing material efficiency aspects of products, in addition to their energy consumption. The module identifies four material efficiency parameters to be assessed within Task 2 of the MEErP: recyclability benefit rates, recycled content, lifetime and Critical Raw Material Index.

In addition, a new revision of the MEErP was published in 2024, in particular to update, when and where necessary, some of the data used in the analysis (e.g. by updating the background datasets in the Ecoreport tool, and to align it with the current EF 3.1 database) and to ensure that it is still fit for purpose, in line with the policy developments of recent years (more systematic inclusion of material efficiency aspects and alignment with the EF method, e.g. in some modelling options and in the impact categories to be reported).

The Joint Research Centre (JRC) is currently revising the existing methodology used to conduct preparatory studies under the Ecodesign Directive (the MEErP) to accommodate the expanded scope and requirements of the ESPR.

Table 22. List of tasks performed under the ESPR the outcomes of which are relevant for Task B10

Task		
B1	Criteria for the choice of method for the assessment of life-cycle environmental impacts of products, and integration in or relation with the Method for the Ecodesign of Energy-related Products	(Gonzalez Torres et al., 2025)
B2	Method for the assessment of circularity aspects (durability, reparability, recyclability, etc.) and integration in or relation with the Method for the Ecodesign of Energy-related Products	(Rodríguez-Manotas et al., 2025)
B3	Method for the assessment of product aspects of a range of products in view of setting horizontal requirements	(Spiliotopoulos et al., 2025)
B4	Method for the ranking of potential requirements, based on expected impacts and costs	(Magrini et al., 2025)
B5	Method for the identification and tracking of substances of concern in products and for the preparation of restriction measures on the use of substances in products	(Perez Camacho et al., 2025)
B6	Methods for the definition of classes of performance and labels	(Senatore et al., 2025)
B8	Method for the definition of mandatory Green Public Procurement requirements, requirements on incentives	-
B9	Method for assessing data from the disclosure obligation on the destruction of unsold consumer products and for the definition of product-specific or sectoral bans	(Romagnoli et al., 2026)
B10	Method for the integration of the support to ESPR impact assessments within the evaluation process of products, including international trade aspects and impact of measures on third countries.	(Arcipowska et al., 2026)
B11	Method for the assessment of potential contribution to EU open strategic autonomy	(Maury-Micolier et al., 2025)
B12	Development of a Product Carbon Footprint method integrating ETS, CBAM, and ESPR approaches, as well as EF methods (for the Scope 3 emissions).	-

Source: own elaboration

Annex 2. ESPR requirements for DPP

A. DPP content requirements

Table 23. Traceability Matrix for DPP data content requirements in the ESPR

Requirement Source	Data description
Product and producer identification	
ESPR.9.2a	The data to be included in the digital product passport pursuant to Annex III
ESPR.Annex3.b	Unique Product Identifier (UPI)
ESPR.Annex3.c	GTIN as provided in ISO/IEC 15459-6
ESPR.Annex3.d	Relevant commodity codes (e.g. TARIC code)
ESPR.Annex3.g	Unique Operator Identifier Digital instructions
ESPR.Annex3.h	Unique Operator Identifiers for other entities
ESPR.Annex3.i	Unique Facility Identifiers
ESPR.Annex3.j	Importer information including [See ESPR.29.3.a] Economic Operators Registration and Identification (EORI) number
ESPR.Annex3.k	Contact and identifying information of the economic operator responsible in the Union for Art. 4 of ESPR or Art. 15 of Product Safety Regulation or similar
ESPR.27.6.a	Manufacturer contact details (name, trade name/trademark, postal address, electronic contact)
ESPR.29.3.a	Importer contact details (name, trade name/trademark, postal address, electronic contact)
Product-specific parameters and information	
ESPR.7.2(b)(i).Repairability	Repairability score
ESPR.7.2(b)(i).Durability	Durability score
ESPR.7.2(b)(i).Carbon	Carbon footprint
ESPR.7.2(b)(i).Environment	Environmental footprint
ESPR.7.2(b)(ii)	Information on sustainable installation, use, maintenance and repair
ESPR.7.2(b)(iii)	Information on disassembly, reuse, refurbishment, recycling and end-of-life disposal

ESPR.7.2(b)(iv)	Other information influencing sustainable product choices, for customers and for other parties other than the manufacturer
ESPR.Annex.1.a	*Durability and Reliability*: The product's guaranteed lifetime, technical lifetime, mean time between failures, indication of real use information on the product, resistance to stress of aging mechanisms
ESPR.Annex.1.b	*Repair and Maintenance:* characteristics, availability, delivery time and affordability of spare parts, modularity, compatibility with commonly available tools and spare parts, availability of repair and maintenance instructions, number of materials and components used, use of standard components, use of component and material coding standards for the identification of components and materials, number and complexity of processes and whether specialised tools are needed, ease of non-destructive disassembly and re-assembly, conditions for access to product data, conditions for access to or use of hardware and software needed
ESPR.Annex.1.c	*Upgrading, reuse, manufacturing, and refurbishment:* number of materials and components used, use of standard components, use of component and material coding standards for the identification of components and materials, number and complexity of processes and tools needed, ease of non-destructive disassembly and re-assembly, conditions for access to product data, conditions for access to or use of hardware and software needed, conditions of access to test protocols or not commonly available testing equipment, availability of guarantees specific to remanufactured or refurbished products, conditions for access to or use of technologies protected by intellectual property rights, modularity
ESPR.Annex.1.d	*Design for (ease and quality of) recycling:* Use of easily recyclable materials, Safe, easy and non-destructive access to recyclable components and materials or components and materials containing hazardous substances and material composition and homogeneity, possibility for high-purity sorting, number of materials and components used, use of standard components, use of component and material coding standards for the identification of components and materials, number and complexity of processes and tools needed, ease of non-destructive disassembly and re-assembly, conditions for access to product data, conditions for access to or use of hardware and software needed
ESPR.Annex.1.g	*Environmental impact:* Use or consumption of energy, water and other resources in one or more life-cycle stages of the product, Effect of physical factors or software and firmware updates on product efficiency, Impact on deforestation
ESPR.Annex.1.h	*Recycled materials:* Use or content of recycled materials, Recovery of materials, Includes critical raw materials
ESPR.Annex.1.i	*Renewable materials:* Use of sustainable renewable materials, Content of sustainable renewable materials
ESPR.Annex.1.j	*Weight and volume* of product and product packaging
ESPR.Annex.1.k	*Recycled materials:* Incorporation of used components
ESPR.Annex.1.l.	Quantity, characteristics and availability of consumables needed for proper *use and maintenance* (i.e. Yield, Technical lifetime, Ability to reuse, repair, and remanufacture, Mass-resource efficiency, and Interoperability)

ESPR.Annex.1.m	*Environmental footprint* (quantified) based on a product's life-cycle environmental impacts, whether in relation to one or more environmental impact categories or an aggregated set of impact categories
ESPR.Annex.1.n	*Carbon footprint* of the product
ESPR.Annex.1.o	*Material footprint* of the product
ESPR.Annex.1.p	*Microplastic and nanoplastic* release during relevant product life-cycle stages, e.g. microplastic and nanoplastic release during manufacturing, transport, use and end-of-life stages
ESPR.Annex.1.q	Quantity and nature of *air, water, soil and noise emissions* during (one or more) life-cycle stages
ESPR.Annex.1.r	Amounts of *waste generated*, including amounts of plastic waste generated and amounts of packaging waste generated and ease of reuse of waste, and amounts of hazardous waste generated
ESPR.Annex.1.s	*Functional performance and conditions:* ability to perform its intended use, precautions for use, skills required and compatibility with other products or systems
ESPR.Annex.1.t	*Lightweight Design:* Reduction of material consumption, load- and stress-optimisation of structures, integration of functions within the material or into a single product component, use of lower density or high-strength materials and hybrid materials, with regard to material savings, recycling and other circularity aspects, and waste reduction
ESPR.Annex3.Opt	Voluntary information relevant to ecodesign requirements
Information on substances of concern, Article 7(5)	
ESPR.Annex.1.f	Use of substances of concern
ESPR.7.5.(a)(i)	Name or numerical code of substances of concern (e.g. IUPAC or alternative international name)
ESPR.7.5.(a)(ii)	Other names (usual, trade, abbreviation) for substances of concern
ESPR.7.5.(a)(iii)	EC/EINECS/ELINCS/ECHA number (or equivalent) for substances of concern
ESPR.7.5.(a)(iv)	CAS name and number for substances of concern
ESPR.7.5.(b)	Location of the substances of concern within the product
ESPR.7.5.(c)	Concentration, maximum concentration or range of the substances of concern, at level of product, components or spare parts
ESPR.7.5.(d)	Relevant instructions for the safe use of the product
ESPR.7.5.(e)	Information for disassembly, preparation for reuse, recycling and environmentally sound end-of-life management
Information required under other Union law, Annex III(a,e,f)	
ESPR.Annex3.e	Information content
ESPR.Annex3.e	Declaration of conformity, technical documentation, conformity certificates

ESPR.Annex3.f	User manuals, User instructions, warnings or safety information
ESPR.10.2.	Additional disclosures required under other union law

Source: own elaboration

B. Non-functional requirements

Table 24. Traceability Matrix for non-functional requirements for DPP data in the ESPR

Requirement Source	**Data description**
Accessibility and purpose-oriented usability	
ESPR.7.2.c.	The DPP data must be clear, easily understandable and tailored to the particular characteristics of the product groups concerned and the intended recipients of the information. The DPP data specification must be tailored to the intended recipients of the information.
ESPR.7.2.b.ii	Information on installation, use, maintenance and repair should be provided to assist in minimising product impact on environment.
ESPR.7.2.b.ii	Information on installation, use, maintenance and repair should be provided to assist in maximise product durability.
ESPR.7.2.b.iiv	Information should be provided to customers and parties other than the manufacturer to facilitate appropriate use, value-retaining operations and correct treatment at end-of-life.
(Recital 32)	DPP should help customers make informed choices (..)
ESPR.9.1	The data in the digital product passport shall be accurate, complete and up to date.
ESPR.9.3.a	The DPP data specification must ensure that actors along the value chain can easily access and understand relevant information.
ESPR.9.3.b	The DPP data specification shall facilitate the verification of product compliance.
ESPR.9.3.c	The DPP data specification must ensure improved traceability along the supply chain.
Interoperability and format requirements	
ESPR.10.1.d.	DPP data shall be based on open standards.
ESPR.10.1.d.	DPP data shall use an interoperable format.
ESPR.10.1.d.	DPP data shall be machine-readable as appropriate.
ESPR.10.1.d.	DPP data shall be structured as appropriate.
ESPR.10.1.d.	DPP data shall be searchable as appropriate.
ESPR.10.1.d.	DPP data shall be transferable through an open interoperable data exchange network without vendor lock-in.

ESPR 11.a.	DPP shall be fully interoperable with other DPPs required by delegated acts adopted pursuant to Article 4 in relation to the technical, semantic and organisational aspects of end-to-end communication and data transfer.
Data retention	
ESPR.9.2.i	DPP to remain available at least during the expected lifetime of a specific product.
ESPR.11.e	DPP to remain available for the period specified in delegated acts.

Source: own elaboration

C. DPP system information

Table 25. Traceability Matrix of selected elements of DPP system information in the ESPR

Requirement Source	Data description
Access rights	
ESPR.9.2.f	Actors that are to have access to data in the DPP and to what data they are to have access.
ESPR.9.2.g	Actors that are to create a DPP or update the data in a DPP and what data they may introduce or update.
ESPR.11.b	Free of charge and easy access to the DPP on their respective access rights.
Data governance	
ESPR.9.2.h	Rules for introducing or updating data
ESPR.10.e.	Personal data shall not be stored in the DPP without their explicit consent
ESPR.11.c	Rules for data storage
ESPR.11.d	New DPP should be link to the original DPP or DPPs
ESPR.11.f	Rights to introduce, modify or update data in the DPP
ESPR.11.g	Data authentication, reliability and integrity
ESPR.11.h	Security and privacy of data
ESPR.12.2 & ESPR 12.3	Rules for requesting a unique operator identifier
ESPR.27.7	Digital instructions (how to access/use digital instructions provided with the product)
ESPR.Annex3.l	Reference to the DPP hosting the DPP back-up copy
Granularity	
ESPR.9.2.d	Model-, item- and product-level specification for DPP data
ESPR.10.f	Data included in the DPP shall refer to the product model, batch or item
DPP registry and web portal	
Art.13 & Art 15.	DPP registry
Art.14	DPP web portal

Source: own elaboration

D. DPP data carrier

Table 26. Traceability Matrix for DPP data carriers in the ESPR

Requirement Source	Data description
ESPR.9.2.b	Data carrier to be used
ESPR.9.2.c	Data carrier layout and positioning
ESPR.9.2.e	The manner of availability of the DPP
ESPR.10.1.a	The DPP shall be connected through a data carrier to a persistent unique product identifier.
ESPR.10.1.b	The data carrier shall be physically present on the product, its packaging or on documentation accompanying the product.

Source: own elaboration

Annex 3. Identifying use cases for DPPs

A. Guiding principles

To specify the data required for product-specific DPPs under the ESPR, it is essential to identify use cases that are aligned with the Regulation's objectives and legal provisions and coherent with other relevant, sector-specific initiatives. This Annex provides guidance for systematically defining DPP use cases, drawing on existing examples and established practices, and ensuring that the DPP includes information that is relevant for different actors across the product value chain.

The purpose of this Annex is to support the ESPR preparatory study process in identifying and formulating use cases that address real operational needs in the value chain while fulfilling ESPR requirements. The guidance set out here complements Step B.1 of the methodology and provides a structured approach for developing use cases that can be directly translated into DPP data needs.

i) Components of a good use case

In the context of this methodology, a good use case clearly explains who is doing what, for what purpose, and using which information. Each use case should be sufficiently detailed to allow the identification of the data required to enable the described actions.

At a minimum, a use case should include the following core components:

- **Primary and secondary (or 'supporting') actor(s):** Identification of the actor(s) interacting with the DPP. The primary actor is the one directly pursuing the main goal of the use case, while secondary actors support the primary actor or pursue ancillary goals.
- **Scenario:** A description of the situation in which the use case takes place, including the current situation (how processes work today and where data gaps or challenges exist) and the proposed DPP-enabled solution (how access to DPP data would change or improve the situation).
- **Goal:** A clear statement of what the actor aims to achieve through the use case.

  Actions: A step-by-step description of the sequence of (atomic) actions required to achieve the goal, starting from the triggering event. Actions may be performed by the primary actor or by secondary actors and should explicitly describe interactions with the DPP where relevant.
- **Data required:** An identification of the data needed to enable each action in the use case, described at a conceptual level.

ii) Process for establishing DPP use cases

The following process provides structured guidance for identifying and formulating DPP use cases within the ESPR preparatory study context.

Step 1: Review available use cases and user stories

The following process provides structured guidance for identifying and formulating DPP use cases within the ESPR preparatory study context. This includes, in particular, the following:

— **Use cases identified by standardisation initiatives:** The CEN/CENELEC Joint Technical Committee on DPP (JTC 24) has identified core functional use cases for a DPP system (e.g. unique product identification, data access and update mechanisms, and data verification) which are broadly applicable across industries.[11] These use cases must be taken into account to identify any that are relevant and applicable to the product group in question. Verify if any similar standards are relevant at the product-group level.

— **User stories and use cases developed under relevant projects:** such as the CIRPASS or CIRPASS-2 project, including product-group specific user stories in electronics, batteries and textiles (Wautelet et al., 2024), and generic user stories provided by CIRPASS-2 (van Nieuwenhuijze et al., 2024). If a sector has ongoing pilot projects, DPP use cases should be aligned to complement those. This avoids duplicating work and helps ensure that when your DPP is implemented, it can integrate with or build upon existing systems.

Reference may be made to the generic use cases formulated in this methodology (Sections B and C of this Annex), which could serve as a starting point when identifying product-group-specific use cases.

Step 2: Identify relevant actions in the value chain

Building on the data collected in Step A.4, the preparatory study team should identify actions currently being performed in the value chain, and actions that could be performed, and the actions that *should* be performed to meet the objectives of the DPPs.

This includes identifying mandatory actions arising from the ESPR and related legislation, as well as key circular-economy actions such as repair, reuse, refurbishment, recycling or maintenance, and assessing whether these actions are currently constrained by information gaps.

Step 3: Formulate use cases to enable priority actions

Based on the inputs above, use cases are formulated to enable the identified actions. For each use case, the preparatory study team should do the following:

- Identify the primary and secondary actor(s).
- Specify the use case *scenario,* detailing as necessary and feasible:
    - the current situation (how things work today and the challenges/data gaps involved),
    - the proposed DPP-enabled solution (what new data or process the DPP would provide).
- Specify the goal to be achieved in the use case, i.e. the expected outcome or benefits.
- Specify the trigger that starts the use case.

[11] JTC 24, Consolidated List of Use Cases, CEN/CLC/JTC 24/WG 1 N 124.

- Specify the atomic actions required to execute the use case, starting with the trigger, in a manner that achieves the stated goal:
    - In specifying these actions, articulate which actors interact with the DPP and what information is exchanged and used.
    - It can be helpful to map this in a step-by-step narrative or a simple flow diagram.
    - *Describe each action with reference to the actor that performs it (e.g. 'the consumer scans…') as far as possible.*
- Align with the fundamental DPP system capabilities: for instance, ensuring that the use case assumes a unique product identifier and the ability to retrieve/update relevant data (as per JTC 24's foundational use cases).
- Specify what data is needed for each of the use cases as completely as possible.
- *Keeping in mind the diversity of users across the EU, and their varying degrees of comfort with and access to technology, ensure that the use cases are accessible to all EU consumers as far as feasible.*

These use cases can then further be used to specify the data needs, as in Step B.4 and Annex 4, and validated with stakeholders in Step B.2.

B. Literature review and identification of use cases for DPPs

Table 27 provides an overview of intended uses of DPPs identified in the literature and policy documents. These uses represent recurring patterns of how DPP information is expected to support policy objectives and operational activities across value chains. They provide a useful reference when selecting and formulating use cases for a specific product group.

Table 27. Literature review of intended uses for DPPs

Intended Use	Description	Potential use cases	Key Literature & Sources
1. Enable Circular Economy	DPP provides data on product composition, disassembly, and recyclability to support reuse, repair and recycling.	A refurbisher accesses a DPP to refurbish the product it is linked to and give it a second life. A consumer accesses a DPP at a second-hand store to evaluate a product before buying it.	ESPR (Psarommatis et al., 2024)
2. Improve Consumer Transparency	Allows consumers to access information about durability, energy use, reparability, and environmental footprint.	A consumer accesses a DPP at an online marketplace to evaluate a product before buying it.	(Boston Consulting Group, 2023) (European Commission, 2024a)
3. Enhance Compliance &	Authorities can access DPP data to check	Public Authorities retrieve a collection of DPPs from the EU Registry and web portal to monitor compliance.	European Commission Staff Working Document (Impact

Market Surveillance	conformity and enforce rules efficiently across borders.	Environmental Impact Research Bodies release a new state-of-the-art analysis on possible design choices to reduce EI. Policy makers adapt the existing regulation on EI based on this new analysis. New EI thresholds are mandatory for future products.	Assessment, SWD/2022/0091 final) (ProductIP, 2024)
4. Support Business-to-Business Data Exchange	B2B users can access information on materials, components, and supplier practices for due diligence and sustainability reporting.	A manufacturer receives an intermediate product with DPPs and uses the sustainability and due diligence data on the DPP to make a DPP for the final product.	(Kebede et al., 2024) WBCSD DPP Implementation Guide (Boston Consulting Group, 2023)
5. Promote Sustainable Product Design	Helps manufacturers collect life-cycle data to improve ecodesign and innovation.	A manufacturer collects life-cycle data from their batteries at their end of life at a designated recycling point.	(Psarommatis et al., 2024) Ellen MacArthur Foundation – Circular Design Toolkit (indirectly supports rationale) (Ellen MacArthur Foundation, 2025)
6. Facilitate Green Public Procurement	Public buyers can verify sustainability attributes for tenders and procurement decisions.	A contracting authority checks the DPPs of an applicant tenderer for sustainability information to ensure compliance with the Green Public Procurement Criteria before awarding a public contract.	European Commission Green Public Procurement Criteria (European Commission, 2024b) ESPR Article 9 on access to DPP
7. End-of-life	Usage of DPP data to make end-of-life processes more efficient.	A waste manager / recycler uses the life-cycle data collected in the product DPP to improve the effectiveness of recycling operations, thus ensuring each product is processed in the optimal way.	ESPR Article 7.2.(b)(iv)

Source: own elaboration

C. Illustrative use cases

The following use cases illustrate how the above guidance can be applied in practice and serve as generic use cases that would need to be adopted for a specific ESPR products. They are illustrative examples and do not prejudge the final selection of use cases or data requirements for any specific product group.

Use case 1: Enable circular economy

Table 28. Generic use case: Refurbishment of used product

Use case: Refurbishment of used product	
Primary actor: Refurbisher	**Secondary actors:** None
Scenario: A refurbisher receives a used or damaged product. In the past, incomplete information might have led to downcycling or discarding. With access to the DPP, they are able to identify the correct components, materials and refurbishing procedures to restore the product and extend its useful life.	
Goal: Extend the product's life cycle by restoring it to working condition for resale or reuse	**Trigger:** Refurbisher receives or identifies a product suitable for refurbishment
Actions	
1. Refurbisher scans a QR code or accesses the product's DPP (JTC 24 UC TP-01). 2. DPP provides detailed product specifications, disassembly guides, and component IDs (e.g. "Battery module: 3.7V Li-ion, Model B-204"), along with availability of spare parts. 3. Refurbisher orders compatible parts or confirms reuse of standardised components. 4. Refurbisher follows refurbishment steps, including safety and testing procedures, and ensuring deletion of personal data. 5. Refurbished product is verified, repackaged and marked as refurbished for resale, and the DPP is updated (JTC 24 TP-02, TP-04). 6. Use case ends.	
Data required	**Data update events**
• Full component list with model/specification details • Disassembly and reassembly instructions • Safety and testing protocols for refurbished items • Tools for personal data deletion • Supply chain references for compatible parts	Refurbisher adds refurbishing event to the DPP.

Source: own elaboration

Use case 2: Improve consumer transparency

Table 29. Generic use case: Pre-purchase evaluation in second-hand store

Use case: Pre-purchase evaluation in second-hand store	
Primary actor: Consumer	**Secondary actors:** Second-hand store staff
Scenario: A consumer is browsing in a second-hand store and comes across a product they are interested in. Consumers buying second-hand goods often have no access to origin, material content, or condition	

history, leading to uncertainty and lower trust. By scanning the QR code and accessing the product's DPP, they gain insights that help them make an informed purchase decision.	
Goal: Facilitate an informed second-hand purchase based on accurate product history and specifications and encourage reuse	**Trigger:** Consumer considers buying a second-hand product and wants to evaluate its condition and background
Actions	
1. Consumer inspects the product physically. 2. Consumer scans the QR code or accesses the product's DPP using a smartphone (JTC 24 UC PUB-05). 3. DPP provides product specifications, manufacturing details, certifications, usage history (if available), repair history, and material composition (JTC 24 UC PUB-01) 4. Consumer checks for known issues, available repair options, and remaining lifespan indicators (e.g. battery cycles, firmware version). 5. Optionally, the consumer confirms the validity of the disclosures made through the certifications made available on the DPP. 5. Consumer evaluates whether the product still suits their needs based on transparent data. 6. Consumer proceeds with or decides against the purchase. 7. Use case ends.	
Data required	**Data update events**
• Product specifications and manufacturing details • Usage and repair history (if logged) • Known issues or recalls • Material and component composition • Estimated remaining lifespan or performance indicators • Product certifications, including for instance CE Conformity markings or safety standard certifications or environmental certifications	

Source: own elaboration

Table 30. Generic use case: Pre-purchase evaluation of first-hand product in online marketplace

Use case: Pre-purchase evaluation of first-hand product in online marketplace	
Primary actor: Consumer	**Secondary actors:** Online retailer (indirect)
Scenario: A consumer browsing an online store is interested in buying a new product but wants to understand its materials, repairability and sustainability before purchasing. Consumers currently face limited access to credible environmental and durability data when purchasing new products online. DPPs enable access to detailed specifications, repairability, life-cycle data, and sustainability metrics.	
Goal: Support informed, responsible purchasing of new products by transparently providing product data	**Trigger:** Consumer considers buying a new product and wants to review its specifications and sustainability profile
Actions	
1. Consumer browses a product listing in an online marketplace. 2. Consumer accesses the product's DPP through a link or QR code (JTC 24 UC PUB-05). 3. DPP displays detailed product specifications, material composition, repairability score and sustainability information (JTC 24 UC PUB-01). 4. Consumer checks for ease of repair, part availability, expected lifespan, and environmental impact.	

5. Consumer evaluates how the product aligns with their values or technical needs. 6. Consumer decides whether to proceed with the purchase. 7. Use case ends.	
Data required	**Data update events**
• Product specifications and material composition • Repairability and part availability • Manufacturer sustainability practices • Warranty and service information • End-of-life options (recycling, reuse, etc.)	

Source: own elaboration

Use case 3: Enhance compliance & market surveillance

Table 31. Generic use case: Automated DPP system verification of completeness of disclosures

Use case: Automated DPP system verification of completeness of disclosures	
Primary actor: DPP System (automated service, can be deployed by multiple actors)	**Secondary actors:** None
Scenario: Before a DPP can be finalised and made accessible, an automated validation check can be used to ensure all required data fields—defined in the applicable delegated act—are present and correctly formatted. This validation helps prevent incomplete or non-compliant passports from entering the registry. It is important to note, however, that this only checks the presence and formatting of information, not its accuracy.	
Goal: Ensure that each DPP contains all mandatory information before it is accepted into the registry or shared with stakeholders. (Note: within the current technical architectures it is likely only possible to check presence and formatting of information)	**Trigger:** A manufacturer submits or updates a DPP for a product
Actions	
1. Manufacturer uploads DPP data to the DPP system. 2. The automated DPP validation service initiates a completeness check based on the applicable delegated act for the product group. 3. The system verifies the presence and structure of each required data field (e.g. product identifier, energy class, material composition, recyclability). 4. If data is missing or invalid, the system generates a detailed error report and prevents submission. 6. The manufacturer receives feedback, corrects the data, and resubmits the DPP. 7. Once all required fields are validated, the system flags the DPP as complete and allows publication or registry integration. 8. The system logs the validation result for audit or regulatory review. 9. Use case ends.	
Data required	**Data update events**
• All mandatory DPP information, potentially including: • Product commodity code • (potential) Product Label • (potential) Certification documents • (potential) Product testing instructions	(Optional) The validation results can (also) be appended to the product's DPP as evidence of the rejection of registration.

• Environmental impact metric and respective testing method • (potential) Certification documents • Product specifications and material composition • Repairability and part availability • Manufacturer sustainability practices	

Source: own elaboration

Table 32. Generic use case: Compliance checking for imported product

Use case: Compliance checking for imported product	
Primary actor: Customs authorities (and officers)	**Secondary actors:** None
Scenario: When a product enters the EU from outside its jurisdiction, customs authorities verify that a DPP is present and corresponds with the official EU DPP registry. This helps enforce Article 15 of the ESPR regarding market access requirements.	
Goal: Confirm that imported products carry a valid DPP that matches registry records before allowing market entry	**Trigger:** Product is imported from outside of the jurisdiction of the EU
Actions	
1. Customs authorities receive a shipment manifest, including a list of unique product identifiers and commodity codes related to imported products. 2. Customs officers check the physical product or associated documentation for a DPP data carrier, and access the associated data. This process can be automated as well. 3. Customs officers input these identifiers into the EU registry to verify if the data matches the registry records (Art. 15 of the ESPR). 4. If a mismatch or absence is found, customs may hold the shipment for further investigation or deny entry. 5. Use case ends.	
Data required	**Data update events**
• Product commodity code • (potential) Product Label • (potential) Certification documents • (potential) Product testing instructions	(Optional) The customs inspection report may be appended to the DPP.

Source: own elaboration

Table 33. Generic use case: Ongoing compliance monitoring by market surveillance authorities

Use case: Ongoing compliance monitoring by market surveillance authorities	
Primary actor: National Market Surveillance Authorities (MSAs) (and officers)	**Secondary actors:** None
Scenario: MSAs continuously monitor products on the EU market to ensure ongoing compliance with sustainability and safety regulations. They can use the EU DPP web portal and registry to retrieve DPP data for products and assess alignment with legal and technical standards.	

Goal: Detect and address non-compliance in products circulating on the EU market	**Trigger:** A product is selected for routine or risk-based market surveillance
Actions	
1. MSA selects products for inspection, for instance based on risk profiles, reports, random sampling, request, or regulatory requirements. 2. MSA retrieves relevant DPPs from the web portal or the Registry using product identifiers. 3. MSA checks for required elements such as certification, labelling, and testing procedures. 4. Optionally, MSA checks the validity of the attached digital certificates. 5. MSA may request documentation, perform lab testing, or flag the product for corrective action where DPP data is missing, incorrect, or indicates non-compliance. 6. Use case ends.	
Data required	**Data update events**
• Product commodity code • (potential) Product Label • (potential) Certification documents • (potential) Product testing instructions	(Optional) MSA may append results of its inspection to the DPP.

Source: own elaboration

Annex 4. Criteria for determining the data needs

As described in Step B.3, data needs in the context of this methodology refer to the specific pieces of information required to fulfil the objectives of the ESPR and the defined use cases for a given product group. Data needs encompass all aspects that make data fit for purpose, i.e. capable of enabling the execution of a use case in an effective and proportionate manner.

This Annex sets out the criteria used to determine data needs on the basis of the validated use cases identified in Steps B.1 and B.2 and assessed conceptually in Step B.3. The purpose is to ensure that all necessary information is specified, in terms of content, source, format and quality, while avoiding unnecessary data collection where existing systems and disclosures already suffice.

The criteria are applied during Step B.4 and support the identification, refinement, prioritisation and justification of candidate data points, as well as their classification for policy design purposes.

1. **Usecase-driven relevance**

   For each use case, compile a list of the specific data points that are needed. For example, if a use case is to improve recycling, relevant data needs might include material composition, presence of hazardous substances, and product model identification for recycling instructions. From this list, filter the data points that are essential for the use case. Data points that do not serve a clear purpose in a use case or legal mandate should be critically and sceptically examined before inclusion.

2. **Data quality**

   Identify the required level of data quality for each data point for each use case. Evaluate if the data that is available meets the quality level required by the use case. For example, if the use case is to inform recycling, material composition may need to be detailed to the level of specific polymers; a high-level “plastic” label might not suffice, and more detailed data might be needed. If the data available does not match the quality required by the use case, either the use case may need to be adjusted or new data acquisition processes may need to be initiated, with the latter likely to be expensive.

3. **Data acquisition**

   For each remaining candidate data point, identify *how and from where* that information can be obtained and at what level of granularity, if at all. The feasibility of data acquisition is a key criterion – if a required piece of information cannot realistically be measured or collected at any point in the value chain, the use case might need adjustment. To evaluate the feasibility of data acquisition, consider who the originator of the data is, the collection method, and the frequency and timing of its collection. Critically consider whether the data is already being collected or if its collection would require novel systems.

4. **Barriers to data sharing, including data confidentiality and undue administrative burden**

Determine who needs access to the data points in question, and whether they are subject to any constraints that restrict data sharing in the ecosystem. If a certain data point is necessary for a use case but subject to confidentiality constraints or its collection is unduly burdensome, it may require access control or abstraction (i.e. an indicator of the data point is communicated rather than the data point itself). If no feasible mitigation is available, the inclusion of the data point as a DPP element should be carefully weighed against its necessity for fulfilling the use case or legal requirement.

Annex 5. Reference to performance-related common vocabulary terms for ESPR purposes

This Annex provides a reference overview of common performance-related vocabulary terms relevant to the DPP, based on a broad review of ESPR Annex I, related Union legislation, harmonised and other standards, and widely used vocabulary and definition sources. The table supports Steps C.1 and C.2 by illustrating how key ESPR information requirements are currently defined across existing vocabularies, identifying primary and alternative definition sources, and highlighting areas of convergence or fragmentation. It is intended as a mapping and reference tool, not as a prescriptive selection, to inform vocabulary reuse, adaptation or extension decisions at product-group level.

Table 34. Broad review mapping ESPR Annex I terms to existing definitions and vocabularies

Information/ Data Item	Description/Definition	Existing Vocabulary (Primary Choice)	Alternative Vocabulary
Durability	Ability of a product to maintain its function and performance over time under specified use and maintenance conditions (ESPR Regulation (EU) 2024/1781). It indicates how long the product lasts before reaching an end-of-life state.	*EU ESPR 2024 Definition:* Regulation (EU) 2024/1781 defines "durability" as the ability to function under given conditions until a final limiting state is reached (ESPR Regulation (EU) 2024/1781).	*EN 45552:2020* – European standard for assessing product durability (provides common terms and methods). (European Committee for Standardisation, 2020a)
Reliability	The probability that a product functions as required under given conditions for a given duration without an occurrence which results in a primary or secondary function of the product no longer being performed (ESPR Art. 2(23)). It reflects consistency of performance.	*EN 45552:2020* – Defines reliability in line with IEC dependability vocabulary (probability of failure-free operation for a time period); aligns with ESPR definition. (European Committee for Standardisation, 2020a)	

Repairability & Maintenance	How easily a product can be maintained and restored to working order, including the availability of spare parts, documentation, and design features that enable non-destructive disassembly and reassembly. A highly repairable product can be fixed at reasonable cost and effort instead of discarded.	*EN 45554:2020* – European standard for assessing the ability to repair (and reuse/upgrade) products. It defines criteria like spare part availability, tool accessibility, etc., to score repairability. (European Committee for Standardisation, 2020c)	*French Repairability Index* – National scoring system (0–10) based on documentation, ease of disassembly, spare parts availability & price, and product-specific factors.
Upgradability	How easily a product's functionality or performance can be enhanced or improved after purchase. An "upgradable" product can accept hardware or software updates (e.g. extra modules, newer firmware) to extend its capabilities and/or lifespan.	*EN 45554:2020* – Also covers upgradeability (alongside repairability), evaluating design features that enable component upgrades or performance improvements. (European Committee for Standardisation, 2020c)	*Product-Specific Standards:* Many industry standards embed upgradability – e.g. computer designs follow ATX specifications allowing component upgrades. No separate generic vocabulary; criteria are product-specific.
Reusability	"*'Re-use' means any operation by which products or components that are not waste are used again for the same purpose for which they were conceived*". Waste Framework Directive (2008/98/EC), Art. 3(13).	*Waste Framework Directive (2008/98/EC)*	*EN 45554:2020* – Treats "ability to reuse" alongside repair/upgrade in its criteria (e.g. ease of cleaning and minor repair to prepare for reuse). Potentially also the EU Ecolabel. (European Committee for Standardisation, 2020c)

Reused Components Content	The share of the product composed of reused parts – i.e. components that were previously part of another product and have been recovered for use in this product.	*EN 45556:2019* – European standard providing a method to assess the proportion of reused components in a product, gives a consistent way to calculate "reused content" by mass. (European Committee for Standardisation, 2019b). As the benefit of reusing parts differs relevantly, these should not be summed up, but be considered individually, as any legal mandate should and likely would act on that level (e.g. reporting reuse of fibres or polymer parts, but less so reused copper tubes as the latter bring relatively less environmental benefits).	
Remanufacturing & Refurbishment Potential	The ease with which a used product can be remanufactured – rebuilt to like-new condition – or refurbished – restored to full functionality with cleaning and repair.	"*'remanufacturing' means actions through which a new product is produced from objects that are waste, products or components and through which at least one change is made that substantially affects the safety, performance, purpose or type of the product;*" ESPR Art. 2(16). "*'refurbishment' means actions carried out to prepare, clean, test, service and, where necessary, repair a product or a discarded product in order to restore its performance or functionality within the intended use and range of performance originally conceived at the design stage at the time of the placing of the product on the market;*" ESPR Art. 2(18).	EN 45553:2020 is the European standard for assessing a product's ability to be remanufactured, defining factors (e.g. availability of technical data, design modularity, etc.) that enable effective remanufacturing; EN 45554:2020 is the relevant standard for refurbishments.(European Committee for Standardisation, 2020b)
Recyclability	How well a product's materials can be recovered as high-quality recyclate at end of life.	*"'recycling' means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations;"* Waste Framework Directive (2008/98/EC) Art. 3(17).	*ISO 22628:2002* – International standard (automotive sector) for calculating recyclability rate (%) and recoverability of vehicles. (International Organization for Standardization, 2002)

		EN 45555:2019 – European standard for assessing product recyclability and recoverability, provides a methodology to calculate the recyclable percentage of a product's mass and identifies design features affecting recycling (e.g. material homogeneity, accessible joints). (European Committee for Standardisation, 2019a). Should be used on a material-by-material basis; if aggregating the rates, the environmental "value" of each material should be used as weight.	
Substances of Concern Content	Information on the presence of hazardous chemical substances in the product, especially those meeting criteria that make them of high concern. *"Substance of concern"* is defined to include substances identified as SVHC under REACH (e.g. on the Candidate List), those in certain hazardous classes (carcinogenic, mutagenic, etc.), POPs, or any substance that hinders reuse or recycling (ESPR Art. 2(27).	International Union of Pure and Applied Chemistry nomenclature European Community numbers European List of Notified Chemical Substances numbers No Longer Polymer list Numbers assigned by European Chemicals Agency Chemical Abstracts Service name and number.	REACH Candidate List (Substances of Very High Concern) (ECHA, 2025) .
Energy Use & Efficiency	The energy a product consumes over its life cycle or in specific stages (especially use phase), and how efficiently it uses energy to perform its function. For many products this means electricity usage during operation (e.g. kWh per cycle for appliances) and possibly energy efficiency class.	EU Energy Label Classes (Energy Labelling Framework Regulation, 2010/30/EU) – A–G efficiency classes, where A is most efficient and G least. This scale provides a primary and widely adopted vocabulary for comparing energy efficiency. Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU	*SI Units (kWh)* – Energy consumption is universally measured in kilowatt-hours or joules.

Water Use & Efficiency	The amount of water a product uses (if applicable) and how efficiently it uses water to perform its function.	ISO 14046 can be used to communicate "water footprint", quantifying total water use. Not a direct measure of efficiency, however. (International Organization for Standardization, 2014)	*Water Efficiency indicators:* Currently no unified EU classification like the energy classes. Some voluntary schemes (e.g. the EU Water Label initiative) use their own rating.
Recycled Material Content	The proportion of a product's material that is recycled (coming from recovered waste materials rather than virgin sources). Usually expressed as a percentage of total material mass. This can be overall or broken down by material type (e.g. "% recycled metal, % recycled plastic").	*EN 45557:2020* – European standard for assessing the proportion of recycled material content in products (European Committee for Standardisation, 2020d). As the benefit of reusing different materials differs considerably, these should not be summed up, but be considered individually, as any legal mandate should and likely would act on that level (e.g. mandate minimum recycled plastic content, but not recycled steel or copper content as the latter two bring no environmental benefits).	*ISO 14021:2016* – Defines terms for recycled content in environmental claims (distinguishes post-consumer vs pre-consumer recycled content). (International Organization for Standardization, 2016)
Recoverability	The fraction of a product (by weight) that can be recovered at end of life, either through recycling or energy recovery. Often expressed as a percentage of the product's mass that does not end up as waste to landfill.	*"'recovery' means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy."* Waste Framework Directive (Art. 3(15)). *EN 45555:2019* – (Same standard as recyclability) defines recoverability rate, which = recyclability + energy recovery potential. (European Committee for Standardisation, 2019a)	*ISO 22628:2002* – (Automotive) also defines "Recoverability Rate" (%) for vehicles in a similar manner. (International Organization for Standardization, 2016)
Critical Raw Material Content	Identification and quantity of any Critical Raw Materials (CRMs) contained in the product. The EU defines CRMs as raw	*EU Critical Raw Materials List (2023)* – The European Commission's official list of CRMs, in Annex II to the proposed Critical Raw Materials Act and the Raw Materials Information System (European Commission, 2025).	

	materials of high economic importance to the EU and high supply risk. Examples include rare earth elements, cobalt, lithium, nickel, etc.	*EN 45558:2019* – European standard for declaring use of critical raw materials in products.(European Committee for Standardisation, 2019c)	
Weight & Volume; Packaging Ratio	The overall weight and volume of the product and its packaging, and the ratio between product and packaging. For example, a "product-to-packaging ratio" might be defined as the volume of the product divided by the volume of its package, or similarly by weight.	None	None
Consumables Usage	Information on any consumables the product requires during use or maintenance – e.g. ink cartridges, toner, filters, batteries, lubricant. Can include the type of consumable, how much is used (quantity/yield), its lifespan, and availability or replaceability.	Likely to be product-group specific. EN 45559:2019 standard on material efficiency contains information on consumables. (European Committee for Standardisation, 2019d)	
Environmental Footprint	*"means a quantification of the environmental impacts resulting from a product throughout its life cycle, whether in relation to a single environmental impact category or an aggregated set*	*EU Product Environmental Footprint (PEF) Method* – The recommended method (Commission Recommendation (EU) 2021/2279) for calculating life-cycle environmental impacts (ESPR), providing a harmonised set of impact categories and evaluation rules. A delegated act may require using PEF to report a	*ISO 14040/14044 (LCA)* – International LCA standards which underpin methods like PEF (International Organization for Standardization, 2006a, 2006b). Also, Environmental Product

	of impact categories based on the Product Environmental Footprint method established by Recommendation (EU) 2021/2279 or other scientific methods developed by international organisations, widely tested in collaboration with different industry sectors and adopted or implemented by the Commission in other Union law;" ESPR Art. 2(24).	carbon footprint, an acidification score, etc., or a weighted aggregate (e.g. the PEF single score or a different one).	Declarations (EPDs) per EN 15804 (for construction products) are an alternative format – they report multiple impact indicators. These could serve if a sector already uses them.
Carbon Footprint	"*means the sum of greenhouse gas emissions and greenhouse gas removals in a product system, expressed as CO2 equivalents and based on a life cycle assessment using the single impact category of climate change;*" ESPR Art. 2(25).	PEFs are relevant here as well – the carbon footprint is one of the indicators covered in the environmental footprint.	*ISO 14067:2018* – International standard for carbon footprint of products, aligning with life-cycle GHG accounting principles (International Organization for Standardization, 2018). *GHG Protocol Product Standard* – Widely used framework for life-cycle GHG accounting.
Material Footprint	"refers to the total amount of raw materials extracted to meet final consumption demands;" ESPR Art. 2(26).	Often expressed in mass (kg). It is an aggregated measure of resource consumption – sometimes referred to as RMI (Raw Material Input) or RMC (Raw Material Consumption) at product level. Note that this indicator requires a similar data collection effort to the PEF study while being much more coarse and less accurate, as the specific environmental relevance of materials and losses such as emissions is not considered.	
Microplastic & Nanoplastic Release	The quantity of microplastics and nanoplastics the product releases during its life cycle.	No cross-sectoral definition; CEN/TR standards are in development.	*ISO 4484-2:2023 (Textiles)* – An example of an emerging test standard quantifying microplastic

			shedding from textiles (International Organization for Standardization, 2023).
Emissions to Air/Water/Soil (incl. Noise)	Any polluting emissions the product causes during use (or other life-cycle stages) aside from GHGs. This can include airborne pollutants (e.g. NOx, SO_2, VOCs, particulate matter), waterborne pollutants (e.g. chemical run-off, micro-pollutants) or soil contaminants. Noise is also treated as an emission (sound emitted to the environment, measured in dB).	*EU Emissions Directives:* e.g. the Industrial Emissions Directive and sectoral rules provide classification of emissions.	*Regulated Pollutant Categories:* There may be additional vocabularies available at the regulated pollutant level or sector level as well, such as the Euro vehicle emission standards or Class A/B indoor air quality labels.
Waste Generation	Information on the amounts and types of waste the product will generate. This includes packaging waste when the product is unboxed (e.g. how much plastic or cardboard), waste generated during the product's use (e.g. spent consumables that become waste), and waste at end of life. The ESPR includes in its scope "expected generation of waste" as well.	*EU Waste Classification:* Waste can be categorised by the European List of Waste (LoW) codes (Commission Decision 2000/532/EC)	
Functional Performance & Conditions of Use	Key functional parameters of the product and any special conditions required for its	Highly product-group-specific, likely to be in non-technical language. EU Energy/Quality Labels, such as Energy Efficiency labels, are likely to qualify for inclusion in this category. The	

	intended use. This ensures that sustainability information is given in the context of the product doing its job. It may include the product's primary performance metric(s) (e.g. brightness for a lamp in lumens, washing capacity in kg, processing speed) and any usage conditions or limitations (e.g. "indoor use only", "requires food-grade CO_2 cartridge", "compatible only with system X") and any precautions or skills needed for use may be noted. (ESPR Annex I)	functional unit that is used in LCA (incl. in the PEF) to anchor a product's environmental performance and make it comparable can be used.	
Lightweight Design Features	Information on how the product's design optimises weight and material usage – i.e. achieving required strength or functionality with less material, which can reduce environmental impact.	*Qualitative Descriptors:* There is not a formal code for lightweight design aspects. The Task B2 Report suggests indicating the use of specific lightweight design strategies (Rodríguez-Manotas et al., 2025). This may include noting use of high-strength lightweight materials (e.g. composites, aluminium instead of steel), structural optimisations (ribbed designs, etc.), or integration of functions that allow reducing parts' count and weight. Included/fully considered in PEF model and result.	

Source: own elaboration

Annex 6. Identifying, reusing and merging existing product classification vocabularies

A. Guidance for reviewing and performing gap analysis for existing vocabularies against information requirements

Evaluation Criteria: The following (cross-domain) metrics can be used to assess each vocabulary's suitability:

— **Completeness:** Determine how fully a similar existing vocabulary (if any) and the common vocabulary cover the needed concepts and terms. This involves checking each required data element against the vocabulary's entries and vocabulary elements, and, if necessary, calculating coverage (e.g. if 45 out of 50 required concepts are present: completeness = 90%). A high completeness score indicates the common vocabulary is **comprehensive** for the relevant domain. Conversely, missing terms highlight gaps. For example, Gómez-Pérez, (2004) identify completeness as a core criterion in ontology evaluation.

— **Coverage and Specificity:** Determine if the common vocabulary matches our needs. For example, if regulatory requirements demand distinguishing between different recycling processes, the vocabulary should have specific terms for each process, not just a single "recycling" entry. This can be evaluated by reviewing the vocabulary's terms to see if it has entries corresponding to each important category or sub-category in our requirements.

— **Consistency:** Evaluate whether any additionally foreseen candidate vocabulary is internally consistent and aligns with regulatory definitions (while the common vocabulary will be aligned, as is derived from the ESPR). This means checking that terms are clearly defined with no contradictions or ambiguities. Semantic reasoning tools can be used to ensure no logical conflicts. Consistency also covers uniformity of naming conventions and relationships. A consistent vocabulary will use terms in a stable, unambiguous way across the entire set.

— **Interoperability:** Assess how well the vocabulary can integrate with other systems and standards.

- An interoperable vocabulary:
    - uses common data formats (e.g. RDF, JSON-LD);
    - aligns with other ontologies in use for other product groups, and can particularly be interoperable with other, previously established ontologies under the ESPR or other legislation; and
    - aligns with broader standards or reference frameworks, enabling data exchange between platforms.
- The more easily a vocabulary's data can be shared and understood in different contexts, the higher its interoperability score.
- Another positive sign is if the vocabulary has a modular design that fits easily into larger data ecosystems.

— **Maintainability and Governance:** Since regulations and industry practices evolve, an ideal vocabulary should be updated regularly or at least be stable and not deprecated. A well-governed vocabulary (e.g. published by a recognised standards organisation or a trusted open community) is one that likely remains available and up to date. This criterion requires an evaluation of, for instance, who (a standards body, an open community, or a vendor with different business interests but also different funds) maintains the vocabulary, and how changes to it are managed, whether there is a process to request new terms and how accessible this process is. An indirect indicator of the same can be the version history or update frequency of a vocabulary's documentation. A stable maintenance outlook ensures the vocabulary can be reliably used long term.

— **Documentation and Clarity:** Ensure the vocabulary or ontology is well documented and easy to understand, as this can aid in adoption and consistent application. An ontology can be evaluated on, for instance, whether it includes:

  - easy access to relevant documentation,
  - clear data labels and definitions for each term,
  - usage examples,
  - multilingual support (particularly relevant if the vocabulary will be used across the EU),
  - class diagrams.

— **Adoption Rate**: Another important factor to consider, particularly from the perspective of ensuring that the vocabulary is useful, simplifying the regulatory environment, and coordinating policies, is the percentage of relevant industry and governmental stakeholders or systems that currently use the vocabulary (or could easily adopt it). A vocabulary with slightly lower completeness might still be chosen if its adoption is very high, because leveraging a widely used standard can outweigh the benefit of a more complete but unknown vocabulary.[12] Quantitative thresholds for adoption can potentially be applied (e.g. vocabularies with >50% industry being considered "high adoption") and adoption can potentially be estimated by looking at industry surveys, references in regulatory frameworks, the number of downloads/uses of the vocabulary if such data is available. Qualitative thresholds can also potentially be applied, taking into account Stakeholder Consultations and which vocabulary is mentioned most often by the relevant stakeholders. Important to note here is not only the adoption rate but its feasibility to be accurately implemented. The absence of test methods for quantifying and verifying data in accordance with a specific ontology would imply the need for the adaptation of the vocabulary.

[12] For instance, if a particular material classification schema is used by 70% of manufacturers, adopting it (and perhaps extending it) will allow 70% of the manufacturers to align with the regulations directly. Conversely, a vocabulary with poor adoption would require the development of custom mappings to others and partners may not understand it, representing a significant drawback.

— **Cost to Implement:** Cost is evaluated in terms of licensing fees and the effort required to integrate the vocabulary and is also again relevant from the perspective of simplifying the regulatory environment.

- **Licensing:** Open-source or open-licence ontologies are strongly preferred, as they can be implemented without direct fees and usually come with community support. Proprietary ontologies may require purchasing rights or subscriptions, which makes them unsuitable for being specified in the delegated act. A suitable open vocabulary is therefore necessary.

Efforts: Even beyond licensing, cost includes the complexity of integration: a very complex vocabulary might require more training for implementers, which should also be taken into account.

General Evaluation Process: Using the above criteria and recommendations, the elements of the common vocabulary, each candidate vocabulary, and additional vocabularies etc. are rated or scored with an appropriate scoring model (e.g. with quantitative measures for completeness and qualitative judgment for others). Relevant information can be obtained from a variety of sources, including consulting both the vocabulary's official documentation, or consulting independent analyses when available, or conducting independent analyses. Which of these is appropriate is best determined on a case-by-case basis.

B. Decision criteria for selecting, extending or developing a vocabulary

The decision criteria can include quantitative thresholds for the evaluation metrics, as well as practical factors like adoption rate and implementation cost. The following is an early illustration of these decisions:

— **Use 'As Is' (adequate):** If the common or candidate vocabulary meets or exceeds the critical thresholds on key metrics, it is deemed adequate for direct adoption:

1. The vocabulary covers all of the required terms, i.e. **100% completeness**.
2. It also exhibits strong consistency (no major conflicts with regulatory definitions) and high interoperability (compatible with other systems out-of-the-box).
3. The vocabulary also has a **strong adoption rate** in the relevant community and is feasible to implement.
4. The vocabulary is well-maintained, with a clear process for updates and adaptation.
5. The vocabulary is available under an open licence or at least free of prohibitive fees.
6. The vocabulary does not require extensive integration and training to implement.

— **Adapt or extend an existing vocabulary:** If no single vocabulary is a perfect fit but one or two come close, the next option is to adapt an existing vocabulary. Adaptation can take the form of **extending** the vocabulary with missing terms, **refining** definitions, or **creating mappings** between ontologies. This route should be applied when the identified gaps are specific and can be filled without undermining the vocabulary's overall structure, for instance as follows:

1. the vocabulary should cover many of the required terms, and the rest of the terms can be added without undermining the overall structure of the vocabulary;
2. it still has strong consistency and high interoperability;
3. it is reasonably well-adopted or has a clear potential for broader adoption (for instance, an emerging standard backed by a reputable organisation, even if not yet universally used);
4. the base vocabulary is open-source or permissively licensed, allowing extensions without legal barriers; and
5. the cost to implement the vocabulary and develop the needed extensions is lower than creating a new vocabulary from scratch.

— **Develop a new vocabulary:** If none of the evaluated ontologies meet the minimum thresholds – for instance, all candidates have low coverage (or significant issues in consistency or interoperability – then creating a new vocabulary becomes the last resort. This path may also be considered if the only available vocabulary with decent coverage is proprietary or comes with high implementation costs, making it impractical despite their content. Notably, developing a new vocabulary doesn't happen in isolation: elements from previously reviewed ontologies should be reused (through alignment or by referencing existing definitions) wherever feasible, to ensure the result is not diverging unnecessarily from established terminology. It is important to note that this option can incur significant effort and runs the risk of slower uptake and should therefore only be used if adaptation of an existing vocabulary is judged infeasible. The development of a new vocabulary from scratch would start from the common vocabulary developed here, plus drawing on the other evaluated input.

Annex 7. Guidance on setting granularity levels

DPPs may have different *levels of granularity*, meaning a DPP may correspond to a **product model**, a **production batch**, or an **individual item**. The ESPR explicitly allows all three possibilities and directs that the choice will be made in each product's delegated act (*"…whether the product passport is to correspond to the model, batch, or item level."*). This guidance framework provides a starting point for making this decision. The guidelines can assist the product-specific vocabulary DPP specification team (Step C of the methodology) in recommending a suitable granularity level consistent with both practical considerations and regulatory intent (Step C.3).

Understand the options:

- **Model-level passport:** One DPP entry represents an entire product model or type. All units based on that model share identical passport information (e.g. every unit of a particular hoodie model would refer to the same DPP data for its specs and compliance information). This case may even include non-substantial model variants, e.g. where different prints/images may be printed on an apparel product model that is otherwise identical. The conditions on when the very same DPP data can be used need to be fixed, e.g. by allowing ranges of actual values that can be represented by the same DPP entry, e.g. on material composition (e.g. the different prints on the apparel using somewhat different amounts of chemicals).
- **Batch-level passport:** DPP data is specific to a group of products produced under similar conditions (e.g. same factory and time period, same raw material sourcing). Units in the same batch share a passport, capturing details unique to that batch (e.g. a textile lot produced with a particular dye lot and materials sourcing might have a batch-level passport noting those specifics, distinct from another batch of the same garment model produced later).
- **Item-level passport:** Each individual product item (identified by a unique ID) gets its own passport record. The item-level DPP allows the capture of specific life-cycle information of said product item (e.g. each leather jacket has its own passport tracking its manufacturing details and repair history over time). One (potential) variant of this is to allow the creation of an instance-specific extension on top of a model/batch-level DPP (introducing an item-level DPP as a new data artifact on demand by the product's owner, with its own unique identifier and data carrier and link to the original DPP. Consequently, this would allow for flexible data governance of storage, such as repair or parts replacement information hosted by the actors introducing new item-level data, while reducing the burden on the original producers and the responsible economic operator.

Regulatory guidance: The Regulation implies that the choice should be **"appropriate for the product groups covered"**. This suggests considering the nature of the product, the variability of information, and possibly other criteria. If critical information varies significantly item by item, an item-level DPP may be mandated; if not, model or batch may suffice. Consequently, the Commission's standardisation guidance gives a hint: batch level may be relevant for differences in production location/time (e.g. carbon footprint differences) if the use cases (e.g. purchase decisions) are expected to be relevant at that level, whereas item level refers to *the specific product in hand*. Delegated acts will need to decide on the specific reasoning. For instance, the new EU Battery Regulation chooses an item-level passport: each battery will have a unique electronic record and identifier. This is a consequence of batteries having significant performance and safety attributes that develop over time based on the usage of the battery (charging cycles, state-of-health) –

making item-level tracking necessary. It is however to be noted that the current scope covers larger batteries of an accordingly much higher price plus having the abilities built in to record use-stage data, as opposed to AA type and similar small batteries.

Criteria for assessing granularity:

1. **Variability of characteristics:** How much does relevant information vary between individual items? If two units of the same model can significantly differ in the data that the DPP needs to convey, then model-level alone is insufficient. For example, for a simple pair of socks with no user-specific data, all units are virtually the same in terms of required information (materials, manufacturer, etc.), so a model-level passport could work. On the other hand, consider a car or a battery: each is identifiable by a serial number and can accumulate different usage or maintenance records, which are important for its sustainability and valuation when sold as a second-hand item, or to ensure cost-efficient maintenance and repair – here an item-level passport is warranted. Batch-level is a middle ground: if products have variations based on the production batch (due to time or location of manufacturing, or a particular materials lot), but are uniform within each batch, then batch-level data may be ideal. A good example might be all shirts of a given design produced in one factory in one month, which all share the sewing machine, which might vary per batch, depending on the adjustment of the knitting tension for the machine. If the knitting tension differs significantly (in view of the use cases), batch-level would be most suitable. *In summary, simplified, high variability at item level suggests item DPP; high uniformity suggests model DPP; consistency within batches but variability across batches suggests batch DPP*.

2. **Use-case requirements:** The identified use cases also determine what granularity is implied. If one use case is tracking the maintenance history of a product or verifying the authenticity of a specific product, that inherently calls for item-level identification. For instance, a use case like *"trace repair history to inform second-hand buyers"* can only be fulfilled if each item has its own record of repairs. Conversely, a use case focused on providing general consumer information at point of sale (PoS) (e.g. material content, origin) might be sufficiently served by model-level data if all items share that information. This implies that item-level products should also provide the potential buyer model-level information at the PoS or online shop. Batch-level might be needed for use cases like *"provide the carbon footprint of this product's specific production lot"*, since carbon accounting could differ per batch (one batch made in Factory A vs. another in Factory B, or one using primary materials, another batch partly or fully secondary materials). This applies however only when the purchaser can know and select specific lots and this would lead to actual reduction in environmental impacts: choosing batches produced during the day with PV/wind-power-rich electricity over nighttime batches makes little sense, if production runs in 24-hour shifts anyway. Choosing batches from one site with on-site green electricity production over another that uses the grid may make sense, by giving incentives to also install on-site green electricity in the other site or expand production (and green electricity generation) at the "greener" site. A possible downside could be if the company were to route all products from the "green" site to the EU, the production from the other sites to other markets, reducing the real benefit to situations where the EU demand exceeds the capacity of the "green" site and induces actual improvements. The decisions on mandating batch-level DPPs appear the most complex ones. *In summary, the granularity should cover the relevant use-case requirements and consider the effects of actual improvement of the product's sustainability performance.*

3. **Information volume and feasibility:** Consider the volume of DPP records and the economic feasibility of their maintenance. An item-level DPP for inexpensive, mass-produced goods (like millions of t-shirts) would mean an enormous number of passport entries, which could be unsustainable (at least economically, and for some products even environmentally, i.e. where the extra environmental impact of establishing and operating the DPP outweighs the environmental benefits of using its information). If the added value of item-specific data for such products cannot counterbalance the publishing and maintenance costs (because they are largely identical and the products have short lifetimes), a model-level or batch-level approach may be more appropriate. On the other hand, for high-value or high-impact products (e.g. vehicles, industrial equipment), if the volume of DPPs required per euro of product price is lower and the lifespan longer (e.g. 10+ years) this would justify tracking per item. Batch-level can sometimes offer a balance – as depicted in the knitting tension example from point 1. Then, the practical feasibility of collecting, storing and transmitting use-stage data is to be considered: for many data, this necessitates using existing (or cheap to add) automatic data measurement and recording devices, on-board storage and – when connectivity allows – transmission of the data to the DPP (in contrast to repair events where the event data would be entered by human intervention anyway). For traction batteries in cars or laptops, this is practically possible, for many machines such devices would need to be added, increasing the cost. *In summary, an assessment needs to be conducted on the value added counterbalanced by the costs and in some cases even environmental net impacts of adoption and maintenance of a certain granularity level for DPPs.*

4. **Life-cycle data and updates:** Determine if the product will accumulate/produce unique data over its lifespan that should be appended to the DPP. If yes and said unique data point is relevant based on the data needs (see point 2), item-level is recommended. For example, a DPP that includes a *use-stage* attribute (like total energy consumed, or number of refurbishment cycles, or incidents of operation outside a permitted temperature range) inherently becomes item-specific once the product use begins, since each unit diverges. The ESPR anticipates that certain data might be added over time – for instance, Article 9(2)g of the draft ESPR mentions keeping the passport updated over the product's lifespan. If the delegated act foresees such updates (perhaps recording repair events, or software upgrades, or product aging), then an item-level identity is needed (even if initial data is common per model). It is possible to have a **hybrid approach**: the delegated act could specify that some information is at model level and some at item level. For example, a battery passport might have static model-level data (chemistry, design capacity, etc. – typically all upstream information until the final product is sold) and dynamic item-level data (actual capacity, number of cycles – during use and potential refurbishment and similar). In such cases, the economic operator would provide and host the static data for all battery DPPs. The dynamic use stage data for each battery would likely be hosted on behalf of and be accessible only by the product owner and user (and some of it by subsequent owners), while logically be connected to the DPP's static data. Moreover, this hybrid approach is supported by JTC 24 as well, as they describe life-cycle APIs to access data for a type of model. Then, another variant is to voluntarily allow adding item-level information for a model-level DPP (or to complement a model-level DPP with an item-level DPP with its own unique identifier and potentially even its own data carrier or another mechanism to identify the specific item). It is noted that item-level DPPs have potential issues touching on the General Data Protection Regulation (GDPR) and proof of ownership question (e.g. whether a car has been driven off-road and where, or whether a product has been used for specific purposes inside or even outside its intended use), and hence information access credentials management. *In summary, if any significant part of the DPP content requires per-item updates or tracking, an item-level DPP granularity is recommended, at least to complement the model-level core DPP (or even as an option only).*

5. **Traceability and liability:** If traceability of individual products is legally required or critical for liability or warranty reasons, item-level granularity is the correct option. For instance, certain safety-critical products might require traceability of each serialised unit (medical devices, aerospace parts) – a DPP at item level enables the tracking of this data based on a serial number that will be referenceable in the future. The choice should reflect the level at which traceability is needed to meet policy, producer and product owner goals and use cases. Environmental footprint or conflict minerals tracking might be adequately done per batch (since/if all items in that batch share production inputs, unless the use stage differs and specific use stages are relevant for a relevant use case), whereas tracking warranty claims requires an item-level granularity. *In summary, the chosen granularity level of the DPP should be able to cover all the traceability policy, producer and product owner requirements.*

Annex 8. Guidance on setting data access rights

The successful implementation of the DPP hinges not merely on the *availability* of data, but on a clear framework for its *accessibility*, ensuring proper supply chain actors have access to the data points relevant for their operational activities. The central challenge lies in balancing the ESPR's objective of transparency with the legitimate needs of economic operators to protect intellectual property (IP), trade secrets and commercially sensitive information, while also adhering to data privacy regulations such as the GDPR.

Unfettered access to all DPP data for all actors is both impractical and undesirable. It risks exposing proprietary process details, undermining competitive advantages, and creating an overwhelming volume of irrelevant information for certain users. Conversely, an overly restrictive model would negate the very purpose of the DPP, leaving stakeholders without the critical data needed to extend product life cycles, ensure proper end-of-life treatment and verify sustainability claims.

This guidance framework proposes a structured starting point for considerations on data access control within the DPP ecosystem. The guidelines can assist the product-specific vocabulary DPP specification team on determining proper data access control (Step C.4 of the methodology). It is predicated on a "Role-Based, Need-to-Know" principle, arguing that access rights should not be uniform but granularly assigned based on the data required for the operational activities of each supply chain participant. This approach ensures that actors receive the precise data necessary to fulfil their roles in the circular economy, thereby maximising the utility of the DPP while minimising risks to confidentiality and security. The guidance framework will be illustrated by applying it to specific performance and information requirements outlined in the ESPR, demonstrating how access to data on key sustainability metrics could be classified in a tiered architecture.

A. Principle-based model: role-based, need-to-know access

The foundation of a viable DPP data access model must be a departure from a binary open/closed paradigm. Instead, a multi-tiered, permission-based architecture is required, at the level of each information item and data point. The "Role-Based, Need-to-Know" principle provides the necessary logic for constructing this architecture.

1. **Role-based access control (RBAC):** This principle dictates that access permissions are assigned to specific roles rather than individual entities. Stakeholders are grouped into predefined categories based on their function in the product life cycle (e.g. Consumer, Professional Repairer, Recycler, Market Surveillance Authority). Delegated acts for specific product groups should clearly define these roles and the datasets associated with them. This standardises access and simplifies management. Any access rights to specific entities (such as business customers, different in-house actors, reviewers) are to be anticipated but would be outside and beyond the legal basis and have to be established and managed by the respective data owner.

2. **The "Need-to-Know" principle:** This principle acts as a filter within the RBAC model. For any given role, access is granted only to the minimum set of data elements essential for that role to perform its intended function effectively and contribute to the ESPR's objectives. A consumer, for instance, *needs to know* a product's repairability score to make an informed purchase but does not *need to know* the detailed technical data and test reports that generated that score. This principle prevents data overload, protects sensitive underlying information, and focuses user attention on the most relevant attributes for their context. We anticipate that additional filters would be implemented, e.g. in consumer apps to access only parts of the accessible DPP data, allowing filtering to the individual's specific interests; this however does not imply any access rights and will hence not further be addressed below.

This dual-principle approach allows for a system where a single DPP can serve multiple audiences securely and efficiently. The data remains a comprehensive whole, but it is revealed in layers, with each stakeholder holding a key to the specific layers relevant to their purpose. Any additional data beyond the legal scope and the related access rights would be managed by the respective economic operator at their own discretion.

B. Stakeholder analysis and corresponding data access tiers

Applying the "Role-Based, Need-to-Know" principle requires a clear mapping of value chain actors to their data requirements. In the subsequent tiers, the "Need-to-Know" is to be considered only for illustration purposes, as the complexity and comprehensiveness might differ based on the product group. The following presents a proposed tiered access model:

— **Tier 1: Public/Consumer access:** This is the default, open-access layer. The data here is designed to inform purchasing decisions, ensure proper use and care, and guide end-of-life choices.

- **Role:** Consumers, potential buyers, civil society.
- **Need-to-Know:** High-level sustainability scores (e.g. durability, repairability score), primary material composition, energy/water efficiency class, recycled content percentage, instructions for use and maintenance, warranty information, and clear guidance on return, take-back, and recycling options.
- **Confidentiality:** This tier should contain no proprietary technical details, supplier information, or (potentially) complex chemical formulations beyond what is required for safe use.

— **Tier 2: Professional operator access (repair, refurbishment, remanufacturing):** This tier is for economic operators whose function is to extend the product's useful life. Access could be conditional, for example, requiring registration or certification to ensure legitimate use.

- **Role:** Independent repairers, refurbishers, remanufacturers.
- **Need-to-Know:** Detailed disassembly and reassembly instructions, diagnostic software access codes, schematics, a comprehensive list of spare parts with unique identifiers and interoperability information, and guidance on resetting software or firmware post-repair.

- **Confidentiality:** While more detailed than Tier 1, it would still omit core IP like source code or the precise farm source of the fabric, focusing instead on procedural and component-level information.

— **Tier 3: End-of-life operator access (waste management & recycling):** This tier provides the necessary information for safe and efficient material recovery.

- **Role:** Recyclers, waste sorters, material recovery facilities.
- **Need-to-Know:** Detailed material composition of all major components, precise location and identity (e.g. CAS number) of Substances of Concern (SoC) to prevent contamination of recycled streams, material and part specifics to be able to judge applicable repair options, and instructions for safely dismantling and separating different material types.
- **Confidentiality:** This information is critical for environmental protection and worker safety, efficient and effective recycling operations including even reporting materiality information on secondary materials obtained, and must be provided, but it would not include manufacturing process data or supplier relationships.

— **Tier 4: Production/Supply network professional access (of intermediate products):** This tier is for economic operators in the wider manufacturing stage up to and including the final product producer, to be able prepare the DPPs on their products.

- **Role:** Further processors, manufacturers, assemblers.
- **Need-to-Know:** Detailed material composition, SoC, recycled content, environmental footprint, and all other data that needs to be either aggregated to the next higher level (material, part, assembly, or final product, and possibly more steps in between) or directly be reported in the final product DPP at product level. This includes data on consumables and packaging (e.g. environmental footprint of solvents and corrugated board boxes) that do not end up physically in the further processed or final product. The need-to-know likely includes specific, selected data coming back upstream from the use stage, repair/refurbishment, end of life, to inform the original producer on their product's performance, to be used for improvement. Importantly, this data may also feed into improved default scenarios for a product's use stage and end of life in Product Environmental Footprint Category Rules (PEFCRs) (e.g. average technical lifetime and actual recycling rates and secondary material qualities for this type of product) to calculate a more accurate overall environmental footprint for better informed purchase decisions and improved ecodesign.
- **Confidentiality:** This information is necessary to be able to calculate and report data on the higher levels of further processed intermediate products and the final products.

— **Tier 5: Regulatory & Enforcement access:** This tier provides the most comprehensive access, enabling authorities to verify compliance with all applicable regulations.

- **Role:** Market Surveillance Authorities, customs authorities, the European Commission.

- **Need-to-Know:** Full, unrestricted access to all legally mandated data within the DPP. This includes the technical documentation used for conformity assessment, full test reports, certificates, declarations of conformity, and traceability data pertaining to the supply chain (e.g. supplier certificates for recycled content).
- **Confidentiality:** This access is fundamental to the integrity and trustworthiness of the entire DPP system. Robust security protocols must be in place to ensure this data is accessed only by authenticated authorities for legitimate enforcement purposes.

C. Application of the access framework to ESPR performance metrics

To illustrate the practical application of this tiered model, we can examine how data related to key ESPR performance and information requirements (as listed in Annex I) would be managed. Note that all the following examples, metrics and scores are purely illustrative.

1. Repairability & Durability (Annex I, para. a, b)
A future delegated act for smartphones might mandate a "Repairability Score" from A to G.

— **Data point:** The score itself and its underlying components.

— **Access control:**

- **Tier 1 (consumer):** The final letter grade (e.g. "B") and a high-level summary (e.g. "Good availability of spare parts, standard tools required"). This directly informs the purchasing decision.
- **Tier 2 (repairer):** Access to the detailed sub-scores that constitute the final grade: a specific score for ease of disassembly, the official list of spare parts with part numbers, and a link to the supplier portal or authorised distributors.
- **Tier 4 (authorities):** Full access to the manufacturer's conformity assessment file, including the unabridged test reports, the calculation methodology used to arrive at each sub-score, and the evidence supporting claims about spare part availability and pricing.

2. Presence of Substances of Concern (Annex I, para. f)
Consider a textile product containing a flame retardant identified as an SoC.

— **Data point:** Information regarding the presence, identity and location of the SoC.

— **Access Control:**

- **Tier 1 (consumer):** A clear, understandable warning: "This product contains [common name of substance] for fire safety of the upholstery fabric. Follow care instructions to minimize exposure." No complex chemical data is needed.
- **Tier 3 (recycler):** Precise information is critical. The DPP must provide the chemical name (e.g. DecaBDE) and its specific location ("applied as a back-coating to the upholstery fabric") so the component can be segregated to avoid contaminating the recycling feedstock.

- **Tier 4 (authorities):** The full technical file, including the concentration level of the SoC, and evidence/declaration of compliance with substance restriction legislation like REACH or the POPs Regulation.

3. Recycled content (Annex I, para. h)
A laptop manufacturer claims its product's casing contains "50% certified post-consumer recycled plastic", assuming this is a prescribed or optional information requirement (i.e. this is generally relevant, non-misleading and complementary to other environmental performance information).

— **Data point:** The percentage claim and its verification.

— **Access control:**

- **Tier 1 (consumer):** The public-facing claim: "Casing made with 50% recycled plastic." This is a key marketing and sustainability attribute.
- **Tier 4 (authorities):** Access to the evidence underpinning the claim. This is a trade secret and would not be public. It would include mass-balance accounting records from the production facility (assuming a mass-balance approach is permitted under the delegated act), and chain-of-custody certificates (e.g. Global Recycled Standard - GRS) from the material supplier, verifying the origin and quantity of the recycled feedstock. This protects the manufacturer's supply chain relationships while enabling robust enforcement against greenwashing.

4. Carbon footprint (Annex I, para. n)
A product's DPP includes its cradle-to-grave carbon footprint, calculated primarily based on the PEF method.

— **Data point:** The final footprint value and the Life Cycle Assessment (LCA) data behind it.

— **Access Control:**

- **Consumer:** The final aggregated figure (e.g. "150 kg CO_2e per item") and potentially a comparative label (e.g. Class A-G), allowing easy comparison with similar products.
- **Business-to-Business (B2B) customers/public procurers:** May be granted access to a disaggregated footprint, showing impacts and elementary flows by life-cycle stage (e.g. raw materials acquisition, manufacturing, use scenario, end-of-life scenario), and transport assumptions. This allows them to align procurement with specific decarbonisation goals (e.g. prioritising products with low manufacturing emissions), also adjusting calculations based on their specific use situation and end-of-life setting (e.g. take-back scheme with dedicated refurbishment or recycling as opposed to generic EU scenario), to contribute more accurately to their own corporate carbon footprint calculations.
- **Authorities:** (Potentially) complete access to the underlying LCA model (which reveals highly sensitive business information, so might be skipped) and datasets included, and in any case to the assumptions, limitations, etc. in the form of the study report, and to the third-party verification reports. This is necessary to validate the methodology and ensure consistency with the PEF framework (if/as foreseen in the delegated act).

Annex 9. Guidance on introducing, editing and sharing DPP data throughout the product life cycle

While the “birth” of the DPP occurs at the point of offering its associated product on the EU market, its ultimate utility is realised throughout the product's downstream life cycle—from use and repair to resale and recycling, and already upstream of the final production step through informing improved ecodesign all the way along the supply network. The DPP should not be treated as a static "birth certificate," a fixed set of compliance and performance data created and sealed by the original economic operator. This view would severely curtail its potential. For the DPP to be a truly transformative tool for the circular economy, it must evolve beyond a read-only record into a dynamic, "living ledger" that accurately chronicles a product's journey and transformations over time.

This evolution from a static to a dynamic document introduces profound challenges related to data governance, integrity and security. Unregulated editing rights would unavoidably lead to data corruption, fraud and the dilution of the manufacturer's original, verified information, turning the DPP into an unreliable "digital landfill." Conversely, prohibiting any downstream data additions would render the DPP obsolete the moment a product is repaired, upgraded or refurbished, or would even prevent error correction or adding information after sales, thereby failing to capture the value-retaining activities the ESPR seeks to promote.

At the same time, the actual flow of data into and out of DPPs is a “litmus test” for the practical establishment of DPPs and the use of the information therein. While this method excludes aspects of the system architecture, it is important to also understand the data flow and the related challenges to make sure that information and performance requirements can actually be recorded in DPPs.

This guidance framework provides a starting point for considerations on the management of editing and sharing of DPP data throughout the downstream product life cycle. The guidelines can assist the product-specific vocabulary DPP specification team in determining proper data governance throughout the product downstream life cycle (Step C.5 of the methodology). The guidance framework is built upon the core principle of a **Governed Life-cycle Data Framework**, which segregates the immutable "Core DPP" from an append-only "Life-cycle Log." This structure ensures that updates are authenticated, auditable and attributed to specific, authorised actors at key moments in the product's life cycle. By linking these moments directly to the ESPR performance requirements, this guidance framework offers a secure and practical pathway for the DPP to fulfil its role as a trusted repository of life-cycle information, thereby enabling a truly circular and transparent market.

A. Core principles for a governed life cycle data framework

To manage the dynamic nature of the DPP, a robust governance structure is essential. The following principles should underpin the technical and legal architecture for all downstream data additions:

1. **Data segregation: the "Core DPP" and the "Life-cycle Log"**
   The DPP should be conceptually and technically divided into two parts.

(a) **The Core DPP:** This comprises the original data provided by the manufacturer at the time of placing the product on the market. It includes fundamental compliance information, design specifications and performance metrics declared under conformity assessment (e.g. carbon footprint, material composition, initial repairability score). This Core DPP must be treated as **immutable or subject to extremely restricted edit rights** by the original manufacturer only (e.g. for critical safety recalls).

(b) **The Life-cycle Log:** This is an **append-only ledger** linked to the Core DPP. All downstream events—repairs, software updates, ownership changes, refurbishment activities—are recorded here as new, time-stamped entries. This model preserves the integrity of the original data while allowing the product's story to be expanded upon by other actors.

2. **Authenticated and role-based write permissions**
   Just as read access is recommended to be tiered, the right to *add data* to the **"Life-cycle Log"** must be strictly controlled. Permissions should be granted based on an actor's verified role and the specific event being recorded. An independent repairer, for instance, must be authenticated as such before being granted the right to log a repair event. This prevents unauthorised or fraudulent data entry. Importantly, as much of the data at the level of the final product are to be provided by several tiers of upstream suppliers, these suppliers should also be able to update information and data, and the final producer needs to update the related information accordingly at that the final product level. It is even necessary – as it is to be assumed that initially a substantial part of data from suppliers is unavailable and default values are to be used (e.g. for carbon footprint calculations, also for recycled content for example), that once a supplier of a part (manufactured in China for example) is able to provide specific data on that part, that this producer is authorised (by its direct customer or the final product producer) to access and overwrite the default data, i.e. take over a "stand-in DPP" that was previously owned by the final producer. Then, for item-level DPPs with use-stage event or status-based records, the product itself is to be authorised in a standardised way (without creating data graves), as final consumers cannot be expected to actively do so. One practical challenge related to use-stage data is then the necessary on-product/near-product temporary storage of the data until it can be transferred via the internet to the DPP, once connectivity is established.

3. **Verifiability and attributability**
   Every entry in the Life-cycle Log must be digitally signed or otherwise cryptographically linked to the actor who created it. This ensures full traceability and accountability. If a refurbisher adds data about a battery replacement, their identity is permanently associated with that claim, establishing a clear line of responsibility.

4. **Standardisation of life-cycle events**
   For data to be interoperable and machine-readable, the format for recording common life-cycle events must be standardised. A "repair event," for example, should be a structured data object with defined fields (e.g. event type: repair, date, ID of component replaced, ID of repairer, new warranty period). Delegated acts should reference these standardised event schemas.

B. Key moments for data updates in the downstream life cycle

Applying this framework, we can identify specific trigger events in the downstream life cycle where the DPP should be updated by authorised actors. These events directly relate to enhancing the transparency and verifiability of key ESPR performance aspects.

1. Event: Correction, update or addition of information

— **Trigger:** a) Data or information has been found to be erroneous (by the producer or one of the suppliers on the respective part or component, a user, a post-market introduction review, market surveillance event or court case). b) Information needed to be updated (e.g. the legal address of the producer); also here, any actor might identify such a case and information in all parts of the product, and all life-cycle stages can be affected. c) Information has been added (e.g. an additional video to support the printed use or repair instructions).

— **Responsible actor:** The actor "owning" the data or information to be corrected, updated or added, and ultimately the economic operator responsible, or for use and EoL-related information or data the respective downstream actor.

— **Data to be changed or added to Life-cycle Log:** The corrected, updated or added data or information (plus meta data identifying who made this change or addition, what it was (correction, update, addition) and when it was done, and possibly even why/adding a comment)).

2. Event: Professional repair & maintenance

— **Trigger:** A key component (e.g. a smartphone camera, a washing machine motor) is replaced by a professional, or the product is repaired without component replacement.

— **Responsible actor:** Certified professional repairer or independent operator.

— **Data to be added to Life-cycle Log:**

- A standardised "Repair Event" entry.
- Date of the repair.
- Unique identifier (part number) of the new component, if any, or information about any added materials (e.g. glue, welding rod), if relevant for recycling/refurbishment or durability for example.
- Confirmation that an original or compatible spare part was used, if any.
- Identifier of the registered repair business.
- Details of any new warranty provided for the repair.

— **Relevant ESPR requirement (Annex I):** This directly substantiates metrics for **ease of repair and maintenance (b)** and **durability (a)**. A verifiable repair history increases a product's second-hand value and gives subsequent owners confidence in its condition. It provides tangible evidence that the product is, in fact, repairable as claimed in the Core DPP.

3. Event: Software or firmware update

— **Trigger:** The manufacturer pushes an update that affects the product's performance, functionality, or energy consumption / environmental performance.

— **Responsible actor:** Original Manufacturer or their authorised representative.

— **Data to be added to Life-cycle Log:**

- A "Software Update Event" entry.
- New software/firmware version number.
- A log of significant changes, particularly any that could impact performance parameters declared in the Core DPP.
- For updates requiring user consent for performance degradation (as per Article 40), a record of that consent should be logged.

— **Relevant ESPR requirement:** This is critical for **upgradability (c)** and preventing **circumvention and worsening of performance (Article 40)**. It provides a transparent audit trail to ensure that updates do not secretly degrade energy efficiency or disable hardware, a key concern in tackling premature obsolescence.

4. Event: Refurbishment and preparation for resale

— **Trigger:** A used product is professionally processed to be sold on the second-hand market.

— **Responsible actor:** Certified refurbisher or remanufacturer.

— **Data to be added to Life-cycle Log:** This event effectively creates a "second birth certificate" for the product, while keeping relevant information from the first life (e.g. BOM of retained materials/components and the related DPPs).

- A "Refurbishment Event" entry, with date and refurbisher ID.
- Updated assessment of the product's condition (e.g. cosmetic grade A/B/C).
- New performance metrics for components with variable lifespans (e.g. a battery's new state-of-health and cycle count).
- A list of any components that were repaired or replaced during the process (e.g. the tread rubber added when re-treading tyres).
- A new, clearly defined warranty period for the refurbished product.

— **Relevant ESPR requirement:** This action is central to enabling **reusability (c)** and **remanufacturing (l)**. By providing trusted, updated information, it formalises the second-hand market, increases consumer confidence, and allows the market to accurately price used goods based on their verified condition, not just their age.

5. Event: Component upgrading (by end-user or technician)

— **Trigger:** A user-replaceable component, such as computer RAM or a modular part of a smartphone, is upgraded.

— **Responsible actor:** End-user (on a voluntary basis) or a professional technician.

— **Data to be added to Life-cycle Log:**

- An "Upgrade Event" entry.
- Identifier of the new component installed.
- Date of installation.

— **Relevant ESPR requirement:** This supports **upgradability (c)** and **modularity**. While making this mandatory for users is impractical, the DPP architecture should *allow* for such voluntary updates. For professional upgrades, logging the event could be a condition of validating a new warranty. This creates a more complete picture of the product's current configuration, which is valuable for future repairs or resale.

6. Event: Transfer of ownership

— **Trigger:** The product is sold on the second-hand market (among previous and secondary consumer and business owners, in any combination).

— **Responsible actor:** Seller and/or buyer (facilitated by the platform/system).

— **Data to be added to Life-cycle Log:**

- An "Ownership Transfer Event," which may be anonymised (e.g. logging the transfer without recording personal data, simply invalidating the previous owner's primary access credentials). The initial owner would need to declare in writing to the second owner that all relevant (and possibly DA-mandated) events and acts during the use stage of item-level products or where mandated also for batch- and model-level DPPs have been recorded (i.e. no unauthorised “wild” self-repair etc.)
- Personal data from the use stage of the product would need to be removed to avoid privacy issues; this should be done without the consumer being required to know how this is done, i.e. automatically.

— **Relevant ESPR requirement:** While not a direct performance metric, managing ownership is crucial for the integrity of the Life-cycle Log. It ensures that the right to view sensitive data and authorise future updates is transferred to the new legitimate owner, which is essential for the entire system's security and trustworthiness, and that the DPP is up to date as to any relevant events during use.

7. Event: End-of-Life (EoL) Collection

— **Trigger:** The product is handed over to a recognised waste collection facility.

— **Responsible actor:** Waste collector or recycling facility.

— **Data to be added to Life-cycle Log:**

- An "EoL Reception Event".
- Date and location (facility ID) of collection.
- The intended treatment path (e.g. "preparation for partial/part reuse", "material recycling").

- The materiality information (and possibly further data) of the EoL product's DPP will feed into the new DPP (if foreseen) of the secondary material or reusable part for secondary life cycles (e.g. secondary steel, copper tubes from remelted clean copper scrap).

— **Relevant ESPR requirement:** This provides the final, crucial data point in the product's life cycle, "closing the loop." It creates invaluable data for authorities and producer responsibility organisations to accurately measure collection rates, verify recycling targets, and understand material flows, directly supporting objectives related to **expected generation of waste (p)** and **design for recycling (d)**.

Getting in touch with the EU

In person

All over the European Union there are hundreds of Europe Direct centres. You can find the address of the centre nearest you online (european-union.europa.eu/contact-eu/meet-us_en).

On the phone or in writing

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

— by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
— at the following standard number: +32 22999696,
— via the following form: european-union.europa.eu/contact-eu/write-us_en.

Finding information about the EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website (europa.eu).

EU publications

You can view or order EU publications at op.europa.eu/en/publications. Multiple copies of free publications can be obtained by contacting Europe Direct or your local documentation centre (european-union.europa.eu/contact-eu/write-us_en).

EU law and related documents

For access to legal information from the EU, including all EU law since 1951 in all the official language versions, go to EUR-Lex (eur-lex.europa.eu).

Open data from the EU

The portal data.europa.eu provides access to open datasets from the EU institutions, bodies and agencies. These can be downloaded and reused for free, for both commercial and non-commercial purposes. The portal also provides access to a wealth of datasets from European countries.

Science for policy

The Joint Research Centre (JRC) provides independent, evidence-based knowledge and science, supporting EU policies to positively impact society

Scan the QR code to visit:

Joint Research Centre
https://joint-research-centre.ec.europa.eu

Publications Office
of the European Union