DPP-related Data Management in the Furniture Sector

An Interdisciplinary Institutional Analysis towards a Governance Framework for Circular Economy-oriented Practices (Draft – Revolve WP2 working paper)

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sofia-Discussion Paper Nr. 26-3, Vers. 1.0 as of 01.10.2026

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Abbreviations

Art.	Article(s)
B2B	Business to business
B2C	Business to consumer
B2G	Business to government authorities and other public bodies
CE	Circular Economy (see Glossary)
CEBM	Circular economy business model(s)
CLP	Regulation (EC) 1272/2008 on classification, labelling and packaging of substances and mixtures
DPP	Digital Product Passport
EC	European Commission
ECOS	Environmental Coalition on Standards
EoL	End-of-life
EoW	End-of-waste (criteria)
EPRS	European Parliamentary Research Service
ESPR	Ecodesign for Sustainable Products Regulation (EU) 2024/1781
EU	European Union
GPSR	General Product Safety Regulation EU/2023/988
JRC	Joint Research Centre (of the European Commission)
MS	Member State(s)
NCEAP	New Circular Economy Action Plan, COM(2020) 98 final
NLF	New Legislative Framework
No.	Number
REACH	Regulation (EC) No 1907/2006 on Registration, Evaluation, Authorisation and Restriction of Chemicals
SoC	Substance of concern (as defined in Art. 2(27) ESPR)
SVHC	Substance(s) of very high concern (as defined according to Art. 57 and 59(1) REACH)

Glossary

Circular Economy	According to the "new Circular Economy Action Plan [NCEAP] - For a cleaner and more competitive Europe" (COM(2020) 98, p. 14) a Circular Economy aims at "preventing waste, increasing recycled content, promoting safer and cleaner waste streams, and ensuring high-quality recycling". Circular Economy responds to the problem statement in the Green Deal (COM(2019) 640, p. 7; NCEAP, p. 3): "half of total greenhouse gas emissions and more than 90% of biodiversity loss and water stress come from resource extraction and processing." With the aim of "keeping its resource consumption within planetary boundaries", the EU is pursuing a "strategy for a climate-neutral, resource-efficient and competitive economy", which simultaneously leads to "a toxic-free environment" (NCEAP, 3 and 14).
Circularity strategies	Everyday practices that contribute to a resource-preserving, low in toxicity and climate-friendly 'Circular Economy' (Circular Economy)
Collection	The gathering of waste, including the preliminary sorting and preliminary storage of waste for the purposes of transport to a waste treatment facility (Art. 3(10) WFD)
Consumer	any natural person who, in relation to contracts covered by this Directive, is acting for purposes which are outside that person's trade, business, craft or profession (Art. 2(2) Directive (EU) 2019/771, as referenced by Art. 2 ESPR.)
Customer	means a natural or legal person that purchases, hires or receives a product for their own use whether or not acting for purposes which are outside their trade, business, craft or profession (Art. 2(35) ESPR); the term thus includes private consumers as well as public or private procurers
Component	means "a product intended to be incorporated into another product" (Article 2(2)).
Data	see 'information needs'.
Disposal	Any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy. Annex I sets out a non-exhaustive list of disposal operations (Art. 3(19) WFD)
Digital Product Passport	means according to Article 2(28) "a set of data specific to a product that includes the information specified in the applicable delegated act (…) and that is electronically accessible". The ESPR intends to "accelerate the transition to a circular economy model" and to "support production and consumption patterns" in which "sustainable, circular, safe and non-toxic products and ma-terials should become the norm" (Recitals 1, 6 and 8, similar in Article 1(1)). In view of this regulatory approach, WP2 takes a future-oriented perspective. Rather than viewing the DPP primarily as a compliance instrument, WP2 conceptualises it as a product-linked dataset that enables actors to make the decisions that foster circular economy practices across the furniture ecosystem. This includes both mandatory and voluntary data points.
Durability	"the ability of a product to maintain over time its function and performance under specified conditions of use, maintenance and repair (Art. 2(22) ESPR).
Ecodesign requirement	A performance requirement or an information requirement aimed at making a product, including processes taking place throughout the product's value chain, more environmentally sustainable (Art. 2(7) ESPR)
Governance	a set of 'rules of the game' that specify the product related 'data management' under the ESPR
Intermediate product	"a product that requires further manufacturing or transformation such as mixing, coating or assembling to make it suitable for end-users" (Article 2(3)).
Information needs	refers to what actors require in the specific decision-making contexts, while 'data' refers to structured product-related elements that can be represented, exchanged and processed in DPP-related systems,
Information requirement	An obligation for a product to be accompanied by information as specified in Article 7(2) (Art. 2(9) ESPR)
Life cycle	The consecutive and interlinked stages of a product's life, consisting of raw material acquisition or generation from natural resources, pre-processing, manufacturing, storage, distribution, installation, use, maintenance, repair, upgrading, refurbishment and reuse, and end-of-life (Art. 2(12) ESPR)
Manufacturer	any natural or legal person that manufactures a product or that has a product designed or manufactured, and markets that product under their name or trademark (Art. 2(42) ESPR)
Performance requirement	A quantitative or non-quantitative requirement for or in relation to a product to achieve a certain performance level in relation to a product parameter referred to in Annex I (Art. 2(8) ESPR)

Preparing for re-use	Checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing (Art. 3(16) WFD)
Prevention	Measures taken before a substance, material or product has become waste, that reduce: (a) the quantity of waste, including through the re-use of products or the extension of the life span of products; (b) the adverse impacts of the generated waste on the environment and human health; or (c) the content of hazardous substances in materials and products (Art. 3(12) WFD)
Professional repairer	A natural or legal person that provides professional repair or maintenance services for a product, irrespective of whether that person acts within the manufacturer's distribution system or independently (Art. 2 (48) ESPR)
Recovery	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. Annex II sets out a non-exhaustive list of recovery operations (Art. 3(15) WFD)
Recycling	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 (Art. 3(17) WFD)
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 (Art. 2(23) ESPR)
Repair	means one or more actions carried out to return a defective product or waste to a condition where it fulfils its intended purpose (Art. 2(20) ESPR)
Re-use	Any operation by which products or components that are not waste are used again for the same purpose for which they were conceived (Art. 3(13 WFD)
Supply chain	All upstream activities and processes of the product's value chain, up to the point where the product reaches the customer (Art. 2(10) ESPR)
Upgrading	means actions carried out to enhance the functionality, performance, capacity, safety or aesthetics of a product (Art. 2(17) ESPR)
Value chain	All activities and processes that are part of the life cycle of a product, as well as its possible remanufacturing (Art. 2(11) ESPR)
Waste hierarchy	The following waste hierarchy shall apply as a priority order in waste prevention and management legislation and policy: (a) prevention; (b) preparing for re-use; (c) recycling; (d) other recovery, e.g. energy recovery; and (e) disposal (Art. 4(1) WFD)
Waste management	The collection, transport, recovery (including sorting), and disposal of waste, including the supervision of such operations and the after-care of disposal sites, and including actions taken as a dealer or broker (Art. 3(9) WFD)
Waste	Any substance or object which the holder discards or intends or is required to discard (Art. 3(1) WFD)

1
Introduction

This document presents the first part of an analysis within Work Package 2 (WP2) of the R-evolve project.[1] WP2 aims to develop a Governance Framework for DPP-related data management in the furniture sector. The analysis addresses the Digital Product Passport (DPP), as set out by the Ecodesign for Sustainable Products Regulation (ESPR).[2] It examines which governance mechanisms are needed for the management of product-related data in order to support Circular Economy-oriented practices. The findings provide the basis for developing the Governance Framework.
This document is a draft and covers only the first part of the analysis. It comprises the introduction and the target state analysis; the subsequent analytical steps and the resulting Governance Framework will be addressed in later drafts and publications of the report.
Key terms used in this report are defined in the glossary; where necessary for the argument, selected terms are introduced in the relevant sections.
Section 1.1 describes the problem constellation, leading to the research question presented in Section 1.2. Section 1.3 then describes the methodological approach used for the analysis.

1.1
Problem constellation

Furniture are essential everyday products. They influence the way people live and work, as well as how they use their spaces. However, the sector also causes significant environmental impacts, which are addressed within the European Union's policy agenda and the related legal framework (see Section 1.1.1). The outlined transformation to achieve a more sustainable future makes additional systemic innovation in the sector necessary (Section 1.1.2). To this end, the availability, accessibility and use of product-related information across value chains are critical prerequisites, especially for enabling Circular Economy practices. This gives rise to governance challenges, particularly with regard to data management (Section 1.1.3).

1.1.1
Environmental impacts of furniture and policy drivers for circularity

The furniture sector is associated with considerable environmental impacts, notably related to resource use, emissions during production processes, use and end-of-life phase (Faraca et al. 2024; Vanacore 2021; Saes et al. 2024). Against this background, furniture is identified as a priority product group under the ESPR Working Plan.[3] This prioritisation reflects both the sector's environmental relevance and its potential for improvement (see Box 1).

Box 1: Furniture a priority product group under the ESPR

The "ESPR preliminary study on new product priorities" (Faraca et al. 2024) by the Joint Research Centre of the EU (JRC) provides the scientific basis for specifying priority product groups and requirements under the ESPR. It assessed a wide range of end products and intermediate products as well as horizontal requirements relevant to all product categories using criteria such as environmental impacts, improvement potential through design measures, market relevance and policy alignment. Based on this multi-criteria evaluation, the study established a shortlist of product groups that offer both significant environmental impact and high potential for circularity improvements. In doing so, it informed the development of the ESPR Working Plan and highlights key areas where regulatory intervention, including product design requirements and information provisions, can most effectively support the transition towards a more circular economy.

[1] Details on the project can be found under https://r-evolve.eu/.

[2] In this document Articles, Recitals, Annexes, Titles without further specification are those of the ESPR.

[3] European Commission 2025 (Ecodesign for Sustainable Products and Energy Labelling Working Plan 2025-2030, COM(2025) 187 final).

The JRC study (Faraca et al. 2024, p. 62) identifies furniture as one of the key priorities:
"Furniture exhibited a high improvement potential in terms of waste generation and lifetime extension, which could be improved by performance requirements on design for durability, design for reliability (e.g. resistance to stress or weathering), design for disassembly, design for refurbishing and/or recyclability, availability of spare parts and mandatory minimum recycled content materials. These circularity measures have the potential to extend the lifetime of the product or its components, potentially saving on new resources, and therefore having an effect on other categories such as air, soil and biodiversity."

The ESPR is embedded in the EU's broader Circular Economy policy framework, including the European Green Deal[4] and the Circular Economy Action Plan.[5] Its Circular Economy orientation has been further continued and operationalised in more recent EU policy initiatives, such as the Clean Industrial Deal[6] and the Single Market Strategy.[7] This policy trajectory indicates that the intended transition is not limited to incremental efficiency improvements within existing linear value chains. Rather, it is directed towards broader Circular Economy-oriented practices, reflected in the Clean Industrial Deal's ambition to make the EU "the world leader on circular economy by 2030" and to ensure that products containing valuable and scarce materials are "(re-)used efficiently and for as long as possible before they become waste" (European Commission 2025, COM(2025) 85 final).

1.1.2
System innovation as a prerequisite and opportunity for a Circular Economy

Current practices in the furniture sector remain largely organised around linear value chains in which products are manufactured, sold, used and eventually disposed of. Neither long product lifetimes nor the high-quality recovery of materials are systematically supported by current market structures, organisational practices and existing infrastructures. Consequently, actors adapt their business practices to these prevailing system conditions, thereby reinforcing shared expectations regarding what is technically, organisationally and economically feasible (Vanacore et al. 2021; CEO 2026a).[8]

This implies that a circular transition cannot be achieved through minor adjustments within existing linear structures. Rather, it requires system innovation[9] across the entire value chain, including coordinated changes in technologies, product design, business models, actor relationships, supply-chain collaboration, policy frameworks, organisational routines and information infrastructures (Geels 2004; Vanacore et al. 2021; Manshoven et al. 2026). From this perspective, Circular Economy-oriented business practices shift value creation away from one-off product sales towards maintaining product, component and material value across multiple life cycles.[10]

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4 European Commission 2019 (The European Green Deal, COM/2019/640 final).

5 European Commission 2020 (A new Circular Economy Action Plan For a cleaner and more competitive Europe, COM(2020) 98 final).

6 European Commission 2025 (The Clean Industrial Deal: A joint roadmap for competitiveness and decarbonisation COM/2025/85 final).

7 European Commission 2025 (The Single Market: our European home market in an uncertain world, COM(2025)500).

8 CEO (2026a, p. 75) emphasises that transitioning to a circular economy requires overcoming entrenched resistance at multiple levels. Internally, organisations may face inertia from established linear processes; upstream, the shift can disrupt existing value propositions; downstream, changing customer habits and preferences requires concerted effort and engagement.

9 The term system innovation is used here in line with Geels' socio-technical understanding of system innovation as a large-scale transition in the way societal functions are fulfilled. Such systems include not only technologies, but also regulation, user practices, markets, infrastructures, maintenance networks and supply networks (Geels 2004). R-evolve Deliverable D1.1 uses the related project-specific term "Product-System Innovation" to describe the systemic reconfiguration required to shift from a linear to a circular furniture economy, including product design, supply chains, business models, user practices, end-of-life processes and digital systems.

10 The Swedish transfer organisation RISE describes this under the heading "System innovation /Circular transition" as "Business Model Innovation for the Circular Economy" with the following explanation: "By basing business models and value propositions on a circular logic, companies can reduce their environmental impact while strengthening their business. Instead of producing material products with primary resources and offering these via linear sales, companies can invest in creating, delivering and capturing value based on circular principles." RISE (2024).

Within this broader transition logic, the ESPR can be understood as a regulatory instrument that contributes to changing the framework conditions for product-related economic practices, with the explicit aim "to make sustainable products the norm" (Article 1(1)). To this end, Article 5(1) sets out 16 product aspects that are to be improved through the delegated acts for various product groups under this legislation. These 'product aspects' reflect the R-Strategies (Kirchherr et al. 2017), which include reliability, reusability, repairability, and refurbishment. To put these into practice, it is necessary to adapt novel design strategies, integrate new actors into the product lifecycle and facilitate coordination and exchange along value chains (CEO 2026a). This raises the question of how actors in the furniture sector can develop and adopt new forms of collaboration to enable Circular Economy-oriented business practices – both beneficial for the environment as well as the involved actors.

1.1.3
From information deficits to governance challenges: data management practices for circular furniture value chains

From a systemic perspective, the transition towards circular furniture value chains depends, among other factors, on the availability and accessibility of product-related information across organisational and geographical boundaries (Steinwender et al. 2024; Klint et a. 2024; Dalipi et al. 2026). However, those involved in the value chain often lack access to relevant information on materials, product characteristics, production processes and environmental performance (Walden et al. 2021; Jensen et al. 2023): A lack of information prevents product designers from selecting materials and supplier components that support product durability, repairability, recyclability and improved environmental performance. It also complicates repair, refurbishment and reuse services and limits high-quality recycling, and constrains customers'[11] ability to select more circular and environmentally preferable products and to make use- and end-of-use decisions that keep products in use or direct them into circular pathways.

These actor-specific information deficits arise from the sector's global multi-tier supply chains, fragmented organisational information systems and established practices of selective data sharing. They reflect a double dependency structure: manufacturers and brands depend on upstream suppliers for material-, component-, process- and environmental-performance information, while actors in after-sales, repair, refurbishment and recycling depend on product-related information being made accessible beyond the point of sale. Customers add a further information dependency, as they rely on product-related information being provided by different actors across the value chain and over the product lifecycle. This creates a structural tension between data generation, control and use across the value chain (Psarommatis & May 2024; Chawla et al. 2026).

In response to these structural information deficits, the DPP as set out in the ESPR can be understood as a key instrument for collecting, managing and sharing product-related information along the value chain (see Box 2).

Box 2: Digital Product Passport as product-specific dataset and value-chain information instrument

According to Article 2(28) the term 'digital product passport' means "a set of data specific to a product that includes the information specified in the applicable delegated act (…) that is accessible via electronic means (…)".

This definition has to be read in light of the broader function assigned to product-related data in the ESPR. Recital 3 emphasises that common ecodesign requirements should provide industry and consumers with access to reliable and clear data, thereby allowing for more sustainable choices and supporting the development and scaling-up of new circular economy business models. Recital 32 further describes the DPP as an important tool for making information available to actors along the entire value chain, enhancing end-to-end traceability and enabling different actors to access, introduce or update relevant data.

[11] In line with Article 2(35) ESPR, this report uses the term 'customer' as the overarching term for natural or legal persons purchasing, hiring or receiving products for their own use. It therefore includes private consumers as well as business and public-sector customers. Where the ESPR specifically refers to 'consumers', that terminology is retained when describing the respective legal provision.

Article 10(2) further provides that, where other Union law requires or allows the inclusion of specific data in the DPP, those data may be included pursuant to the applicable delegated act. This indicates that the DPP may also function as an interface for product-related information requirements beyond the ESPR context.

Taken together, Article 2(28), Article 10(2) and Recitals 3 and 32 frame the DPP as a product-specific dataset and value-chain information instrument that can support Circular Economy-oriented business practices across the future furniture ecosystem. Figure 1 illustrates this envisaged ecosystem and the role of DPP-related data management.

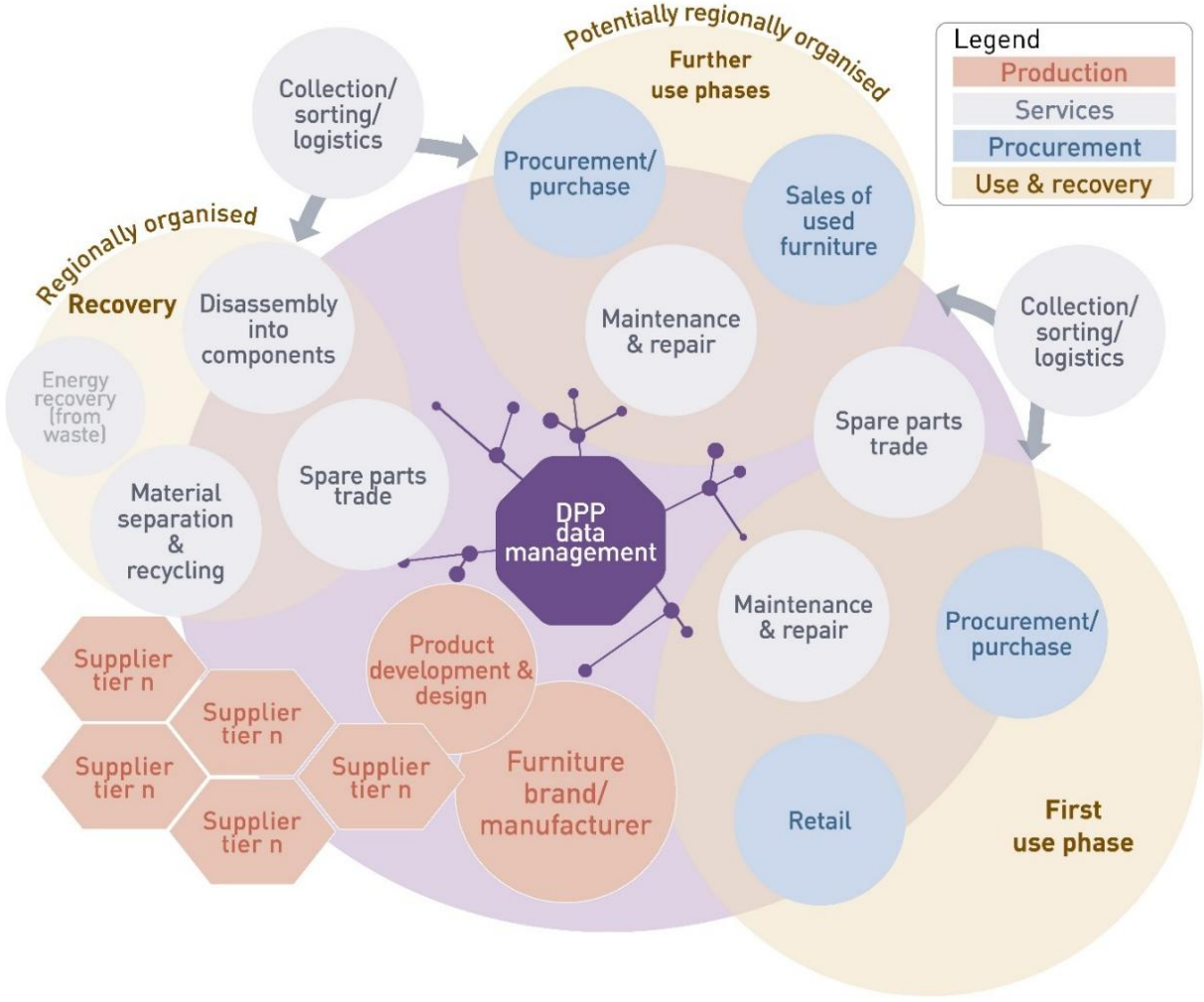


Figure 1: Future circular furniture ecosystem

In this context, DPP-related data management is not only a technical question, but also a question of coordinating product-related data flows to support Circular Economy-oriented business practices across actors and lifecycle stages. It requires clarity on which product-related data are needed, which actors provide or use them, and under which conditions these data can be made available, accessed, shared, verified, updated and trusted in an interoperable form across the value chain (Jensen et al. 2023). Such data management has an inherent governance dimension, as it requires mechanisms that coordinate the roles, responsibilities and interactions of actors during data sharing across organisational boundaries (Langley et al. 2023).

1.2 Key question

Against the background of the problem constellation outlined above, this analysis focuses on DPP-related data management as a prerequisite for Circular Economy-oriented business practices in the furniture sector. The preceding section has shown that such practices depend on product-related information

that is available, accessible, usable and trustworthy across the value chain. However, the current system is characterised by fragmented information flows, limited data availability and a lack of shared practices for generating, managing and using product-related information. The central governance challenge is therefore to reshape these information practices so that product-related data can fulfil this enabling across the furniture value chain.

In this context, the central question of this analysis is:

How should governance mechanisms for managing DPP-related data be designed to enable actors in the furniture sector to establish Circular Economy-oriented business practices in line with the ecodesign requirements of Article 5(1) ESPR and the associated information requirements under Article 9 et seq. ESPR?

This question addresses a problem constellation that can be analytically decomposed into two interrelated dimensions:

1. What requirements for the underlying data, structure and management of a DPP-related data set arise from actors' information needs for enabling Circular Economy-oriented business prac-tices in the furniture sector?
2. Which governance mechanisms are required to enable the generation, sharing and use of these data, to close existing data gaps, incentivise productive collaboration and foster mutual trust among actors with regard to data quality?

Particular attention is paid to how sufficient confidence in the quality of DPP data can be created and maintained among actors in the furniture value chain, as such confidence is necessary for actors to rely on these data in circular decision-making.

1.3 Methodological approach: actor-centred institutional analysis

To address the research question outlined above, this analysis follows the logic of an actor-centred institutional analysis. The Interdisciplinary Institutional Analysis provides a behaviour-oriented analytical approach for systematically linking normative goals with real-world actor constellations (Bizer & Führ 2015). It was developed by the Society for Institutional Analysis (sofia research group) and draws on approaches from different disciplines, including classical and institutional economics, social psychology, sociology and legal analysis. It provides a framework for examining the organisational and institutional contexts in which relevant actors operate.

Applied to this analysis, the institutional approach proceeds in four analytical steps. First, the analysis translates the normative objective of enabling Circular Economy-oriented business practices in the furniture sector into a future-oriented target state for DPP-related data management. Second, it examines current data management practices in the furniture value chain as the status quo. Third, the target state is contrasted with the status quo in a delta analysis. Fourth, the identified delta provides the basis for deriving governance mechanisms for DPP-related data management.

The actor-centred perspective is essential throughout these steps. It directs attention to the actors whose contributions are necessary for future Circular Economy-oriented business practices, to the decisions they have to make, to their dependencies on product-related information, and to the organisational and institutional conditions that shape their ability and willingness to generate, share and use DPP-related data.

The analysis is based on a qualitative assessment of legal and policy documents, project-internal scenario work, scientific literature, practice-oriented publications and available sector-specific studies on circular furniture practices, DPP data requirements and data management practices. It is being complemented by expert input and guide-based interviews with selected actors from the furniture value chain. These inputs are used to check the plausibility and completeness of the identified actor roles, information needs, data gaps, behavioural factors and governance mechanisms, and to refine the analysis iteratively. Findings from later steps may therefore lead to adjustments in the formulation of the target state, the status quo description or the derived governance mechanisms.

This report includes only step one: the target-state analysis with the regulatory baseline and the analysis of future-oriented use cases (see chapter 2). The aim of this step is to identify the product-related information that actors need in a future circular furniture ecosystem for Circular Economy-oriented practices

and the DPP-related data that must be generated, shared, updated and made usable to provide this information. It therefore asks which information is needed by which actors, for which decisions, from whom, when and in what form, and which DPP-related data requirements follow from these information needs.

For this analysis, a distinction is made between 'data' and 'information'. This distinction is important because the target-state analysis starts from actor-specific information needs and then derives DPP-related data requirements. Box 3 sets out the terminology used in this analysis.

Box 3: Terminology 'data' and 'information' (based on ISO/IEC 2382:2015/2025)

The definition of the DPP in Article 2(28) includes the terms "set of data" and "information", but does not provide any further explanations.

In this document, 'data' refers to the entries in the specific data fields of the DPP dataset. 'Information' refers to the perspective of the dataset's recipients and the decision-making function that the data enables.

This distinction is in line with the relevant ISO/IEC 2382:2015[12] standard. According to this standard, 'information' is defined as "knowledge concerning objects (such as facts …) that within a certain context has a particular meaning (2121271)", while 'data' is defined as "reinterpretable representation of information in a formalised manner suitable for communication, interpretation, or processing" (2121272); in essence:

- Data = characters, values, codes, measurements, files
- Information = what this data means in a specific context

The target-state analysis proceeds in three stages.

First, the analysis reconstructs the regulatory target state for DPP-related data management. This target state is centred on the ESPR, but is considered in the broader EU product-policy context because this context shapes the future role of the DPP as a product-related data infrastructure. This includes both the possible inclusion of data required or permitted under other Union law and wider efforts to digitalise and harmonise product-related information flows. The purpose of this step is to derive from the regulatory target state the requirements for a future circular furniture ecosystem and to clarify what these requirements imply for the generation, sharing, access to, updating and use of product-related data.

Second, the analysis translates this regulatory target state into future-oriented use cases. This translation is necessary because the regulatory framework provides the normative orientation for DPP-related data management, but does not specify in operational terms how data flows between actors should function to enable and stimulate future Circular Economy-oriented practices of actors in the value chain. The use cases therefore operationalise the target state by describing practice-based decision situations in which DPP-related data become relevant.

The future-oriented character of the use cases draws on the overall target-state orientation developed in the R-evolve scenario process (Kleihauer & Führ 2025). The use cases do not merely describe current practices. Rather, they describe intended Circular Economy-oriented practices of the actors in the value chain, future actor interactions and the information flows required within a circular furniture ecosystem. The use case approach is in line with the JRC methodology for defining DPP data requirements (Chawla et al. 2026), which uses use cases to identify and structure data needs for DPPs. In this analysis, use cases represent typical and policy-relevant situations in which actors require product-related information to perform specific actions or decisions. Methodologically, each use case is analysed by identifying the relevant actors, the decision points at which product-related information is required, the actor-specific information needs and dependencies, and the corresponding data requirements (granularity, credibility/traceability, usability, lifecycle relevance/updateability).

The findings are then subsequently consolidated in into a cross-case to identify recurring patterns and overarching requirements across the use cases. Recurring information needs are consolidated into broader information-need clusters from the actor- and decision-specific perspective of the use cases. For

[12] ISO/IEC 2382 is the fundamental IT vocabulary of ISO and IEC (https://www.iso.org/standard/63598.html: the 2015 edition "was last reviewed and confirmed in 2025").

each information need, the underlying DPP-related data required to provide the respective information are identified and, where necessary, further specified. In doing so, actor- and decision-specific information is distinguished from the formalised data entries, records, files and relationships through which that information can be provided. This clustering retains the decision-oriented perspective of the use cases: information needs are grouped according to the decision functions they support, irrespective of whether they rely on the same or different underlying data. Afterwards the underlying DPP-related data are analysed across these information-need clusters and consolidated into recurring data families. These are grouped according to similarities in their underlying data unit, reference object, allocation and lifecycle characteristics. In this way, the cross-cutting identifies data that recur across different information needs and distinguishes data families according to their structural and lifecycle characteristics. The resulting data families are assessed against the identified requirements (granularity, credibility/traceability, usability, lifecycle relevance/updateability) and analysed in terms of their relationships and their contribution to actor- and decision-specific information through direct use, linking, aggregation or contextualisation. The resulting analysis identifies the reference points, allocation logic, relationships and update logic required for DPP-related data management.

Third, the findings from the regulatory analysis and the use cases are synthesised at system level. This synthesis integrates the regulatory requirements with the identified DPP-related data, relationships, actor dependencies and data origins derived from the use cases to develop a common target-state framework for DPP-related data management for the future circular furniture ecosystem.

In this way, the target-state analysis moves from individual decision situations to a structured system-level description of DPP-related data requirements. In contrast, an analysis based solely on the status quo would risk reproducing existing data routines and would therefore be insufficient for identifying the information needs of future Circular Economy-oriented business practices. The system-level description resulting from this step provides the reference point for the subsequent status quo and delta analyses.

2
Target-state analysis: DPP-related data management for a future circular furniture ecosystem

In light of the envisaged transition of the furniture sector outlined in Section 1.1 and the pivotal role of data management in enabling a circular furniture ecosystem, as visualised in Figure 1 on page 10, this chapter addresses the question: "What requirements for the underlying data, structure and management of a DPP-related data set arise from actors' information needs for enabling Circular Economy-oriented business practices in the furniture sector?"

Section 2.1 derives the regulatory baseline for DPP-related data management. Building on this Section 2.2 derives actor-specific information needs and underlying DPP-related data requirements. The analysis is structured around seven future-oriented use cases covering Circular Economy-oriented business practices in the furniture ecosystem. Section 2.3 brings together the regulatory baseline and the findings from the use-case analysis to define the target state for DPP-related data management.

2.1 Regulatory target state for DPP-related data management

This section examines the regulatory requirements and orientations for DPP-related data management from the ESPR and the broader EU product-policy context, focusing on their implications for the generation, sharing, access, updating and use of product-related data in the furniture value chain.

Section 2.1.1 briefly highlights the broader regulatory context, including the ongoing work on a 'European Product Act'. Section 2.1.2 discusses the functions of the DPP in light of the core elements of the ESPR. Section 2.1.3 brings together the findings from these two sections and derives the regulatory baseline for DPP-related data management.

2.1.1 Regulatory context: DPP as a 'digital container' for product-related data

The ESPR requirements are embedded in a broader field of product-related legislation.[13] Article 10(2) ESPR stipulates that where "other Union law requires or allows the inclusion of specific data in the digital product passport, those data may be included in the digital product passport pursuant to the applicable delegated act". In this way the DPP may gain the function of a 'digital container' for different compliance issues, as outlined in the 'Single Market Strategy' (COM(2025) 500 final, p. 10).

This broader context is relevant for the target-state analysis because EU product policy is increasingly moving towards the digitalisation, harmonisation and streamlining of product-related information flows. Under the label 'European Product Act' the European Commission[14] started in 2026 an initiative which potentially addresses emerging digital and circularity elements intended to strengthen and future-proof the Single Market. This initiative addresses the following legal frameworks:

- New Legislative Framework (NLF)[15] including Decision 768/2008/EC[16] and Regulation 765/2008/EC[17]
- Market Surveillance Regulation 2019/1020[18] and

[13] For a detailed analysis see the furniture case study in European Commission (Ökopol/RPA/sofia) 2020, INFORMATION FLOWS ON SUBSTANCircular EconomyS OF CONCircular EconomyRN IN PRODUCTS FROM SUPPLY CHAINS TO WASTE OPERATORS., p. 446 et seq.

[14] See the 2026 Commission work programme and annexes.

[15] See European Commission (Centre for Strategy & Evaluation services and Centre for Industrial Studies) 2022, Supporting Study for the evaluation of certain aspects of the New Legislative Framework, Luxembourg 2022, doi:10.2873/625443.

[16] Decision No 768/2008/EC of 9 July 2008 on a common framework for the marketing of products, and repealing Council Decision 93/465/EEC, OJ L 218, 13.8.2008, pp. 82–128.

[17] Regulation (EC) No 765/2008 of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93, OJ L 218, 13.8.2008, pp. 30–47.

[18] Regulation (EU) 2019/1020 of 20 June 2019 on market surveillance and compliance of products and amending Directive 2004/42/EC and Regulations (EC) No 765/2008 and (EU) No 305/2011, OJ L 169, 25.6.2019, pp. 1–44 (consolidated version as of 23/05/2024).

- Standardisation Regulation 1025/2012.[19]

The European Commission has announced to publish a proposal for the European Product Act in Q3 2026.[20] If the European Commission continues to pursue this course of action consistently, more streamlined legislation could address interface problems between the legal frameworks. This would "reinforce fundamental elements that rule the Single Market, close loopholes, update important definitions, and make it easier for companies and market authorities to ensure products comply with EU regulations" (ECOS 2026). In this context, the growing volume of products sold online also has to be considered.[21]

To address these challenges, EU product legislation increasingly relies on digital solutions, as the current reliance on paper-based technical documentation limits the efficiency of compliance verification. The DPP aims to provide digital access to key product information required under EU product legislation, thereby supporting more efficient and more effective compliance checks and enforcement.[22]

A joint non-paper titled "The European Product Act as cornerstone of the Single Market" signed in May 2026[23] by the Netherlands, Finland, France, Poland, Portugal, and Sweden, "highlights the following priorities:

- Making the European product legislation framework future-proof: it is important that the European product framework is updated and future-proof. Alignment with related EU product legislation, enhancing consistency and introducing clear, uniform definitions are therefore essential.
- Further enhancing the use of digital tools and cooperation: it is essential to identify opportunities to improve data exchange and make better use of digital tools – such as the Digital Product Passport (DPP) and the EU Customs Data Hub – and to enhance cooperation at the European level.
- Further leveling the playing field in the Single Market: a level playing field across the Single Market is necessary for fair competition and consumer protection. European businesses express severe concerns about the level playing field, especially due to the large inflow of products from third countries (e-commerce). Addressing this challenge requires urgent and decisive action at the EU level."

The non-paper also asks to "integrate and fully reflect the horizontal aspects of the GPSR" (General Product Safety Regulation). Article 5 GPSR provides that "[e]conomic operators shall place or make available on the market only safe products." In conjunction with the provisions in the following Articles the GPSR provides overarching safety requirements for consumer products.[24]

These forthcoming developments highlight the importance of the data set communicated via the DPP as the 'single source of truth' for product related data. They also indicate that the DPP should not be understood only as an ESPR-specific dataset, but as part of a broader product-policy architecture in which product-related data are expected to support circularity, compliance verification, market surveillance, customs control and fair competition.

2.1.2 The DPP in light of the ESPR's core aims and regulatory instruments

This section examines how the ESPR frames the DPP within the regulatory target state for sustainable and circular products and derives the resulting requirements for DPP-related data management. With

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[19] Regulation (EU) No 1025/2012 of 25 October 2012 on European standardization, OJ L 316, 14.11.2012, pp. 12–33 (consolidated version as of 13/12/2024)

[20] See 2026 Commission work programme and annexes: Annex I (p. 2) announces for the "European Product Act" an "Update of the new legislative framework of product rules (legislative, Article 114 TFEU, Q3 2026)". Annex II (p. 7) lists the plan for an "Evaluation of the market surveillance and compliance of products Regulation Q4 2026".

[21] SWD(2022) 364 final/2, p. 20 f.; European Commission 2025, E-commerce: product compliance and safety, p. 1–2. See also Ashton 2026 (EPRS briefing on the European product act)

[22] Single market strategy (COM(2025) 500 final, p.11; Rukanova et al. (2026), p. 10 et seq.

[23] See Council of the European Union, 9568/1/26/REV 1 as of 27.05.206, p. 1-2; download https://data.consilium.europa.eu/doc/document/ST-9568-2026-REV-1/en/pdf.

[24] For a brief summary of the Regulation see https://eur-lex.europa.eu/EN/legal-content/summary/general-product-safety-regulation-2023.html.

the ESPR, the EU aims to achieve a fundamental change in production and consumption patterns. According to Recital 8, "sustainable, circular, safe and non-toxic products and materials should become the norm" (). Recital 3 states that the setting of ecodesign requirements will "enable the development, deployment and scaling-up of new circular economy business models throughout the internal market"(). Consequently, Article 1(1) sets out

"the aim of improving the environmental sustainability of products in order to make sustainable products the norm and to reduce the overall carbon footprint and environmental footprint of products over their life cycle".

The scope and the precise content of ecodesign requirements will be defined by delegated acts, adopted under Article 4, targeting individual product groups. According to the definition in Article 2(7) the term 'ecodesign requirement' means

"a performance requirement or an information requirement aimed at making a product, including processes taking place throughout the product's value chain, more environmentally sustainable".

The definition of the term 'value chain' refers to "all activities and processes that are part of the life cycle of a product, as well as its possible remanufacturing" (Art. 2(11) ESPR).

In conjunction with the definition of 'life cycle',[25] this means that the ESPR does not only address products at the point of placing them on the Union market, but also environmental impacts arising from the upstream production and assembling processes as well as downstream stages during and after the use phase. For DPP-related data management, this value-chain and lifecycle perspective is decisive: the relevant information must enable actors to address product-related requirements across these stages. Consequently, the DPP dataset needs to support information flows across the value chain and over the product lifecycle.

This value-chain perspective is reinforced by the ESPR's product-group logic. According to Article 2 (1), 'product' means any physical good that is placed on the market or put into service. Components and intermediate products are themselves defined as products under Articles 2 (2) and 2 (3). They may therefore become subject to ecodesign and information requirements where the relevant delegated acts address the respective product group, component or intermediate product.

Against this value-chain and lifecycle perspective, the DPP is not only a technical means of data sharing. Within the ESPR, it has an important compliance-related function. The ESPR intends to "accelerate the transition to a circular economy model" and to "support production and consumption patterns" in which "sustainable, circular, safe and non-toxic products and materials should become the norm" (Recitals 1, 6 and 8, similar in Article 1(1)). To this end, the 'no data, no market' principle under the ESPR requires all those who place products on the EU market to provide a DPP data set simultaneously. From this perspective, the main function of the DPP data set is to demonstrate that the relevant product meets the 'information requirements'[26] set out in the delegated act.

At the same time, the ESPR frames the DPP as more than a compliance instrument. According to Recital 39, the "roll-out" of the DPP should be "supporting innovation" and be "in line with business models, markets and innovation" (Recital 41). The recitals also emphasise the intention to "accelerate the transition to a circular economy model" (Recital 2).[27] Therefore, the role of the DPP is not merely to provide evidence that a product complies with the information requirements. In fact, the legal text distinguishes between mandatory and voluntary data. According to paragraph 1 of Annex III, the delegated act "shall specify what data *are to or can be included* in the digital product passport" (emphasis

[25] According to Article 2 (12) the term 'life cycle' means "the consecutive and interlinked stages of a product's life, consisting of raw material acquisition or generation from natural resources, pre-processing, manufacturing, storage, distribution, installation, use, maintenance, repair, upgrading, refurbishment and reuse, and end-of-life".

[26] According to Article 2(9) 'information requirement' means an obligation for a product to be accompanied by information as specified in Article 7(2); for further explanations see Section 2.1.2.

[27] The term ‚transition' is used also in Recitals 1 ("urgent need to transition to a circular economy model"), 4 ("Union's overarching ambition to foster a 'twin transition' to climate neutrality and digital leadership"), 8 ("the transition to a circular economy can provide solutions to address the current environmental challenges and the economic crisis"), 10 ("transition to a non–toxic circular economy"), 100 (refering to the role of public procurement in "transitioning to a circular economy").

added). Given that the specifications for the data points in the delegated act allow this, innovative companies are able to provide additional data in the DPP in support of ambitious Circular Economy-oriented business practices.

In view of this regulatory approach, this document takes a forward-looking perspective. Rather than viewing the DPP primarily as a compliance instrument, it conceptualises it as a product-linked dataset that enables actors to make the decisions that foster Circular Economy-oriented business practices across the entire furniture sector.

Box 4: DPP as an enabling factor for Circular Economy-oriented business practices

When this document refers to the DPP and its dataset, it encompasses all functions relating to the ESPR (both mandatory and voluntary) and other product-related regulatory frameworks. The DPP is considered an instrument that can facilitate Circular Economy -oriented business practices across the furniture ecosystem.

It should be noted, however, that the data quality requirements do not distinguish between data that are a mandatory part of the dataset and data that are added on a voluntary basis. According to the legal text, the requirements set out below apply to both.

In view of the DPP's role in enabling for Circular Economy-oriented business practices, three regulatory elements are particularly relevant: (1) performance requirements, (2) information requirements and (3) the related market entry conditions based on the "no data, no market" principle. These conditions ensure that a dataset is provided for each product affected by the implementing act. This allows all actors in the supply and value chains to make informed purchasing decisions and enables the competent authorities to verify conformity with ecodesign requirements.

(1) In terms of performance requirements, and "[i]n order to address environmental impacts" Article 5(1) sets the overarching objectives for products placed on the EU market, aligned with Circular Economy principles.[28] They are also referred to as 'R-Strategies' and include inter alia durability, repairability, re-usability, upgradability, remanufacturability, recyclability, recycled content, and the avoidance of substances of concern (SoC). DPP data must therefore enable all relevant actors to assess, verify, and act upon these product aspects throughout the product's life cycle.

(2) According to Article 7(2)(a) the information requirements "shall include, as a minimum, requirements related to the digital product passport set out in Chapter III [i.e. Articles 9 to 15] and requirements related to substances of concern set out in paragraph 5". Articles 9 and following in conjunction with ESPR's Annex III define the DPP's scope, structure, and future content, as well as the obligations for economic operators.[29] These provisions will be specified by delegated acts, which will determine what information must or can be generated, collected, updated, and made accessible. Article 9(2) further requires the delegated acts to specify key elements of the DPP. This includes, in particular, the level at which the DPP is to be established – model, batch or item – and the definition of these levels (Article 9(2)(d)), as well as the actors that are to have access to DPP data and the data to which they are to have access (Article 9(2)(f)). However, the ESPR leaves the specific operational arrangements open.

Article 9(3) makes explicit that the DPP shall contribute to achieving the product performance objectives in Article 5, creating a direct functional link between the data to be provided and the Circular Economy outcomes defined in the 'R-Strategies' in terms of the environmental performance of the product.

This means that the traceability of products, components and its materials is a key component of the future Circular Economy as set out in Article 1(1). For further explanation of the regulatory intention,

[28] Annex I complements the product aspects listed in Article 5(1) by specifying product parameters that may provide the basis for performance and information requirements in delegated acts.

[29] For details in this respect see Annex A.

see Recitals 32, 36, 39, 73 and the provisions in Article 9(3)(c),[30] Annex V point 4.[31] In terms of the material composition, Recital 31 provides the following reasoning:

[REACH and CLP] "already ensure communication on hazards to health or the environment posed by certain substances of concern on their own or in a mixture. Users of substances and mixtures should also be provided with pertinent information. Furthermore, users of products other than substances or mixtures, and managers of waste from such products, should also receive relevant information, including information primarily related to the hazards of chemicals to health or the environment. Therefore, this Regulation should provide for the setting of requirements related to the tracking and communication of sustainability information, including the presence of substances of concern in products throughout their life cycle, also with a view to the decontamination and recovery of such products when they become waste. Such a framework should aim to progressively cover the substances of concern in all products listed in working plans to be adopted by the Commission. Such requirements concerning the tracking of substances of concern should be included by default where an information requirement is to be set under this Regulation, except when such an information requirement is part of horizontal ecodesign requirements. In order to take into account the criteria to be met by ecodesign requirements, and in particular to avoid a disproportionate administrative burden for economic operators, the Commission should be able, as appropriate for the product group concerned, to set thresholds on the concentration of substances in the product or relevant components triggering the tracking requirement, set differentiated application deadlines and, in duly justified cases, provide derogations from the tracking requirement."

Following these considerations, Article 7(5) provides a specific legal basis for tracking substances of concern across the product life cycle. In any case, data on SVHC are to be included for every component in which an SVHC is present above a concentration above 0.1%.[32]

Taken together, the ESPR identifies six core categories of substantive data relevant to DPP-related data management,[33] as listed in the following box.

Box 5: Substantial content related data categories set out in the ESPR

According to the ESPR provisions identify the following substantial data categories that may form part of the DPP dataset, subject to specification in the applicable delegated act:

- data providing information on product performance in relation to the 'product aspects' listed in Article 5(1) based on the relevant product parameters set out in ESPR Annex I, including, for example, durability, repairability, recyclability, recycled content, the presence of substances of concern and environmental impacts, including carbon footprint and environmental footprint;
- specific data required for tracking substances of concern throughout the product lifecycle, including substance identification, location and concentration (Article 7(5));
- data enabling correct use, maintenance, repair and end-of-life treatment (Article 7(2)(b));
- data for the identification of the product and contact details of responsible actors (Article 29(3) and Annex III ESPR).
- data required under other Union law applicable to the relevant product group (Annex III ESPR)
- DPP-specific metadata on access rights, update responsibilities, and the level of provision (model, batch, item) (Article 9 and Annex III ESPR).

Annex A provides a list of content-related data points.

[30] With the wording „improve the traceability of products along the value chain."

[31] With the wording "Object of the declaration (description of the product sufficient for its unambiguous identification and allowing traceability; it may, where necessary for the identification of the product, include an image)".

[32] This follows from Article 7(5) point c) which sets out the minimum informations requirement as follows "the concentration, maximum concentration or concentration range of the substances of concern, at the level of the product, *its relevant components, or spare parts*" and Article 7(6) point b) clause 2 which sets out „substances of concern within the meaning of Article 2(27), point (a), shall not be exempted if they are present in products, their relevant *components* or *spare parts* in a concentration above 0,1 % weight by weight" (emphasis added).

[33] For details in this respect see Annex A.

In addition to these content-related data categories, the ESPR establishes normative requirements in order to enable effective and efficient data management. The relevant provisions specify the quality and usability of the DPP dataset, as summarised in the following box.

Box 6: Data management requirements set out in the ESPR

According to the ESPR provisions, the economic operator responsible for the DPP dataset must assure the following data quality requirements:

- the data in the DPP should be accurate, complete and up to date (Article 9(1));
- actors should be able to easily access and understand product information relevant to them; this requires differentiated access rights to DPP data according to the actors concerned and the data to which they are to have access (Article 9(3)(a)), Article 9(2)(f));
- the information provided through the DPP supports the verification of compliance with applicable product requirements (Article 5(12), Article 9(3)(b));
- the data exchange shall be based on open standards, facilitated through an interoperable format and APIs, and shall be, as appropriate, machine-readable, structured, searchable, and transferable through an open interoperable data exchange network without vendor lock-in (Article 10(1)(d))
- the DPP and the corresponding information shall be available for at least the expected lifetime of a specific product (Article 9(2)(i). The exact period for which the DPP has to be available will be specified in the delegated acts (Art. 11(e)).

(3) In terms of market entry conditions, Article 27(2) links the DPP to the declaration of conformity, making timely and accurate data provision a condition for placing products on the market ("no data, no market"). This creates a binding requirement for the completeness of all mandatory data points and the accuracy of the entire DPP dataset at the point of market entry. This applies to both economic operators who place final products on the market and supply chain actors. The conformity declaration via the DPP is highly relevant (a) for furniture manufacturers and (b) for market surveillance activities.

(a) Since the final furniture product is usually assembled from a set of components, it is essential that each component supplier uses the DPP dataset to demonstrate that the parts they are delivering are fully compliant. According to Article 38(a), they must therefore "provide, upon request and free of charge, manufacturers (…), with available relevant information related to the products they supply or the services they provide". The same applies to suppliers of intermediate products. Since the furniture manufacturer is responsible for the assembled product, they have a strong interest in ordering components and materials that fulfil all legal requirements. They can also select suppliers that offer parts that meet their own level of ambition. In this way, not only are the downstream recipients in a position to make informed decisions with a view to advanced Circular Economy-oriented business practices, but they also act as the first line of compliance checks.

According to the underlying logic, the transparency and traceability provided by the DPP data set help to achieve the aim set out in Article 1(1).

(b) From a market surveillance perspective, Article 38(c) sets out that

"supply chain actors shall (…) enable notified bodies and competent national authorities to verify the accuracy of relevant information related to their activities."

This can be considered the second line of compliance checks.

Taken together, the ESPR frames the DPP as more than a dataset for documenting compliance with mandatory information requirements. It combines compliance, verification and Circular Economy-enabling functions and applies this broader understanding to both mandatory and voluntary data included in the DPP dataset. In this sense, the DPP plays a crucial role in enabling all actors in the value chain to orient their actions towards the objectives of the Circular Economy.

2.1.3 Regulatory baseline for DPP-related data management

This section brings together the findings from Sections 2.1.1 and 2.1.2 and derives the regulatory baseline for DPP-related data management. The broader EU product-policy context shows that DPP-related data management must be able to connect different product-related requirements and decision contexts

across the furniture value chain. The ESPR, in turn, frames the DPP as an instrument that supports compliance, enables verification and provides the information basis for actor-specific Circular Economy-oriented decisions across the value chain and over the product lifecycle.

Against this broader regulatory background, the ESPR framework provides two central elements for specifying DPP-related data requirements. The ESPR defines content-related data categories, summarised in Box 5 and further detailed in Annex A to this report. At the same time, it defines formal requirements specifying data quality, access to data and overarching usability, summarised in Box 6 Together, these elements show that DPP-related data management is not limited to the existence of data fields. It also concerns whether product-related data are capable of supporting information on the product aspects and product parameters addressed by the ESPR, as well as the quality, accessibility, interoperability, granularity, availability and organisational handling of DPP-related data. Box 7 summarises the resulting ESPR-derived baseline conditions for DPP-related data management.

Box 7: ESPR-derived baseline conditions for DPP-related data management

The following data properties provide baseline conditions for DPP-related data management.

1. **DPP-related data must be capable of providing information on the product aspects and product parameters addressed by the ESPR.** This means that the dataset must be able to represent product-related information relevant to the product aspects listed in Article 5(1) and the product parameters specified in ESPR Annex I. This includes, for example, information on durability, repairability, reusability, recyclability, substances of concern, recycled content, environmental impacts, material composition, use, maintenance, repair and end-of-life treatment, where these aspects are specified for the product group concerned.
2. **DPP-related data must be accurate, complete and up to date.** This means that the data and the information derived from them have to be sufficiently reliable for the decision, verification or compliance purpose they support, and that responsibilities for providing, updating and maintaining data need to be clearly assigned. This applies to mandatory data as well as to data included on a voluntary basis.
3. **DPP-related data must be available for products, components and intermediate products.** Components and intermediate products are themselves defined as 'products' in Articles 2(2) and 2(3) ESPR. Where applicable information requirements are specified in the delegated acts, a DPP-compatible dataset must be available.
4. **DPP-related data must be accessible according to actor roles and decision needs.** Access does not imply that all actors require the same information. Rather, data access needs to follow a role-based logic in which actors can retrieve the information necessary for their specific function, while confidentiality, security and legitimate restrictions are respected.
5. **DPP-related data must be structured, machine-readable and interoperable.** Relevant data need to be available in a form that can be processed across organisational systems and connected to other product-related information flows.
6. **DPP-related data must be provided at the level of granularity required for the respective purpose.** Depending on the decision, verification or lifecycle context, this may require data at model, batch or item level. The relevant level of granularity has to be specified in the delegated acts for the respective product group.
7. **DPP-related data must remain available and usable over time.** Since Circular Economy-oriented business practices extend beyond the point of placing a product on the market, data need to support later lifecycle stages, including use, maintenance, repair, reuse, refurbishment, recycling, compliance verification and market surveillance.

Taken together, these baseline conditions indicate what DPP-related data management must provide in order to support Circular Economy-oriented business practices. This is directly linked to the ESPR's explicit[34] objective of fostering a transition towards sustainable and circular production and consumption patterns. Such a transition implies new forms of interaction and information exchange across the value

[34] See, e.g., Recitals 1, 2, 4, 8, 10 and 100 ESPR, as well as Article 1(1). Recital 10 refers to the Union's objective of staying within planetary boundaries and identifies enabling conditions for priority objectives, including the transition to a non-toxic circular economy.

chain. The baseline conditions therefore form the normative reference point for the subsequent use case, status quo and delta analyses.

2.2 Use case analysis: Future practices and related information needs

Building on the regulatory baseline developed in Section 2.1, this section analyses which information flows are needed to enable Circular Economy-oriented business practices in the future furniture ecosystem visualised in Figure 1. It does so through a forward-looking, use-case-based analysis.
Section 2.2.1 describes the selection of the use cases. Section 2.2.2 explains the analytical structure. Sections 2.2.3 to 2.2.9 analyse the individual use cases according to this structure. The consistent structure enables a systematic derivation of actor- and decision-specific information needs, the underlying DPP-related data, and case-specific requirements concerning these data and the information they enable. Section 2.2.10 consolidates the findings across the use cases and identifies recurring information needs and the underlying DPP-related data. These findings provide the use-case-derived basis for the synthesis with the regulatory baseline in Section 2.3.

2.2.1 Selection of the use cases

The selection of the use cases is guided by the systemic perspective introduced in Section 1.1.2 and by circular economy pathways identified in the literature (Coscieme et al. 2022; Chawla et al. 2026; Manshoven et al. 2026). It also takes up the regulatory target state developed in Section 2.1 by translating the product aspects addressed by Article 5(1) ESPR into practice-based decision situations in which product-related information and DPP-related data become relevant.
Against this background, the use cases are organised in two groups. The first group covers four central circular economy pathways in the furniture sector: product longevity, lifetime extension, reuse and material recovery. These pathways represent core circular configurations through which value creation can shift from linear to circular systems (Manshoven et al. 2026, p. 15f.; see also Coscieme et al. 2022, p. 454). The second group covers cross-cutting decision contexts that are relevant across several lifecycle phases and circular pathways. These address customer decisions, environmental performance assessment and strategic preparedness for compliance and market demands.

Box 8 provides an overview of the selected use cases.

Box 8: Overview of the selected use cases

Core circular economy pathways:

Case 1 – Circular practices for longevity (furniture manufacturer perspective): Future-oriented practice in which furniture products are designed and produced for extended lifetimes. This includes decisions on material selection, construction, durability, repairability and upgradability.

Case 2 – Lifetime-extending practices (service provider perspective): Practice in which products are maintained, repaired, refurbished or upgraded during use in order to extend their lifetime.

Case 3 – Reuse (reuse pathway operator perspective): Practice in which furniture products are collected, assessed and redistributed into second-use markets, extending their use phase before recovery.

Case 4 – Material recycling and secondary material provision (recycling processor / secondary material supplier perspective): Practice focused on recovering materials from end-of-use furniture products through disassembly, sorting and processing into secondary materials.

Cross-cutting decision contexts:

Case 5 - Customers in circular pathways: Practice in which purchasing, use and return decisions by consumers, businesses and public procurers determine whether circular pathways such as repair, resale and recycling are activated.

Case 6 – Environmental performance assessment for circular decision-making: Cross-cutting practice describing how environmental performance information (e.g. LCA-based indicators) supports decision-making in design, sourcing and circular strategies.

Case 7 – Strategic preparedness for compliance and market demands: Cross-cutting practice focused on how actors use product-related data to anticipate regulatory requirements, procurement criteria and market expectations, and to manage risks in circular markets.

Figure 2 illustrates the arrangement of the use cases within the furniture value chain.

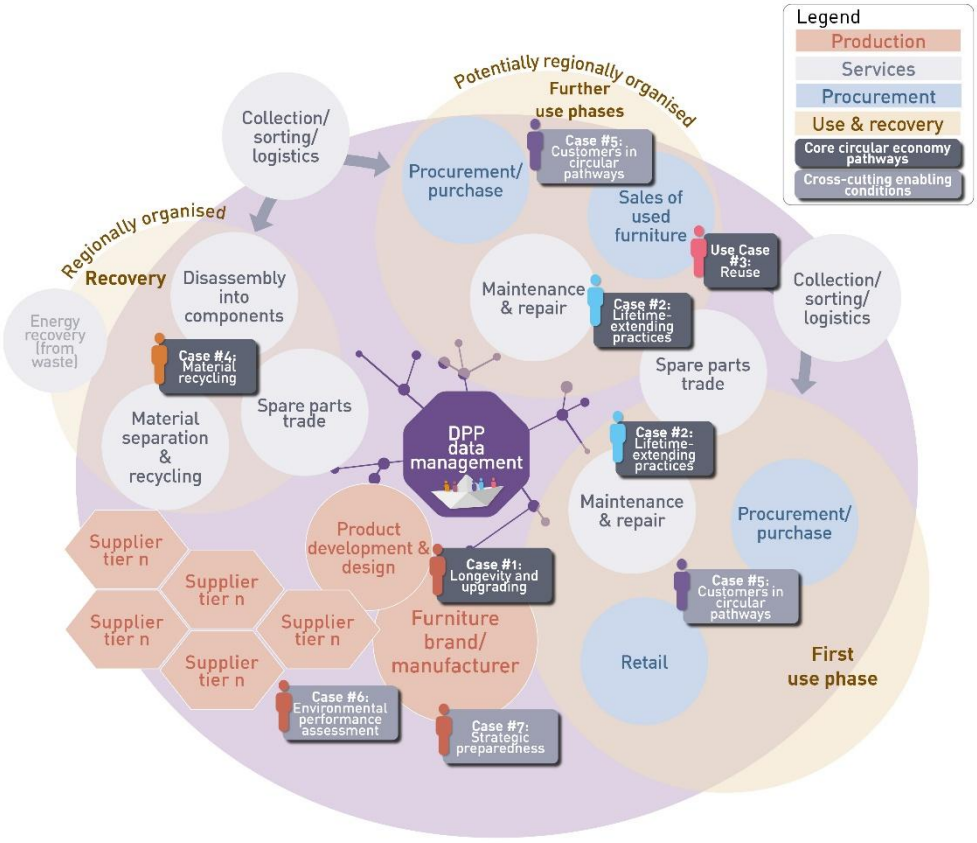


Figure 2: Use cases in the future furniture value chain

Figure 2 shows how the selected use cases relate to different lifecycle phases and actor constellations, while also making clear that circular practices and cross-cutting decision contexts are interrelated rather than isolated.

2.2.2 Analytical structure

The use cases are analysed within a detailed and standardised framework in order to systematically derive actor-specific information needs in a future circular furniture ecosystem. This approach ensures that critical decisions, information dependencies and data characteristics are captured in a comparable way across different Circular Economy-oriented practices.

Each use case begins with a short narrative that outlines a forward-looking practice. These narratives build on the positive R-evolve scenario for the European furniture sector in 2040 (Kleihauer & Führ 2025). While the scenario narrative describes a possible future at system level, the use case narratives translate this broader future orientation into concrete practice situations. They are used as analytical entry points: they describe how a Circular Economy-oriented practice could unfold in everyday operations and thereby make visible the actor interactions, coordination needs and decision situations that are relevant for the subsequent analysis.

Building on this narrative, the analysis proceeds in four analytical steps.

- Identification of central actors: The analysis identifies the actors whose decisions are critical for enabling the practice. The focus lies on those actors who actively shape the future practice through their decisions and actions, rather than on all actors affected by it.[35]
- Identification of information-relevant decision points: For each central actor[36], the analysis identifies strategic or operational points in the future circular economy practice at which actors have to make decisions based on product-related information. These include, for example, decisions on product design, use, maintenance, repair, reuse, recycling, assessment and verification. The focus is not on all decisions involved in the practice, but on those points at which DPP-relevant product-related information is needed for enabling, supporting or verifying circular practices.[37]
- Identification of information needs and actor-specific data dependencies: For each information-relevant decision point, the analysis identifies which DPP-relevant product-related information the actor needs in order to perform the respective decision or action. It then examines which DPP-related data are required to make this information available, which actors generate, provide or update these data, and where dependencies between actors arise. This step reflects the distinction between 'information' as the meaning that data have for actors in a specific decision context and 'data' as entries in specific fields of the DPP dataset (for further details on the distinction between 'data' and 'information', see Box 3 on page 12).
- Characterisation of case-specific requirements for information and underlying data: The analysis examines the properties that the decision-relevant information and the underlying DPP-related data must have, as well as how these data are provided, in order to support the respective decision situation in practice. This includes the required level of granularity[38], credibility and trust, usability, and lifecycle relevance and updateability. Baseline conditions set out in Section 2.1.3, such as structured and machine-readable data provision and interoperability, are not assessed as separate case-specific findings, but are assumed as general requirements for DPP-related data.

The results of these four steps are consolidated in Table 1and Table 2 in Section 2.2.10.

2.2.3 Case 1 – Circular practices for longevity (furniture manufacturer perspective)

This use case illustrates circular practices for longevity from the furniture manufacturer[39] perspective. It focuses on design and manufacturing decisions that determine whether furniture products can remain in use over extended periods of time. Box 9 provides a narrative overview of use case 1.

Box 9: Case 1 - Future practice of longevity

By 2040, furniture manufacturers have strategically aligned their product development with Circular Economy principles, placing product longevity at the centre of value creation. The development of a new product begins with decisions on product architecture, materials, components and functionality that support long-term use, repairability, adaptability and upgrading. Manufacturers work closely with suppliers and service-related actors,

[35] This step builds on the actor-oriented perspective proposed in the JRC methodology (Chawla et al. 2026, p. 32ff.), which emphasises the role of actors in generating, controlling and using product-related data along the value chain.

[36] The analysis refers to actors in terms of their functional roles within the furniture ecosystem, such as supplier, manufacturer, distributor or customer. Decisions are taken within the respective organisational context and may involve different business units or individual decision-makers.

[37] In line with the JRC use case methodology (Chawla et al. 2026, p. 40ff.), the analysis links these decisions to specific life cycle stages and triggering events.

[38] Article 9(2)(d) ESPR provides that the delegated acts shall specify whether the DPP is to be established at model, batch or item level and define these levels as appropriate for the product group. Recital 33 provides an initial understanding: 'model' usually refers to a version of a product of which all units share the same technical characteristics relevant for the ecodesign requirements and the same model identifier; 'batch' usually refers to a subset of a specific model composed of all products produced in a specific manufacturing plant at a specific moment in time; and 'item' usually refers to a single unit of a model.

[39] The term "furniture manufacturer" refers to the economic actor responsible for the final furniture product and its placement on the market.

using information on material properties, component performance and ageing behaviour. Reliable product information flows across these actors support the development of furniture products that can remain in circulation for longer periods.

Particular attention is paid to durability and reliability, as well as to product characteristics that enable repair, adaptation and upgrading during the use phase (Manshoven et al. 2026, p. 15).

2.2.3.1 Central actors in this use case

The central actor in this use case is the furniture manufacturer, as product development and design decisions determine whether longevity, repairability and upgradeability can be realised during the use phase(s) of the product. Suppliers are relevant because they provide information on materials, components, fittings and treatments that influence product performance over time.

Actors from the use phase, in particular professional repair and maintenance providers, are relevant as information sources where they provide feedback on product performance, failure modes, repair constraints and maintenance requirements. Their own service decisions are analysed in use case 2, while customer decisions are addressed in use case 5.

2.2.3.2 Information-relevant decision points enabling circular practices for longevity

At the product development stage, key aspects such as aesthetics, material choices and performance, as well as durability, repairability and ease of maintenance, are defined (Ševčíková 2021, p. 240; Yang 2025, p. 13). The analysis focuses on those decision points at which product-related information becomes relevant for enabling circular practices for longevity. These information-relevant decision points include (CEO 2026b, p. 27ff.):

- decisions on product structure that enable long-term use, accessibility of relevant components and disassembly;
- selection of materials, components and fittings for durability and repair compatibility;
- selection of surface treatments and finishes that affect durability, repair feasibility and ageing behaviour.

2.2.3.3 Information needs and actor-specific data dependencies

The following information needs support the design decisions identified above and indicate which actors generate or provide the DPP-related data required to make this information available (CEO 2026b, p. 27 ff.; Roskladka et al. 2023, p. 324 ff.; Zhang & Seuring 2024, p. 2524):

- Product structure: Manufacturers require information on typical usage patterns, documented failure modes, expected lifetime assumptions, joining and fastening methods, accessibility of connections and possible disassembly sequences. This information is derived from supplier data and feedback from use-phase actors, such as repair and maintenance providers.
- Selection of materials, components and fittings: Manufacturers require information on material composition and on the suitability of materials, components and fittings for durability, repairability and upgradeability. This includes durability-relevant test or performance data, performance over time, compatibility between components and potential effects on durability, repairability and upgradeability. This information is provided by material, component and fitting suppliers and complemented by feedback from use-phase actors on performance over time, wear patterns, recurring failures and repair constraints.
- Selection of surface treatments and finishes: Manufacturers require information on the substances and mixtures used for material treatments and finishes and their functional purpose, including their implications for durability, ageing behaviour and repair feasibility. This information is provided by chemical suppliers and component suppliers and complemented by feedback from use-phase actors on performance over time, wear patterns, recurring failures and repair constraints.

2.2.3.4 Characterisation of case-specific requirements for information and underlying DPP-related data

The following case-specific requirements are relevant for furniture manufacturer design decisions:

- Granularity: Design-related decisions primarily rely on model-level data. Batch-level data becomes relevant where materials, components, surface treatments or finishes vary between production batches and affect durability, ageing behaviour or repair feasibility.
- Credibility and trust: DPP-related data must go beyond simple list-based confirmations or certificates and be traceable to their source where design decisions depend on actual material, component or treatment characteristics.
- Usability: Data must be comparable across suppliers, materials and components. This requires harmonised parameters and assessment methods that enable manufacturers to evaluate durability, repairability and upgradeability in a consistent and reproducible way.

Lifecycle relevance and updateability: While design decisions are primarily based on product-development and supplier data, lifecycle feedback becomes relevant for future design iterations. Data on product performance during use, recurring failures, wear patterns and repair constraints should therefore be capable of being fed back into manufacturer design and sourcing decisions.

2.2.4 Case 2 – Lifetime-extending practices (professionals providing related services)

This use case addresses lifetime-extending practices from the perspective of professionals[40] providing related services. It focuses on the product-related information required to assess whether and how a furniture product can be maintained, repaired, refurbished or upgraded.[41] Box 10 provides a narrative overview of this use case. Customer decisions on whether to request or use such services are addressed in use case 5.

Box 10: Case 2 – Future lifetime-extending practices

In 2040, repair, maintenance, refurbishment and upgrading are established practices in the furniture sector. Products such as sofas, tables, wardrobes or office chairs are routinely kept in use over long periods of time, supported by specialised service providers. When users notice wear, damage or reduced functionality, they request targeted interventions instead of discarding the product.

Professionals providing lifetime-extending services assess the condition of the product, identify affected components and determine appropriate maintenance, repair, refurbishment or upgrade options. They use product-related information to identify suitable spare parts, tools and safety requirements. Based on this assessment, they define the required steps, estimate time and costs, and carry out the intervention. As a result, lifetime extension becomes a stable and scalable service practice that supports the continued use of furniture products across different use contexts.

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2.2.4.1 Central actors in this use case

The central actors in this use case are professionals providing lifetime extending services such as maintenance, repair, refurbishment or upgrading activities. This may include independent operators,

[40] Those professionals may – in the ESPR terminology – act as 'independend operator' (Article 2(48)) or 'professional repairer' (Article 2(48)).

[41] According to the ESPR 'Maintenance' means one or more actions carried out to keep a product in a condition in which it can fulfil its intended purpose (Article 2(19) ESPR); 'Repair' means one or more actions undertaken to restore a defective product or waste item to a state in which it can again perform its intended function (Article 2(20) ESPR); '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 (Article 2(18) ESPR) and 'Upgrading' means actions carried out to enhance the functionality, performance, capacity, safety or aesthetics of a product (Article 2(17) ESPR).

professional repairers, specialised refurbishment providers or service actors operating within a manufacturer's service network.
Users initiate the pathway when they decide whether a furniture product should be maintained, repaired, refurbished, upgraded or replaced. Their decision-making is subject to use case 5. Manufacturers, spare-part suppliers are relevant because they generate or provide the product-related data needed for diagnosis, intervention planning and safe execution.

2.2.4.2 Information-relevant decision points enabling lifetime-extending practices

The analysis focuses on decision points at which product-related information becomes relevant for enabling safe, effective and economically viable maintenance, repair, refurbishment or upgrading. These information-relevant decision points include (Klint et al. 2024):
- decisions on whether and how a product can be maintained, repaired, refurbished or upgraded;
- determination of the most appropriate maintenance, repair, refurbishment or upgrade option.

2.2.4.3 Information needs and actor-specific data dependencies

The following information needs support the decisions identified above and indicate which actors generate, provide or update the DPP-related data required to make this information available (Zhang & Seuring, 2024, p. 2524f.):
- Assessment of maintainability, repairability, potential for refurbishment or upgradeability: Professionals providing lifetime-extending services require information that enables them to assess whether and how components can be identified, accessed, demounted and replaced. This assessment relies on information on product design and construction, including computer-aided design (CAD) data, technical drawings, exploded diagrams and relevant assembly and disassembly information (Vinnova 2024, p. 23; CEO 2026b, p. 48; Chawla et al., 2026, p. 108f.; Klint et al. 2024). Information on highly stressed components, compatible spare parts, typical failure modes, repair constraints and previous interventions or upgrades is also relevant for diagnosis and effective lifetime-extending activities, e.g. predictive or precautionary maintenance.
  The DPP-related data required to provide this information are mainly generated or provided by manufacturers, component suppliers, spare-part suppliers. Information on previous interventions depends on data documented or updated by service providers who have carried out earlier maintenance, repair, refurbishment or upgrading activities.
- Selection of the appropriate maintenance, repair, refurbishment or upgrade option: To assess and select the most suitable intervention, professionals providing related services require operational information on the availability, delivery times and costs of spare parts (Chawla et al., 2026, p. 108 ff.; Klint et al., 2024). Information on required specialised tools, specific repair and care instructions and applicable safety guidelines is also necessary to ensure that maintenance, repair, refurbishment or upgrading can be carried out efficiently and safely.

The DPP-related data required to provide this information are generated or provided by manufacturers, spare-part suppliers. If earlier interventions affect compatibility, safety or the appropriate next intervention, professionals providing related services also require intervention data documented by previous service providers.

2.2.4.4 Characterisation of case-specific requirements for information and underlying DPP-related data

The following case-specific requirements are relevant for professional service provider decisions:
- Granularity: Model-level data are sufficient for general product construction, component specifications, repair instructions and safety information. Batch-level data are relevant when materials, treatments or components vary between batches and affect repairability, safe handling or compatibility. Item-level data are relevant when a product has already undergone repair, refurbishment or upgrading, as previous interventions may affect the appropriate next intervention.

- Credibility and trust: Data must be traceable to trusted sources. Robust version control is essential, including explicit information on when updates were made and by whom. When repairs, refurbishment or upgrades are carried out, documented intervention histories become relevant because modified products may raise questions of compatibility, safety and responsibility. This is particularly important where non-original parts or later modifications affect product function or safety.
- Usability: For professionals providing lifetime extending services, information must be directly actionable in repair, maintenance, refurbishment and upgrading contexts. This includes exploded diagrams linked to part names or numbers, illustrated step-by-step instructions, images or videos, and concise handling and safety instructions. The level of detail should support practical decisions on access to components, required tools, compatible spare parts without creating unnecessary complexity.
- Lifecycle relevance and updateability: Data must be available and up to date at the time of intervention. This is particularly relevant for spare-part compatibility, previous repair or upgrade history, updated safety information, and changes in components. Where interventions are carried out, relevant information should be documented so that future service decisions can take the changed product condition into account.

2.2.5 Case 3 – Reuse (reuse pathway operator)

This use case addresses reuse[42] from the perspective of reuse pathway operators, including actors involved in collection, sorting, preparation for reuse and resale. It focuses on the practices that enable furniture products to enter further use phases after they are no longer needed by their current users. Detailed service decisions related to maintenance, repair, refurbishment and upgrading are addressed in use case 2, while customer decisions are addressed in use case 5. Box 11 provides a narrative overview of the future every day practices in use case 3.

Box 11: Case 3 – Future practice for reuse

In 2040, reuse is an established and routine part of the furniture market. Professional actors along structured reuse pathways enable furniture that is no longer needed by one user to be transferred to a new user. As a result, furniture products circulate across multiple ownership cycles and retain their value over time.

2.2.5.1 Central actors in this use case

The central actors in this use case are collectors, sorting operators, preparation-for-reuse operators and resale operators. Together, they form the operational chain through which furniture products that are no longer needed by their current users can be collected, assessed, prepared where necessary and reintroduced into the market.

Collectors and sorting operators are relevant as the first actors in the reuse pathway. Preparation-for-reuse operators are relevant where products require minor preparation before further use. Where preparation for reuse involves more substantial maintenance, repair, refurbishment or upgrading activities, the related service decisions are addressed in use case 2. Resale operators include 'economic operators' such as manufacturers, distributors, independent resellers and digital platforms involved in reintroducing reusable furniture into the market.

[42] The ESPR refers to the Waste Framework Directive for the definition of reuse. This use case follows the definition, which is why 're-use' is understood here as "any operation by which products or components that are not waste are used again for the same purpose for which they were conceived" (Art. 3 (13) WFD). 'Preparing for re-use' means "checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing" (Art. 3(16) WFD).

2.2.5.2 Information-relevant decision points enabling reuse

The analysis focuses on those decision points at which product-related information becomes relevant for sorting furniture products into reuse or recovery pathways and reintroducing suitable products into the market:

- decisions on how an individual furniture product should be sorted, including whether it can be reused directly, requires minor preparation before resale, should be referred to maintenance, repair, refurbishment or upgrading services, or should be directed towards material recovery;
- decisions on whether and how the product can be reintroduced into the market, including the selection of an appropriate resale channel and market positioning.

2.2.5.3 Information needs and actor-specific data dependencies

The following information needs support the decisions identified above and indicate which actors generate or provide the DPP-related data required to make this information available (Zhang & Seuring, 2024, p. 2524):

- Collectors and sorting operators require product-related information to complement visual inspection and support reliable decisions on reusability and routing. To maintain proportionality, DPP-related data should primarily provide information that cannot be reliably assessed by visual inspection alone, such as product identity, model specifications, intended use, main materials and components, substances of concern, safety- and compliance-relevant characteristics, and basic construction features. Product identity may also include brand, model and relevant design characteristics where these support automated identification or sorting. Information on documented repairs, refurbishment or upgrades is also required where previous interventions may affect suitability for reuse, preparation for reuse or material recovery. The data required to deliver this information via the DPP are provided by manufacturers and upstream supply chain actors and documented or updated by actors who carried out previous interventions.
- Market reintroduction and resale: Resale operators require information that supports decisions on whether and how a product can be reintroduced into the market, including the selection of an appropriate resale channel and market positioning. This includes information on documented product condition relevant to resale, intervention history (eg. maintenance, repair, refurbishment or upgrading), functionality, intended use, safety- and compliance-relevant characteristics, and, where available, use history or other lifecycle records that may affect customer trust or resale value. Information on market demand and price positioning may also influence resale decisions, but is not treated here as DPP-related data. The data required to deliver this information via the DPP are generated or provided by manufacturers and upstream supply chain actors, while condition, preparation, intervention and use-phase records are added by reuse, service or other actors who have handled the product.

2.2.5.4 Characterisation of case-specific requirements for information and underlying DPP-related data

The following case-specific requirements are relevant for reuse decisions:

- Granularity: Product identification, model specifications and general product characteristics can usually be provided at model level. Batch-level data become relevant where material composition, treatments or compliance-related characteristics vary between batches. Item-level data are required where product-specific condition or lifecycle information is recorded, including intervention history and other lifecycle records, because reuse decisions may depend on the actual state and history of the individual product.
- Credibility and trust: Reuse decisions require reliable information on product identity, including the manufacturer or brand responsible for placing the product on the market, safety- and compliance-relevant characteristics and previous interventions. Preparation records and intervention data need

to indicate when and by whom they were generated or updated, because they influence routing, preparation-for-reuse and resale decisions.
- Usability: Information must support quick routing and resale decisions. Collectors and sorting operators require clear eligibility information indicating whether a product can be reused directly, requires preparation, or should be directed towards another recovery pathway. Preparation-for-reuse and resale operators require sufficiently structured information to support preparation decisions, product descriptions and transparent resale listings.
- Lifecycle relevance and updateability: Reuse depends on product-related information remaining available beyond the first use phase. Product identity, intervention history and safety- or compliance-relevant information need to remain linked to the individual furniture product across ownership changes and preparation steps.

2.2.6 Case 4 – Material recycling (recycling processor/secondary material supplier)

This use case addresses material recycling[43] from the perspective of material recycling processors and secondary material suppliers. It focuses on how material fractions from furniture are processed into reliable, safe and usable secondary materials that can be returned to the production process. Material-specific differences are considered where they affect recycling decisions and information needs. The prelimnary sorting stage is addressed in use case 3. This use case includes further sorting steps, including pre-processing. Box 12 provides a narrative overview of this use case.

Box 12: Case 4 – Future practice material recycling

By 2040, furniture-related material streams have become a reliable source of secondary materials. Where products or components can no longer remain in use, material-specific recycling routes transform separated furniture-related material fractions into specified secondary materials for downstream use. Wood-based materials, metals, plastics, foam, textile and composite fractions are channelled into material-specific recycling routes.

2.2.6.1 Central actors in this use case

The central actors in this use case are material recycling processors and secondary material suppliers. Depending on the material-specific recycling route, these roles may be performed by the same actor or by different actors. Together, these roles cover the transformation of separated material fractions into secondary materials and their provision for downstream production.
Recycling pre-processors are relevant because their dismantling, sorting and separation activities determine the quality and suitability of the input material streams. Secondary material users are also relevant, as their requirements define whether secondary materials can be integrated into new products and under which conditions.

2.2.6.2 Information-relevant decision points enabling material recycling

The analysis focuses on those decision points at which product- or material-related information becomes relevant for safe and effective recycling and for the use of secondary materials in new products. These information-relevant decision points include:
- decisions on pre-processing and routing of material streams;
- selection of recycling processes and process control parameters;
- assessment of whether secondary materials are suitable for use in new products.

[43] The term recycling is used in line with Article 3(17) WFD, which defines recycling as the reprocessing of waste materials into products, materials or substances and excludes energy recovery, fuels and backfilling.
For the definition of recycling the ESPR refers to the Art. 3(17) of the Waste Framework Directive (WFD): "'recycling' means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes". Sentence 2 of the Art. 3(17) WFD continues "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."

2.2.6.3 Information needs and actor-specific data dependencies

The following information needs support the decisions identified above and indicate which actors generate, provide or update the DPP-related data required to make this information available (European Commission 2026, p. 12; Zhang & Seuring 2024, p. 2524):

- Pre-processing and routing of material streams: Recycling pre-processors require information on material composition, substances of concern, disassembly options and previous interventions that may affect separability or recyclability in order to identify, separate and route material fractions. Product and material information is provided by manufacturers and upstream supply chain actors. Intervention-related data are documented or updated by professional service providers during previous repair, refurbishment or upgrading activities.
- Selection of recycling processes and process control parameters: Material recycling processors require information on the material fraction, including its chemical composition, in order to select and control suitable recycling processes. The required level of detail is material-dependent and should be sufficient to identify those characteristics that determine process compatibility, contamination risks and the quality of the resulting secondary material. The DPP-related data are generated or provided by manufacturers and upstream supply chain actors. Intervention-related data are documented or updated by professional service providers during previous repair, refurbishment or upgrading activities.
- Assessment of suitability of secondary materials for use in new products: Secondary material users require information on the properties of secondary material to assess whether it can replace virgin materials and meet safety, quality, performance and regulatory requirements in new products. This includes information on material composition, quality and performance specifications, origin of the secondary material, substances of concern, use restrictions and environmental performance data. The DPP-related data required to provide this information are generated by material recycling processors or secondary material suppliers on the basis of input material characteristics and recycling-process data.

2.2.6.4 Characterisation of case-specific requirements for information and underlying DPP-related data

The following case-specific requirements are relevant for material recycling decisions:

- Granularity: Model-level can be sufficient for general product and material data where characteristics are stable across identical products. Batch-level data become relevant for material composition, coatings, adhesives, additives, surface treatments, substances of concern and secondary material specifications. Item-level data are relevant where refurbishment, upgrading, spare-part replacement or other previous interventions have altered the material composition or recyclability of a specific product.
- Credibility and trust: Recycling decisions require traceable and verifiable information, particularly for material composition, including chemical composition and substances of concern. For secondary materials, a transparent link between input data, recycling process and output material specification is needed to support trust throughout the recycling chain, including for downstream users of the secondary material.
- Usability: Information must be actionable under operational recycling conditions and tailored to material-specific recycling routes. For pre-processing, this includes decision-relevant information for safe separation, dismantling and sorting. For recycling processors, data must focus on parameters that affect process compatibility and output quality, such as contamination, polymer type, additives, coatings, adhesives or material layers. For secondary material users, information must be structured in a way that supports assessment of material suitability, restrictions and compliance without requiring unnecessary product-level detail.
- Lifecycle relevance and updateability: Material recycling depends on data remaining valid when the material enters the recycling process and is transformed into secondary material. This is particularly

relevant for substances of concern, refurbishment or upgrading history, spare-part integration and changing downstream regulatory or safety requirements. Secondary material specifications need to be updated when substance classifications, performance requirements or permitted applications or other regulatory requirements relevant to their use change.

2.2.7 Case 5 – Customers in circular pathways (B2C/B2B/B2G perspective)

This use case addresses customers[44] in circular pathways across business-to-consumer (B2C), business-to-business (B2B) and business-to-government (B2G) contexts. It focuses on customer decisions related to purchasing or hiring and continued use practices – including use-phase care and the use of repair or service options – and end-of-use routing. Box 13 provides a narrative overview of use case 5.

Box 13: Case 5 – Customers in circular pathways

By 2040, customers in the furniture sector actively participate in established circular pathways. Private consumers, professional and public procurers increasingly regard furniture as an asset that can remain in use, be maintained, repaired, upgraded, shared, returned or transferred to new users. In purchasing/hiring, use and end-of-use situations, they rely on product-related information to choose circular options and keep products in circulation. Through these choices, customers contribute to whether and how circular offerings become established in practice.

2.2.7.1 Central actors in this use case

The central actors in this use case are private and professional customers in B2C, B2B and B2G contexts.

2.2.7.2 Information-relevant decision points enabling customers in circular pathways

The analysis focuses on those decision points at which product-related information becomes relevant for enabling customers to choose, use and redirect furniture products within circular pathways. These information-relevant decision points include:

- purchase or hiring decisions in first-hand and second-hand contexts;
- use-phase decisions on continued use, including maintenance, care and the use of repair or upgrade options;
- end-of-use decisions on resale, return, donation, take-back, recycling or disposal;
- risk and compliance assessments in B2B and B2G contexts.

2.2.7.3 Information needs and actor-specific data dependencies

The following information needs support the decisions identified above and indicate which actors generate, provide or update the DPP-related data required to make this information available (European Commission 2026, p. 11 and p. 20; Chawla et al. 2026, p. 108ff.; Klint et al. 2024; Zhang & Seuring 2024, p. 2524):

- Purchase or hiring decisions in first-hand and second-hand contexts: Customers require information that enables them to compare furniture options not only in terms of price and performance, but also with regard to circularity, environmental performance and safe use. This includes circularity information on durability, repairability and recyclability, environmental performance information, recycled content, warranty information and relevant certifications. In addition, customers require information on safety- and health-related material aspects, in particular substances of concern. In second-hand contexts, information on refurbishment or upgrading history becomes particularly relevant. The DPP-related data required to provide this information are generated or provided by manufacturers and upstream supply chain actors. For second-hand products, they are

[44] According to Article 2 (35) the term 'customer' means "a natural or legal person that purchases, hires or receives a product for their own use whether or not acting for purposes which are outside their trade, business, craft or profession".

complemented by documented refurbishment or upgrading histories from professional service providers or previous owners.
- Decisions during the use phase: Customers require information that enables them to maintain functionality and extend product lifetime. This includes maintenance instructions, warnings about practices that may shorten product life, repair guidance, information on whether repairs can be carried out by users or require professional service providers, required tools, spare-part availability, possible upgrades and service options; including links or other references indicating how and where these services can be accessed. The DPP-related data required to provide this information are generated or provided by manufacturers, spare-part providers and professional service providers.
- End-of-use decisions: Customers require clear information on resale, return, take-back, donation, refurbishment and recycling options. This includes instructions on how and where the product can be redirected into circular pathways. The DPP-related data required to provide this information are provided by manufacturers, retailers, resale operators and take-back providers.
- Risk and compliance assessments in B2B and B2G contexts: Professional B2B and B2G procurers require information on regulatory compliance, product safety, substances of concern, environmental performance, procurement criteria and organisational requirements. The DPP-related data required to provide this information are generated by manufacturers and upstream supply chain actors.

2.2.7.4 Characterisation of case-specific requirements for information and underlying DPP-related data

The following case-specific requirements are relevant for customer decisions in circular pathways:
- Granularity: Model-level data are generally sufficient for product identification, intended use, warranty information, durability, repairability, maintenance guidance and general environmental information. Batch-level data become relevant where material composition, substances of concern or environmental performance vary between production batches. Item-level data are required for second-hand products where refurbishment, upgrading or repair history affect purchasing, use-phase or resale decisions.
- Credibility and trust: Customer decisions require information that is traceable to responsible actors, including, where relevant, the manufacturer or brand under which the product was placed on the market. Reliable product identification and authenticity are also important to prevent counterfeit or falsely attributed product information. Claims related to durability, repairability, environmental performance, recycled content, substances of concern, refurbishment or upgrading history need to be based on harmonised methods so that they can support comparison, purchase, procurement, compliance or accountability decisions.
- Usability: Information must be understandable and actionable for different customer groups with varying levels of expertise. For B2C customers, information should be presented in a simplified and intuitive manner, using comparable indicators, clear labels or short explanations rather than detailed technical data. At the first level, safety-related information should be provided as clear and easily understandable statements, for example concerning substances of concern. More detailed information should remain accessible at a second level where needed (Chawla et al., 2026, p. 109 ff.). Practical guidance for use, maintenance or repair should be supported by visual elements such as infographics, images, videos or illustrated step-by-step instructions that can be accessed via links or other references provided through the DPP (Vinnova, 2024, p. 23). For B2B and B2G customers, usability requirements focus more strongly on standardisation, comparability and system integration. Information should support comparison across suppliers, alignment with procurement criteria and integration into asset management or procurement systems, including the use of structured indicators or disaggregated scores, eg. for carbon footprint where procurement or internal management systems require them (Chawla et al., 2026, p. 111).
- Lifecycle relevance and updateability: Customer-relevant information must remain available beyond the point of purchase. This is particularly relevant for maintenance instructions, repair guidance,

spare-part information, take-back or resale options, substances of concern, condition information and refurbishment or upgrading history. Information should reflect changes that occur during use and remain valid at the point of need.

2.2.8 Case 6 – Environmental performance assessment (circular decision-making perspective)

This use case addresses environmental performance assessment as a cross-cutting information function in circular furniture systems.[45] It discusses decisions across several circular pathways in which actors use environmental performance information to compare alternatives and justify choices in product development, purchasing and hiring and customer-facing contexts. Box 14 provides a narrative overview of use case 6.

Box 14: Case 6 – Future practice of environmental performance assessment

By 2040, environmental performance assessment has become a standard element of decision-making in the furniture sector. Material and component suppliers as well as manufacturers use environmental performance information to improve and compare materials, components and design options. Retailers and actors in B2C, B2B and B2G contexts use environmental performance information when comparing products, suppliers or service options.

2.2.8.1 Central actors in this use case

The central actors in this use case are upstream suppliers, manufacturers, distributors and actors in B2C, B2B and B2G contexts.

2.2.8.2 Information-relevant decision points enabling environmental performance assessment

The analysis focuses on those decision points at which environmental performance information becomes relevant for comparing alternatives and justifying choices. These information-relevant decision points include:

- decisions by material and component suppliers and manufacturers on the selection or adaptation of materials, components, production processes and product design options to improve environmental performance;
- supplier selection and assortment decisions by retailers and other professional actors;
- procurement decisions in B2B and B2G contexts;
- customer-facing purchase or rental decisions.

2.2.8.3 Information needs and actor-specific data dependencies

The following information needs support the decisions identified above and indicate which actors generate, provide or update the DPP-related data required to make this information available (Psarommatis & May 2024; Chawla et al. 2026; Zhang & Seuring& 2024, p. 2524).

- Selection or adaptation of materials, components, processes and design configurations: Material, component and other upstream suppliers and manufacturers require environmental performanlce information that enables them to identify improvement options and compare alternative materials, components, production processes and design configurations. This includes product carbon footprint and further indicators on resource use, energy-related impacts, water use, emissions or other relevant environmental aspects. For these comparisons, actors need environmental data that reflect the actual production conditions of relevant materials, components and processes. The DPP-related data required to provide this information are generated by the actors themselves and by upstream

[45] ESPR, Recital 23 clarifies that methods used for environmental performance assessment should reflect the nature and lifecycle impacts of each product and may be further developed by the Commission. It refers to the evolution of science-based tools and to the improvement or development of methodologies that better account for circularity aspects such as durability, repairability, reusability and chemicals that hinder reuse or recycling. This indicates that environmental performance assessment is not a fixed benchmark, but part of an evolving methodological framework.

supply chain actors whose materials, components or processes contribute to the assessed environmental performance.

- Supplier selection and assortment decisions: Distributors and other professional actors require environmental performance indicators that allow them to compare functionally comparable furniture solutions. The DPP-related data required to provide these indicators are generated by manufacturers and upstream supply chain actors and translated into product-level or aggregated environmental performance information by manufacturers.
- Procurement decisions in B2B and B2G contexts: Professional purchasers in private companies and public procurers require environmental performance information that can be used in award criteria, documentation and reporting processes. This information includes product carbon footprint or other environmental performance indicators, the methodological basis of the assessment and supporting evidence for audit, accountability or reporting purposes. The DPP-related data required to provide this information are generated by manufacturers and upstream supply chain actors.
- Customer-facing purchase or rental decisions: Actors in B2C contexts require aggregated and understandable environmental performance information that supports comparison between products or service options. The underlying DPP-related data are generated by manufacturers and upstream supply chain actors and need to be suitable for deriving this information in a comparable, traceable and understandable form.[46]

2.2.8.4 Characterisation of case-specific requirements for information and underlying DPP-related data

The following case-specific requirements are relevant for environmental performance assessment:

- Granularity: Environmental performance data need to reflect actual raw material extraction and subsequent production conditions. Batch-level data become relevant where the same model is produced at different sites or with different suppliers, materials or processes.
- Credibility and trust: Environmental performance indicators must be traceable to their methodological basis and underlying data sources. For key impact drivers, product-, process- or supplier-specific primary data are required to reflect actual production conditions and to make environmental differences between products, suppliers or production routes visible, thereby providing a meaningful basis for selecting environmentally preferable alternatives. Indicators should be based on consistent reference units, system boundaries, allocation and aggregation rules and calculation methods so that decision-makers can understand how results were derived.[47]
- Usability: Environmental performance indicators must be usable in the specific decision context. Manufacturers and upstream suppliers need primary data and disaggregated assessment results that support hotspot identification and comparison of materials, components, processes and product development options. Distributors, B2B professionals and public procurers need aggregated, standardised indicators that can be integrated into evaluation, procurement and reporting processes. Actors in B2C contexts mostly need simplified, aggregated signals that allow comparison without requiring technical expertise. The underlying data and methodological basis should nevertheless remain accessible to enable verification of the information provided.
- Lifecycle relevance and updateability: Environmental performance indicators should be updateable when underlying data are corrected at later stage or methodological requirements change. This is particularly relevant because environmental performance assessment methods are expected to

[46] ESPR, Articles 5(1)(o) and 7(2)(b) require that product-specific environmental impacts be addressed and made available in a comparable and traceable manner through the Digital Product Passport. Recitals 23 and 54 emphasise that environmental information should be comparable, reliable, understandable, and based on data reflecting real production conditions, thereby enabling informed decisions by both professionals and consumers.

[47] ESPR, Recital 47 emphasises that the assessment of environmental impacts must be based on relevant and reliable information covering the entire value chain, particularly with regard to environmental and resource efficiency.

evolve further. This may affect the inclusion of circularity aspects such as durability, repairability, reusability and substances that may hinder reuse or recycling into the relevant methodological standards.

2.2.9 Case 7 – Strategic preparedness for compliance and market demands

This use case addresses strategic preparedness from the perspective of companies in the furniture value chain. It focuses on the use of structured product-related data to anticipate future compliance requirements and market demands. Strategic preparedness is understood as the capability to use product-related data proactively, rather than relying on retroactive data collection when requirements change (European Commission 2026, p. 17 f.; CEO 2026b; Zhang & Seuring 2024, p. 2524). Box 15 provides a narrative overview of use case 7.

Box 15: Case 7 – Preparedness as a strategic capability in 2040

By 2040, companies in the furniture value chain maintain structured product-related data to anticipate future compliance requirements and market demands. When requirements change, they can reassess products and portfolios in a highly automated manner on the basis of available records, instead of starting retroactive data collection.

2.2.9.1 Central actors in this use case

The central actors in this use case are upstream suppliers, component manufacturers and furniture manufacturers. They use structured product-related information to anticipate future compliance requirements, procurement criteria and market demands for their own products, components or materials.

2.2.9.2 Information-relevant decision points enabling strategic preparedness

The analysis focuses on those decision points at which product-related information becomes relevant for anticipating compliance requirements and market demands. These information-relevant decision points include:

- decisions on product development and the selection of materials and components under anticipated ecodesign, substance and other product related legislation as well as market requirements (CEO 2026b) and
- decisions on portfolio screening and risk management, including whether existing or planned products require adaptation under changing regulatory requirements, substance classifications, new scientific knowledge, procurement criteria or other market expectations (European Commission 2026, p. 17 f.; Zhang & Seuring 2024, p. 2524).

2.2.9.3 Information needs and actor-specific data dependencies

The following information needs support the decisions identified above and indicate which actors generate, provide or update the DPP-related data required to make this information available (European Commission 2026, p. 17 f.; CEO 2026b; Chawla et al. 2026; Zhang & Seuring 2024, p. 2524):

- Product development and selection of materials and components: Companies require structured product-related information to assess whether materials, components and product configurations are compatible with anticipated ecodesign, substance and market requirements. This includes information on product composition, including the materials and substances used, recycled content, and environmental performance. The DPP-related data required to provide this information are generated by upstream suppliers, component manufacturers and furniture manufacturers, depending on the respective product, component or material concerned.
- Portfolio screening and risk management: Companies require continuously maintained product-related records that allow existing and planned products, components or materials to be screened against changing or emerging regulatory requirements, substance classifications, new scientific knowledge, procurement criteria and other market expectations. This entails information on product composition, including the materials and substances used, recycled content, and environmental

performance. The DPP-related data required to provide this information are generated, maintained or updated by upstream suppliers, component manufacturers and furniture manufacturers through their respective product and process data management.

2.2.9.4 Characterisation of case-specific requirements for information and underlying DPP-related data

The following case-specific requirements are relevant for strategic preparedness:

- Granularity: Strategic preparedness requires DPP-related data at the level at which future compliance or market-related risks may arise. Model-level data may be sufficient where product composition, components, materials, substances used and supplier-specific environmental performance are stable across identical products. Batch-level data become relevant where product composition, components, materials, substances used or supplier-specific environmental performance vary between production batches.
- Credibility and trust: Strategic preparedness depends on DPP-related data that are sufficiently specific and traceable to support future compliance and market-related assessments. Generic declarations (on unspecified conformity or the absence of certain substances or groups of substances) are not sufficient where decisions depend on actual product composition, components, materials, substances used or supplier-specific environmental performance. The data must allow products and portfolios to be reassessed under changing requirements.
- Usability: DPP-related data must be usable for screening materials, components, products and portfolios against anticipated or changing requirements. This requires that data on product composition, components, materials, substances used and supplier-specific environmental performance can be related to regulatory, procurement or market criteria. The data must support (highly automated) comparison between product variants, material and component options and portfolio risks without requiring retroactive data collection.
- Lifecycle relevance and updateability: Strategic preparedness depends on DPP-related data remaining usable beyond the initial compliance or market-entry situation. Data must be updateable when substance classifications, new scientific knowledge, ESPR requirements, procurement criteria, supplier-specific environmental performance data or market expectations change. Earlier data states must remain interpretable so that materials, components, products and portfolios can be reassessed over time.

2.2.10 Consolidated use case findings

This section brings together the findings from the use case analyses in three steps. Section 2.2.10.1 first provides a structured overview of the use-case-specific decision-related information needs, data dependencies and case-specific requirements. Section 2.2.10.2 then compares recurring information needs across the use cases and groups them into broader information-need clusters, while identifying the underlying DPP-related data required to provide the respective information. Section 2.2.10.3 subsequently analyses these underlying data across the information-need clusters, consolidates them into recurring DPP-related data families and characterises their requirements and structural relationships, including how they can support decision-relevant information through direct use, linking, aggregation or contextualisation.

2.2.10.1 Overview on decision-related information needs, data dependencies and case-specific requirements

Building on the methodological approach set out in Section 1.3.1, this subsection provides a structured overview of the use-case-specific results concerning decision-related information needs, underlying DPP-related data and case-specific requirements. Table 1 summarises the information needs and related data dependencies at the level of the individual decision contexts.

Table 1: Actor-specific information needs and data dependencies across use cases

Use case	Central actor(s)	Decision point	Information needs / underlying DPP-related data	Actor-specific data dependencies
Case 1 Circular practices for longevity	Manufacturer	Product structure	Typical usage patterns; documented failure modes; expected lifetime assumptions; joining and fastening methods; accessibility of connections; possible disassembly sequences	Suppliers; use-phase actors, such as repair and maintenance providers
	Manufacturer	Selection of materials, components and fittings	Material composition; durability-relevant test or performance data; performance over time; compatibility between components; potential effects on durability, repairability and upgradeability; feedback on wear patterns, recurring failures and repair constraints	Material, component and fitting suppliers; use-phase actors, including repair and maintenance providers
	Manufacturer	Selection of surface treatments and finishes	Chemical composition of treatments and finishes; functional purpose of treatments or finishes; implications for durability, ageing behaviour and repair feasibility; feedback on wear patterns, recurring failures and repair constraints	Chemical suppliers; component suppliers; use-phase actors, such as repair and maintenance providers
Case 2 Lifetime-extending practices	Professionals offering lifetime-extending services	Assessment of maintainability, repairability, refurbishment or upgradeability	Information on component accessibility, demountability and replaceability, based on product design and construction information such as computer-aided design (CAD) data, technical drawings, exploded diagrams and relevant assembly and disassembly information; information on highly stressed components, compatible spare parts, typical failure modes, repair constraints and previous interventions or upgrades	Furniture manufacturers; component manufacturers; spare-part suppliers; previous service providers for intervention data
	Professionals offering lifetime-extending services	Selection of the appropriate maintenance, repair, refurbishment or upgrade option	Availability, delivery times and costs of spare parts; specialised tools; repair and care instructions; safety guidelines; previous intervention data where earlier interventions affect compatibility, safety or the appropriate next intervention	Manufacturers; spare-part suppliers; previous service providers where earlier interventions affect the next intervention
Case 3 Reuse	Collectors; sorting operators; preparation-for-reuse operators	Sorting and routing into reuse, preparation for reuse, service or material recovery	Product identity, including manufacturer/brand, model and relevant design characteristics; model specifications; intended use; main materials and components; substances of concern; safety- and compliance-relevant characteristics; basic construction features; documented repairs, refurbishment or upgrades	Manufacturers and upstream supply chain actors; actors who carried out previous interventions
	Resale operators	Market reintroduction and resale	Documented product condition relevant to resale; functionality; intended use; safety- and compliance-relevant characteristics; intervention history (e.g. maintenance, repair, refurbishment or upgrading); use history or other lifecycle records	Manufacturers; upstream actors; use-phase actors; preparation and previous service actors
Case 4 Material recycling	Preprocessors	Pre-processing and routing material streams	Material composition; substances of concern; disassembly options; previous interventions affecting separability or recyclability	Manufacturers and upstream supply chain actors; service providers documenting previous interventions
	Recycling processors	Selection of recycling processes and process control parameters	Material composition; chemical composition; process compatibility; contamination risks; characteristics affecting output quality	Manufacturers and upstream supply chain actors; service providers documenting previous interventions
	Secondary material users	Assessment of suitability of secondary materials for use in new products	Material composition; quality and performance specifications; origin of the secondary material; substances of concern; use restrictions; environmental performance data	Material recycling processors/ secondary material suppliers
Case 5 Customers in circular pathways	Customers	Purchase or hiring decisions in first-hand and second-hand contexts	Circularity information on durability, repairability and recyclability; environmental performance indicators; recycled content; relevant certifications; substances of concern; refurbishment or upgrading history in second-hand contexts	Manufacturers and upstream supply chain actors; professional service providers or previous owners for documented refurbishment or upgrading history
	Customers	Decisions during the use phase	Maintenance instructions; warnings about practices that may shorten product life; repair guidance; information on user repair options; required tools; spare-part availability; possible upgrades; available professional maintenance, repair, refurbishment and upgrading services, including links or other references indicating how and where these services can be accessed	Manufacturers; spare-part providers; professional offering life-extending services

Use case	Central actor(s)	Decision point	Information needs / underlying DPP-related data	Actor-specific data dependencies
	Customers	End-of-use decisions	Resale, return, take-back, donation, refurbishment and recycling options; instructions on how and where the product can be redirected into circular pathways	Manufacturers; distributors; resale operators; take-back providers
	Professional B2B procurers	Risk and compliance assessments in B2B and B2G contexts	Regulatory compliance; product safety; substances of concern; environmental performance indicators; procurement criteria; organisational requirements	Manufacturers and upstream supply chain actors
Case 6 Environmental performance assessment	Material, component and other upstream suppliers; manufacturers	Selection or adaptation of materials, components, processes and design configurations	Environmental performance information, such as product carbon footprint and indicators on resource use, energy-related impacts, water use, emissions or other relevant environmental aspects; environmental data reflecting actual production conditions	Actors' own product and process data; upstream supply chain actors
	Distributors; other professional actors	Supplier selection and assortment decisions	Environmental performance indicators for comparing functionally comparable furniture solutions	Manufacturers and upstream supply chain actors
	Professional purchasers; public procurers	Procurement decisions in B2B and B2G contexts	Environmental performance indicators, such as product carbon footprint or other relevant indicators, for award criteria, documentation and reporting; methodological basis; supporting evidence for audit, accountability or reporting purposes	Manufacturers and upstream supply chain actors
	Actors in B2C contexts	Customer-facing purchase or rental decisions	Aggregated and understandable environmental performance information for comparing products or service options	Manufacturers and upstream supply chain actors
Case 7 Strategic preparedness	Upstream suppliers; component manufacturers; furniture manufacturers	Product development and selection of materials and components under anticipated ecodesign, substance and market requirements	Product composition, including materials and substances used; recycled content; environmental performance; information needed to assess compatibility with anticipated requirements	Upstream suppliers; component manufacturers; furniture manufacturers
	Furniture manufacturers; component manufacturers; upstream suppliers	Portfolio screening and risk management under changing regulatory, requirements, procurement criteria and market expectations	Continuously maintained product-related records on product composition, including materials and substances used, recycled content and environmental performance; information needed to reassess products, components, materials and portfolios	Upstream suppliers; component manufacturers; furniture manufacturers

Based on these information needs and underlying data dependencies, Table 2 summarises the case-specific requirements identified in the use-case analyses across the four analytical dimensions of granularity, credibility and trust, usability, and lifecycle relevance and updateability.

Table 2: Case-specific requirements for information and underlying DPP-related data regarding granularity, credibility and trust, usability, and lifecycle relevance and updateability across use cases

Use case	Granularity	Credibility and trust	Usability	Lifecycle relevance and updateability
Case 1 Circular practices for longevity	Model-level data for design decisions; batch-level data where materials, components, surface treatments or finishes vary and affect durability, ageing behaviour or repair feasibility	DPP-related data must go beyond simple list-based confirmations or certificates and be traceable to their source where design decisions depend on actual material, component or treatment characteristics	Comparable across suppliers, materials and components; harmonised parameters and assessment methods for durability, repairability and upgradeability	Lifecycle feedback relevant for future design iterations, particularly data on product performance during use, recurring failures, wear patterns and repair constraints
Case 2 Lifetime-extending practices	Model-level data for product construction, component specifications, repair instructions and safety information; batch-level data where materials, treatments, components vary; item-level data where	Traceable data from trusted sources; version control indicating when updates were made and by whom; documented intervention histories where modifications affect compatibility, safety or responsibility	Directly actionable information for service contexts, including exploded diagrams, step-by-step instructions, visual guidance and concise handling and safety instructions	Data available and up to date at the time of intervention; updates relevant for spare-part compatibility, intervention history, safety information, components

Use case	Granularity	Credibility and trust	Usability	Lifecycle relevance and updateability
	previous interventions affect the next intervention			
Case 3 Reuse	Model-level data for product identification, model specifications and general product characteristics; batch-level data where material composition, treatments or compliance-relevant characteristics vary; item-level data for intervention history and other lifecycle records	Reliable and traceable data on product identity, including the manufacturer/brand responsible for placing the product on the market, safety- and compliance-relevant characteristics and previous interventions; preparation records and intervention data indicate when and by whom they were generated or updated	Quick and actionable information for routing, preparation and resale decisions; clear eligibility information for reuse, preparation, service referral or material recovery; structured information for product descriptions and resale listings	Product identity, intervention history and safety- or compliance-relevant information remain linked to the individual product across ownership changes and preparation steps
Case 4 Material recycling	Model-level for stable product and material data; batch-level data for material composition, coatings, adhesives, additives, surface treatments, substances of concern and secondary material specifications; item-level data where previous interventions alter composition or recyclability	Traceable and verifiable data on material composition, chemical composition and substances of concern; transparent link between input data, recycling process and secondary material specification throughout the recycling chain, including for downstream users of the secondary material	Actionable information for material pre-processing, recycling-process selection and secondary-material assessment; tailored to material-specific recycling routes and focused on process compatibility, output quality, restrictions and compliance	Data remain valid when materials enter the recycling process and are transformed into secondary materials; secondary material specifications updateable when substance classifications, performance requirements, permitted applications or other regulatory requirements relevant to their use change
Case 5 Customers in circular pathways	Model-level data for product identification, intended use, warranty, durability, repairability, maintenance guidance and general environmental information; batch-level data where material composition, substances of concern or environmental performance vary; item-level data for refurbishment, upgrading or repair history of second-hand products	Traceable information linked to responsible actors, including the manufacturer or brand under which the product was placed on the market; reliable product identification and authenticity; claims on durability, repairability, environmental performance, recycled content, substances of concern and refurbishment or upgrading history based on harmonised methods	Understandable and actionable information for different customer groups; simplified and comparable information for B2C customers, with more detailed information accessible at a second level; practical guidance accessible through links or other references; standardised, comparable and system-integrable information for B2B and B2G customers	Customer-relevant information remains available beyond purchase and reflects changes during use, including maintenance, repair, spare parts, take-back or resale options, substances of concern, and refurbishment or upgrading history
Case 6 Environmental performance assessment	Environmental performance data reflect actual raw material extraction and subsequent production conditions; batch-level data where production sites, suppliers, materials or processes vary	Environmental performance indicators traceable to their methodological basis and underlying data sources; product-, process- or supplier-specific primary data for key impact drivers to reflect actual production conditions and distinguish environmental differences between alternatives; consistent reference units, system boundaries, allocation and aggregation rules and calculation methods; underlying data and methodological information accessible for verification	Usable indicators for different decision contexts; primary data and disaggregated assessment results for manufacturers and upstream suppliers; aggregated, standardised indicators for retailers, B2B professionals and public procurers; simplified aggregated signals for B2C actors	Environmental performance indicators updateable when underlying data are corrected or methodological requirements change; ability to reflect evolving assessment methods, including the integration of relevant circularity aspects
Case 7	Model-level data where product composition,	Specific and traceable DPP-related data for future	Usable for screening materials, products and	DPP-related data remain usable and updateable when

Use case	Granularity	Credibility and trust	Usability	Lifecycle relevance and updateability
Strategic preparedness	material inputs, substances used and supplier-specific environmental performance are stable; batch-level data where these vary between production batches	compliance and market-related assessments; generic declarations are insufficient where decisions depend on actual product composition, material inputs, substances used or supplier-specific environmental performance	portfolios against anticipated or changing requirements; data can be related to regulatory, procurement or market criteria and support comparison without retroactive data collection.	substance classifications, new scientific knowledge, ESPR requirements, procurement criteria or market expectations change; supplier-specific environmental performance data can be updated as new information becomes available; earlier data states remain interpretable for reassessment over time

Taken together, Table 1 and Table 2 provide the use-case-specific evidence base for the cross-case analysis in the following subsections.

2.2.10.2 Clustering of recurring information needs across use cases

This subsection compares the decision-related information needs across the seven use cases and groups recurring needs into broader information-need clusters. In line with the distinction introduced in Box 3, the analysis separates the information required in the respective decision contexts from the underlying DPP-related data needed to provide this information. Where the use-case findings identify an information need without yet specifying the underlying data in sufficient detail, these data are further specified on the basis of the respective decision context and the regulatory reference points developed in Section 2.1.

Table 3 presents the resulting cross-case clustering of information needs. The recurring information needs are organised into ten information-need clusters. For each information need, the table identifies the underlying DPP-related data on which the respective information depends, together with the actors requiring the information, the actors generating, providing or updating the underlying data, and the use cases in which the information need occurs.

Table 4 then relates the case-specific requirements summarised in Table 2 to the information needs and underlying DPP-related data identified in Table 3. It specifies how requirements concerning granularity, credibility and traceability, usability, and lifecycle relevance and updateability apply to the respective information needs and data dependencies across the use cases.

Table 3: Recurring information-need clusters and underlying DPP-related data across use cases

Information-Need-Cluster	Information required in the decision context	Underlying DPP-related data required to provide this information	Actors requiring the information	Actors generating/providing/updating the data	Use cases
Product identification and basic product information: *Which product is concerned and what information is required to identify it and understand its intended use and functionality?*	**Information on product identity**	Product identifier; manufacturer/brand identifier; model identifier/designation	Collectors; sorting operators; preparation-for-reuse operators; resale operators	Furniture manufacturers	Case 3
	Information on intended use, functionality and basic product specifications	Intended-use data; model specification data	Collectors; sorting operators; preparation-for-reuse operators; resale operators	Furniture manufacturers	Case 3
Product structure information: *How is the product constructed and how are its components arranged and connected?*	**Information on product construction**	Component and material position and structural relation; connection and fastening data; joining methods; technical drawings; CAD data; exploded diagrams	Professionals offering lifetime-extending services; reuse actors; recycling preprocessors	Furniture manufacturers; component manufacturers	Cases 1, 2, 3, 4
Composition-related information: *What constitutes the product, its components*	**Information on product composition**	Components and materials contained in the product	Furniture manufacturers; reuse actors; recycling actors; actors involved in strategic preparedness	Furniture manufacturers; component and material suppliers	Cases 1, 3, 4, 7

Information-Need-Cluster	Information required in the decision context	Underlying DPP-related data required to provide this information	Actors requiring the information	Actors generating/providing/updating the data	Use cases
and materials, and what is their chemical composition? This also includes composition information on spare parts introduced during later lifecycle stages.	Information on component composition	Materials contained in the component	Furniture manufacturers; professional service providers; recycling actors; actors involved in strategic preparedness	Component manufacturers; material suppliers	Cases 1, 2, 4, 7
	Information on spare-part[48] composition	Components and/or materials contained in the spare part	Furniture manufacturers; professional service providers; recycling actors; actors involved in strategic preparedness	Component manufacturers; material suppliers	Cases 1, 2, 4, 7
	Information on material composition	Material composition	Furniture manufacturers; component manufacturers; reuse and recycling actors; customers	Suppliers/manufacturers of materials; recycling processors/secondary material suppliers	Cases 1, 3, 4, 5, 7
	Information on chemical composition	Chemical composition	Suppliers/manufacturers of components and furniture; recycling actors; secondary material users	Chemical suppliers; suppliers/manufacturers of materials	Cases 1, 4, 7
	Information on substances of concern, including their location and concentration	Substance identity; concentration; location within the relevant material or material fraction	Furniture manufacturers; reuse and recycling actors; customers	Chemical suppliers; suppliers/manufacturers of materials including secondary materials, components and furniture	Cases 3, 4, 5
	Information on recycled content	Material composition	Customers; component manufacturers; furniture manufacturers	Upstream material suppliers; component manufacturers; furniture manufacturers	Cases 5, 7
Safety and compliance information: *What information is required to assess product safety and compliance for the respective use, reuse, resale or procurement context?*	Information on product safety and compliance	Intended-use data; substance identity, concentration and location	Reuse actors; resale operators; customers; professional B2B/B2G procurers	Furniture manufacturers; upstream actors providing the relevant underlying data and evidence	Cases 3, 5
Environmental performance information: *What information is required to assess and compare the environmental performance of the product and its constituent parts?*	Information on environmental performance, including product carbon footprint and environmental footprint indicators	Primary activity and process data, including energy use, water use, resource use and process emissions, each related to a defined reference unit	Upstream suppliers; furniture manufacturers; retailers; customers	Actors generating the respective product and process data; upstream supply chain actors; furniture manufacturers	Cases 4, 5, 6, 7
Quality, performance and durability information: *What information is required to assess the quality, performance and*	Information on durability and ageing behaviour of materials	Material composition; where relevant, chemical composition; durability-relevant test results and test conditions; use-phase observation records linked to the material	Furniture manufacturers; professional service providers; secondary material users; customers	Suppliers/manufacturers of materials; recycling processors/secondary material	Cases 1, 2, 4, 5

[48] In line with Article 2(2) ESPR, a 'component' is a product intended to be incorporated into another product. In this analysis, 'spare part' refers to a part provided for the replacement of a component or other product part in repair or maintenance contexts. The distinction reflects the ESPR terminology, which treats components and spare parts separately, including in Annex I.

Information-Need-Cluster	Information required in the decision context	Underlying DPP-related data required to provide this information	Actors requiring the information	Actors generating/providing/updating the data	Use cases
durability of materials, components and products?				suppliers; use-phase actors	
	Information on durability and ageing behaviour of components	Construction data; durability-relevant test results and test conditions; use-phase observation records linked to the component	Furniture manufacturers; professional service providers; customers	Component manufacturers; use-phase actors	Cases 1, 2, 5
	Information on durability and ageing behaviour of products	Product construction data; durability-relevant product test results and test conditions; use-phase observation, wear and failure records linked to the product and, where relevant, to affected components or product parts	Furniture manufacturers; professional service providers; customers	Furniture manufacturers; use-phase actors; professional service providers	Cases 1, 2, 5
	Information on secondary-material quality and suitability	Material composition; quality and performance specifications; origin of the secondary material; substances of concern; applicable use restrictions; relevant environmental-performance data	Secondary material users	Recycling processors/secondary material suppliers	Case 4
Maintainability, repairability, refurbishment, upgradeability and recyclability information: *What information is required to assess whether and how the product can be maintained, repaired, refurbished, upgraded or recycled?*	Information on maintainability	Product construction and component-accessibility data; consumable data; relevant tool data; use-phase observation and intervention records where relevant	Professionals offering lifetime-extending services; customers	Furniture manufacturers; professionals offering lifetime-extending services	Cases 2, 5
	Information on repairability	Product construction and disassembly data, including component accessibility, access points, connection-release methods, disassembly and reassembly sequences and disassembly constraints; spare-part compatibility and availability data; tool data; relevant intervention records	Professionals offering lifetime-extending services; customers	Furniture manufacturers; component manufacturers; spare-part suppliers; professionals offering lifetime-extending services	Cases 2, 5
	Information on potential for refurbishment	Product construction and disassembly data, including component accessibility, access points, connection-release methods, disassembly and reassembly sequences and disassembly constraints; intervention event records; relevant tool data	Professionals offering lifetime-extending services; reuse actors; resale operators; customers	Furniture manufacturers; component manufacturers; professionals offering lifetime-extending services; reuse actors; resale operators	Cases 2, 3, 5
	Information on upgradeability	Product construction and disassembly data, including component accessibility, access points, connection-release methods, disassembly and reassembly sequences and disassembly constraints; compatible component and spare-part data; tool data; relevant intervention records	Professionals offering lifetime-extending services; customers	Furniture manufacturers; component manufacturers; spare-part suppliers; professionals offering lifetime-extending services	Cases 2, 5
	Information on recyclability and recycling-process suitability	Material and chemical composition; substance identity, concentration and location; product construction and disassembly data; relevant intervention records	Recycling pre-processors; recycling processors	Furniture manufacturers; upstream material and component suppliers; professionals offering lifetime-extending	Case 4

Information-Need-Cluster	Information required in the decision context	Underlying DPP-related data required to provide this information	Actors requiring the information	Actors generating/providing/updating the data	Use cases
				services where previous interventions affect separability or recyclability	
Intervention equipment and supply information: *Which spare parts and tools are required and available to carry out the intervention?*	Information on spare parts	Spare-part identifier; component or product part to be replaced; spare-part specification; compatibility relation; availability; delivery time; cost	Professionals offering lifetime-extending services; customers	Furniture manufacturers; component manufacturers; spare-part suppliers	Cases 2, 5
	Information on required tools	Tool identifier; tool type; required specification; relation to affected component or connection	Professionals offering lifetime-extending services; customers	Furniture manufacturers	Cases 2, 5
Use-phase and lifecycle information *What has happened to the product during its actual use and subsequent lifecycle?*	Information on product performance during use, failure modes and wear patterns	Use-phase observation records; measured performance values; failure event records; wear records; repair-constraint observations; actor and timestamp; affected component or product part	Furniture manufacturers; professionals offering lifetime-extending services	Use-phase actors; professionals offering lifetime-extending services	Cases 1, 2
	Information on current condition	Condition assessment record; assessment date; assessing actor; observed defects; functionality status	Professionals offering lifetime-extending services; reuse actors; resale operators; customers	Reuse actors; resale operators; previous owners	Cases 3, 5
	Information on previous interventions	Intervention event records, including intervention type, affected product part, date, actor, materials or components added or removed, and resulting changes to condition or construction	Professionals offering lifetime-extending services; reuse actors; resale operators; customers; recycling actors	Professionals offering lifetime-extending services; reuse actors; resale operators; previous owners; actors who carried out previous interventions	Cases 2, 3, 4, 5
Circular service and pathway access information: *Which services and circular pathways are available and how can they be accessed?*	Information on available professional maintenance, repair, refurbishment and upgrading services	Service type; service provider; applicable product or model; service location or geographical coverage; contact and access information	Customers	Furniture manufacturers; professionals offering lifetime-extending services; retailers	Cases 5
	Information on circular redirection pathways	Pathway type; responsible operator; applicable product or product category; geographical scope; acceptance criteria; collection or access point; contact and access information	Reuse actors; resale operators; customers	Furniture manufacturers; retailers; resale operators; take-back providers	Cases 3, 5

Table 3 shows that the relationship between decision-related information needs and the underlying DPP-related data is not uniform. In some cases, the required information corresponds closely to a specific data type, for example material composition or chemical composition. In other cases, decision-relevant information depends on several underlying data types that need to be related, combined or contextualised. This is particularly evident for information on maintainability, repairability, refurbishment potential, upgradeability or recyclability.

These differences also affect the requirements that the information and the underlying DPP-related data need to fulfil in the respective decision contexts. The case-specific requirements summarised in Table 2 are therefore related back to the recurring information needs and their underlying data dependencies identified in Table 3. Table 4 shows how requirements concerning granularity, credibility and traceability,

usability, and lifecycle relevance and updateability apply across the information-need clusters and the underlying data required to support them.

Table 4: Requirements for recurring information needs and their underlying DPP-related data across use cases

Information-Need-Cluster	Underlying DPP-related data	Information required in the decision context	Granularity and allocation level	Traceability, credibility and evidence	Usability requirements	Lifecycle availability, updateability and versioning
Product identification and basic product information	Product identifier; manufacturer/brand identifier; model identifier/designation	Information on product identity	Model-level for manufacturer/brand and model identification; item-level where an individual product identifier is required	Identifiers remain unambiguous and traceable to the responsible manufacturer or brand and the respective product/model; product authenticity must be verifiable	Must enable unambiguous product identification and retrieval of the data associated with the relevant product or model	Identification data remain stable and available throughout the product lifecycle
	Intended-use data; model specification data	Information on intended use, functionality and basic product specifications	Model-level where intended use, functionality and specifications are stable; item-level only where product-specific configuration affects the applicable specification.	Traceable to the responsible manufacturer and the applicable model/specification version.	Must enable actors to understand the product's intended use, functionality and relevant model-specific characteristics.	Must remain available throughout the product lifecycle; updated where intended use, model specifications or applicable product configurations change.
Product construction information	Component position and structural relation; connection and fastening data; joining methods; technical drawings; CAD data; exploded diagrams	Information on product construction	Model-level where construction is stable; item-level where interventions alter construction	Traceable to manufacturer/component manufacturer	Must allow professional actors to identify and access relevant components	Available at intervention and across ownership changes
Composition-related information	Components and materials contained in the product and their allocation within the product structure	Information on product composition	Model-level where product composition is stable; batch-level where components or materials vary between production batches	Traceable to the relevant product and upstream data sources; generic declarations insufficient where decisions depend on actual composition	Must support product-level screening, comparison and reassessment	Must remain usable for later reassessment; earlier data states interpretable where requirements change
	Materials contained in the component and their allocation within the component structure	Information on component composition	Model-level where component composition is stable; batch-level where materials or subcomponents vary	Traceable to component manufacturer and upstream material sources	Must support component selection, repair-related assessment, recycling and strategic screening	Must remain available and interpretable for later reassessment
	Components and/or materials contained in the spare part	Information on spare-part composition	Model-level where spare-part composition is stable; batch-level where materials or other composition-relevant characteristics vary	Traceable to the spare-part manufacturer/supplier and, where relevant, to upstream component and material data	Must allow the composition of the spare part to be related to the component or product part it replaces and to relevant repair, safety,	Must remain available and interpretable for later reassessment

Information-Need-Cluster	Underlying DPP-related data	Information required in the decision context	Granularity and allocation level	Traceability, credibility and evidence	Usability requirements	Lifecycle availability, updateability and versioning
			between spare-part batches		recycling or reassessment decisions	
	Material/mixture composition of the consumable	Information on consumable composition	Model-level where consumable composition/specification is stable; batch-level where relevant characteristics vary between batches and affect compatibility or safe handling	Traceable to the supplier/manufacturer of the consumable and relevant upstream sources	Must support compatibility, safe-use, disposal and replacement decisions in the intervention context	Must be available and up to date at the time of intervention
	Material composition	Information on material composition	Batch-level where material composition varies between batches; model-level only where stable; item-level where documented interventions have altered the material composition of the individual product	Traceable to source; generic declarations insufficient.	Must allow context-specific information to be derived for design, reuse, recycling and customer-facing decisions.	Must remain available and interpretable for reassessment when substance classifications, performance requirements or permitted applications change
	Chemical composition	Information on chemical composition	Batch-level where chemical characteristics vary; model-level where stable	Traceable to the source of the chemical composition data; generic declarations insufficient	Must support substance, safety, recycling and preparedness assessments	Must remain available and interpretable for reassessment when substance classifications, new scientific knowledge or regulatory requirements change
	Substance identity; concentration; location within the relevant material or material fraction	Information on substances of concern, including location and concentration	Batch-level where substances vary; item-level where interventions affect SoC presence	Traceable and verifiable; sufficiently specific for safety and compliance assessments.	Must allow identification of substance, location and concentration	Must remain available beyond purchase and use; updateable when classifications, restrictions or permitted applications change
	Material composition data relevant to recycled content	Information on recycled content	Batch-level where material inputs/recycled content vary; model-level where stable	Specific and traceable; claims based on harmonised methods	Must support customer comparison and screening against anticipated/changing requirements	Must remain usable for reassessment when relevant requirements change

Information-Need-Cluster	Underlying DPP-related data	Information required in the decision context	Granularity and allocation level	Traceability, credibility and evidence	Usability requirements	Lifecycle availability, updateability and versioning
Safety and compliance information	Intended-use data; substance identity; concentration; location	Information on product safety and compliance	Batch-level where safety- and compliance-relevant characteristics may vary between production batches; model-level where these characteristics are stable; item-level where later interventions affect safety or conformity	Underlying data and assessment results must be traceable to the responsible actor and, where applicable, to the supporting conformity assessment or other evidence	Must support assessment of product safety and compliance in the respective reuse, resale or procurement context.	Must remain continuously maintained and available for later reassessment and lifecycle decisions, and be updateable where classifications, restrictions, conformity status, applicable requirements or relevant evidence change
Environmental performance information	Primary activity and process data, such as energy use, water use, resource use and process emissions, each related to a defined reference unit	Information on environmental performance, including PCF and environmental footprint indicators	Reflect actual raw material extraction and subsequent production conditions; batch-level where site, supplier, material or process varies	Traceable to the methodological basis and underlying data sources; product-, process- or supplier-specific primary data for key impact drivers to reflect actual production conditions and distinguish environmental differences between alternatives; consistent reference units, system boundaries, allocation and aggregation rules and calculation methods; underlying data and methodological information accessible for verification	Disaggregated for technical actors; aggregated/standardised for professional purchasers; simplified for B2C	Updateable when underlying data or methodological requirements change.
Quality, performance and durability information	Material composition; where relevant chemical composition; durability-relevant test results and test conditions; use-phase observation records linked to the material	Information on durability and ageing behaviour of materials	Batch-level where material composition or durability-relevant conditions vary	Traceable to source; generic claims insufficient	Must support assessment of durability, ageing behaviour and repair feasibility	Updateable when new test results or use-phase evidence emerge
	Construction data; durability-relevant test results and test conditions; use-phase observation records linked to the component	Information on durability and ageing behaviour of components	Batch-level where component characteristics vary; model-level where stable	Traceable to source; generic claims insufficient	Must support assessment of durability, repairability and upgradeability	Updateable when new test results or use-phase evidence emerge

Information-Need-Cluster	Underlying DPP-related data	Information required in the decision context	Granularity and allocation level	Traceability, credibility and evidence	Usability requirements	Lifecycle availability, updateability and versioning
	Product construction data; durability-relevant product test results and test conditions; use-phase observation, wear and failure records	Information on durability and ageing behaviour of products	Batch-level where materials/components/production conditions vary; model-level where stable	Traceable to source; generic claims insufficient	Must be comparable and understandable for the respective actor group	Updateable when new test results, observations or failure records become available
	Material composition; quality and performance specifications; origin of the secondary material; substances of concern; applicable use restrictions; relevant environmental-performance data	Information on secondary-material quality and suitability	Batch-level where secondary-material composition, quality or performance varies; model/material-grade level where characteristics are stable.	Traceable to the recycling processor/secondary-material supplier and the underlying material, process and quality data.	Must support assessment and comparison of suitability for intended applications.	Must remain interpretable and updateable where quality specifications, substance classifications or permitted applications change.
Maintainability, repairability, refurbishment, upgradeability and recyclability information	Product construction and component-accessibility data; consumable data; relevant tool data; use-phase observation and intervention records where relevant	Information on maintainability	Model-level where stable; item-level where previous interventions matter	Instructions traceable to source	Clear and practical for the actor carrying out maintenance; harmonised where comparable assessments are required	Available and up to date at the time of maintenance
	Product construction and disassembly data, including component accessibility, access points, connection-release methods, disassembly and reassembly sequences and disassembly constraints; spare-part compatibility and availability data; tool data; relevant intervention records	Information on repairability	Model-level for general repair information; item-level where previous interventions affect repairability	Underlying data and repair guidance traceable; intervention history actor/time specific	Must indicate whether and how repair can be carried out; comparable where repairability claims are compared	Available and current at time of repair; regenerable when underlying data change
	Product construction and disassembly data, including component accessibility, access points, connection-release methods, disassembly and reassembly sequences and	Information on potential for refurbishment	Model-level for general construction and intervention-related data; item-level where previous interventions affect refurbishment decisions	Preparation records and constraints traceable	Must support assessment of whether and how refurbishment can be carried out	Must remain linked to individual product across preparation and ownership changes

Information-Need-Cluster	Underlying DPP-related data	Information required in the decision context	Granularity and allocation level	Traceability, credibility and evidence	Usability requirements	Lifecycle availability, updateability and versioning
	disassembly constraints; intervention event records; relevant tool data					
	Product construction and disassembly data, including component accessibility, access points, connection-release methods, disassembly and reassembly sequences and disassembly constraints; compatible component and spare-part data; tool data; relevant intervention records	Information on upgradeability	Model-level for general upgrade options; item-level where previous interventions matter	Upgrade options/safety information traceable; intervention records actor/time specific	Must indicate possible upgrades and constraints	Updateable where new upgrade options or interventions affect future decisions
	Material and chemical composition; substance identity, concentration and location; product construction and disassembly data; relevant intervention records	Information on recyclability and recycling-process suitability	Model-level where construction and recyclability-relevant characteristics are stable; batch-level where material or chemical composition varies; item-level where interventions alter separability or recyclability	Underlying composition, construction and intervention data remain traceable to their source and relevant product or material reference	Must support assessment of whether and how the product or material can enter the relevant recycling process and whether constraints affect process suitability or output quality	Must remain available at end-of-life; updated where interventions or changes in material/process requirements affect recyclability
Intervention equipment and supply information	Spare-part identifier; component or product part to be replaced; spare-part specification; compatibility relation; availability; delivery time; cost	Information on spare parts	Model-level where compatibility is stable; item-level where previous interventions affect compatibility	Traceable to manufacturer/spare-part supplier; availability information current	Must identify compatible and available spare parts for the specific intervention	Compatibility, availability, delivery time and cost updateable
	Tool identifier; tool type; required specification; relation to affected component or connection	Information on required tools	Model-level where tool requirements are stable; item-level where previous interventions affect tool needs	Traceable to source of repair/maintenance instruction	Must identify the tools needed for the respective intervention	Updateable where construction or intervention procedures change
Use-phase and lifecycle information	Use-phase observation records; measured performance values; failure event records; wear records; repair-constraint observations; actor and	Information on product performance during use, failure modes and	Item-level for individual histories; model-level for recurring patterns across comparable products	Records indicate when and by whom observations were generated	Must allow recurring failures, wear patterns and repair constraints to be recognised	Updateable as new observations, repairs or failures occur

Information-Need-Cluster	Underlying DPP-related data	Information required in the decision context	Granularity and allocation level	Traceability, credibility and evidence	Usability requirements	Lifecycle availability, updateability and versioning
	timestamp; affected component or product part	wear patterns				
	~~Condition assessment record; assessment date; assessing actor; condition category/score; observed defects; functionality status; affected product parts~~	~~Information on current condition~~	~~Item-level.~~	~~Records indicate when and by whom generated/updated~~	~~Clear enough to support routing, repair, resale and customer decisions~~	~~Updateable whenever condition changes~~
	Intervention event records, including intervention type, affected product part, date, actor, materials/components added or removed and resulting changes	Information on previous interventions	Item-level.	Records indicate what was done, when and by whom	Must support assessment of compatibility, safety and the next intervention	Must remain linked to the individual product across later lifecycle decisions
Circular service and pathway access information	Service type; service provider; applicable product/model; service location/geographical coverage; contact/access information	Information on available professional maintenance, repair, refurbishment and upgrading services	Model/category where linked to product; context-specific where availability depends on location	Traceable to responsible provider	Clear and actionable for customers	Updateable when services/providers/access conditions change
	Pathway type; responsible operator; applicable product/category; geographical scope; acceptance criteria; collection/access point; contact/access information	Information on circular redirection pathways	Model/category where linked to product; context-specific where pathway depends on location/infrastructure	Traceable to the responsible operator	Clear and actionable pathway/access information	Updateable when pathways/operators/access conditions change

Table 4 shows that the requirements applying to the underlying DPP-related data differ according to their characteristics and role in the respective decision context. A recurring pattern is visible for granularity: batch-level data are particularly relevant where material composition, substance-related characteristics, environmental performance or material properties vary between production batches; model-level data are generally sufficient where product-related characteristics remain stable; and item-level records become relevant where use-phase observations or previous interventions affect subsequent decisions.

Different traceability requirements likewise emerge. Composition-, environmental-performance- and performance-related data need to remain attributable to the relevant source and reference object and, where necessary, to the methodological basis on which they are interpreted or assessed. Use-phase and

intervention records require a different form of traceability: they need to indicate what was recorded, when, by whom and in relation to which individual product or affected product part.
The distinction between underlying DPP-related data and decision-relevant information is also reflected in the usability requirements. Requirements for the underlying data concern their generation, allocation, traceability, maintenance and linkage to the relevant product-, component-, material- or lifecycle-related reference. Requirements for the resulting information concern how these data need to be combined, aggregated or contextualised so that they can support the respective decision. Comparable environmental-performance information, for example, depends on consistent reference units and assessment methods, while information on durability, maintainability, repairability, refurbishment potential, upgradeability or recyclability may draw on several different underlying data types.
Taken together, the cross-case analysis shows that recurring information needs and underlying DPP-related data follow different organisational structures. While the information-need clusters retain the actor- and decision-oriented perspective of the use cases, the same underlying data recur across different clusters and decision contexts. This provides the basis for analysing the underlying DPP-related data independently of the information-need clusters in Section 2.2.10.3.

2.2.10.3 Consolidation of underlying DPP-related data and structural requirements

This subsection analyses the underlying DPP-related data independently of the information-need clusters. The purpose is to identify recurring data families, and to determine the structural relationships required between them.
The cross-case analysis shows that the information-need clusters identified in Section 2.2.10.2 and the underlying DPP-related data do not translate into a one-to-one structure. For some information-need clusters, a relatively direct correspondence with a recurring type of underlying data can be identified. Composition-related information, for example, relies predominantly on product-, component-, material- and substance-related composition data. Environmental-performance information relies on primary activity and process data.
Other information-need clusters, however, do not form corresponding data families because the respective information is derived from data originating from several different areas. This is particularly the case for safety and compliance, maintainability, repairability, refurbishment potential, upgradeability and recyclability. These information needs depend on combinations of underlying data, such as product-construction data, composition data, performance and property data, intervention equipment and supply data and lifecycle records. The data-oriented consolidation therefore cuts across the information-need clusters and groups recurring underlying data according to similarities in their data-unit characteristics, reference objects, allocation requirements and lifecycle properties.
On this basis, the analysis reveals seven distinct but interrelated families of DPP-related data: Product construction data describe how components are arranged and related within the product. Composition data describe what constitutes the product and its constituent parts. Performance and property data characterise relevant properties and performance of materials, components and products. Environmental performance data provide the primary activity and process data required for environmental assessment. Intervention equipment and supply data identify the spare parts, tools relevant for lifetime-extending activities. Use-phase and lifecycle record data complement these predominantly pre-market data with observations, failure and wear records and documented interventions generated during the product lifecycle. Circular service and pathway access data provide contextual data on available services and circular redirection options.
Product-related identification and reference data fulfil a different structural function. Rather than constituting a substantive data family, identifiers and references provide the framework through which the other DPP-related data can be assigned to and retrieved for the relevant product, model, component, material or individual item. Basic product-related data such as intended-use and model specification data are linked directly to these reference objects but do not form a separate cross-cutting data family.
Table 5 summarises the resulting DPP-related data families and their main characteristics in terms of the underlying data included, the actors generating, providing or updating these data, their reference objects, typical granularity and lifecycle dynamics.

Table 5: Recurring DPP-related data families

DPP-related data family	Underlying data included	Actors generating/providing/updating the data	Main reference object / allocation	Typical granularity	Lifecycle characteristics
Product construction data	Component position and structural relations; connection and fastening data; joining methods; access points; connection-release mechanisms	Furniture manufacturers; component manufacturers	Product; component; connection; structural relationship	Mainly model-level; item-level where later interventions alter product structure	Primarily generated during product/component design; remains stable unless the physical structure is modified during the lifecycle
Composition data	Components and materials contained in the product; materials contained in components and their allocation within the component structure; components and/or materials contained in spare parts; material composition; chemical composition; substance identity, concentration and location within the relevant material or material fraction	Chemical suppliers; material suppliers/manufacturers, including secondary-material suppliers; component manufacturers; furniture manufacturers; spare-part and consumable suppliers/manufacturers	Product; component; spare part; consumable; material; material fraction	Batch-level where composition varies; model-level where stable; item-level where interventions alter composition	Mainly generated upstream and during manufacturing; must remain linked to the relevant product/component/material and available for later reassessment
Performance and property data	Durability-relevant test results and test conditions; measured or specified physical, mechanical and chemical material-property values	Material suppliers/manufacturers; component manufacturers; furniture manufacturers; recycling processors/secondary-material suppliers	Material; component; product; secondary material/material fraction	Batch-level where properties vary; model-level where stable	Generated through testing, measurement or performance assessment; relevant data remain available for later comparison and reassessment
Environmental performance data	Primary activity and process data, including energy use, water use, resource use and process emissions, each related to a defined reference unit	Actors generating the respective activity and process data, including upstream material/component suppliers and furniture manufacturers	Process; supplier; material; component; product	Batch-level where site, supplier, material or process conditions vary; otherwise related to the relevant production/process context	Generated throughout the upstream value chain and manufacturing; updateable where underlying production/process data or methodological requirements change
Intervention equipment and supply data	Spare-part identifier; component or product part to be replaced; spare-part specification; compatibility relation; availability; delivery time; cost; consumable identifier and specification; compatibility relation; supplier; availability; delivery time; cost; tool identifier; tool type; required specification; relation to affected component or connection	Furniture manufacturers; component manufacturers; spare-part suppliers; consumable suppliers; actors maintaining availability, delivery-time and cost data	Product; component; connection; spare part; consumable; tool	Mainly model-level for specifications and compatibility; batch-level where consumable characteristics vary; item-level where previous interventions affect compatibility; availability-related data are dynamic	Generated and maintained by manufacturers and relevant suppliers; compatibility/specification data remain applicable while availability, delivery and cost data require updating

DPP-related data family	Underlying data included	Actors generating/providing/updating the data	Main reference object / allocation	Typical granularity	Lifecycle characteristics
Real-use and lifecycle record data	Use-phase observation records; measured performance values generated during use; failure event records; wear records; repair-constraint observations; actor and timestamp; affected component or product part; intervention event records, including intervention type, affected product part, date, actor, materials or components added or removed, and resulting changes to condition or construction	Use-phase actors; professionals offering lifetime-extending services; reuse actors; previous owners and other actors carrying out or documenting lifecycle interventions	Individual item; affected component/product part; lifecycle event	Predominantly item-level	Generated progressively during use and subsequent lifecycle activities; cumulative and extendable as new observations, failures or interventions occur
Circular service and pathway access data	Service type; service provider; applicable product or model; service location or geographical coverage; contact and access information; pathway type; responsible operator; applicable product or product category; geographical scope; acceptance criteria; collection or access point	Furniture manufacturers where they offer or coordinate services; professionals offering lifetime-extending services; retailers; reuse/resale operators; take-back providers and other pathway operators	Service/pathway; provider/operator; geographical context; linked product/model/category where relevant	Context-specific rather than primarily model-, batch- or item-level	Generated and maintained by service providers and pathway operators; dynamic and updateable when providers, pathways or access conditions change[49]

These data families differ not only in content but also in the reference objects to which the respective data need to be assigned. Composition data, for example, must remain attributable to the relevant product, component, material or material fraction, while product construction data describe relationships between components and connections. Performance and environmental-performance data may refer to materials, components, products or production processes, whereas use-phase and lifecycle records relate predominantly to individual items, affected product parts and lifecycle events. Circular service and pathway access data follow a different reference logic because they are primarily linked to providers, operators and geographical or organisational contexts.

The cross-case analysis also highlights different data dependencies along the value chain. Furniture manufacturers generate parts of the product-level data themselves but depend on upstream actors for composition, material-property and production-related data concerning supplied materials, components and intermediate products. These upstream data are required for product-design and material/component-selection decisions, including the assessment of durability and other relevant product characteristics, and for determining the environmental performance of the final furniture product. Actors operating during use, repair, reuse and recycling in turn depend on these upstream and manufacturer-generated data remaining accessible beyond the point of sale, while themselves generating new item-specific lifecycle records that may become relevant for subsequent actors and decisions.

A central structural requirement follows from these differences: the underlying data must remain assignable to identifiable product-related reference objects and relationships. This requires a product-related reference structure linking the product to its components, materials and substance-related composition and allowing further DPP-related data to be assigned to the relevant reference object. Functionally, this resembles a bill of materials (BoM) structure, although its role extends beyond manufacturing by providing a persistent reference framework for data generated and used across the product lifecycle.

This allocation is essential for later circular decisions. For example, substance identity and concentration are of limited practical value for recycling if the substance cannot be located within the relevant material,

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component or product part. Likewise, performance data, compatibility data or intervention records can only be reused reliably if their relationship to the relevant product-related reference object is preserved. The resulting structure therefore enables the same underlying data to support different information needs without being repeatedly generated for each decision context. Some information can be obtained relatively directly from individual data types, whereas other information requires data from several families to be linked, aggregated or contextualised. Information on repairability, upgradeability or recyclability, for example, may draw simultaneously on product-structure data, composition data, intervention equipment and supply data and lifecycle records. The value-creating function of the DPP therefore depends not only on the availability of individual data points, but on their persistent allocation, linkage and reusability across decision contexts.
Figure 3 illustrates this use-case-derived data structure by showing how the recurring data families relate to the product-related reference structure and other reference contexts, and how the same underlying data can support actor- and decision-specific information through direct use, linking, aggregation or contextualisation.

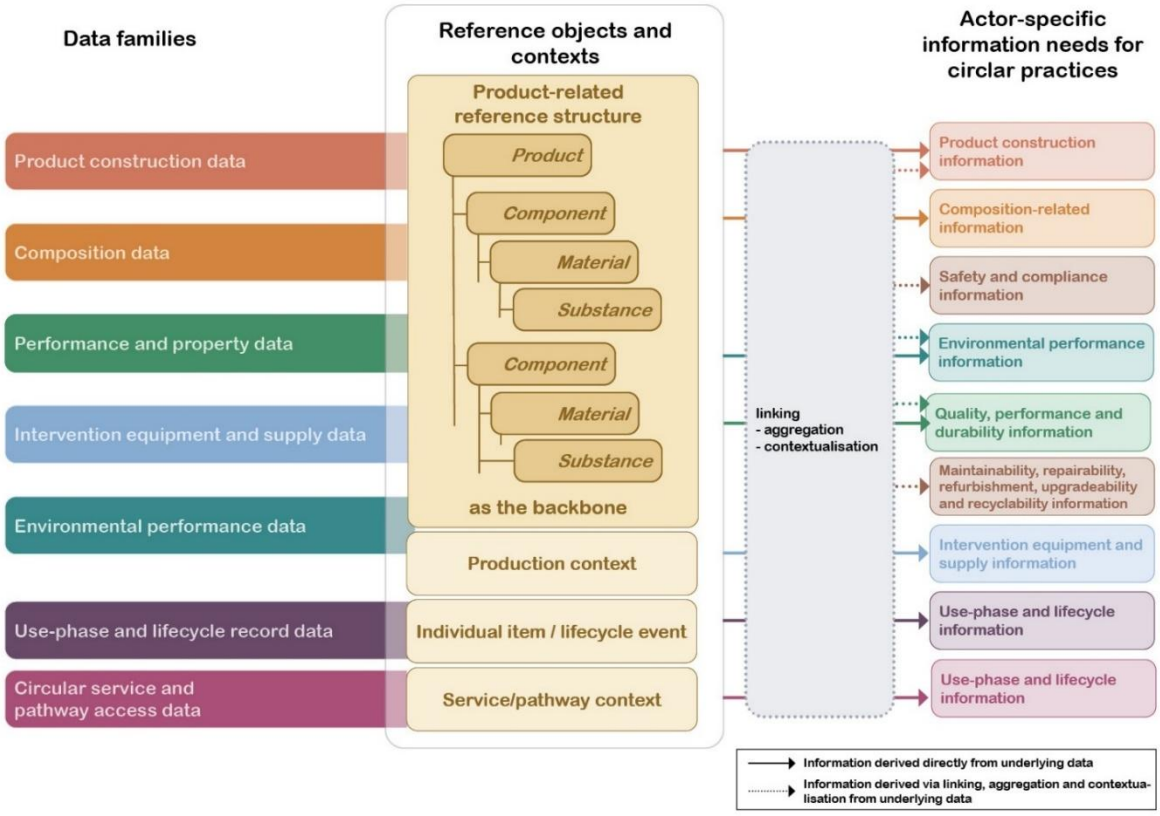


Figure 3: Use-case-derived structure and relationships of DPP-related data and actor- and decision-specific information

Taken together, the analysis identifies a shared but differentiated DPP-related data basis in which data generated at different points in the value chain and product lifecycle remain attributable to identifiable reference objects and relationships and can be reused across information needs and circular practices. This use-case-derived data structure provides the basis for the synthesis with the regulatory target-state requirements in Section 2.3.

2.3 Integrated target state for DPP-related data management

The transition towards a circular furniture economy requires coordinated changes across actors, value-chain stages and organisational practices. Within this broader system transition, DPP-related data management provides part of the information infrastructure needed to make relevant product- and lifecycle-related data available, relatable and usable across actors, circular practices and lifecycle stages. Sections 2.1 and 2.2 develop two complementary perspectives on the target state for DPP-related data management in the future furniture ecosystem (see Figure 1, p. 10). Section 2.1 establishes the regulatory target state derived from the ESPR. It identifies the product-related information that DPP-related data must be

capable of supporting and the overarching requirements for their management, including data quality, accessibility, interoperability, granularity and lifecycle availability. Section 2.2 complements this regulatory perspective with an actor- and practice-oriented analysis. Based on the use cases, it identifies the underlying DPP-related data required for circular decision-making, the reference objects and relationships to which these data need to be linked, the actors generating, providing or updating these data and the resulting data dependencies across the value chain and product lifecycle. Bringing these two perspectives together, this section asks: What must DPP-related data management look like in the target state so that the regulatory requirements identified in Section 2.1 and the actor- and practice-specific information needs identified in Section 2.2 can be fulfilled?
The purpose of this synthesis is to translate the regulatory and use-case-derived findings into a common target-state framework that can subsequently serve as the reference point for analysing current DPP-related data management practices in the furniture sector.
Section 2.3.1 first integrates the regulatory requirements derived in Section 2.1 with the use-case-derived data needs, relationships and actor dependencies and data origins identified in Section 2.2. On this basis, it defines the key elements of the target state for DPP-related data management. Section 2.3.2 applies these elements to the seven DPP-related data families identified in the use-case analysis and consolidates the resulting target state for DPP-related data management. The section concludes with a structured target-state table that provides the analytical reference for the subsequent assessment of current data management practices and the later comparison between target and current state.

2.3.1 Integration of regulatory and use-case-derived target-state requirements

Section 2.2.10.3 identifies the recurring DPP-related data families, their reference objects and actor dependencies, as well as the structural relationships required to make the underlying data relatable and reusable across decision contexts. Figure 3 summarises these use-case-derived findings. Bringing them together with the ESPR-derived requirements identified in Section 2.1, the integrated target state can be characterised by seven interrelated key elements:

1. Required data basis: The seven DPP-related data families identified in Section 2.2 constitute the underlying data basis required to support the ESPR-derived target state for DPP-related data management in the future furniture ecosystem. They provide the data required for the product-related information addressed by the ESPR and for the actor- and decision-specific information needs identified in the use cases. The seven families comprise product structure data; product, component, material and substance composition data; performance and property data; environmental performance data; intervention equipment and supply data; real-use and lifecycle record data; and circular service and pathway access data. Product-related identification and reference data fulfil a complementary structural function by enabling these data to be assigned to and retrieved for the relevant reference objects.
2. Product-related reference and linkage structure: At the core of DPP-related data management is a product-related reference structure linking the product to its components, materials and chemical composition. Product-related identification and reference data allow the respective product, model, component, material or individual item to be unambiguously identified and the associated data to be retrieved. Further product- and lifecycle-related data are assigned to the relevant reference objects and relationships, including products, components, materials, connections, individual items and lifecycle events. Circular service and pathway access data follow a different reference logic and are linked to the relevant product, model or category and to the applicable geographical or organisational context where required. Where the final product incorporates components or intermediate products for which structured product-related datasets are available, these datasets remain linked to the corresponding component or intermediate-product reference and can be integrated or referenced at final-product level.
3. Data origin and generation: Underlying DPP-related data are generated and documented by the actors at the point in the value chain or product lifecycle at which the respective data arise. Data therefore originate from different actors, including chemical and material suppliers, component and intermediate-product manufacturers, furniture manufacturers, professionals offering lifetime-extending services and other actors operating during use and subsequent circular practices. Furniture manufacturers consequently depend on upstream data for product-design and material/component-selection decisions and for determining the environmental performance of the final furniture product, while downstream actors depend on upstream and manufacturer-

generated data remaining available beyond the point of sale. The origin of the respective data remains identifiable so that they can be integrated and related to the relevant reference objects.

4. Responsibility for data provision and lifecycle maintenance: In the target state, responsibility for providing and maintaining underlying DPP-related data follows their origin and the actor's control over the respective source data. Actors generating the respective data provide them for subsequent DPP-related use and maintain their validity where the underlying conditions within their responsibility change. Furniture manufacturers integrate upstream and internally generated data in relation to the final product, but this does not transfer responsibility for the generation or validity of upstream source data to them. Where new item-specific records arise during use or subsequent circular activities, the actor generating the respective record provides it and links it to the relevant item, product part or lifecycle event. Dynamic supply, service and pathway data are maintained by the actors controlling the respective availability or access conditions.
5. Data quality, documentation and traceability: DPP-related data are generated and documented in ways that ensure their accuracy and completeness and preserve their origin, evidential basis and allocation to the relevant reference objects and relationships. They are structured, machine-readable and interoperable so that data generated by different actors and systems can be combined and used across organisational boundaries. Where information is derived through linking, aggregation or contextualisation, the relationship to the underlying data, reference objects and evidence remains identifiable.
6. Sharing and access: DPP-related data are shared and made accessible according to actor roles and decision needs. Because the actors requiring data are frequently not those at whose stage the data originate, relevant underlying data remain accessible across organisational and lifecycle boundaries. The same underlying data basis can support different actor- and decision-specific information needs. Detailed and disaggregated data remain accessible where required for technical, operational, verification or compliance-related decisions, while data can be linked, aggregated or contextualised for other decision contexts, such as procurement or customer-facing comparison. Upstream product-related data therefore need to be transferable or accessible across value-chain stages so that downstream manufacturers can use them for design, assessment and the generation of the final-product data basis.
7. Granularity and lifecycle continuity: DPP-related data are managed at the level required by their respective characteristics and decision context. Batch-level data are required where composition, material properties or production-related characteristics vary between production batches; model-level data are sufficient where relevant characteristics remain stable; and item-level data are required where use-phase observations, interventions or other lifecycle events affect subsequent decisions. Relevant data and earlier data states remain available and interpretable across lifecycle stages so that products, components and materials can be reassessed and later circular decisions can build on previously generated data.

Taken together, these seven key elements define the integrated target state for DPP-related data management and provide the structure for its data-family-specific specification in Section 2.3.2.

2.3.2 Consolidated target-state framework for DPP-related data management

This section applies the seven key elements of the integrated target state derived in Section 2.3.1 to the seven DPP-related data families identified in Section 2.2.10.3. For each data family, the analysis specifies the required underlying data, their allocation to the relevant reference objects and relationships, the actors from which the data originate, responsibilities for their provision and lifecycle maintenance, as well as requirements concerning data quality, documentation and traceability, sharing and access, and granularity and lifecycle continuity. The resulting structured target-state table provides the reference for the subsequent analysis of current data practices, that will follow as part of the ongoing work.
The consolidation focuses on the underlying DPP-related data rather than on each actor- and decision-specific form of information identified in Section 2.2. This reflects the finding that the same underlying data may support different decision contexts and may either be used relatively directly or linked, aggregated or contextualised to provide further information. Table 6 therefore captures the underlying DPP-related data basis and the conditions under which these data are generated, allocated, documented, maintained, shared and made accessible. Requirements that apply specifically to information derived from these data are not repeated, except where they translate into requirements for the underlying data, for example concerning traceability, methodological context or reference units.

Across all data families, the general ESPR-derived requirements identified in Section 2.1 apply, including accuracy and completeness as well as structured, machine-readable and interoperable provision. Table 6 therefore focuses on the data-family-specific requirements resulting from the integration of the regulatory baseline in Section 2.1 with the use-case-derived findings in Section 2.2.

Table 6: Target state for DPP-related data management at data-family level

DPP-related data family	Required data basis	Product-related reference and linkage structure	Actors generating the data / data origin	Actors responsible for provision and lifecycle maintenance	Data quality, documentation and traceability	Actors requiring access / sharing requirements	Granularity and lifecycle continuity
Product construction data	Component position and structural relations; connection and fastening data; joining methods; access points; connection-release mechanisms	Linked to the product-related reference structure, particularly the relevant product, components, connections and structural relationships	Furniture manufacturers; component manufacturers	Furniture manufacturers provide and maintain product-level structure data; component manufacturers provide and maintain component-specific data	Traceable to the source of the structure data; components, connections and structural relationships remain unambiguously identifiable; later structural changes remain documented	Professionals offering lifetime-extending services; reuse actors; recycling pre-processors requiring detailed product-structure data	Mainly model-level; item-level where interventions alter product structure. Data remain available at later intervention and recycling stages and across ownership changes
Composition data	Components and materials contained in the product; materials contained in components; components and/or materials contained in spare parts;; material composition; chemical composition; substance identity, concentration and location within the relevant material or material fraction	Linked to the relevant product, component, spare part, consumable, material or material fraction within the product-related reference structure	Chemical suppliers; material suppliers/manufacturers, including secondary-material suppliers; component manufacturers; furniture manufacturers; spare-part and consumable suppliers/manufacturers	Actors generating the respective composition data provide and maintain the data originating within their responsibility. Furniture manufacturers integrate upstream and internally generated data at product level. Later composition changes are documented by the actor carrying out the respective intervention	Source-traceable and sufficiently specific to represent actual composition where required; substance-related data identify the relevant substance, concentration and location; changes to composition remain identifiable	Role-based access for actors requiring underlying composition data for design, repair, reuse, recycling, compliance or reassessment; data shared along the value chain where required for these purposes	Batch-level where composition varies; model-level where stable; item-level where interventions alter composition. Earlier data states remain available and interpretable for reassessment
Performance and property data	Durability-relevant test results and test conditions; measured or specified physical, mechanical and chemical material-property values	Linked to the material, component, product or secondary material/material fraction to which the	Material suppliers/manufacturers; component manufacturers; furniture manufacturers; recycling	Actors generating the respective test, measurement or performance data provide and maintain them; new	Traceable to the relevant data source and tested or measured reference object; test results remain linked to	Actors requiring detailed performance or property data for design, material/component selection, repair-	Batch-level where properties vary; model-level where stable. Relevant data remain available for later comparison and reassessment

DPP-related data family	Required data basis	Product-related reference and linkage structure	Actors generating the data / data origin	Actors responsible for provision and lifecycle maintenance	Data quality, documentation and traceability	Actors requiring access / sharing requirements	Granularity and lifecycle continuity
		respective test result or property value refers	processors/secondary-material suppliers	evidence is added by the actor generating it	the applicable test conditions	related assessment or verification	
Environmental performance data	Primary activity and process data, including energy use, water use, resource use and process emissions, each related to a defined reference unit	Linked to the relevant process, supplier, material, component or product and the respective production/process context	Actors generating the respective activity and process data, including upstream material/component suppliers and furniture manufacturers	Actors generating the respective primary activity and process data provide and maintain them and make them available where required further along the supply chain	Traceable to the underlying data source and production/process context; methodological context and reference units retained where required for subsequent environmental-performance assessment	Underlying data accessible to actors requiring them for technical assessment, design, sourcing or verification; sharing across supply-chain stages where necessary for product-level assessment	Batch-level where site, supplier, material or process conditions vary; otherwise related to the relevant production/process context. Underlying data remain available so that environmental-performance information can be reassessed where source data or methodological requirements change
Intervention equipment and supply data	Spare-part identifier; component or product part to be replaced; spare-part specification; compatibility relation; availability; delivery time; cost; consumable identifier and specification; compatibility relation; supplier; availability; delivery time; cost; tool identifier; tool type; required specification; relation to affected component or connection	Linked to the product, component, connection, spare part, consumable or tool to which the respective data refer; compatibility relationships remain linked to the relevant reference objects	Furniture manufacturers; component manufacturers; spare-part suppliers; consumable suppliers; actors maintaining availability, delivery-time and cost data	Actors generating the respective spare-part, consumable or tool data provide and maintain them; actors controlling supply maintain availability-, delivery-time- and cost-related data	Identifiers, specifications and compatibility relations remain traceable to the relevant source and product/component reference; availability, delivery-time and cost data remain current	Professionals offering lifetime-extending services and, where relevant, customers carrying out permitted interventions	Mainly model-level for specifications and compatibility; batch-level where consumable characteristics vary; item-level where previous interventions affect compatibility; availability-related data are dynamic
Real-use and lifecycle record data	Use-phase observation records; measured performance values generated during use; failure event records; wear records; repair-constraint observations;	Linked to the individual item, the affected component/product part and the relevant lifecycle event	Use-phase actors; professionals offering lifetime-extending services; reuse actors; previous owners	The actor generating the respective lifecycle record provides it and is responsible for its validity at the time of	Actor-, time- and event-specific traceability; records identify what was observed or done,	Actors requiring item-specific history for subsequent maintenance, repair,	Predominantly item-level. Records accumulate and remain linked to the individual

DPP-related data family	Required data basis	Product-related reference and linkage structure	Actors generating the data / data origin	Actors responsible for provision and lifecycle maintenance	Data quality, documentation and traceability	Actors requiring access / sharing requirements	Granularity and lifecycle continuity
	actor and timestamp; affected component or product part; intervention event records, including intervention type, affected product part, date, actor, materials or components added or removed, and resulting changes to condition or construction		and other actors carrying out or documenting lifecycle interventions	documentation; subsequent lifecycle actors add new records	when and by whom; previous interventions remain identifiable	refurbishment, reuse or recycling decisions	product across later lifecycle and ownership decisions
Circular service and pathway access data	Service type; service provider; applicable product or model; service location or geographical coverage; contact and access information; pathway type; responsible operator; applicable product or product category; geographical scope; acceptance criteria; collection or access point	Linked to the applicable product, model or product category where relevant and otherwise to the relevant service/pathway, provider/operator and geographical or organisational context; not part of the product-related reference structure itself	Furniture manufacturers where they offer or coordinate services; professionals offering lifetime-extending services; retailers; reuse/resale operators; take-back providers and other pathway operators	The actor providing the service or responsible for the respective pathway provides and maintains the associated availability and access data	Traceable to the responsible provider/operator; applicable product/category, geographical scope, acceptance criteria and access information remain identifiable	Customers, reuse actors and resale operators requiring access to the relevant service or pathway data	Context-specific rather than primarily model-, batch- or item-level. Data are updated when providers, pathways or access conditions change

The second part of the analysis will build on this target-state framework. It will examine current DPP-related data management practices in the furniture sector and identifie where relevant data are missing, fragmented, insufficiently reliable, not available at the required level of granularity or not accessible to the actors who need them. In addition, it will contrast these current practices with the target state developed in Chapter 2 in order to identify the resulting data gaps and the behavioural factors that stabilise them. As a result, it will identify governance mechanisms required to address these data gaps and enable the target state for DPP-related data management across the circular furniture ecosystem.

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Annex

Annex A

List of content wise data points explicitly mentioned in the ESPR

The ESPR contains several provisions that stipulate the specific content of certain data points. The following tables list data points that are explicitly mentioned in the ESPR.

Some of them the legal text categorised as minimum requirements (see Table 7). For other data points the legal text mentions that they "shall, as appropriate for the product groups covered" (so the introduction to the list of requirements in Art. 9(2)) be specified (see Table 8).

Table 7: List of data points mentioned in the ESPR as minimum requirements

Nr.	Inf. Req.	ESPR	Further informtation/definitions
Data on substances of concerns in products			
1	Name in the International Union of Pure and Applied Chemistry (IUPAC) nomenclature, or another international name when IUPAC name is not available;	Art. 7 (5) (a) (i)	Art. 2 (27) 'substance of concern' means a substance that: (a) meets the criteria laid down in Article 57 of Regulation (EC) No 1907/2006 (REACH) and is identified in accordance with Article 59(1) of that Regulation; (b) is classified in Part 3 of Annex VI to Regulation (EC) No 1272/2008 (CLP) in one of the following hazard classes or hazard categories: (i) carcinogenicity categories 1 and 2; (ii) germ cell mutagenicity categories 1 and 2; (iii) reproductive toxicity categories 1 and 2; (iv) endocrine disruption for human health categories 1 and 2; (v) endocrine disruption for the environment categories 1 and 2; (vi) persistent, mobile and toxic or very persistent, very mobile properties; (vii) persistent, bioaccumulative and toxic or very persistent, very bioaccumulative properties; (viii) respiratory sensitisation category 1; (ix) skin sensitisation category 1; (x) hazardous to the aquatic environment — categories chronic 1 to 4; (xi) hazardous to the ozone layer;
2	Other names, including usual name, trade name, abbreviation;	Art. 7 (5) (a) (ii)	
3	European Community (EC) number, as indicated in the European Inventory of Existing Commercial Chemical Substances (EINECS), the European List of Notified Chemical Substances (ELINCS) or the No Longer Polymer (NLP) list or the number assigned by the European Chemicals Agency (ECHA), if available and appropriate;	Art. 7 (5) (a) (iii)	
4	The Chemical Abstract Service (CAS) name and number, if available;	Art. 7 (5) (a) (iv)	
5	Location of the substances of concern within the product	Art. 7 (5) (b)	
6	The concentration, maximum concentration or concentration range of the substances of concern, at the level of the product, its relevant components, or spare parts	Art. 7 (5) (c)	
7	Relevant instructions for the safe use of the product	Art. 7 (5) (d)	

8	Information relevant for disassembly	Art. 7 (5) (e)	(xii) specific target organ toxicity — repeated exposure categories 1 and 2; (xiii) specific target organ toxicity — single exposure categories 1 and 2; (c) is regulated under Regulation (EU) 2019/1021 (POP); or (d) negatively affects the reuse and recycling of materials in the product in which it is present;
9	Information relevant for preparation for reuse	Art. 7 (5) (e)	
10	Information relevant for reuse	Art. 7 (5) (e)	
11	Information relevant for recycling	Art. 7 (5) (e)	
12	Information relevant for the environmentally sound management of the product at end-of-life	Art. 7 (5) (e)	

Table 8: List of data points mentioned in the ESPR to be specified "as appropriate" in the delegated acts

Nr.	Inf. Req.	ESPR	Further informtation/definitions
Data on product performance in relation to the product aspects			
13	Repairability score	Art. 7 (2) (b) (i)	Annex I: Ease of repair and maintenance, as expressed through 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;
14	Durability score	Art. 7 (2) (b) (i)	Annex I: durability and reliability of the product or its components as expressed through the product's guaranteed lifetime, technical lifetime, mean time between failures, indication of real use information on the product, resistance to stresses or ageing mechanisms;
15	Carbon or environmental footprint	Art. 7 (2) (b) (i)	
16	Further information on the performance of the product in relation to other product paramters	Art. 7 (2) (b) (i)	
Data enabling correct use, maintenance, repair and end-of-life treatment			
17	Information for customers about installation	Art. 7 (2) (b) (ii)	Art. 27(7): Manufacturers shall ensure that a product covered by a delegated act adopted pursuant to Article 4 is accompanied by instructions in digital format concerning the product ('digital instructions') in a language that can be easily understood, as determined by the Member State concerned. Digital instructions shall be clear, understandable and legible and include at least the information set out in Article 7(2), point (b)(ii), as specified in that delegated act. However, manufacturers shall provide in paper, in a concise format, safety information and the instructions relevant for the health and safety of customers and other relevant actors. When providing the digital instructions, the manufacturer shall include them in the digital product passport and make them accessible through the corresponding data carrier, or, where the digital product passport is not applicable, indicate on the product, or, where that is not possible, on its packaging or in an accompanying document, how to access the digital instructions. The manufacturer shall present the digital instructions in a format that makes it possible to download and save them on an electronic device so that the user can access them at all times and shall make them accessible online during the expected lifetime of the product, but in any event for at
18	Information for customers about usage	Art. 7 (2) (b) (ii)	
19	Information for customers about maintenance	Art. 7 (2) (b) (ii)	
20	Information for customers about repair	Art. 7 (2) (b) (ii)	
21	If relevant, information for customers about installing third-party operating systems	Art. 7 (2) (b) (ii)	
22	Information for customers about the collection for refurbishment/remanufacture	Art. 7 (2) (b) (ii)	

23	Information for customers on how to return or handle the product at end-of-life	Art. 7 (2) (b) (ii)	least 10 years after the placing on the market or putting into service of the product. Where the customer so requests at the time of the purchase, or up to six months after that purchase, the manufacturer shall provide the digital instructions in a paper format, free of charge, within one month of receiving the request.
24	Information for treatment facilities on disassembly	Art. 7 (2) (b) (iii)	
25	Information for treatment facilities on reuse	Art. 7 (2) (b) (iii)	
26	Information for treatment facilities on refurbishment	Art. 7 (2) (b) (iii)	
27	Information for treatment facilities on recycling	Art. 7 (2) (b) (iii)	
28	Information for treatment facilities on disposal at end-of-life	Art. 7 (2) (b) (iii)	
29	User manuals (if required by other Union law)	ANNEX III (f)	
30	Instructions (if required by other Union law)	ANNEX III (f)	
31	Warnings or safety information (if required by other Union law)	ANNEX III (f)	
Data for identification			
32	Unique product identifier at the level indicated in the applicable delegated act	ANNEX III (b)	Art. 2 (30) '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;
33	GTIN (Global Trade Identification Number)	ANNEX III (c)	
34	TARIC-Code	ANNEX III (d)	
35	Compliance documentation such as declaration of conformity, technical documentation or conformity certificates	ANNEX III (e)	Art 2. (51) 'conformity assessment' means the process demonstrating whether the ecodesign requirements set out in the relevant delegated acts adopted pursuant to Article 4 have been fulfilled;
36	Unique operator identifier (Manufacturer)	ANNEX III (g)	Art. 2 (31) 'unique operator identifier' means a unique string of characters for the identification of an actor involved in a product's value chain;
37	Unique operator identifiers other than that of the manufacturer	ANNEX III (h)	
38	Unique facility identifiers	ANNEX III (i)	Art. 2 (33) 'unique facility identifier' means a unique string of characters for the identification of locations or buildings involved in a product's value chain or used by actors involved in a product's value chain;
39	Economic Operators Registration and Identification (EORI) number	ANNEX III (j)	Art. 2 (46) 'economic operator' means the manufacturer, the authorised representative, the importer, the distributor, the dealer and the fulfilment service provider;
40	The name of the economic operator established in the Union	ANNEX III (k)	
41	Contact details of the economic operator established in the Union	ANNEX III (k)	

42	Unique operator identifier of the economic operator established in the Union	ANNEX III (k)	
43	The reference of the digital product passport service provider hosting the back-up copy of the digital product passport	ANNEX III (l)	Art. 2 (32) 'digital product passport service provider' means a natural or legal person that is an independent third-party authorised by the economic operator which places the product on the market or puts it into service and that processes the digital product passport data for that product for the purpose of making such data available to economic operators and other relevant actors with a right to access those data under this Regulation or other Union law;
44	Name of importer	Art. 29 (3)	Art. 2 (44) 'importer' means any natural or legal person established in the Union that places a product from a third country on the Union market; Art. 29 (3): (a) on the public part of the digital product passport, where applicable; and (b) on the product or, where that is not possible, on the packaging, or in a document accompanying the product. The contact details shall be clear, understandable and legible.
45	Registered trade name or trade mark of importer	Art. 29 (3)	
46	Postal address at which importer can be contacted	Art. 29 (3)	
47	Electronic means of communication through which importer can be contacted	Art. 29 (3)	