Deliverable D2.1:

**Governance aspects of the DPP in the textile sector**

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| **Abstract:** | The report addresses the data management requirements of actors in the textile sector when aligning their strategies and operations with the objectives of the 'Textile Strategy' and their implementation in the ESPR with regard to the DPP.<br>Chapter 1 outlines the problem constellation and the methodological approach. Chapter 2 sets out the normative orientation and target practices by analysing ESPR requirements, relevant JRC preparatory studies, and selected data management cases. Chapter 3 examines the current state of data-related practices in the textile sector, identifying missing data and existing barriers. Chapter 4 provides a 'delta analysis' by comparing the results of the previous two steps. Chapter 5 summarises the findings and identifies key governance aspects for DPP data management. Chapter 6 considers how the results will be further refined in subsequent TRUSTex work packages and in response to evolving EU-level policy developments. |

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## List of acronyms

| | |
|---|---|
| BoM | Bill of Materials |
| BoC | Bill of Chemicals |
| CE | Circular Economy (as defined in the NCEAP) |
| CEN | Comité Européen de Normalisation (European Committee for Standardization) |
| CENELEC | Comité Européen de Normalisation Électrotechnique (European Committee for Electrotechnical Standardization) |
| CEBM | Circular Economy Business Model(s) aligned to the 'Textile Strategy' of the EU |
| DA | Data Access Specifications |
| DC | Data completeness assurance measures |
| DPP | Digital Product Passport |
| DU | Data up to date assurance measures |
| DQ | Data Quality Specifications |
| ESPR | Regulation 2924/1781 establishing a framework for the setting of ecodesign requirements for sustainable products |
| ERP | Enterprise Resource Planning (IT-system) |
| EU | European Union |
| GPSR | General Product Safety Regulation |
| IC | Inclusivity and Capability Support in Data Processes |
| JRC | Joint Research Centre (of the European Commission) |
| JTC | Joint Technical Committee |
| MRSL | Manufacturing Substances List |
| NCEAP | New Circular Economy Action Plan |
| NLF | New Legislative Framework |
| NIAS | Non-intentionally added substances |
| OU | Overarching Usability features |
| PCF | Product Carbon Footprint |
| POP | Regulation 2019/1021 on Persistent Organic Pollutants |
| PLM | Product Lifecycle Management |
| REACH | Regulation 1907/2006 on Registration, Evaluation, Authorisation and Restriction of Chemicals |
| RSL | Restricted Substances List |
| ROI | Return on Investment |
| SoC | Substance(s) of Concern |
| SME | Micro, small and medium-sized enterprise(s) |
| specs | (order) specifications |
| SSbD | Safe and Sustainable by Design |
| TLR | Textile Labelling Regulation |
| ToD | Terms of delivery |
| ToS | Terms of service |
| UNEP | United Nations Environment Programme |
| WFD | Waste Framework Directive |
| WP | Work Package |
| ZDHC | Zero Discharge of Hazardous Chemicals |

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## Legal definitions and other terms used in this report

‘Bill of Chemicals’ (BoC): A BoC-equivalent dataset is a structured collection of information about the chemical composition of the materials present in a product’s components (listed in the Bill of Materials) and how these materials were treated. It includes details of dyes, coatings, finishes, auxiliaries, additives, processing chemicals and known residues. Although the ESPR does not use the term Bill of Chemicals, Article 5(1) identifies chemical characteristics as a key product aspect, and Article 7(5) requires this information to be traceable, updatable and linked to specific functions, locations and concentrations (see Table 17 at p. 101 for details in this respect). These provisions imply the need for a chemical data structure equivalent to a BoC, which would enable those involved in the supply chain to identify substances that could impact the reuse, remanufacturing or recycling of products (see also Box 11 at p. 42).

‘Bill of Materials’ (BoM): A BoM-equivalent dataset is a structured collection of information on the components of a product and its material composition. This includes details such as fibre types, polymer identity, blend ratios, multilayer structures and non-textile components. Although the term is not used in the regulation, the ESPR requires product information to be linked to specific product aspects such as material composition (relevant for the ‘product aspects’ set out in Article 5(1) and the related ‘performance requirements’) and to be structured in a way that enables data integration, traceability and verifiability along the supply chain (Article 7). In practical terms, this effectively constitutes a BoM-equivalent structure (see also Box 11 at p. 42).

'Circular Economy' (CE): According to the “new Circular Economy Action Plan [NCEAP]- For a cleaner and more competitive Europe” (COM(2020) 98, p. 14) CE aims at “preventing waste, increasing recycled content, promoting safer and cleaner waste streams, and ensuring high-quality recycling”. CE responds to the problem statement in the Green Deal (COM(2019) 640, p. 7/ CE 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’ in the sense of this report are everyday practices that contribute to a resource-preserving, low in toxicity and climate-friendly ‘Circular Economy’ (CE).

‘collection’ means 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’ means 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 consumer as well as public or private procurers;.

‘disposal’ means any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy. Annex I [to the WFD] sets out a non-exhaustive list of disposal operations (Art. 3(19) WFD).

‘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 (Art. 2(7) ESPR).

‘Governance Framework’ in a broader sense refers to all legislative and non-legislative framework conditions steering the behaviour in a certain field of action (thus including measures at the macro- and the meso-level). In a narrower sense, 'Governance Framework' refers to all measures at the meso-level.

‘information requirement’ means an obligation for a product to be accompanied by information as specified in Article 7(2) (Art. 2(9) ESPR).

‘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 (Art. 2(12) ESPR).

‘life-cycle costing’ [under Directive 2014/24/EU] shall to the extent relevant cover parts or all of the following costs over the life cycle of a product, service or works: (a) costs, borne by the contracting authority or other users, (...) (b) costs imputed to environmental externalities linked to the product,

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service or works during its life cycle, provided their monetary value can be determined and verified (…). (Art. 68(1) Directive 2014/24/EU) Whenever a common method for the calculation of life-cycle costs has been made mandatory by a legislative act of the Union, that common method shall be applied for the assessment of life-cycle costs. (…) (Art. 68(3) Directive 2014/24/EU).

'macro-level': The Governance Framework at this level defines binding regulatory obligations and minimum dataset structures through the ESPR and its delegated acts. Establishes which data must be provided, how core dataset components relate to each other in terms of verifiability (e.g. BoM, including BoC, and product-linked primary environmental data), and which baseline criteria apply regarding accuracy, updateability, granularity and linkage to product identity (see also Box 14, at p. 76).

'meso-level': The Governance Framework at this level operationalises macro-level obligations through sector-specific Governance Frameworks. It translates abstract requirements into shared conventions, including harmonised dataset schemas, allocation logics, tiered access models and trust-building mechanisms that enable data exchange beyond bilateral relationships (see also Box 14, at p. 76).

'micro-level': The Governance Framework at this level implements regulatory and sectoral requirements within companies and other organisations. Integrates data obligations into organisational processes, contractual arrangements and internal data management systems, thereby reducing transaction costs and clarifying responsibilities across supply-chain relationships (see also Box 14, at p. 76).

'microenterprises': Within the SME category, a microenterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million (Art. 2(3) of Annex I to Commission Recommendation 2003/361/EC, as referenced by Art. 2 ESPR).

'nano-level' means the perspective of individuals acting within an organisation such as a company or as private person such as a consumer. This level shapes how governance requirements are enacted in daily practice. Individual capabilities, roles and routines determine how data are collected, consolidated, validated and updated, requiring targeted capacity-building measures and practical guidance (see also Box 14, at p. 76).

'performance requirement' means 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).

'premature obsolescence' means a product design feature or subsequent action or omission resulting in the product becoming non-functional or performing less well without such changes of functionality or performance being the result of normal wear and tear (Art. 2(21) ESPR); the EmpCo Directive (EU) 2024/825 uses the phrase 'early obsolescence' in Recitals (2), (16), (23)).

'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).

'prevention' means 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).

'producer responsibility organisation' means a legal entity that financially, or financially and operationally, organises the fulfilment of extended producer responsibility obligations on behalf of producers (Art. 3(4d) WFD as amended by Directive (EU) 2025/1892).

'recovery' means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy. Annex II sets out a non-exhaustive list of recovery operations (Art. 3(15) WFD).

'recycling' means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations (Art. 3(17) WFD).

're-use' means any operation by which products or components that are not waste are used again for the same purpose for which they were conceived (Art. 3(13 WFD).

'small enterprises': Within the SME category, a small enterprise is defined as an enterprise which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not

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exceed EUR 10 million (Art. 2(2) of Annex I to Commission Recommendation 2003/361/EC, as referenced by Art. 2 ESPR).

'SME': The category of micro, small and medium-sized enterprises (SME) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million (Art. 2(1) of Annex I to Commission Recommendation 2003/361/EC, as referenced by Art. 2 ESPR).

'supply chain' means 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).

'textile product' means any raw, semi-worked, worked, semi-manufactured, manufactured, semi-made-up or made-up product which is exclusively composed of textile fibres, regardless of the mixing or assembly process employed; (Art. 3(1)(a) TLR; Art. 2(2) stipulates that products containing at least 80 % by weight of textile fibres shall be treated in the same way as textile products, as well as specific textile components of floor coverings, mattresses, and camping goods when those components themselves make up at least 80 % of the relevant layer or covering).

'Textile Strategy': European Commission (2022): EU Strategy for Sustainable and Circular Textiles, COM(2022) 141 final, 30 March 2022.

'unsold consumer product' means any consumer product that has not been sold including surplus stock, excess inventory and deadstock and products returned by a consumer on the basis of their right of withdrawal in accordance with Article 9 of Directive 2011/83/EU or, where applicable, during any longer withdrawal period provided by the trader (Art. 2(37) ESPR).

'value chain' means all activities and processes that are part of the life cycle of a product, as well as its possible (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' means 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' means any substance or object which the holder discards or intends or is required to discard (Art. 3(1) WFD).

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## 0. Executive Summary

In the context of the ESPR, product-related data management is not limited to technical or organisational issues. To analyse governance aspects in this respect, this report takes an actor-based perspective. As a starting point, it considers the data management requirements that arise from the actors' need to align their strategies and operations with the objectives of the 'Textile Strategy' and its implementation in the ESPR with regard to the DPP in the textile sector.

To gain a clearer picture of potential data governance aspects, the report employs a two-step approach. First, it addresses the following research question:

1. Which actors need to provide which information, when, to whom, and in what form, to enable Circular Economy Business Models aligned with the EU 'Textiles Strategy'?

Based on the results obtained, the report addresses the subsequent research question in its second step:

2. Which governance aspects are relevant for closing data gaps and fostering mutual trust among actors in the textile sector with regard to the quality of DPP data?

The findings respond to the challenges associated with the differing needs of various stakeholders in future business relationships within the textile sector, proposing a set of governance measures

The methodological approach of this report follows the 'Interdisciplinary Institutional Analysis' (Bizer & Führ 2015), a behaviour-oriented approach that systematically links normative goals with real-world actors and their organisational contexts. Drawing on insights from institutional economics, social psychology, sociology and legal analysis, it enables an in-depth examination of the organisational and institutional context of each actor. To explain how these institutional settings translate into concrete actor behaviour in practice, the analysis integrates three analytical categories formulated by Ashford (2000): the personal *capacity* of the relevant individual actors, their actual *opportunity* to shape innovation-oriented decisions and processes within the context of an organisation (or in the cooperation with other organisations), and their perception of the incentives and disincentives that influence their *willingness* to act in this manner. In this way, it is possible to work out *why* the actors behave the way they do.

Building on this methodological framework, the analysis proceeds in four analytical steps. First, it identifies the information requirements associated with circular economy business models in the textile sector, with particular attention to normative expectations arising from the Ecodesign for Sustainable Products Regulation (ESPR) and related preparatory studies (Sections 2.1 and 2.2). These requirements are then operationalised through target practices formulated as case studies, which describe concrete interaction patterns between actors along the textile value chain, specifying who needs which data from whom, when and through which mechanisms (Section 2.3). In doing so, they illustrate how actors are expected to interact using the DPP in order to achieve the objectives set out in the 'Textile Strategy'. Section 2.4 summarises the resulting data needs of the actors in a future circular textile ecosystem. It specifies the information that each actor must provide to others at defined moments during design, production, reuse, recycling or risk assessment, and in a format suited to the receiving actor's decision-making context (see Table 7). Essentially, circularity-oriented decisions within the value chain require a data set that is hierarchically structured according to the product's components, as listed in the 'Bill of Materials'. Linked to each component are chemical information (in the form of a 'Bill of Chemicals') and environmental performance data (at process-node level). BoC-equivalent chemical data and environmental performance data are therefore not independent datasets, but are structurally embedded and contextualised through their linkage to BoM-equivalent product structures (see also see Box 11 at p. 42). The section concludes that circularity does not emerge from uniform transparency requirements, but rather from purpose-specific information flows that are timely, credible and interoperable. By making these dependencies explicit, an answer to the first part of the research question is provided.

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The analysis subsequently examines current data management practices in the textile value chain, focusing on existing routines, missing data and barriers (Chapter 3). By systematically comparing target practices with current practices, the delta-analysis identifies key data gaps and the behavioural factors underlying these deviations (Chapter 4). Finally, the analysis explores governance mechanisms for generating missing data and establishing trust in DPP data quality among actors in the textile sector (Chapter 5). Chapter 6 outlines how the results will be further refined in subsequent TRUSTex work packages and in response to evolving EU-level developments.

The analysis in Chapter 3 shows that the data gaps relevant to the DPP in the textile sector are not are not simply a matter of missing IT solutions or data formats, but rooted in long-standing social and organisational information practices. While actors already generate BoM-, BoC- and environmental performance data, these data are rarely structured, retained and shared in ways that support circular decision-making across the product life cycle.

Current practices – shaped by linear supply-chain logics, indirect compliance communication and third-party verification – systematically limit data completeness, interoperability, traceability and credibility across all three information domains. As a consequence, the DPP cannot rely on existing practices alone to function as a trustworthy, decision-relevant data infrastructure.By structuring the findings of the delta analysis (for details see Chapter 4 and Section 4.4) along the behavioural categories developed by Ashford it is possible to understand more precisely why individuals within a particular organisational function behave as they do, rather than as the target state requires:

- *Capability* constraints do not primarily concern the absence of relevant data, but the limited sector-wide ability to transform information into datasets that are structured, standardised, allocatable and interoperable.
- *Opportunity* constraints in the textile ecosystem are driven by structural fragmentation and governance absence: actors do not simply "fail to share data"; they operate in organisational and institutional contexts in which data sharing remains non-standardised, discontinuous and difficult to operationalise. Even where direct contractual interaction takes places, the traditional pattern of trade secrets and missing infrastructure hinder data sharing.
  This structurally limits the feasibility of creating the traceable and interoperable data chain required in the target state.
  In addition, the opportunity gap is reinforced by information asymmetry: downstream actors (including brands) cannot reliably ascertain which data exist upstream, what format they are in, or under what conditions they could be made accessible. This limits the perceived scope for action and entrenches reliance on indirect compliance mechanisms rather than proactive, dataset-based transparency.
- In terms of *willingness*, the delta analysis shows that current data practices remain stabilised by incentive structures that rarely reward transparency-oriented behaviour. In the status quo, actors often perceive structured data disclosure as a cost and risk factor rather than as a source of value creation.
  The incentive structure across BoM, BoC and environmental primary data follows a common pattern: actors disclose only what is mandatory, rather than what is required for downstream circular decision-making. This leads to selective sharing, minimal compliance confirmation, and risk-avoidance strategies, rather than to the creation of shared datasets.

In summary, the persistence of data gaps reflects a rational behavioural equilibrium in which actors behave consistently with the current incentive structures that prioritise procurement efficiency, risk minimisation and confidentiality over transparency, interoperability and the long-term readiness of circular data.

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A further stabilising mechanism concerns verification and trust dynamics. Because actors do not systematically disclose structured datasets, downstream actors must rely on certificates, audits and targeted testing. This shifts verification costs downstream, reinforces selective compliance checks, and further reduces upstream incentives for proactive transparency. The system therefore reproduces a circular loop: limited disclosure generates mistrust; mistrust increases verification costs; high verification costs favour compliance confirmation rather than dataset-based exchange; and datasets remain insufficient for circular decision-making.

Against this background, Chapter 5 reframes DPP-related data gaps as a systemic governance challenge rather than a firm-level implementation problem. It shows that DPP-compatible data exchange requires coordinated efforts across interdependent actors and tiers, which cannot be achieved through isolated technical solutions or regulatory obligations alone. Instead, effective governance must simultaneously address behavioural constraints related to capability, opportunity and willingness.

From this diagnosis, the report derives three core governance requirements:

(1) enabling the generation of meaningful, reusable and product-linked datasets;
(2) establishing institutionally secured, trustworthy and verifiable data flows across life-cycle stages; and
(3) aligning incentives and access conditions so that dataset provision becomes a rational and valued practice.

These requirements are mutually reinforcing and must be addressed in an integrated manner to shift the current equilibrium away from selective disclosure towards shared, interoperable and verifiable datasets.

To operationalise these requirements, the analysis adopts a multi-level governance perspective.

- Macro-level regulation under the ESPR defines binding obligations and minimum dataset structures, providing legal certainty and a common baseline across the internal market. It is only through ambitious and precise macro-level requirements that the intended system innovation will occur.
- Meso-level governance frameworks translate these obligations into sector-specific conventions, harmonised schemas, allocation logics and trust-building mechanisms that enable data exchange beyond bilateral relationships.
- Micro-level arrangements incorporate these requirements into organisational practices and patterns of cooperation with other actors in the value chain, which are often based on contractual relationships.
- Nano-level measures support individual capabilities and routines through targeted guidance and capacity-building.
- IT infrastructures play a supporting role across all levels by enabling interoperability, access control and verification, but do not substitute for governance decisions.

Overall, the report concludes that only the coherent interaction of governance levels can enable DPP-compatible data practices that go beyond compliance and support circular decision-making across the full textile life cycle. Establishing such governance arrangements is a necessary precondition for realising the objectives of the EU ‘Textiles Strategy’ and for enabling Circular Economy Business Models grounded in reliable, trusted and reusable product data.

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# 1. Introduction

This document presents Deliverable D2.1 within Work Package 2 (WP2) of the TRUSTex project. It addresses governance aspects of the Digital Product Passport (DPP) in the textile sector.

Section 1.1 outlines the underlying problem constellation that leads to the central research question, which is presented in Section 1.2. Section 1.3 then goes on to describe the methodological approach and the structure of the report.

## 1.1. Problem constellation

The textile sector causes significant adverse environmental impacts, which are addressed by the EU's Textile Strategy (see Section 1.1.1). It describes the need to bring about systemic innovation (Section 1.1.2), which gives rise to governance challenges, including data management (Section 1.1.3).

### 1.1.1. The EU 'Textile Strategy' and the role of transparency and traceability

The textile sector is associated with substantial environmental burdens across the full product life cycle and has therefore become a key target area of EU circular economy policy. The sector's impacts include high greenhouse gas emissions, extensive water use, significant chemical pollution and large volumes of textile waste, alongside additional pressures related to microplastic release (Niinimäki et al. 2020; JRC 2025).

These challenges are closely linked to prevailing production and consumption patterns that remain largely organised around a linear economic model characterised by short use phases and insufficient material recovery. The resulting waste streams are complex and heterogeneous, and current recycling systems in many cases rely on downcycling routes or thermal treatment rather than closed-loop fibre-to-fibre recycling (JRC 2025).

Against this background, the EU has defined a comprehensive political and regulatory programme aiming to establish a competitive and resilient circular textiles ecosystem. The EU Strategy for Sustainable and Circular Textiles ('Textile Strategy'[1]) formulates a sector-specific vision for a circular transformation of the textile sector by 2030, encompassing product design, production, consumption and end-of-life stages (European Commission 2022, see Box 1 for details).

Box 1: 2030 vision for the textile Sector (European Commission 2022, 'Textile Strategy', p. 2)

*"By 2030 textile products placed on the EU market are long-lived and recyclable, to a great extent made of recycled fibres, free of hazardous substances and produced in respect of social rights and the environment. Consumers benefit longer from high quality affordable textiles, fast fashion is out of fashion, and economically profitable re-use and repair services are widely available. In a competitive, resilient and innovative textiles sector, producers take responsibility for their products along the value chain, including when they become waste. The circular textiles ecosystem is thriving, driven by sufficient capacities for innovative fibre-to-fibre recycling, while the incineration and landfilling of textiles is reduced to the minimum."*

This strategic orientation is embedded in overarching EU circular economy policy frameworks such as the European Green Deal and the New Circular Economy Action Plan (NCEAP 2020). A key implication of this policy trajectory is that the intended transition cannot be achieved solely through incremental efficiency improvements within the existing linear value chain. Instead, it requires the scaling of circular economy business models (CEBM) and the operationalisation of circular pathways such as durability and repair, reuse and resale, and high-quality fibre-to-fibre recycling (see Box 1). However, these pathways depend on decision-relevant product information across organisational and geographical boundaries. In practice, the sector's global fragmentation and extensive outsourcing structures create persistent information

[1] European Commission 2022 (EU Strategy for Sustainable and Circular Textiles ('Textile Strategy'), COM(2022) 141 final, 30.03.2022), p. 2.

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deficits, particularly with regard to upstream processes and chemical use. Globalised supply chains and multi-tier supplier structures limit transparency and make it difficult for downstream actors to obtain reliable information on material composition, chemical content, and production-related environmental impacts (EPRS 2024).

### 1.1.2. How to orchestrate system innovation?

From the transformative perspective outlined in the 'Textile Strategy', the current production and consumption patterns of the textile industry can be viewed as an established system. Much of the market operates according to the logic of fast fashion. Supply chain actors have adapted their business practices accordingly, or disappeared from the market. The remaining players are increasingly bound to these patterns, thus reinforcing the overarching business logic (Sahimaa et al. 2024, 1117). They follow the same “style of thought” and constitute a “thought collective”;[2] in other words, the context conditions impregnated the vast majority of the relevant actors in a similar manner leading to a predominant mindset. This includes a perception of the feasibility of technical or organisational innovations. Consequently, single-point interventions such as recycled PET and eco-labels based on certificates and audits cannot fundamentally transform the prevailing logic and dominant attitude shaped by it. Rather, a systemic approach is needed. It aims at overcoming traditional patterns of interaction in the value chain and the related business models. In this sense, the ESPR's regulatory approach can be viewed as an attempt to reshape the framework conditions fundamentally, with the explicit aim "to make sustainable products the norm" (Article 1(1)). However, as its full title indicates, the ESPR as it stands is merely a 'framework for setting ecodesign requirements for sustainable products'. The framework itself contains a comprehensive set of instruments: The interplay between the material 'performance requirements', which spell out the 'product aspects', and the 'information requirements', which mirror them, has the potential to initiate the intended systemic change. The overarching regulatory principles 'no performance, no market' and 'no data, no market' provide a strong stimulus for market actors.

The level of ambition and legal clarity in the delegated acts will now be crucial. If the full range of 'ecodesign requirements' is properly utilised, a new system logic for the sector can be established. In this case, it can be expected that “actors respond to one another and adapt accordingly, leading to new patterns of behaviour. Without those new patterns of behaviour, there is no systems change”, as highlighted by Sahimaa et al. (2024, 1116). Generating and sharing product-related data can be seen as the informational foundation, or the 'basso continuo' in musical terms, for the regulatory approach to orchestrating the intended system innovation.

### 1.1.3. Governance challenge

In terms of data management, the central governance challenge lies in reshaping the information practices through which actors generate, structure, verify, and share data across the value chain. This challenge becomes particularly visible for circular downstream applications. Sorting and recycling actors require reliable composition and chemical information to make operational decisions (e.g. sorting fractions, reuse suitability, recycling process selection), yet these data are frequently unavailable, incomplete, inaccessible at end-of-use stages. Within the supply chain they are regularly communicated only indirectly through compliance confirmation mechanisms. The information gaps are therefore not merely technical but embedded in current social and organisational practices of supply-chain information management and disclosure. At the same time, data are often dispersed across multiple actors, treated as commercially sensitive, and exchanged only bilaterally and selectively (JRC 2025).

In order to address these structural information deficits and enable circular textile pathways on a large scale, the EU has introduced the Digital Product Passport (DPP) as a core element of the

[2] “Denkstil” and “Denkkollektiv” in the sense of Ludwik Fleck 1935; see https://plato.stanford.edu/entries/fleck/.

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regulatory transition. Anchored in the Ecodesign for Sustainable Products Regulation (ESPR)[3] and embedded into a broader regulatory landscape[4] regarding information (e.g., the Textile Labelling Regulation, TLR)[5] and product related waste policy (extended producer responsibility schemes to be established according to the Waste Framework Directive, WFD),[6] the DPP is designed to establish a harmonised infrastructure for collecting, managing and sharing relevant product information across the value chain and throughout the product life cycle. From this perspective, the Digital Product Passport can be understood as a potentially paradigm-shifting instrument for the textile industry. By providing unprecedented transparency and traceability across the product life cycle, it challenges entrenched linear production logics and enables more sustainable and circular practices throughout the value chain (Carvalho et al. 2025). Therefore, the DPP dataset is often seen as the 'key enabling factor' for the envisaged transition.[7]

However, despite the DPP's enabling ambition, the practical implementation of a DPP-based data ecosystem raises substantial governance challenges that extend beyond interoperability as a technical standardisation task (Jensen et al. 2023, 253). In particular, it remains unclear how the information needs of circular economy practices can be operationalised into concrete and workable data management requirements along textile supply chains, and how actors can be enabled and motivated to generate missing data and share them in decision-relevant form. Moreover, DPP implementation must address the problem of mutual trust: actors will only be able to rely on DPP data for circular business relationships if data quality, credibility and verifiability can be ensured and maintained, while at the same time protecting confidential business information and preventing strategic misuse.

In principle, it can be assumed that the most relevant and basic requirements are set out in the delegated act. On the other hand, it is unlikely that all aspects relevant for generating and sharing product related data within the value chain will be specified in sufficient detail in the delegated act at a macro-level. Therefore, suitable governance mechanisms are needed at the meso-level to close data gaps and build mutual confidence in DPP data quality. Since the level of specification in the delegated act is yet unclear, the following considerations cover both levels in principle.

### 1.2. Key question

Against the backdrop of the aforementioned analysis the problem constellation can be summarised as follows: The EU's transition to a circular textile economy requires new business relationships and decision-making practices. However, the current textile ecosystem lacks the necessary data availability, communication routines and conditions of trust to enable these practices to be implemented on a large scale. The DPP aims to address this issue, but its successful implementation hinges on defining data management requirements specific to each stakeholder and establishing governance mechanisms to close data gaps and foster mutual trust in the quality of DPP data.

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3 Regulation (EU) 2024/1781 establishing a framework for the setting of ecodesign requirements for sustainable products. In this document Articles, Chapters and Annexes as well as Recitals are those of the ESPR, unless stated otherwise.

4 For analysis of the regulatory landscape see Deliverable 1.2 in TRUSTex: Führ et al. 2026.

5 Regulation (EU) No 1007/2011 on textile fibre names and related labelling and marking of the fibre composition of textile products ("Textile Labelling Regulation") establishes mandatory consumer-facing information requirements on fibre composition. The regulation is currently under review, with the Commission proposing updated provisions to improve information quality and enforcement and to align labelling requirements with emerging digital information systems, including the Digital Product Passport.

6 Directive (EU) 2025/1892 amending Directive 2008/98/EC, entered into force on 16.10.2025.

7 See, e.g., Walden et al. 2021, Schenten et al. 2022, Götz et al. 2022, Neligan et al. 2023 and Jensen-Abieva et al. 2025.

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To gain a clearer picture of potential data governance aspects, the report employs a two-step approach. First, it addresses the following research question:

> Which actors need to provide which information, when, to whom and in what form, in order to enable Circular Economy Business Models aligned with the EU 'Textiles Strategy'?

The analysis pays particular attention to how sufficient confidence in the quality of the DPP data can be created and maintained among actors in the textile sector, enabling them to establish CEBM aligned to the 'Textile Strategy' while complying with the ESPR's information requirements, which define the scope and quality of the data. Otherwise, the DPP data will not realise its potential as a 'key enabling factor' in supporting the transition to production and consumption patterns that align with sustainability requirements, as set out in the ESPR. To this end, the framework conditions must ensure that the informational basis of the future textile ecosystem is fully functional. Therefore, the following question must be clarified in a second step:

> Which governance aspects are relevant for closing data gaps and fostering mutual trust among actors in the textile sector with regard to the quality of DPP data?

Ultimately, the Governance Framework must respond to the challenges associated with the differing needs of the various actors in future business relationships in the textile sector.

### 1.3. Methodological approach and structure of the report

The methodological approach of this report is designed to address the aforementioned research questions. Both imply an actor-based perspective. Consequently, a behaviour-oriented approach that systematically links normative goals with real-world actors and their organisational contexts must be adopted. The 'Interdisciplinary Institutional Analysis' methodological framework (Bizer & Führ, 2015) draws on insights from institutional economics, social psychology, sociology, and legal analysis. This framework enables an in-depth examination of the organisational and institutional context of each actor. To explain how these institutional settings translate into the behaviour of specific actors in practice, the analysis draws on three analytical categories formulated by Ashford (2000):[8] the personal *capacity* of the relevant individuals, their actual *opportunity* to shape decisions and processes within the context of an organisation (or in the cooperation with other organisations), and their perception of the incentives and disincentives that influence their *willingness* to act. This threefold approach provides a clearer insight into *why* the actors behave the way they do within the delta-analysis in Chapter 4.

Building on this framework, the analysis proceeds in four analytical steps. First, it identifies the information requirements associated with circular economy business models in the textile sector, with particular attention to normative expectations arising from the Ecodesign for Sustainable Products Regulation (ESPR) and related preparatory studies by the JRC (Sections 2.1 and 2.2). These requirements are then operationalised through target practices formulated as case studies, which describe concrete interaction patterns between actors along the textile value chain, specifying who needs which data from whom, when and through which mechanisms (Section 2.3). The case studies identify the data management requirements that arise from the actors' need to align their strategies and operations with the objectives of the 'Textile Strategy' and its implementation in the ESPR with regard to the DPP in the textile sector. The analysis subsequently examines current data management practices in the textile value chain, focusing on existing routines, missing data and barriers (Chapter 3). By systematically comparing target practices with current practices, the delta-analysis identifies key data gaps and the behavioural factors underlying these deviations (Chapter 4). Finally, the analysis explores governance mechanisms for generating missing data and establishing trust in DPP data quality among actors in

[8] Ashford (2000) primarily discusses a technology-based approach to innovations for environmental sustainability. However, his approach is also valid when analysing the transition to new business models aligned to a 'Circular Economy', as outlined in the 'Textile Strategy', and the related data management practices. Therefore, Ashford's three categories are employed to examine why individual actors within a particular organisational function currently act the way they do instead of as required in the target state.

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the textile sector (Chapter 5). Chapter 6 considers how the results will be further refined in subsequent TRUSTex work packages and in response to evolving EU-level developments.

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## 2. Actor-based data needs for DPP-enabled circular economy business models

With the envisaged transition of the textile sector in mind, and considering the role of data management in enabling circular economy business models (CEBM), this chapter addresses the question: "*Which actor needs to provide which information when to whom and in what form?*". The starting point is the ESPR, which defines product aspects, performance parameters, and information requirements, including the DPP (Section 2.1). Section 2.2 specifies how these data domains are further elaborated in the Joint Research Centre (JRC 2025) preparatory study on textile products, particularly in relation to potential ecodesign requirements and information on substances of concern (SoC). Bases on this, Section 2.3 identifies the specific data requirements of the relevant actors in future-oriented case studies. The insights generated in Section 2.1, 2.2 and 2.3 are fed into Section 2.4, which consolidates the findings as actor-based needs within a future circular textile ecosystem. This synthesis lays the groundwork for analysing current practices in Chapter 3 and the data gaps in Chapter 4. Chapter 5 then identifies the most important governance aspects for closing data gaps and establishing mutual trust regarding data quality among stakeholders in the textile sector.

### 2.1. ESPR framework for textiles and DPP-relevant data?

The ESPR establishes a legal framework for setting ecodesign requirements that products must fulfil to be placed on the EU market. According to Article 1(1) ESPR[9] the

> Regulation establishes a framework for the setting of ecodesign requirements that products have to comply with to be placed on the market or put into service, with 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, and of ensuring the free movement of sustainable products within the internal market.
> This Regulation also establishes a digital product passport, provides for the setting of mandatory green public procurement requirements and creates a framework to prevent unsold consumer products from being destroyed.

The scope and the precise content of ecodesign requirements will be defined in product-specific delegated acts adopted under Article 4. 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"

Thus, subject matter of the regulation are not only the products placed on the market but also the impact arising from the 'upstream' production and assembling processes and the downstream stages during and after the use phase.

From a DPP data management perspective, three regulatory elements are particularly relevant.

First, Article 5(1) specifies the product aspects that delegated acts may address. These include, inter alia, durability, repairability, upgradability, recyclability, recycled content, the presence of substances of concern, resource and energy efficiency, remanufacturing and material recovery, expected waste generation, and life-cycle environmental impacts (including carbon and environmental footprints). This list defines the normative sustainability dimensions against which products may be regulated.

Second, Article 7 clarifies that ecodesign requirements may take the form of (i) performance requirements and/or (ii) information requirements, based on product parameters listed in Annex I of the ESPR. Where information requirements apply, delegated acts must specify which parameters must be reported and how the information must be made available (Article 7(7)). In addition, Article 7(5) provides a specific legal basis for tracking substances of concern across the product life cycle.

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

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Third, Article 9 introduces the DPP as the mandatory instrument for making product information available along the value chain. Delegated acts must determine which data are included in the DPP dataset (Annex III of the ESPR), define access and update rights, and specify the level at which the DPP is established (model, batch, or item) (Article 9(2)). The ESPR further requires that DPP data are accurate, complete and up to date (Article 9(1)).

Taken together, the ESPR implies four core DPP-relevant substantial data categories for textiles (see the tables in Annex III, Chapter 9 below):

- data on product performance in relation to the 'product aspects' listed in Article 5(1) (e.g. durability, repairability, recyclability, recycled content, environmental impacts, including carbon footprint and environmental footprint);
- data on substances of concern in products, including their location and concentration (Article 7(5));
- data enabling correct use, maintenance, repair and end-of-life treatment (Article 7(2)(b)); and
- DPP-specific metadata on access rights, update responsibilities, and the level of provision (model, batch, item) (Article 9 and Annex III for the ESPR).

These general ESPR requirements must be specified for individual product groups through delegated acts. In terms of formal requirements, the ESPR defines a comprehensive set of normative criteria that specify data quality, data access and overarching usability. Together, these criteria are designed to enable actors in the value chain to appropriately implement data management under the ESPR. The ESPR implicitly provides for capacity-building activities in organisational and technical aspects. Annex I (Chapter 8 below) provides a more detailed mapping of related Recitals and governance-relevant provisions.

### 2.2. Information needs in the JRC preparatory study (3rd milestone)

The preparatory work carried out by the Joint Research Centre (JRC) provides an important basis for specifying textile-relevant ecodesign requirements and related information needs in the future delegated acts. To further specify the ESPR-derived data categories in a textile-specific context, this report draws on the 3rd milestone of the Joint Research Centre (JRC) Preparatory Study on textile apparel (JRC 2025). The Preparatory Study provides the scientific and technical basis for a future textile-specific delegated act under the ESPR. While the study is ongoing and does not yet represent final regulatory proposals, it offers an important interim indication of which product aspects, performance parameters and data requirements are likely to become relevant for the DPP.

Overall, the Preparatory Study operationalises core ESPR product aspects through a set of prospective information requirements that relate to (i) product robustness and expected lifetime, (ii) recyclability characteristics, (iii) recycled content, (iv) environmental and carbon footprint metrics for the manufacturing stage, and (v) the presence of SoCs in textile products. In practical terms, these requirements imply that the DPP will have to provide a reliable and structured data foundation enabling actors to determine recyclability, verify recycled content, and derive comparable footprint indicators, and identify the presence and location of SoCs across the product life cycle.

At the same time, the Preparatory Study highlights that the feasibility and credibility of such metrics depends critically on data availability and quality. Environmental and carbon footprint assessments are frequently constrained by missing primary data and therefore rely on generic datasets, assumptions and proxy modelling, which limits benchmarking and comparability across products and suppliers. Similarly, the study underlines that chemical transparency remains a key unresolved issue in textile supply chains: the number of substances and formulations used is very high, supply chains are globally fragmented, and list-based approaches provide only limited insight into actual chemical content. The study therefore recognises a "dire need" for increased chemical transparency in textile supply chains while acknowledging that current evidence does not yet support robust substance-related performance requirements.

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Taken together, the JRC findings suggest that future DPP requirements for textiles will not only depend on defining relevant indicators (e.g. recyclability score, recycled content, footprint metrics), but also on establishing actor-specific data generation and communication practices that make these indicators operational, verifiable and decision-relevant across the textile life cycle. This insight motivates the case study approach developed in the following Section 2.3, which translates the regulatory data categories into concrete actor interactions and information dependencies.

## 2.3. Case studies: Future practices and related information needs

Building on the insights derived from the ESPR framework (Section 2.1) and the refined yet provisional specification of textile-related data categories in the JRC preparatory study (Section 2.2), this section develops cases as an analytical tool to derive concrete, actor-specific data needs for the implementation of circular economy business models aligned with the EU Strategy for Sustainable and Circular Textiles ('Textile Strategy').

This case study approach complements the primarily product and requirement-focused perspective of the Preparatory Study by foregrounding interactions between actors and their data dependencies along the textile value chain. It therefore translates the regulatory data categories identified in Sections 2.1 and 2.2 into an actor-centred perspective. More specifically, the cases operationalise the guiding question of the first step of the analysis – '*which actor needs to provide which information, when, to whom and in what form*'.

The analysis is structured as follows. Section 2.3.1 introduces the case study approach and clarifies how the actor-specific data needs are derived. Sections 2.3.22.3.2 onwards then present and analyse the individual cases. Section 2.4 consolidates insights from the individual cases into an actor-based target-state data foundation for DPP-enabled circular textile pathways.

### 2.3.1. Introduction to the case study approach

Section 2.3.1.1 offers a concise overview of how the report implements the case study approach. Section 2.3.1.2 outlines the selection logic applied to the cases. Section 2.3.1.3 then outlines the analytical structure applied consistently across all cases.

#### 2.3.1.1. Purpose and analytical perspective of the case study approach

While sections 2.1 and 2.2 clarify the legally and technically relevant data categories arising from the ESPR and the JRC preparatory study, these sources alone do not fully answer the guiding question of this report: *Which actor needs to provide which information, when, to whom and in what form*? Legal provisions specify information requirements in principle, but they do not determine how data must be generated, structured, exchanged and used across actors in order to make circular economy business models operational in practice.

More specifically, the 3rd milestone of the Preparatory Study approaches DPP-related information requirements mainly from a product and regulatory perspective, focusing on product aspects, potential ecodesign requirements and consumer-oriented information. In contrast, the cases adopted here start from the data dependencies of CEBMs and from actor interactions across the textile ecosystem. The cases therefore translate these abstract regulatory information requirements into concrete actor-to-actor information dependencies, specifying who needs which data, from whom, at which point in time, and for what operational purpose within circular practices.[10] This shift in perspective is essential, as circular practices must unfold in a sector that remains largely structured around linear "take–make–consume–dispose" supply-

[10] This actor- and interaction-centred perspective is consistent with emerging standardisation work on the Digital Product Passport in JTC24. For example, prEN 18239:2025 emphasises that defining access management and business responsibilities for DPP data requires a detailed understanding of product life cycle phases, involved actors and the relevant business transactions occurring across these phases.

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chain coordination logics (JRC 2025, p. 27). In this sense, the case study approach operationalises the systemic transition logic underlying the ESPR and related JRC work by specifying how actor roles, interactions and data dependencies must be configured in practice to enable circular pathways beyond product-level requirements.

As a result, actors face structural barriers that cannot be addressed through product requirements alone. Instead, the transition towards the target vision formulated in the 'Textile Strategy' requires the establishment of a functioning ecosystem in which changed infrastructures and new everyday practices enable circular business relationships and decision-making.

Against this backdrop, this Section introduces cases as an analytical approach to derive the concrete data needs that arise when actors seek to implement circular practices. The focus is not limited to regulatory compliance. It also covers the information flows required for actors to make operational decisions, coordinate activities, and manage risks in a DPP-enabled circular textile ecosystem. In this sense, the DPP is treated not only as a compliance tool but also as an enabling infrastructure that supports new social and economic practices along the textile value chain.

Figure 1 illustrates this ecosystem-level perspective and locates the cases within the broader circular textile system envisaged in the 2030 vision of the 'Textile Strategy' (see Box 1, p. 4).

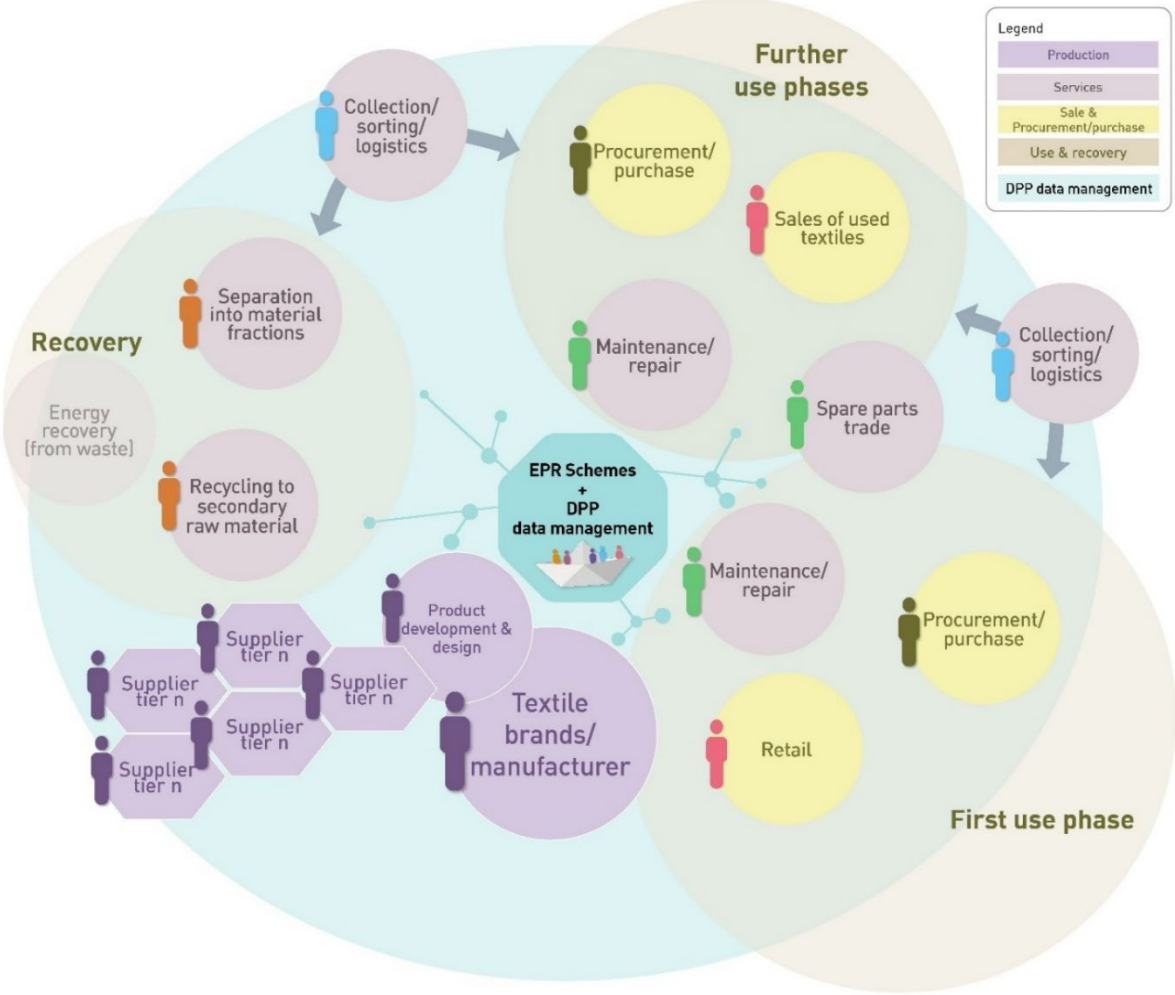


Figure 1: Future DPP-enabled Circular Textile Ecosystem with EPR Schemes

The life cycle is structured into first use, further use, and recovery phases, with actor roles represented at each stage. The different phases visualise the key leverage points for adjusting the textile value chain to circular strategies. EPR schemes and DPP data management function as cross-cutting coordination and information layers that enable circular strategies across the

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value chain. The visualisation complements the product-focused logic of the ESPR by highlighting actor roles, interactions and decision-making processes within the future textile ecosystem.

#### 2.3.1.2. Selection of the cases

The selection of cases follows the objective of capturing the core practices and decision contexts that are expected to play a decisive role in the textile sector's transition from predominantly linear to increasingly circular value-chain logics. The cases are therefore selected as a structured set reflecting (1) key circular pathways and (2) transversal enabling conditions required for their implementation and scaling over time.

The cases one to three are derived from central circular business-model logics discussed in Coscieme et al. (2022), which describe how value creation shifts when durability, reuse and material recovery become central. These cases reflect practices that are widely recognised as key levers for reducing resource use and environmental impacts in the textile sector.

Additionally, three crosscutting cases are introduced to address transversal data dependencies and governance-relevant requirements that recur across all circular pathways. Crosscutting case four addresses the enabling role of customers and procurers in activating circular pathways through purchasing, use and return behaviours. Crosscutting case five focuses on environmental performance assessment, reflecting the normative expectation of both the ESPR and the WFD stipulated EPR schemes that actors increasingly compare alternative design, sourcing and processing options based on environmental performance and footprint metrics. Crosscutting case six addresses preparedness for regulatory and market developments, reflecting the growing strategic relevance of compliance, liability management and risk-based decision-making in textile value chains.

This selection logic is consistent with current research on DPP implementation, which identifies the definition of relevant and decision-useful data across the full product life cycle – including durability, reuse and recycling – as one of the main challenges for establishing DPP systems in practice (Carvalho et al., 2025). It also reflects the broader insight that data practices for circular economy transitions depend on cooperation across fragmented value networks and are shaped by conflicting interests and trust conditions, particularly regarding transparency and data access (Luoma et al., 2022). Taken together, the selected cases cover both (1) circular value-creating practices (design-for-longevity, collection and resale, recycling and material reuse) and (2) system-enabling practices (customer activation, comparability of environmental indicators and organisational risk preparedness). This provides a comprehensive basis for specifying DPP-related data needs across actors, decision contexts and circular pathways. Box 2 summarises the selected cases.

Box 2: Overview of the selected cases.

**Case 1 – Longevity: Durability and repairability (brand/manufacturer perspective)**
Future-oriented practice in which products are designed for extended lifetimes, supported by repair, maintenance and service-based business models.

**Case 2 Collection and resale (sorting and resale perspective)**
Future-oriented practice in which products are redirected into second-life markets through sorting and resale channels, extending use phases before recycling.

**Case 3 - Recycling and reuse of materials (recycling and material-user perspective)**
Future-oriented practice focused on converting post-use textiles into secondary raw materials and enabling fibre-to-fibre recycling.

**Case 4 - Customer engagement in circular pathways (B2C, B2B, B2G)**
Future-oriented practice in which purchasing, use and disposal decisions actively support repair, resale and return schemes, thereby activating circular pathways.

**Case 5 – Environmental performance assessment for circular decision-making (Manufac-turers of components and textile products)**
Crosscutting practice describing how environmental performance information is required for decision-making in design, sourcing, procurement and circular strategy, with emphasis on comparability and credibility.

**Case 6 – Preparedness as a Strategic Capability (Manufac-turers of compo-nents and textile products)**
Crosscutting practice focused on how organisations use DPP data to anticipate regulatory, market and liability developments and to manage compliance and risk as part of future circular strategies.

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Building on this selection logic, the subsequent case sections examine future-oriented circular practices in greater detail. The resulting insights feed into the the consolidated target-state data foundation developed in Section 2.4.

#### 2.3.1.3. Analytical structure of the case descriptions

To ensure comparability, all case descriptions follow the same analytical structure. Each case begins with a short narrative that describes a future-oriented practice scenario. The purpose of this narrative is to illustrate the intended operational logic of the case as a reference point for analysis; it does not define requirements, propose solutions, or assign responsibilities.
Building on this narrative, the analysis proceeds in four analytical steps:

- Identification of **central actors**: The analysis identifies the actors[11] whose decisions are critical for enabling the practice. The focus lies on those who actively shape the practice – not on all actors affected by it.
- Identification of **critical decisions**: For each central actor, the analysis outlines the key strategic or operational decisions that must be taken for the circular economy (CE) practice to function. These decisions represent the points at which information becomes decision-relevant.
- Identification **information needs, information quality and operational decision-making**: For each decision, the analysis specifies:
  - the information required by the actor to make the decision ("data needs"), and
  - which other actors must provide that information ("from whom?").

  This step captures the bidirectional information dependencies along the value chain that are necessary to enable the respective practice.
- **Characterisation of data properties to support decision-making**: The analysis not only identifies which information is required, but also how it must be structured for practical use. This includes:
  - the **granularity** at which data must be available (e.g. model, batch, or item level; for details see Box 3),
  - the requirements for **credibility and trust**, such as completeness, traceability, updateability, and accuracy, and
  - a **future-oriented perspective**: the data must remain interpretable and usable at later stages, for instance when regulatory requirements or market conditions change.

The results of these four steps are synthesised in a table (see, for example, Table 1), which is applied consistently across all cases.

[11] It should be noted that the term 'actors' ultimately refers to the individuals in charge of a given function within an organisation. For simplicity, the text usually refers only to the relevant organisation.

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Box 3: Definitions: model, batch and item as different levels of DPP data set granularity

The definitions in Art. 2 ESPR do mention the terms model, batch and item. However, an explanation is given in Recital 33 to the ESPR which states "The term '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, the term '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 the term 'item' usually refers to a single unit of a model."Art. 9 2(d) ESPR sets out that the question "whether the digital product passport is to be established at model, batch or item level, and the definition of such levels" shall be specified in the delegated acts.
*For example, a 'model' could be a red T-shirt. The same T-shirt in blue would be a different model. During the production process of the red T-shirt, the supplier may have changed their sub-supplier for the colouring agent (the dye's chemical formulation). Red T-shirts coloured with dye A would belong to 'batch one'; shirts coloured with dye B would belong to 'batch two'.*
*The term'item' refers a single unit of a product; each produced T-shirt would be a single 'item'.*
From a manufacturers perspective, the data set for each item produced in one batch is identical. Thus, the differentation between batch and item is only relevant the for the granularity of the 'unique product identifier'.[12] In cases where the delegated acts requests item level identification, a different "string of characters" have to generated and attached to each individual product. When the delegated act provides for batch level identification, all items in one batch carry the same "string of characters".
For further considerations on the level of granularity for the DPP data set see Section 2.4.7.[13]

### 2.3.2. Case 1 – Longevity: Durability and Repairability

The case on "longevity" represents a future-oriented practice in which the functional lifetime of garments is deliberately extended. This shift encompasses more than just isolated product improvements; it signifies a systematic change in how products are designed, manufactured, serviced, and handled after the initial customer purchase (Sahimaa et al. 2024).
The central assumption is that durability and repairability are not standalone attributes, but rather comprehensive performance characteristics which depend i.a. on the coordinated application of information practices and the availability of data throughout the product's life cycle.

Box 4: Case 1 – Future practice in longevity

2030 brands design textile products so that they can remain in use significantly longer than today. Durability, repairability and material robustness are considered standard performance expectations. Repair and maintenance services – partly operated either by the company or through authorised partners – form part of the business model and contribute to extending the functional lifetime of garments, alongside independent repair practices. Decisions on product design, sourcing and service offerings are consistently aligned with the objective of avoiding premature end-of-life and are informed by product-level data that remains accessible across the product's use phase.

**Key actors in this case**

This use case involves three categories of actors whose decisions directly influence the realisation of product longevity:

- *Brand/Manufacturer*: As the central actor, the brand or manufacturer placing products on the EU market is responsible for product design, sourcing decisions and the provision of downstream information. This actor depends on upstream data to make durability- and repairability-relevant decisions and must in turn provide product-level information that enables long-term use, care and repair. It thereby acts as both a data recipient and data provider across the product life cycle.
- *Repair service providers* (authorised or independent): These actors depend on product-specific information to assess repair feasibility and select appropriate repair methods. Their

[12] According to the definition in Article 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. According to Annex III point (b) the delegated act shall specify i.a. the level for which the 'unique product identifier' is requested.
[13] See also Footnote **Fehler! Textmarke nicht definiert.**.

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ability to extend product lifetime relies on accurate data regarding materials, construction, chemical treatments, and available spare parts. The manufacturer must ensure that such data is made available in a usable format across the relevant product lifetime.
- *Textile owners* (consumers and professional users): End users make critical decisions that influence product longevity – from initial product selection based on durability and repairability cues to care and maintenance behaviours. Their ability to extend product use depends on having access to credible and actionable information provided by the brand, including care guidance, repair options and warnings that affect functional lifetime.

Together, these actors illustrate the bidirectional nature of information needs in the longevity case: product lifetime depends both on the upstream provision of durability-relevant data and on the downstream availability of that information to those maintaining, repairing or using the product over time.

**Key decisions enabling longevity**

To embed longevity in product development and market strategies, brand/manufacturers must make a series of forward-looking decisions that influence material choice, processing, quality assurance and after-sales service design (Piippo et al. 2022). These decisions rely on upstream data and generate downstream information needs. Critical decisions include:

- Selection of fibres, materials and blends: Based on material durability, repair compatibility and long-term ageing behaviour.
- Specification of chemical treatments (e.g. finishes, dyes, coatings): With attention to their effects on wear, repair feasibility and potential ageing degradation.
- Durability benchmarking and substantiation of product claims: Requiring data on failure modes, test methods and performance thresholds.
- Definition of repair and maintenance strategy: Including whether and how services are provided, and what data is needed to enable them.
- Provision of actionable information to downstream actors (repairers and consumers): Ensuring products can be maintained and repaired during use.

In addition to brand-level decisions, repair service providers make feasibility judgments based on access to product-specific data, while textile owners make purchasing and maintenance choices based on durability cues and information availability.

**Information needs, information quality and operational decision-making**

Each of the above decisions depends on verifiable, product-specific data that informs trade-offs between durability, repairability, environmental performance and cost. Enabling longevity as a circular practice therefore requires information that goes beyond traditional quality assurance and supports predictive, operational and service-related use cases throughout the product life cycle. Garment durability is shaped by the interaction of multiple technical factors – including fibre properties, fabric construction, chemical treatments and manufacturing variability – all of which affect how garments age and fail in real use conditions (Cooper & Claxton, 2022). These complexities become more critical with the increasing use of recycled fibres, which vary in mechanical properties, prior processing history and potential contamination. To address these challenges, brand/manufacturers must both obtain and provide specific clusters of information:

- Material composition and performance-relevant properties from fibre producers and textile material suppliers: Upstream information is required to assess durability, ageing behaviour and repair compatibility.
- Chemical composition and treatment history relevant to durability from chemical suppliers and processing stages: Brands need verified data on chemical treatments, their long-term effects and implications for wear and repair.

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- Repair-enabling product information for downstream actors provided by brands/manufacturers: Brands must retain and make available structured information (e.g. disassembly guidance, spare part identifiers, repair thresholds) that enables effective repair interventions.
- Use- and care-related information for textile owners provided by brands/manufacturers: To extend product lifetime, brands must provide accessible instructions, care guidance and repair options that enable proper handling and reduce premature failure.

Taken together, these information needs illustrate the bidirectional nature of longevity-related data flows. Upstream data enables informed sourcing and design, while downstream information enables maintenance and repair. The DPP thus serves as a shared infrastructure for aligning operational decision-making with durability objectives across the life cycle.

**Characterisation of data properties relevant for decision-making**

To support durability-oriented circular practices, product-related data must meet specific quality criteria. The longevity case illustrates which data properties are essential for ensuring that information can inform reliable design, sourcing and after-use decisions over extended product lifetimes:

- Granularity: Most decisions rely on model-level data, complemented by batch-level data where manufacturing variability influences durability, and item-level data when repair history becomes relevant for continued use.
- Credibility and trust: Brands and downstream actors require traceable, verifiable and product-specific information that goes beyond certificates. Data must be robust enough to support durability-related design decisions, substantiated claims and effective repairs. Its credibility depends on relevance to actual product function and use context, not abstract product categories.
- Future-oriented perspective: Product data must remain accessible and updateable over time – particularly with regard to substances of concern, repair instructions and spare part compatibility – to enable safe maintenance and repair throughout extended use phases.

Table 1 summarises the central actors involved in the longevity case, the critical decisions they must take, the information required to enable these decisions, and the actors from whom this information is expected to originate.

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Table 1: Case 1 – Future practice regarding longevity (brand/manufacturer)

| Actor | Critical decision enabling longevity | Information required … | … from whom? | Granularity (i/b/m) | Requirements for data credibility and trust | Future-oriented perspective |
|---|---|---|---|---|---|---|
| **Brand/Manufacturer** | Selection of fibres, materials and blends that enable long-term durability and repair compatibility | Material composition (fibre types, blend ratios, recycled content); relevant mechanical properties; ageing behaviour | Fibre producers; textile material suppliers | Model / batch | Primary data; traceable origin; consistent material specification; transparency beyond certificate-only confirmation; disclosure of recycled/secondary material characteristics where relevant | Compatibility with future durability and repair standards; reusability in updated performance evaluations |
| | Decisions on chemical treatments (finishes, dyes, coatings) affecting durability, repair feasibility and ageing behaviour | Chemical treatments applied; functional purpose; durability-/ageing-relevant effects; repair constraints | Chemical suppliers; Tier-1 / Tier-2 processors | Batch | Traceable datasets; process-relevant disclosure beyond list-based confirmation | Retention of data for future SoC re-evaluation and repair impact assessment |
| | Durability benchmarking and evidence for robustness / durability claims | Expected lifetime assumptions; robustness indicators; documented failure modes; testing methodology and limitations | Supplier of material / component; internal data aggregation | Model / batch | Documented methods; reproducibility; comparability; traceability to test setup and production batch | Benchmark validity over time; adaptability to evolving durability testing norms |
| | Definition of repair/maintenance strategy (incl. whether offered in-house or via partners) | Repairability information; spare part availability; disassembly guidance; repair thresholds and limitations | Internal data; suppliers; repair partners | Model | Information must be technically actionable and reflect product-specific construction and repair logic | Repair-relevant data must remain accessible and valid throughout the product lifetime, including consistent references to parts, materials and disassembly logic |
| | Decision to provide meaningful information to downstream actors (repairers, consumers) | Use instructions; care guidance; repair options; warnings affecting longevity | Internal data aggregation | Model | Accessibility; clarity; relevance to actual product configuration and materials | Long-term usability across the product's use phase, including updates when repair constraints evolve |
| **Repair service providers** (authorised/independent**)** | Assessment of repair feasibility and method selection | Material composition; repair instructions; disassembly guidance; chemical constraints (e.g. heat/solvent sensitivity); spare-part compatibility | Brand/Manufacturer | Model | Up-to-date instructions; trust in brand-provided data; relevant repair constraints clearly indicated | Access to evolving repair instructions or warnings where material/process knowledge changes |
| **Textile owner** | Critical decision enabling longevity: Purchase decision favouring durable and repairable products | Clear signals on expected durability and robustness; repairability cues (e.g. availability of repair options or spare parts); care requirements linked to product longevity | Brand/Manufacturer | Model | Understandable and comparable durability and repair signals; realistic and practicable care requirements for everyday use; consistency between claims and actual product performance | Sustained availability of information needed to guide care and repair throughout the product lifetime |

* item/batch/model

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Overall, the longevity case shows that durability-aligned business models rely on multi-directional information flows – spanning materials, processing, design, manufacturing and use phase. Isolated scores or static labels are insufficient. Instead, circular longevity depends on complete, traceable and decision-relevant datasets. This underlines that the DPP must go beyond consumer-facing information and provide structured data that remains usable across lifecycle stages and actors.

### 2.3.3. Case 2 – Reuse: Collection and Resale

The collection and resale case represents a future-oriented practice in which textile products are deliberately kept out of waste streams and redirected into second- or third-life markets when the owner decides to abandon them. Reuse is understood here as the intended circular outcome, while collection, preliminary sorting, preparation for reuse and resale constitute the operational practices through which reuse is realised at scale.

In this use case, decisions taken after first use determine whether products continue to circulate as garments, enter refurbishment pathways, or are redirected towards material recovery (see Use Case 3). These decisions are inherently information-dependent, as they rely on reliable signals regarding product condition, material class and potential safety or compliance risks associated with further use.

The central assumption is that post-consumer reuse depends on the availability of clear, decision-relevant information signals that enable collectors, sorters and resale actors to quickly assess condition, material class and potential safety or compliance risks.

Box 5: Case 2 – Future practice in Collection and Resale

By 2030, actors involved in the collection, sorting and resale of textiles will actively manage circular business practices that extend the use phase of textile products. As part of their daily operations, they collect garments from households, systematically deciding how to handle each item.

Collectors initiate the process by gathering post-consumer textiles and assigning them to preliminary handling streams. Based on basic quality indicators and predefined exclusion criteria , they route textiles either into reuse-oriented streams or into material-recovery streams (see Use Case 3).

Sorters then examine individual garments to determine their suitability for resale. They assess condition, material class and potential safety constraints and decide whether a product can be prepared for direct resale, requires minor preparation or repair, should be redirected to alternative second-hand channels, or must be redirected to material recovery[14] (Use Case 3).

Resale actors – including second-hand retailers and resale platforms – use this classification to determine how products are marketed and reintroduced into circulation. They assess whether garments meet quality and safety expectations, assign them to appropriate sales channels, and communicate relevant usage or care guidance to end users.

Through this coordinated process, collectors, sorters and resale actors ensure that textile products remain in circulation for as long as functionally and safely possible. Rather than relying on end-of-life assumptions, they take deliberate, information-enabled decisions that prioritise continued use wherever feasible. By preparing garments for reuse and reintroducing them into appropriate second-hand channels, they contribute to shifting the system from linear disposal to circular value retention.

**Key actors in this case**

In this use case, the key players are those who actively determine post-consumer routing decisions. These include:

- *Collectors* who represent the first operational decision point after a product is discarded and allocate textiles to preliminary handling streams [15]

[14] WFD 15a. 'material recovery' means any recovery operation, other than energy recovery and the reprocessing into materials that are to be used as fuels or other means to generate energy. It includes, inter alia, preparing for re-use, recycling and backfilling.

[15] Art. 3(10) WFD defines 'collection' as „the gathering of waste, including the preliminary sorting and preliminary storage of waste for the purposes of transport to a waste treatment facility".

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- *Sorting and preparing-for-reuse operators*, who assess products and decide on direct resale, preparation or repair, alternative second-hand channels, or redirection to other pathways;
- *Resale actors*, including retailers and platforms, who determine market placement and consumer-facing reuse conditions.

The analytical focus therefore lies with actors who make routing and market placement decisions based on post-consumer product assessment.

**Key decisions enabling the case**

To enable the collection and resale use case, the central actors must take a sequence of interrelated information-dependent routing and market decisions, including:

- Initial routing decisions at collection stage (preliminary sorting), determining whether a product enters reuse-oriented streams or is excluded from reuse pathways;
- Sorting and grading decisions, assessing product condition, material class and suitability for resale or preparation for reuse;
- Safety and compliance decisions, determining whether products can be responsibly placed on reuse markets without posing environmental, human health, or reputational risks;
- Market placement decisions, including domestic resale, export to second-hand markets or alternative value-retention pathways.

These decisions are operational rather than design-oriented. They do not aim to optimise product performance, but to manage risk, ensure responsible circulation and allocate products to appropriate second-life channels under time and capacity constraints.

**Information needs, information quality and operational decision-making**

In the context of collection and resale, information must support rapid and reliable decision-making under operational time and capacity constraints. Preliminary sorting and reuse-oriented routing do not require exhaustive product data, but depend on clearly structured signals that enable efficient handling of large volumes of heterogeneous products.

- Upstream information dependencies: Collection and preliminary sorting actors depend on information provided by brands or manufacturers that allows them to exclude products unsuitable for reuse. This includes clear material class signals and decision-oriented indications regarding the presence or absence of SoC that could undermine safe reuse or resale. The function of this information is not to describe products comprehensively, but to enable rapid and reliable routing decisions between reuse-oriented handling and redirection to material recovery pathways.
- Information dependencies of downstream actors: Resale actors and platforms depend on information provided by brands or manufacturers that enables responsible communication with end users and appropriate market placement. This includes care instructions and safety-relevant information that help ensure that products can be used without undue risk and in line with their functional characteristics. Such information supports trust in second-hand markets without requiring the depth of technical disclosure needed at design or recycling stages.

Reuse-oriented decisions therefore rely on robust, exclusion-focused information signals rather than on comprehensive technical transparency of product properties. Information must be sufficiently reliable to prevent inappropriate circulation, while remaining simple and operationally usable for high-throughput handling contexts.

**Characterisation of data properties relevant for decision-making**

This use case not only identifies which information is required, but also highlights the specific data characteristics that determine whether information can support reuse-oriented practices:

- Granularity: For collection, preliminary sorting and resale routing, information is typically required at model or batch level. Decisions at this stage focus on eligibility, safety and routing.

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- Credibility and trust: Information must be reliable enough to support exclusion and routing decisions, particularly with regard to SoC and use restrictions. In this context, trust depends less on exhaustive disclosure and more on clear, decision-oriented eligibility signals (e.g. safe/unsafe for reuse under defined conditions) with traceable provenance. Certificates or generic compliance claims that lack contextual relevance for reuse may undermine decision-making rather than support it.
- Future-oriented perspective: Reuse decisions are sensitive to evolving safety and regulatory knowledge. Information therefore needs to remain updateable over time, particularly regarding the status of SoC and relevant use restrictions. Changes in regulatory classifications (e.g. updates to the REACH Candidate List, Annex XVII restrictions, POP listings or CLP hazard classifications) may alter whether certain product groups are considered appropriate for continued use in specific markets or contexts. Ensuring that eligibility signals can be updated is therefore essential for maintaining safe and responsible reuse practices over time.

Building on the analytical structure defined in Section 2.3.1.3 Table 2 summarises the findings of this case by linking central actors, critical operational decisions, and resulting information dependencies. It specifies which data are needed, from whom, at which granularity, and under which credibility conditions in order to enable systematic reuse-oriented routing and responsible resale.

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Table 2: Case 2 – Future practice in collection and resale (sorting / resale actors)

| Actor | Critical decision enabling collection and resale | Information required … | … from whom? | Granularity (i/b/m) | Requirements for data credibility and trust | Future-oriented perspective |
|---|---|---|---|---|---|---|
| **Collector (post-consumer textile collection)** | Initial routing decision: allocate items to reuse-oriented handling vs. material recovery / disposal routes | Exclusion signals (safe/unsafe for reuse)[16] | Brand /Manufacturer; complemented by collection/sorting scheme guidelines | Model /batch | Clear and unambiguous reuse eligibility signals (binary/traffic-light); simple to interpret; traceable to responsible actor; valid at end-of-use. | Updatability of SoC status over time |
| **Sorter/preparing-for-reuse operator** | Safety and compliance decisions: exclusion from reuse | SoC-related reuse eligibility signals (safe for reuse / not safe for reuse); indications of treatments relevant for reuse restrictions (e.g. biocides, FRs) | Brand /Manufacturer | Model /batch | Reliable and standardised SoC information as explicit eligibility/exclusion signals; traceable provenance and versioning; valid and updateable at time of sorting; | Updatability of SoC status over time |
| | Grading and quality classification for reuse channels (premium resale / standard resale / repair-needed / redirection) | Material class / broad fibre composition; care sensitivity cues (e.g. shrinkage/heat sensitivity where relevant for reuse handling) | Brand /Manufacturer; | Model /batch | Reliable and standardised material classification, with traceable provenance and clear indication of when and by whom updates were made (version control). | Information must be valid and updateable at time of sorting |
| **Resale operator (second-hand retailers, platforms)** | Safety and compliance decisions | Safe-for-resale eligibility signal (SoC-related) | Brand /Manufacturer | Batch | Reliable and standardised SoC information as explicit eligibility/exclusion signals; traceable provenance and versioning; valid and updateable at time of resale; | Updatability of SoC status over time |
| | Decision on market placement and resale conditions (sales channel/customer group; restrictions/communication; exclusion due to safety/reputational risks) | Durability and repairability cues | Brand /Manufacturer | Model/batch | Reliable and standardised material classification; traceable provenance and versioning; valid and updateable at time of re-sale | - |

[16] Visual screening will probably remain an operational practice. However, in future, problematic textiles might be excluded with the help of a machine-readable data carrier.

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The collection and resale use case demonstrates that reuse-oriented circular practices depend on selective, exclusion-oriented information flows rather than comprehensive product transparency. In this context, data functions primarily as a routing and risk-management instrument, enabling collectors, sorters and resale actors to decide whether products can remain in circulation through reuse and second-hand pathways.
Crucially, the information required at this stage is designed to support rapid, operational decisions under high-throughput conditions – with the primary aim of avoiding inappropriate reuse (e.g. due to safety-critical substances) and ensuring that resale practices remain responsible and legally compliant. Reuse actors need clear, actionable signals that enable safe and efficient decision-making at the point of collection and resale.
The use case thus underscores the need to tailor DPP data provision to specific decision contexts, rather than assuming that more disclosure automatically leads to better circular outcomes.

### 2.3.4. Case 3 – Recycling and material recovery

The case recycling and material recovery represents a future-oriented circular practice in which post-use textile products are systematically transformed into secondary raw materials that can substitute virgin fibres in new textile production. In this practice, recycling is not understood as a residual waste-management option, but as a value-retention strategy that preserves material quality, functional properties and safety across multiple life cycles.

This case is based on the central assumption that fibre composition, blends, additives and process-related substances embedded in textile products directly affect recycling outcomes (Gaertner 2024). This applies to both mechanical and chemical recycling routes. In addition, recycling performance is influenced by production-related variability and treatment histories that are not visible at product level but can significantly affect process stability and output quality. Consequently, recycling can only function as a core circular pathway if recyclers and downstream material users have access to reliable, granular and verifiable data on fibre composition and chemical content that enables them to assess recyclability, process compatibility and risk (ETC/CE 2022, 42; Carney Almroth et al. 2025, p. 2).

Box 6: Case 3 – Future practice in recycling and reuse of materials

By 2030, recyclers operate as integrated material suppliers within a circular textile system rather than as end-of-pipe waste processors. Post-use textiles are no longer treated as heterogeneous waste streams but as identifiable material inputs whose composition, treatment history and recycling potential are known prior to processing.
Recyclers' business models are based on their ability to direct textile inputs to the most suitable recycling technology. Decisions regarding fibre-to-fibre recycling, downcycling or alternative recovery pathways are made using verified information on fibre composition, chemical content and processing constraints. This approach ensures consistent process yields, reliable output quality, and compliance with regulatory requirements.
Secondary material users, including spinners and textile manufacturers, source recycled fibres as defined material products rather than as residual inputs. Documented material properties and chemical profiles allow recycled fibres to be safely reintegrated into new textile products without compromising quality, regulatory compliance or customer trust.
Throughout these steps, actors rely on structured, decision-relevant product information to guide routing and grading decisions and to ensure that products are directed into the most appropriate next-use pathway while avoiding safety, legal or reputational risks.

**Key actors in this case**

The central actors in this use case are recyclers and secondary material users (e.g. yarn spinners and textile manufacturers integrating recycled inputs).

- *Recyclers* act as material transformation actors within the circular system. They are responsible for converting post-use textiles into defined secondary raw materials and therefore operate at the interface between waste streams and material supply.

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- *Secondary material users* act as downstream material integrators and quality gatekeepers. They incorporate recycled fibres into new products and are responsible for ensuring that recycled inputs meet the technical, safety and performance requirements of the intended applications.

Both actor groups depend on upstream product information and, in turn, generate downstream material information that shapes further circular use.
In addition, *sorting* and *pre-processing actors*[17] play a critical enabling role at the interface between collection and recycling. They translate heterogeneous post-use textile streams into defined input fractions suitable for specific recycling technologies, either within integrated operations or as part of an upstream supply chain. While they do not determine final recycling pathways or output specifications, their decisions directly condition process efficiency, yield and output quality.

**Key decisions enabling the case**

To enable textile-to-textile recycling as a circular practice, recyclers and secondary material users must each make a series of interrelated, information-dependent decisions.

Recyclers first perform a recyclability assessment – in close coordination with sorting and pre-processing actors – to determine whether a textile product or input fraction can be processed at all without unacceptable technical, environmental or safety risks.
On this basis, recyclers make a process selection decision, selecting the most appropriate recycling route based on fibre composition, blend structures, additives and chemical finishes. Different technologies have distinct input requirements and tolerances, making this decision highly sensitive to composition- and chemistry-related information.
Finally, recyclers determine the applications and conditions for market placement of recycled outputs. They define grades, performance characteristics and known limitations of recycled fibres. This classification is essential for enabling reliable downstream use and compliance with regulatory and quality requirements.

Secondary material users – such as yarn spinners and textile manufacturers integrating recycled inputs – make their own set of information-dependent decisions. They first assess substitution feasibility, determining whether recycled fibres can replace virgin materials in a specific application without compromising performance, durability or safety.
They also define application suitability and restrictions, specifying for which product types, performance classes or use contexts recycled materials are appropriate, considering their material and performance profiles.
Before integrating recycled materials into new products, secondary material users must perform a risk and compliance assessment, verifying that available composition and chemistry data is sufficient to ensure regulatory compliance and product safety.

**Information needs, data quality and operational decision-making**

Enabling textile-to-textile recycling as a circular practice requires a fundamentally different information logic than reuse or durability-oriented design strategies. Recycling decisions depend on predicting process-relevant material and chemical behaviour under specific technological conditions (ETC/CE 2022).
From an operational perspective, information needs cluster around two interdependent domains: Material composition and structure, and process-relevant chemical. These information needs originate primarily from brands and manufacturers as upstream data holders, and are complemented by recyclers' own process data and by information generated during sorting and pre-processing.

[17] Pre-processing activities are often carried out within integrated recycling operations, where material preparation is closely aligned with process requirements.

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First, recyclers require verified, granular data on fibre composition, blend ratios, polymer types and structural material combinations (Gaertner 2024). Different recycling technologies have narrow tolerance ranges for feedstock composition; variability in fibre blends, multilayer constructions or hidden material components can compromise process stability, reduce yields and lower output quality. Reliable composition data is therefore essential for assessing recyclability, selecting suitable processes, and managing input variability. This aligns with widely discussed design-for-circularity principles, which emphasise the importance of disclosing constituent materials and their relative proportions in a format usable for downstream recycling operations (ETC/CE 2022).

In addition to material identity, recyclers need complete, process-relevant chemical information – including dyes, finishes, coatings, auxiliaries and other treatment substances – that influence how fibres behave under thermal, chemical or mechanical stress. The relevance of this information lies not primarily in regulatory hazard classification, but in process compatibility and recyclate quality. Certain chemical treatments can interfere with depolymerisation or dissolution, cause unwanted residues or emissions, alter melting points, or degrade fibre integrity — even if these substances are not on existing regulatory lists (Carney Almroth et al., 2025).

To ensure process compatibility and material quality, recyclers require more than hazard-based substance classification. According to Article 2(27) in conjunction with Article 5(1) of the ESPR, Substances of Concern therefore also include those that negatively affect reuse, remanufacturing or recycling.[18] This broader definition acknowledges that substances may impair circular processes due to thermal instability, residue formation or other disruptive behaviour.

To operationalise this broader understanding of SoC, recyclers require function-oriented chemical information that goes beyond hazard-based classifications. Identifying which substances are problematic for specific recycling processes depends on structured and verifiable information about chemical composition, treatment substances and processing history. Without such data, the functional identification of relevant SoCs – as defined in Article 2(27) in conjunction with Article 5(1) of the ESPR – Is not feasible.

These two information domains correspond to what this report refers to as BoM-equivalent and BoC-equivalent data structures (see Box 11 for details).

Combined, BoM- and BoC-equivalent datasets form a knowledge base required to make textile inputs operationally compatible with specific recycling technologies. They reflect the fact that high-quality recycling operates under tighter input tolerances than primary textile production. Without predictable material composition and chemical process performance, recycling becomes technically unstable and economically inefficient.

In the future, reliable, standardised and machine-readable composition and chemistry data will be essential for enabling recyclers to actively manage input quality and variability. They will allow the production of secondary raw materials with defined, traceable and marketable properties – laying the foundation for stable, scalable and high-quality textile-to-textile recycling (van Landeghem 2026).

**Characterisation of data properties relevant for decision-making**

This case study not only identifies which types of information are required, but also highlights the specific data characteristics that determine whether information can effectively support recycling-oriented practices:

- Granularity: Recycling decisions typically require data at batch level, because process stability depends on controlling variability across material streams. Model-level declarations are insufficient when visually similar products differ due to batch-specific dyeing, finishing or functional treatments.

[18] See Article 2(27) and Article 5(1) ESPR, which define Substances of Concern as not only those regulated under existing chemical law, but also those that negatively affect re-use, remanufacturing or recycling.

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- Credibility and trust: Recyclers and secondary material users require verifiable, process-relevant composition and chemistry data with clear provenance (traceability to suppliers and processing steps). Certificates and compliance confirmations alone are insufficient where process compatibility and output safety depend on specific treatments and additives. Trust mechanisms must enable reproducibility, tolerance monitoring and critical parameter validation to ensure robust input quality management.
- Future-oriented perspective: Data must remain usable under evolving regulatory and market requirements – particularly with respect to changing definitions of SoC, stricter safety expectations for recycled materials, and additional documentation duties. This requires updateability of substance classifications and robust linkage between recycled output specifications and upstream input data.

These requirements are synthesised in Table 3, which maps the interrelation between actors, decisions and information dependencies – including granularity, credibility and future-oriented data needs.

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Table 3: Case 3 – Future practice in recycling and reuse of materials

| Actor | Critical decision for recycling and reuse | Information required … | … from whom? | Granularity (i/b/m) | Requirements for data credibility and trust | Future-oriented perspective |
|---|---|---|---|---|---|---|
| **Sorter / pre-processor (for recycling)** | Allocation and separation of post-use textiles into material fractions suitable for specific recycling pathways | Fibre composition (incl. blend ratios), polymer identity, material class (BoM) + presence of treatments or components known to disrupt recycling (e.g. coatings, laminations, prints, finishes); indication of chemical treatment types affecting process compatibility (BoC) | Brand /Manufacturer | Batch | Verifiable, standardised composition and treatment information; clear linkage to responsible actor and product batch; usable under operational sorting conditions | Updatability of SoC status over time |
| **Recycler** | Recyclability assessment (technical feasibility + process safety) | Detailed fibre composition, blend structure, polymer identity, non-textile components (BoM) + full process-relevant chemistry: Chemical treatment history, additives, finishes, dyes, coatings, auxiliaries, contaminants and residues relevant for process performance (BoC) | Brand /Manufacturer | Batch | Complete, process-relevant composition and chemistry disclosure beyond certificates; traceable origin and batch linkage; datasets enabling prediction of process performance | Updatability of SoC status over time |
| | Selection of recycling process | BoM + BoC-equivalent information as above, with focus on parameters affecting thermal, chemical or mechanical process compatibility | Brand /Manufacturer | Batch | Complete, process-relevant composition and chemistry disclosure beyond certificates; traceable origin and batch linkage; datasets enabling prediction of process performance | |
| | Process control & tolerance management | Verified composition ranges; variability indicators for fibre blends and chemical treatments; flags for known disruptive substances or combinations | Own processing data + upstream inputs | Batch | Traceable linkage between input data and output specification; documented classification logic; suitability for downstream verification | Alignment with evolving safety expectations for secondary materials<br>Updatability of SoC status over time |
| | Determining applications and conditions for market placement | Output material specification; residual chemical considerations; use limitations derived from input chemistry | Own data | Batch | Transparent specification of performance limits and chemical constraints; documentation sufficient for downstream compliance assessments. | Updatability as downstream regulatory and safety requirements change |
| **Secondary material user** | Feasibility of replacing virgin material | BoM-equivalent material specification (polymer/fibre type, blend structure, physical fibre parameters, variability range) + BoC-equivalent chemical composition and treatment history (residual/legacy chemicals, relevant additives, process-relevant chemical constraints) | Recycler | Batch | Verifiable, batch-specific BoM & BoC datasets with traceable origin and defined tolerance ranges | Updatability of SoC status over time |
| | Application suitability and restrictions | Performance limits; processing constraints BoM-equivalent material specification + BoC-equivalent chemical composition and treatment history + performance limits and processing constraints of the recycled input | Recycler | Batch | Consistent, standardised and batch-specific BoM & BoC datasets; defined tolerance ranges; traceability to recycler and input streams | Updatability as sector-specific rules, safety expectations or performance requirements evolve |
| | Risk and compliance assessment for recycled inputs | Documented chemical composition history (to the extent relevant for safety); residual substance information; linkage to upstream BoC data | Recycler | Batch | Data must be robust enough to support product safety documentation and regulatory due diligence; not limited to generic compliance statements | Updatability of substance classifications and regulatory obligations over time |

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The recycling use case demonstrates that textile-to-textile recycling cannot be treated as a downstream waste-management activity. Instead, it depends fundamentally on upstream design decisions and on the availability of comprehensive, verifiable material and chemical composition data at appropriate levels of granularity.
Unlike reuse and resale, where selective exclusion information may often be sufficient, recycling requires positive knowledge of what a product contains – not merely confirmation of what is absent. Recyclers must be able to anticipate process performance, material interactions and potential quality constraints based on fibre composition, blend structure and process-relevant chemical treatments. This makes recycling the use case with the highest information intensity and the strongest dependency on batch-level transparency.
By articulating these requirements from a future-oriented perspective, this use case establishes a clear benchmark for assessing current data practices and identifying critical information gaps in the subsequent chapters.

### 2.3.5. Case 4 – Customer engagement in circular practices

The case "customer engagement in circular practices" addresses how purchasing, renting, use and end-of-use decisions by customers condition whether circular textile pathways are activated in practice. Unlike the preceding cases, this case does not analyse a circular business model driven by direct operational self-interest. Instead, it examines a system-enabling practice that mediates between circular product and service offerings on the one hand and their actual uptake on the other.
In a textile system characterised by linear production and consumption patterns, the success of circular business models based on durability, rental services, repairs, resale and recycling depends critically on customer decisions that lie outside the direct control of producers and service providers. Customer engagement therefore functions as a necessary activation mechanism. It is only through customer contributions that circular pathways become more than just technically available – they are utilised on a broad scale. To this end, customers need access to trustworthy, decision-relevant information that makes the benefits and implications of circular choices visible and comparable at the point of decision.[19]
From a data perspective, this case focuses on how product-related information should be organised to support customers in making decisions in different contexts, such as consumer markets (B2C), professional procurement (B2B) and public purchasing (B2G), and how this information can be used to feed back into circular practices further upstream.

Box 7: Case 4 – Future customer engagement in circular practices (B2B; B2G; B2C)

By 2030, customers – private consumers, B2B professional and public procurers – actively use product information to align textile related decisions with circular economy objectives. Products are selected based on credible indicators of durability, repairability and environmental performance that allow meaningful comparison without requiring technical expertise.
During the use phase, customers rely on accessible and reliable information to care for, maintain and repair products appropriately, thereby extending functional lifetimes. At end-of-use, customers participate in return, resale or take-back schemes guided by clear instructions and incentives.
Through these practices, customers do not merely receive information but actively enable circular pathways by stabilising demand for durable products, supporting service-based business models and ensuring that products re-enter reuse or recycling streams instead of being disposed of.

**Key actors in this case**

The central actors in this case are customers operating in different contexts:

- *Private consumers (B2C)*, whose individual decisions shape demand patterns, product lifetimes and participation in repair, resale and take-back schemes.

[19] Consequently, according to Art. 9(2)(e) ESPR the delegated act shall specify "the manner in which the digital product passport is to be made accessible to customers before they are bound by a contract for sale, hire or hire purchase, including in the event of distance selling".

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- *B2B professionals*, such as corporate units, who make repeat procurement decisions based on performance, risk and compliance considerations.
- *Public procurers (B2G)*, who use product information to operationalise policy objectives related to sustainability, durability and lifecycle performance.

While these actors differ in scale and formal responsibility, they share a common role: they act as gatekeepers who determine whether circular product and service offerings are taken up in practice. Their decisions directly affect the viability of upstream circular business models (e.g. renting and repair services, resale platforms) and downstream material recovery pathways. Importantly, customers do not generate primary product data themselves.[20] Instead, they rely on information provided through the DPP and related interfaces. Their level of engagement depends on whether they perceive information as credible, relevant and usable in real decision-making contexts. To this end, they use platforms that offer consolidated information and provide support in managing conflicting objectives.

**Key decisions enabling circular engagement**

In B2C, B2B and B2G contexts, customers must take a series of decisions that influence circular outcomes. These include:

- Purchasing and renting decisions, such as whether to select second use products or those designed for durability, repairability or lower environmental impact over cheaper or less transparent alternatives;
- Use-phase decisions, including how products are cared for, maintained and repaired, which directly affect functional lifetime;
- End-of-use decisions, such as whether products are returned, resold, donated or discarded, and through which channels;
- Risk and compliance assessments, particularly in B2B and B2G contexts, to determine whether products meet internal policies, contractual obligations or regulatory requirements (e.g. personal protection issues for certain workplace conditions).

Each of these decisions depends on specific types of information and on trust that the information accurately reflects product characteristics and implications over time.

**Information needs, information quality and operational decision-making**

From an analytical perspective, customer engagement in circular practices depends less on exhaustive technical transparency and more on decision-relevant information that reduces uncertainty and perceived risk. Customers rarely act on complex datasets. Instead, they rely on interpreted, aggregated and comparable indicators that signal whether a product is fit for certain purposes, such as long-term use, repair or responsible end-of-life handling, or whether it meets expectations in terms of functionality or environmental performance (JRC 2025). However, current sustainability information in the textile sector is often fragmented, methodologically inconsistent and insufficiently comparable, limiting its capacity to guide decision-making in practice (Sahimaa et al. 2024). This lack of comparability is not primarily a communication problem, but reflects differences in the quality, consistency and aggregation logic of underlying primary product data.

Accordingly, customers depend on upstream actors – brands, manufacturers and service providers – to translate detailed product data into information formats that are:

- understandable without specialist knowledge,
- comparable across products,
- credible over time, and

[20] At the same time, customer interactions with products after market placement may generate secondary, use-phase feedback data (e.g. on durability, failure modes or repair frequency). Such data can, in principle, inform upstream actors and support learning over time, but its generation, aggregation and governance remain highly context-dependent and cannot be assumed as a stable or comprehensive data source (Carvalho et al. 2025).

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- clearly linked to actionable choices (e.g. repair, return, resale).

Customer decisions also generate downstream effects. Participation in repair schemes, resale markets, and take-back systems depends on whether customers trust the information provided and perceive the associated practices as legitimate and worthwhile.
In this sense, customer engagement highlights the interdependence between upstream data governance choices and downstream activation of circular practices through customer decision-making.

**Characterisation of data properties relevant for decision-making**

This case not only identifies which information is required, but also highlights the specific data characteristics that determine whether information can support reuse-oriented practices:

- Granularity: Customer decisions are predominantly supported by model-level information, as purchasing, use and end-of-use decisions are generally based on product types rather than individual items. Item-level data may become relevant in specific contexts (e.g. repair history in resale platforms or asset tracking in professional use), but this remains the exception rather than the rule.
- Credibility and trust: For customers, trust depends less on access to primary datasets and more on comparability, consistency and institutional assurance. Information must be presented through harmonised indicators, clear methodologies and recognised verification structures to avoid misleading claims and enable fair comparison. Accountability for data accuracy and updateability must be clearly attributable to responsible actors (e.g. brands, service providers or certified scheme operators).
- Future-oriented perspective: Customer-relevant information must remain up-to-date under evolving regulatory and risk contexts, particularly regarding chemical safety, product restrictions and use limitations. This includes the ability to reflect changing definitions of SoC, new safety requirements and updated care or use recommendations over time. Regulatory measures affecting specific substance groups (e.g. PFAS) may emerge at different speeds across jurisdictions, making it essential that customer-facing information can be updated to reflect current legal and safety expectations.
  For professional and public procurers, this updateability is essential to ensure continued compliance with procurement rules, sector-specific regulations (e.g. PPE)[21] and sustainability reporting obligations.

Table 4 summarises the central customer actors, the critical decisions they take, the information required to support these decisions, and the data characteristics necessary for this information to function as an enabler of circular practices.

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[21] PPE refers to Personal Protective Equipment as defined by Regulation (EU) 2016/425.

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Table 4: Case 4 – Future customer engagement in circular practices (B2B; B2G; B2C)

| Actor | Critical customer decision | Information required … | … from whom? | Granularity (i/b/m) | Requirements for data credibility and trust | Future-oriented perspective |
|---|---|---|---|---|---|---|
| **Private consumers (B2C)** | Purchase and renting decision aligned with durability and circularity | Durability / robustness indicator (expected lifetime / robustness score) Repairability indicator (repairability score; availability of repair services/spare parts); Environmental performance indicator(s) (footprint class / comparative rating, see 2.3.6); Circular pathway options: take-back / return scheme available? resale / rental option supported? Basic restriction info (e.g. safety warnings, use limitations, care sensitivity) | Brand/manufacturer | Model | Comparable and standardised indicators (durability/repairability/footprint); clear and non-misleading presentation; backed by harmonised methods and institutional assurance; consistent across sales channels. | Updateability of safety, restriction and care-relevant information over time (e.g. newly identified risk substances or updated use limitations). |
| | Decision to repair, maintain or continue use | Care instructions; repair guidance; access to repair services, warnings about practices that shorten lifetime (heat, solvents, mechanical stress) | Brand/manufacturer | Model | Practical and actionable guidance; consistent with real product performance; available throughout the use phase; trusted source (brand/repair partner); not designed to hinder independent repair. | |
| | End-of-use decisions | Return / take-back instructions (where/how; QR-based); resale suitability (e.g. “resale recommended” / “recycling recommended”); sorting guidance (textile category; avoid contamination); preparation instructions before return (e.g. wash/dry, remove non-textile parts if needed); Incentives information (deposit/refund/voucher) | Brand/manufacturer + take-back scheme operators / resale platforms | | Clear and simple routing instructions; credible assurance that return/resale/recycling pathways are actually used; alignment with EPR/municipal systems; transparency on outcome; privacy-safe handling of identifiers. | Updateability of routing and safety guidance where product restrictions or handling requirements change. |
| **B2B professionals + Public procurers (B2G)** | Purchase decision aligned with durability and circularity | Expected lifetime/robustness indicators; repairability and service availability; circular service options (leasing/rental; take-back); evidence of environmental performance (comparable footprint/PCF/PEF info (see Section 2.3.6); verified recycled content); compatibility with company policies (CSR/ESG alignment) | Brand/manufacturer | Model | Evidentiary value (verifiable documentation, not only declaration); clear responsibility (accountability for data); updateability (version control reflecting regulatory changes); access control/confidentiality protection; consistency with compliance/enforcement logic | Updatability of SoC status, regulatory restrictions and compliance-relevant information over time. |
| | Risk and compliance assessments | SoC information / chemical safety signals (clear compliance status); product safety and performance certification | Brand/manufacturer | Model | Credible, traceable and up-to-date compliance-relevant data; formal verification where required; harmonised methodologies; clear legal accountability | Continuous update of regulatory status, substance restrictions and safety classifications. |
| | Decision to repair, maintain and continue use | Maintenance instructions (incl. professional laundering/industrial wash); repair protocols (allowed repair methods; thresholds); spare parts/component availability; tracking of use/repair history (where relevant) | Brand/manufacturer + repair/service providers | Batch / item | Operational usability, interoperability with asset management systems; role clarity (brand vs. service provider responsibility) | - |
| | End-of-use decisions (return, resale, take-back, recycling routing) | Return/take-back requirements (sorting and contamination restrictions); reuse eligibility criteria; recycling routing guidance (fractions/recycler; exclusion signals); documentation for disposal (proof of recycling/reporting) | Brand/manufacturer +take-back scheme operators; recyclers | Batch / item | Proof-based information (evidence routing occurred); compatibility with reporting (ESG/CSRD contexts); clear downstream accountability; standardised classification to avoid misrouting | Updateability of routing requirements and documentation obligations under evolving waste, chemical or product legislation. |

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The crosscutting customer engagement case demonstrates that circular textile systems depend not only on the availability of data, but on its translation into decision-relevant signals. In this context, data functions primarily as an instrument of orientation, trust-building and risk reduction, rather than as a technical input for production or processing.

This distinguishes customer-oriented data needs from those of design-, reuse- or recycling-oriented actors and highlights a central governance challenge: enabling circular practices requires not only generating high-quality data, but also organising how this data is interpreted, framed and legitimised across different customer contexts (B2C, B2B and B2G).

In contrast to upstream actors, trust in this context is less derived from access to primary data than from perceived independence, consistency and institutional legitimacy of the information provided.

### 2.3.6. Case 5 – Environmental performance assessment for circular decision-making

This case addresses a dimension that remains implicit in the preceding cases. While Cases 1–3 focus on the operational feasibility of circular pathways (longevity, reuse and recycling) and Case 4 highlights the role of customer engagement, none of these perspectives explicitly examines how environmental performance information is used to compare alternatives and justify decisions within circular textile systems. In this sense, environmental performance assessment provides an additional decision layer that complements the technical and operational information flows addressed in the other cases and is closely linked to emerging regulatory expectations under the ESPR framework.[22]

Environmental performance assessment becomes decision-relevant whenever actors must choose between competing options. Such situations arise throughout the value chain: in design processes (e.g. selecting materials), in sourcing and supplier selection, in procurement contexts, and also in customer-facing decisions where products or services are compared on environmental grounds. In these contexts, environmental performance information serves as a comparative and legitimising reference that helps actors balance conflicting objectives and justify their choices.

Accordingly, this use case does not focus on how environmental impacts are calculated in methodological detail. Instead, it examines what kind of environmental performance information must be available, and with which properties, so that actors can use it as a reliable basis for decision-making in circular textile systems. From this perspective, the central functional requirement for environmental performance information is comparability.

This case is based on the central assumption that meaningful comparison of environmental performance between textile products is only possible when aggregated indicators are grounded in product- and process-specific primary data that reflect real production conditions.[23]

Box 8: Case 5 – Environmental performance assessment for circular decision-making

By 2030, environmental performance information is routinely generated and maintained as an integral part of product data infrastructures in the textile sector. For each textile product placed on the market, environmental data are built up along the value chain, beginning with material production and continuing through component manufacturing, assembly and finishing processes. These data reflect the actual processes and input flows involved.

Through interoperable data systems such as the Digital Product Passport, environmental information from different life-cycle stages is linked and consolidated at product level. Primary data on

[22] 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.

[23] ESPR, Recital 54 states that environmental performance assessments should be based on data that reflect actual production conditions.

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component- and process-specific impacts are generated at the point of activity and passed on along the value chain, enabling those who assemble components or manufacture finished products to access and integrate upstream data. Based on these inputs, harmonised environmental performance indicators are derived using commonly accepted methodological rules. This enables environmental performance to be represented in a form that is both traceable to real production conditions and comparable across products and suppliers.
As a result, actors throughout the value chain – from designers and sourcing departments to professional buyers, public procurers and customers – can draw on a shared and methodologically consistent evidence base when comparing alternatives. Environmental performance information thus becomes a normal part of how textile products are evaluated, selected and justified in circular decision-making contexts, complementing technical, functional and economic considerations. Over time, this systematic integration of environmental data into everyday decisions enables gradual, evidence-based improvements in product and supply-chain performance, as actors can identify hotspots, assess trade-offs and align strategies with circular and sustainability objectives.

**Key actors in this case**

The central actors in this case are decision-makers who must compare alternatives and justify choices on environmental grounds:

- *brands and manufacturers* (design, sourcing and portfolio decisions);
- *B2B professionals and retailers* (supplier selection and assortment decisions);
- *public procurers* (B2G procurement under sustainability criteria) and
- *Customers* (B2C) making purchasing decisions based on environmental comparisons.

These actors differ in how close they are to data generation. Manufacturers partly generate environmental performance data themselves, particularly for their own production processes and for the integration of component- and material-level information into product-level assessments. At the same time, they depend on upstream environmental data from suppliers.

Downstream actors – B2B professionals, public procurers and customers – typically do not generate primary environmental data, but rely on environmental performance information embedded in product-level data systems such as the DPP.

**Key decisions enabled by environmental performance assessment**

Environmental performance assessment becomes relevant in situations where actors must choose between functionally comparable options and justify why one alternative is environmentally preferable to another. These decision situations arise across different roles and stages of the textile value chain.
At the design and sourcing stage, brands and manufacturers face decisions between alternatives materials, product designs or suppliers that fulfil similar performance requirements but differ in their environmental implications. Environmental performance information is used here to compare options and guide the selection of solutions that reduce impacts over the product life cycle, while balancing functional, durability and circularity requirements. It also provides a basis for explaining and documenting these choices in relation to internal sustainability strategies, environmental targets and emerging regulatory expectations.
In procurement contexts, B2B professionals and public procurers must decide between competing product offers that meet the same functional specifications. Environmental performance information provides a structured basis for integrating sustainability criteria into evaluation and award decisions and for demonstrating that procurement outcomes are aligned with organisational policies and public policy objectives.
Environmental performance assessment is also relevant in customer-facing decision contexts. Private consumers as well as professional buyers may choose between products or services with similar use value but differing environmental performance profiles. In these situations, environmental information functions as a comparative reference that supports more sustainable purchasing, rental or service-use decisions.

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Across these contexts, environmental performance information is not used to manage technical processes directly, but to enable comparison, justification and legitimisation of choices where environmental aspects form one of several relevant decision criteria.

**Information needs, information quality and decision relevance**

Across all actor groups, environmental performance information ultimately depends on primary data generated upstream by material suppliers, component manufacturers and production sites, and on the integration of these data by brands and manufacturers at product level (Psarommatis & May 2024). In order for environmental performance assessment to support circular decision-making in practice, different actor groups require environmental information in forms that correspond to their specific roles in comparison and choice situations.

For brands and manufacturers, environmental performance information is closely linked to improvement-oriented design and sourcing decisions. To inform these choices, manufacturers require environmental data that differentiate between relevant life-cycle stages, such as material production, manufacturing and finishing. For key impact drivers, this information must be based on product- and process-specific primary data, allowing environmental consequences of different design and sourcing options to be compared under harmonised methodological rules.

This requirement extends beyond the textile sector itself. Many materials, chemicals and components used in textile products are also employed in other sectors, such as chemicals, plastics, construction or automotive applications. Ensuring meaningful comparability therefore requires that primary environmental data and aggregation rules are interoperable and compatible across sectors, rather than being defined in sector-specific isolation.

B2B professionals and retailers use environmental performance information primarily in supplier selection and assortment decisions. Here, the focus lies less on generating environmental data and more on comparing product alternatives. These actors require standardised environmental performance indicators at product or model level that are derived according to consistent methodological principles. Environmental information must be structured in a way that enables comparison across suppliers and product options within formal evaluation processes. In this role, environmental performance data function as a basis for structured selection and for justifying why certain products or suppliers are preferred over others on environmental grounds.

For public procurers, environmental performance assessment is embedded in procurement procedures that are linked to policy objectives and accountability requirements. Public buyers must be able to compare competing offers not only in terms of price and function, but also in relation to environmental performance. They therefore require indicators that are comparable across bids and that can be integrated into award criteria, documentation and reporting. Environmental information in this context must be sufficiently robust and methodologically consistent to support ex post justification, audit and alignment with sustainability policies and regulatory frameworks.

Customers also encounter environmental performance information when comparing products or services with similar use value. For customers, environmental information primarily supports orientation and comparison rather than technical evaluation, but it still relies on the same underlying data structures and methodological consistency as in professional decision contexts.

Across all these actor groups, environmental performance information must bridge the gap between data generation at process level and decision-making at product and portfolio level. This requires not only access to relevant primary data, but also rule-based structuring and aggregation that enable fair and meaningful comparisons. Without this, environmental indicators risk becoming arbitrary or strategically biased. Properly constructed, however, they serve as a

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foundation for identifying hotspots, managing trade-offs and aligning decisions with circular and sustainability goals. [24]

**Characterisation of data properties relevant for decision-making**

To function as a reliable basis for comparison and justification, environmental performance information must meet specific data quality requirements:

- Granularity: Environmental performance data for decision-making is typically required at the model level, as comparisons are usually made between product designs, supplier offers or material options – not between individual items.
- Credibility and trust: For environmental indicators to be accepted as a legitimate basis for comparison, they must be methodologically consistent and traceable to product- and process-specific primary data.[25] Decision-makers must be able to rely on harmonised system boundaries, allocation rules, and the accurate representation of key impact drivers. If these conditions are not met, environmental information risks being perceived as arbitrary, biased or strategically framed — undermining trust in design, sourcing and procurement contexts (Testa et al., 2016; Grandia & Kruyen, 2020). [26]
- Future-oriented perspective: Environmental indicators must remain usable as methods, regulations and reporting obligations evolve. This includes compatibility with updated footprinting approaches, revised LCA standards and emerging policy frameworks that affect how impacts are calculated and reported.

This forward-looking perspective is less about long-term consumer information and more about ensuring that environmental performance remains valid, comparable and actionable in future-oriented decision contexts – from sourcing and portfolio management to procurement and investment.

Table 5 summarises the central actors, decisions and information dependencies in this case.

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[24] 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 as needed. It explicitly refers to the evolution of science-based tools and encourages the improvement or development of new methodologies — including those that better account for circularity aspects such as durability, repairability, reusability and the presence of chemicals that hinder reuse or recycling. This implies that current life-cycle assessment practices are not fixed benchmarks but part of a continuously evolving framework.

[25] The forthcoming ISO 14021:2025 standard increases governance and transparency requirements for self-declared environmental claims (Type II). While this contributes to trust-building and greenwashing prevention, it does not replace the need for product- and process-specific primary data as the factual basis for environmental performance assessment.

[26] 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.

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Table 5: Case 5 –Data Needs for Environmental Performance Assessment for Circular Decision-Making

| Actor | Critical decision: environmental performance | Information required … | … from whom? | Granularity (i/b/m) | Requirements for data credibility and trust | Future-oriented perspective |
|---|---|---|---|---|---|---|
| **Brand / Manufacturer (design phase)** | Selection between alternative materials or product designs | Environmental performance of key life-cycle stages (especially material production and manufacturing); impact differentiation for design alternatives; contribution of components to overall product footprint | Material suppliers; component suppliers; own production data | Model | Harmonised system boundaries and allocation rules; traceability to product- and process-specific primary data for key impact drivers | Adaptability to future methodological updates; consistency with evolving sustainability targets and regulatory expectations |
| | Portfolio steering and product improvement based on environmental performance | Comparable product-level environmental indicators; breakdown by life-cycle stage to identify improvement hotspots | Material suppliers; component suppliers; own production data | Model | Methodologically consistent aggregation; link to underlying primary data; reproducibility of results across product lines | Compatibility with evolving product footprint benchmarks; enables continuous performance monitoring |
| **B2B professional/ retailer** | Supplier selection and assortment decisions between functionally equivalent products | Comparable environmental performance data across suppliers<br>Environmental performance metrics aligned with procurement rules | Brand / Manufacturer | Model | Standardised and policy-aligned calculation rules; traceability to primary data for key impact drivers | - |
| **Public procurers (B2G** | Evaluation and award decisions integrating environmental criteria into procurement procedures | Comparable environmental performance indicators suitable for use in award criteria; documentation supporting methodological consistency | Brand / Manufacturer | Model | Standardised and policy-aligned calculation rules; traceability to primary data for key impact drivers; robustness sufficient for audit and ex post justification | Compatibility with evolving award and audit criteria; sufficient robustness for long-term accountability frameworks |
| **Customers (B2C)** | Purchase or rental decisions between products/services with similar use value but differing environmental performance | Aggregated and comparable environmental performance signals (e.g. footprint class or rating) that enable relative comparison | Brand / Manufacturer | Model | Clear, standardised and non-misleading aggregation | - |

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The environmental performance assessment case shows that circular textile systems depend on the availability of environmental data and its transformation into datasets that allow different options to be analysed and compared, thereby informing decision-making processes. In this context, environmental data serve as a foundation for comparison, justification, and risk management in the context of strategic decisions. Thus, primary data is indispensable at the point of generation, while aggregation is indispensable at the point of decision-making. Environmental performance information must therefore be constructed using a two-step process:

(1) the use of product- and process-specific primary data to ensure factual comparability; and
(2) rule-based aggregation that enables actors to compare alternatives without re-interpreting methodological choices.

Analytically, this distinguishes environmental performance assessment from the operational logics addressed in Use Cases 1 to 3. It highlights that enabling circular practices requires not only generating accurate data, but organising how environmental information is standardised, aggregated and interpreted across different actor roles and decision contexts, including design, sourcing, procurement, investment and regulatory justification. Without explicitly addressing this function, key decision points shaping circular outcomes would remain analytically invisible. This also implies a governance responsibility: Environmental performance assessment must be embedded in data infrastructures, methodological standards and regulatory mechanisms that ensure consistency, transparency and accountability across all levels of decision-making. The ESPR framework – particularly through the Digital Product Passport and product-specific ecodesign requirements – creates the structural preconditions for such an integrated approach.

### 2.3.7. Case 6 – Preparedness as a strategic capability

This case addresses the organisational capability that is essential for enabling circular economy business models under the 'Textiles Strategy': the ability to maintain complete, accurate, traceable and verifiable product information across the supply chain (see Annex I, Section 8.1). This capability is increasingly reflected in regulatory frameworks and norms that operationalise expectations for structured data management on materials, chemicals and environmental performance – not just at the point of market entry, but across the product life cycle.[27] In the context of delegated power to the European Commission in Article 38 the Recital 77 explains "that supply chain actors provide, free of charge, information on what they supply, such as the quantity and type or chemical composition of materials used or the production process employed, or information on the conditions of the provision of their services."

The ESPR operationalises this expectation by enabling interoperable access to relevant product data throughout the value chain by means of the DPP: Information once generated must be retained, structured and made accessible in ways that allow reuse, verification and adaptation under changing conditions. This enables downstream actors to access relevant product information without having to re-collect it themselves (Psarommatis & May 2024).[28] Such data availability presupposes interoperable structures and traceable identifiers — in line with the traceability and data governance principles set out in UNECE Recommendations 46 (UNECE 2022) and 49 (UNECE 2025, see Figure 2).

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[27] See for example: Article 38 ESPR, which empowers the European Commission to specify in a delegated act "relevant information" to be provided by supply chain actors. See also ISO 9001 and ISO 14001, which emphasise documented quality control, risk-based thinking and traceable process governance; and UNECE Recommendations 46 and 49, which provide operational guidance for traceability and transparency in sustainable value chains.

[28] *See Psarommatis & May (2024, p. 2 and 5): "The DPP acts as a comprehensive digital record […] gathering data at every stage of its lifecycle", and "This allows for the automatic integration and transfer of data from one actor to the next, minimizing the need for manual entry".*

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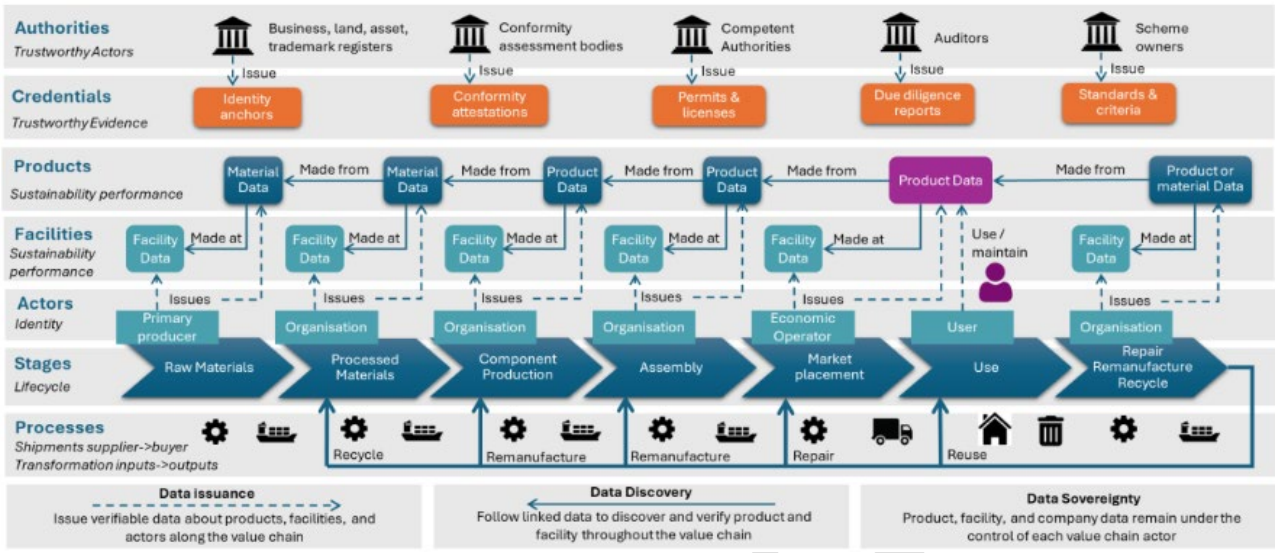


Figure 2: Scope of UNECE Recommendation No. 49 – Global transparency at scale (Source: UNECE, 2025))

This capability may be considered 'data literacy', which is relevant not only for products currently on the market. From a strategic perspective, forward-looking data literacy is arguably even more important. By establishing forward-compatible information systems, companies can use data to proactively guide product development and sourcing decisions, aligning material choices, chemical inputs and production processes with emerging sustainability and compliance requirements.

The central assumption is that preparedness in this sense is a forward-looking function – enabling companies to shape innovation efforts while remaining adaptable and accountable under dynamic regulatory and market conditions.

Box 9: Case 6 – Preparedness as a strategic capability in 2030

By 2030, textile manufacturers and component suppliers actively use structured product data to steer design and sourcing decisions. Rather than responding to compliance requirements retroactively, they proactively develop materials, components and products that remain viable under future regulatory and market conditions. Informed by reliable data on material composition, chemical content and environmental performance, they align innovation efforts with circularity goals, emerging substance restrictions and eco-modulated EPR fee structures.

To enable this, companies have established robust product information systems that ensure traceability, versioning and long-term usability of Bills of Materials (BoM), including Bills of Chemicals (BoC) and life-cycle data. Quality, compliance and vendor management functions collaborate across internal teams and supply chain partners to maintain data flows that support strategic foresight. These systems are not only treated as documentation tools, but also as infrastructure for innovation, market responsiveness and credible sustainability communication.

When policies shift – e.g. through new substance related requirements, eco-design criteria or labelling obligations – companies can reassess products based on existing records instead of initiating costly retroactive data collection. Structured and interoperable information enables them to respond faster to customer and regulatory requests, stay ahead in circular product innovation and demonstrate due diligence. Preparedness is 2023 a strategic capability that is actively developed, maintained and utilised to ensure products and portfolios are future-proofed.

**Key actors in this case**

The central actors in this case are the manufacturers of components and textile products along the value chain. These companies make strategic decisions that determine whether their products remain compliant, marketable and circular-ready under evolving regulatory and market conditions.

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**Key decisions enabling preparedness**

Preparedness as a strategic capability is a key feature in future-oriented product development and sourcing. It also becomes essential when companies must demonstrate the compliance, safety and circularity of their products not only at the point of market entry, but throughout the entire product life cycle – including under new legal requirements or market demands, without relying on burdensome retroactive data collection.

Manufacturers of components and textile products must therefore decide whether to align product development and sourcing strategies today with anticipated regulatory requirements and future market expectations – not only to safeguard compliance, but to actively position their products as resilient, innovation-ready and competitive in a circular economy context.

**Information needs, information quality and decision relevance**

Strategic preparedness depends on the ability to retrieve, interpret and maintain product-related information across the full life cycle (see Figure 2).

Information needs in this context focus on three interrelated data domains that enable companies to build forward-compatible product portfolios and reduce future compliance risks (see also Box 11):

- Material composition (BoM-equivalent data): Structured and verifiable information on fibre types, polymer identities, blend ratios, multilayer structures and non-textile components. This allows companies to assess whether products meet recyclability and EPR-related criteria under current and future frameworks (e.g. Article 5(1), Article 7(4) ESPR).
- Chemical composition (BoC-equivalent data): Traceable data on processing chemicals, additives, finishes, coatings and known residues, including information on function, location and concentration. This is essential for evaluating compliance with substance restrictions and for anticipating future chemical-related risks (e.g. Article 7(5) ESPR).
- Primary environmental performance data: Supplier-specific data on emissions, energy use, water consumption and other resource inputs at key processing stages. This supports credible life cycle or PEF-based assessments and enables differentiated decision-making in sourcing and design.

Across all three data domains, preparedness depends on primary data generated upstream by material suppliers, chemical suppliers and component manufacturers, complemented by own production data, and on the integration and maintenance of these datasets at product level by brands and manufacturers.

Together, these datasets allow manufacturers to align current decisions with future-oriented goals – ensuring that once-collected data remains usable for re-evaluation, portfolio development, risk management, and communication under a dynamic regulatory framework.

**Characterisation of data properties relevant for decision-making**

In order to inform future-oriented decision-making, product-related information must fulfil specific data requirements that go beyond current operational practices. A bill of materials (BoM), including a bill of chemicals (BoC) and environmental performance data are valuable because they facilitate proactive decision-making anticipating to evolving regulatory and market conditions. Furthermore, this data enables continuous reassessment of products in the development pipeline and those already on the market. In this respect, due diligence can be demonstrated. This can be translated into the following features:

- Granularity: The level of detail has to meet the requirements formulated in the section above in terms of BoM- and BoC-data was well as on primary environmental performance data. This includes traceable provenance, documented data sources, and supplier-specific input where appropriate.
- Credibility and trust: Information must be verifiable and withstand internal and external scrutiny. Reliance on generic declarations or certificates is insufficient when companies must demonstrate due diligence or defend decisions under audit.

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- Future-oriented perspective: As regulatory expectations and substance classifications change over time, data systems must allow existing information to be reinterpreted and reused. This includes version control, persistent identifiers, and the ability to update or reclassify data without compromising the audit trail. Information collected today must remain meaningful and usable tomorrow.

Table 6 summarises the central actors, decisions and information dependencies characterising this case.

Table 6: Case 6 – Strategic preparedness information needs

| Actor | Critical decision situation | Information required … | … from whom? | Granularity (i/b/m) | Requirements for data credibility and trust | Future-oriented perspective |
|---|---|---|---|---|---|---|
| **Manufacturers of components and textile products** | Align product development and sourcing strategies today with anticipated regulatory requirements and future market expectations. | BoM-equivalent data: fibre types, polymer identities, blend ratios, multilayer structures<br>BoC-equivalent data: processing chemicals, finishes, coatings, known residues<br>Environmental performance data: emissions, energy and water use at key processing stages | Material suppliers; component suppliers; own production data | Batch | Traceable provenance, documented sources, supplier-specific input, versioning and verifiability (ISO-quality management aligned) | Data must allow for reassessment and screening in light of new requirements regarding opportunities and risks, which must be managed proactively. |

This case study illustrates how manufacturers of components and textiles can enhance their long-term credibility and competitiveness by leveraging product information as a strategic asset. The key decision is whether to align product development and sourcing with emerging regulatory and market expectations today. In order to do this, companies must not only collect data covering BoM, including BoC and environmental performance, but also structure and retain it in a way that allows for traceability, reassessment and justification over time.

Rather than reacting to each new requirement, strategic preparedness enables companies to maintain future-proof product portfolios, reduce compliance risks and position themselves for circularity-aligned innovation. By anchoring product-related information in auditable, interoperable systems, they create the foundation for Digital Product Passports, differentiated design decisions and defensible due diligence across the supply chain.

This strategic capability is not limited to large corporations. For SMEs, which make up the majority of textile value chain actors, preparedness-oriented information practices can unlock specific efficiency gains – particularly through the Digital Product Passport (see Box 10).

Box 10: Strategic preparedness as an opportunity for SMEs

The case highlights that companies able to systematically retain, structure and exchange product-related data gain a strategic capability: they can align product design and sourcing with future regulatory and market conditions, reduce transaction costs, and respond credibly to shifting expectations. While large manufacturers often lead in developing such systems, these benefits are equally relevant for small and medium-sized enterprises (SMEs), which account for a significant share of textile products on the European market (TrustTrace 2024).

When supported by standardised upstream inputs and accessible IT-infrastructure, SMEs can use the Digital Product Passport (DPP) to automate information exchange, reduce manual data entry and streamline compliance processes. Uniform, machine-readable data formats can significantly lower administrative burden – particularly when upstream actors provide structured data that can be directly integrated into internal systems, without the need to recreate Bills of Materials (BoM), Bills of Chemicals (BoC) or environmental performance data.[29] Interoperable data systems enable each actor

[29] According to SME feedback in SBS, 2024, p. 31, structured digital data exchange could reduce manual effort considerably: one respondent estimated that tasks previously requiring several days of work might be handled "in just a few clicks."

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to access information already provided by upstream partners, avoiding redundant collection and allowing lean, low-effort implementation across the product life cycle (Psarommatis & May 2024, p. 5). These capabilities are not only efficiency drivers, but also critical enablers of credible circularity and end-of-life management – especially as SMEs remain in scope for future regulatory obligations such as the ESPR.

The case exemplifies a distinct category of information dependency: anticipatory data needs. These include BoM, BoC and primary environmental performance data, which must be generated and structured today in order to support resilience, documentation and redesign tomorrow.

### 2.4. Findings: Actor-based needs in a future circular textile ecosystem

Building on the normative and technical data categories derived from the ESPR framework and the JRC preparatory study (Sections 2.1 and 2.2), Section 2.3 translated these categories into actor-centred future practices ("cases"). This section moves beyond the individual cases to reconstruct the actor-based information needs and dependencies that characterise a future circular textile ecosystem aligned with the EU 'Textiles Strategy'. By synthesising the insights generated across the cases at system level, it specifies which actors need to provide which types of information, at which stages of the product life cycle, to whom and in what form, thereby answering the first research question set out in Section 1.1.2.

#### 2.4.1. Bigger picture: Circular textile ecosystem shaped by social information practices

From a systemic perspective, the analysis does not conceptualise circularity as an outcome arising from isolated technologies, individual business models or uniform transparency requirements. Instead, the future circular textile ecosystem (Figure 1 on page 12) emerges as a set of interlinked social practices, through which actors coordinate decisions over time by exchanging differentiated, decision-relevant information.

This systemic perspective is in line with the vision articulated in the 'Textile Strategy' (see Box 1 p. 4): Circularity becomes viable when products are designed to be long-lasting and recyclable, are free of hazardous substances, and when reuse and repair become economically viable. It also requires that fibre-to-fibre recycling capacities are scaled up.

The analysis shows that achieving these objectives fundamentally depends on the availability of sufficiently granular, verifiable data, as well as on how this data is structured and exchanged. From this perspective, the DPP is not merely a static repository whose sole function is to ensure compliance. Instead, the dataset shared via the DPP facilitates contextualised information exchanges that promote accountability throughout the value chain, from design and production to use, reuse and recycling. To this end, the DPP is the key instrument that provides transparency with regard to the contributions of the different actors. At the same time, it opens up new avenues for circular economy practices, given that the data assure traceability and are seen as trustworthy by the actors in the value chain, so that they can build and maintain sufficient confidence. This central conclusion becomes tangible through the differentiated social information practices that enable circularity across the textile ecosystem, as outlined in the following sections.

#### 2.4.2. Brands and manufacturers as integrators of information flows

At the core of the ecosystem, brands and manufacturers act as central integrators of upstream and downstream information. To design durable and recyclable textile products that are free from problematic substances and aligned with environmental performance objectives, they require material, chemical and process-related environmental performance information from fibre producers, material suppliers and processors at the design and production stages.

This information must be available already when new products are designed and therefore needs to be provided at a very early stage. The data has to be sufficiently detailed to support

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informed decisions on material selection, construction, chemical treatments and manufacturing processes.
Analytically, this requires an integrated product information structure that allows material composition, chemical characteristics and environmental performance to be consistently related to concrete components and processes (see Box 11).

Box 11: BoM- and BoC-equivalent information linked to environmental performance data

The implementation of the Digital Product Passport (DPP) under the ESPR requires structured, traceable and product-linked information that can be reused, verified and updated across the product life cycle. While the regulation does not explicitly refer to a Bill of Materials (BoM), a Bill of Chemicals (BoC) or an environmental "bill", its provisions on product aspects, traceability, verifiability and comparability imply the need for a comprehensive product data structure that combines material, chemical and environmental performance information.
A BoM-equivalent dataset is a structured collection of information on the components of a product and its material composition. This includes details such as fibre types, polymer identity, blend ratios, multilayer structures and non-textile components. Although the term is not used in the regulation, the ESPR requires product information to be linked to specific product aspects such as material composition (relevant for the 'product aspects' set out in Article 5(1) and the related 'performance requirements') and to be structured in a way that enables data integration, traceability and verifiability along the supply chain (Article 7). In practical terms, this effectively constitutes a BoM-equivalent structure.
A BoC-equivalent dataset is a structured collection of information about the chemical composition of the materials present in a product's components (listed in the Bill of Materials) and how these materials were treated. Although the ESPR does not use the term Bill of Chemicals, Article 5(1) identifies chemical characteristics as a key product aspect, and Article 7(5) requires this information to be traceable, updatable and linked to specific functions, locations and concentrations.[30] These provisions imply the need for a chemical data structure equivalent to a BoC, which would enable those involved in the supply chain to identify substances that could impact the reuse, remanufacturing or recycling of products
In addition, the ESPR requires product-specific environmental performance information to be made available through the Digital Product Passport. Articles 5(1)(o)[31] and 7(2)(b) require that environmental impacts be provided in a comparable, traceable and product-linked manner, while Recitals 23 and 54 clarify that such information should be reliable, understandable and based on data reflecting real production conditions. Although the regulation does not formally establish distinct environmental "bill", these provisions imply that environmental performance data must be structurally linked to the same material and process nodes as BoM- and BoC-equivalent information.
In analytical terms, the BoM-equivalent dataset serves functions as the overarching product's structural framework, to which additional information layers are linked. BoC-equivalent chemical information and product- and process-specific environmental performance data are associated with specific materials, components and processing steps within this structure. Taken together, these hierarchically linked datasets form the informational foundation for circular economy strategies, enabling meaningful comparison, verification and future reassessment across the product life cycle.

While such levels of structured disclosure often exceed current industry practice, the case analysis shows that they constitute a functional precondition for CE-oriented design and downstream circular pathways under the ESPR framework.

For each product placed on the market, the accuracy, completeness and up-to-datedness has to be traceable at model level, where applicable (e.g., change in supply of fabrics or process chemicals) also at batch level.

Manufacturers have to integrate the datasets provided by their suppliers. At the same time, brands and manufacturers become information providers to downstream actors. They retain, update and make accessible product-specific information, such as care instructions, repair options, material composition and chemical content.

[30] See Table 17 for details in this respect.
[31] Article 5(1) points (h), (i) and (j) also refer to environmental performance indicators.

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This information enables different actors in the supply chain to make decisions based on their specific needs. For example, resellers rely on exclusion-oriented signals to avoid products containing problematic substances, while recyclers require comprehensive, verifiable bill of materials (BoM) and bill of chemicals (BoC) datasets to assess processability and output quality. Customers, on the other hand, require trustworthy, interpretable information to guide their purchasing and return behaviour. Thus, producer responsibility along the value chain materialises as an ongoing, differentiated information practice – rather than a one-off disclosure at market entry – adapted to the operational contexts of various post-use circular pathways.

To fulfil this integrative role over time, brands and manufacturers must establish internal organisational practices that ensure the continuity, reliability and future relevance of product-related information. In this respect, preparedness as a strategic capability plays a central role.

From a circular economy perspective, these functions act as an anticipatory information practice, embedded within the integrator role of brands and manufacturers. These management functions ensure that information received from suppliers and generated internally remains usable beyond immediate compliance needs, supporting future decisions in the face of regulatory, market and liability uncertainty. This involves anticipating emerging regulatory requirements and evolving substance classifications due to scientific findings, as well as changing customer expectations. It also involves translating these uncertainties into concrete data requirements for suppliers and internal processes. Rather than re-acting to new requirements after the event, brands and manufacturers seek to establish data foundations that allow them to anticipate future developments. This approach enables them to pro-actively manage their portfolio with a view to future business opportunities and to demonstrate due diligence, and justify decisions throughout the extended lifecycle of their products, at much lower cost than a reactive approach.

In practice, it is necessary to collect and maintain consistent, structured and traceable information on material composition, chemical content and processing history from the outset. In applying the ESPR ecodesign requirements, quality and risk management therefore shapes how information must be provided, documented and retained, even where specific data points are not yet explicitly mandated by the legal text. By performing this anticipatory function, brands and manufacturers stabilise information flows across the value chain, enabling other circular practices, such as after-sales services, reuse, recycling and environmental performance assessment, to operate on a reliable data basis.

### 2.4.3. Collect, sort and resell: routing and risk management practitioners

Building on the product-level information integrated by brands and manufacturers, actors involved in collection, sorting and resale of products must make routing decisions that are essential for keeping the textiles in circulation. After collection, a preliminary sorting typically separates items that appear fit for reuse. This type of sorting is based on rapid visual or tactile screening. In this context, DPP-data primarily functions as an additional risk management tool, ensuring that products are only placed on the reuse and resale markets when environmental and health risks are adequately controlled. Consequently, the data set typically has to be provided at model level, and also at batch level under the above-mentioned conditions.

### 2.4.4. Recyclers and secondary material users as material decision-makers

Further along the circular textile ecosystem, sorter for recycling and recyclers play a critical role in determining whether and how post-use textiles can be returned into the production cycle.

For the sorting step that will precede the fibre-to-fibre recycling, comprehensive data on the material (BoM) and chemical composition (BoC) of the materials is needed. In this stage, information must be available in a machine-readable format to enable highly automated routing decisions.

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The material must be sorted according to specifications suitable for the specific recycling process. These criteria are crucial in this sorting stage, where they determine whether a product is recyclable and which pathway to follow. The quality and usability of secondary materials depend directly on the availability and precision of this data. The more the DPP dataset reflects the requirements of existing and emerging recycling processes, the higher the value and demand for the resulting secondary raw materials.

Secondary material users – such as spinners and textile fabrics manufacturers – depend on the resulting material information to decide whether recycled fibres can safely substitute virgin inputs. In this configuration, recycling is reframed from waste management into a material-supply business model, whose economic viability depends on reliable product- and material-level information.

### 2.4.5. Customers as active players in the circular textile ecosystem

Customers – private consumers, B2B professional and public procurers – occupy a distinct position within the circular textile ecosystem. They do not generate or verify product data, but their decisions determine whether circular practices translate into real-world outcomes based on CE-aligned business models.

From a social practice perspective, customers act as activation agents. Their purchasing or rental, use, maintenance and return decisions activate – or undermine – the value created through upstream practices such as durable design, reuse systems and fibre-to-fibre recycling. To perform this role, customers depend on interpreted, credible and decision-relevant information rather than on raw data. Indicators related to durability, repairability, safe reuse and environmental performance provide guidance to help make responsible choices. Crucially, trust in these signals does not arise from customer-level verification, but from the credibility of upstream information practices. Therefore, the impact of customer-facing information on decision-making depends on the reliability of the processes through which brands, recyclers and other ecosystem actors generate, aggregate and govern data. The more transparent these processes are, the more likely customers are to base their decisions on the provided data and use it to compare different options.

### 2.4.6. Environmental performance assessment as a legitimising information practice

The actors in the circular textile ecosystem engage in environmental performance assessment as a distinct social practice in contexts such as design, sourcing, procurement and investment decision-making, as well as during the use and post-use phases. Unlike the more technical decision-making practices described in Section 2.4.2 to 2.4.5, this practice does not seek to determine the feasibility of a circular pathway, but rather to compare alternatives and justify decisions. Actors in the value chain rely on information about environmental performance whenever they must justify choices between functionally comparable products, materials, suppliers or design options, or when a company is considering investments in new technologies, logistics or infrastructure.

In these situations, environmental information serves as a basis for comparison and justification, enabling decision-makers to demonstrate that their choices are preferable in light of sustainability objectives, regulatory expectations, and financial or reputational risks. The case analysis shows that comparability and trust in environmental performance information do not arise from the mere availability of indicators, but depend on how such information is generated and shared across the value chain. Two conditions are decisive in this regard:

(1) The generation of sufficiently specific, product- and process-level primary data by upstream actors, ensuring that environmental information is grounded in factual differences between materials, processes and products rather than in generic averages; and

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(2) the application of shared, rule-based aggregation and interpretation frameworks, which allow decision-makers to compare alternatives without having to re-interpret methodological assumptions on a case-by-case basis.

From a social practice perspective, environmental performance assessment links the generation of upstream data with the decision-making process at the downstream end of the supply chain. It translates detailed primary data into comparable, decision-relevant information, enabling stakeholders to justify the choices that determine which circular pathways are prioritised, scaled up and economically sustained within the textile ecosystem.

### 2.4.7. Answering the guiding question of Chapter 2

In a circular textile ecosystem, not all actors necessarily need to provide or receive the same level of information. While some actors require granular primary data to enable technical and organisational decisions, others – most notably customers – require translated and legitimised information to activate circular practices. Understanding these differentiated information roles is essential for answering the question of which actor needs to give which information, when, to whom and how. Table 7 describes the actor-based information (inter-)dependencies synthesised in a future circular textile ecosystem coordinated through differentiated information practices.

Synthesising the insights across the cases, the analysis shows that a number of crucial steps in the decision-making process, particularly with regard to product design and sorting and routing decisions prior to recycling, are essential for a future textile ecosystem.

The highest level of granularity is crucial for the system to function properly. This level must be reflected in the DPP dataset. Subsequently, it must be determined which actors can access the dataset and to what extent. Therefore, the Governance Framework must define tiered access rights, which must then be implemented in the IT infrastructure.

The following table summarises how, in a future circular textile ecosystem, the different actors rely on data provided by other actors in their decision-making processes, and which data they must feed into the DPP's dataset.

Throughout the table, BoM-equivalent data refer to the hierarchical product structure to which both BoC-equivalent chemical information and primary environmental performance data are linked at material-, component- and process-node level (see Box 11). BoC-equivalent chemical data and environmental performance data are therefore not independent datasets, but are structurally embedded and contextualised through their linkage to BoM-equivalent product structures.

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Table 7: Actor-based information dependencies and product-linked data structures in a future circular textile ecosystem[32]

| Actor (see Box 12) and 'definitions' in Art. 2 ESPR | Core role in CE textile data ecosystem | Information the actor needs | Information the actor must provide | From: > To whom: → | Lifecycle stage | Enabling function in circular practice | Granularity | Regulatory anchor (sections 2.1 / 2.2) |
|---|---|---|---|---|---|---|---|---|
| **1. Raw material supplier/ Chemical producer and supplier; Art. 3(9)/(11)/(14) REACH: 'manufacturer'/'importer'/'distributor'** | Supplying data on raw material/chemical substances/mixtures: safe handling and environmental performance | SDS, composition data of supplied raw materials or mixtures, and primary environmental performance data from own processes, including upstream environmental performance data where applicable | BoC-equivalent chemical composition data for raw materials and mixtures, linked to primary environmental performance data from production processes | > Chemical sub-suppliers (if applicable)<br>→ Supplier of components | Material production | Enable chemical safety, durability recycling compatibility and environmental performance of input chemicals | Batch | ESPR Art. 7(5); Art. 5(14); Annex I |
| **2. Supplier of components/intermediate products: fibres/fabrics/trims etc. (Tier 1-n)** | Supplying compliant and performance-relevant inputs | BoM-equivalent component data, including linked BoC-equivalent chemical information and primary environmental performance data | BoM (material properties); BoC (substances, treatments) and primary environmental performance data, batch specific as well as accurate, complete and up to date. | → Sub-suppliers: order specifications (specs)<br>> Chemical suppliers / other sup-suppliers<br>→ Brands / manufacturers | Design & sourcing<br>Production | Enable informed design choices on durability, recyclability and environ-mental performance | Batch | ESPR Art. 5(1); ESPR Art. 7(5); Art.; Annex I |
| **3. Brand / manufacturer or other economic operator that places products on the EU market** | Integration of upstream data and channel downstream information flows | BoM (incl. BoC) and environmental performance data | Product-linked information, derived from BoM/BoC and primary environmental performance data, batch specific as well as accurate, complete and up to date.<br>Instructions for care, repair, reuse, and end of use | → Suppliers: order specs<br>> Suppliers: data set<br>→ Customers, repairers, resale actors, sorters, recyclers | Design & sourcing<br>Production<br>Indirectly: Use and Post-use | Coordinate circular practices across lifecycle; operationalise producer responsibility | Model/ batch | Recitals 16, 32; ESPR Art. 5; Art. 7; Art. 9.; Annex I |
| **4. Quality & risk management unit (within a brand/ manufacturer a 'economic operator')** | Anticipatory quality and risk management | BoM + BoC (structured, traceable, reusable) and environmental performance data | Verified and curated product information; due-diligence evidence | > Suppliers / internal<br>→ Internal decision-makers | Continuous/ forward-looking (pre-market & post-market) | Anticipate regulatory change and market demands; support proactive strategies towards innovative CEBM; | Batch | GPSR, ESPR Art. 9(1); innovation, conformity & surveillance recitals |
| **5. Retailer / Resale operator 'dealer'** | Market entry of products for the first time or again | product conformity for market placement and environmental performance data; care, repair, reuse | product conformity for market placement;<br>use & care guidance;<br>Reuse: Condition-relevant cues; | > Economic operator, such as Brands ...<br>> Sorter<br>→ Customers | Entry for first use or Reuse | Enable continued use and market legitimacy of reused products | Modell | ESPR Art. 7; Art. 9 |
| **6. Repair service provider 'professional repairer'** | Enabling prolonged use and maintenance | Repair-relevant component information (e.g. type and size of trims, fasteners, closures) | On customer request: Repair history, condition updates | > Brands → Brands / customers | Use phase | Enables 'refurbishment' and 'upgrading' | > Model → Item | ESPR Recitals 2, 6, 8 et seq. Art.5(1)(e); "Right to Repair" Directive 2024/1799 |
| **7. Sorting actor, in most cases an 'independent operator'** | Routing post-use (preliminary sorting after collection + advanced pre-recycling sorting) | 1. prepare for reuse:<br>2. prepare for recycle: BoM+ BoC | Classification according to the selection criteria of the sorting outcomes (reuse/ recycling) | >Brands/DPP → Resale/ recyclers | Post-use | Decide reuse vs. further routing; manage reuse-related risks | Model / batch | ESPR Art. 7; JRC textile sorting parameters |
| **8. Recycler (fibre-to-fibre), in most cases an 'independent operator'** | Suppliers of secondary materials | BoM + BoC; data from internal environmental impact production process | BoM; BoC and primary environmental performance data | > Brands/DPP → Secondary material users | Design & sourcing | supplier of high-quality secondary materials | Batch | ESPR Art. 5(1)(h); Art. 9; Annex III; JRC recycling areas |
| **9. Secondary material user (spinners and other suppliers, manufacturers)** | Quality gatekeepers for recycled inputs | BoM/ BoC and environmental performance data | BoM + BoC and primary environmental performance data | > Recyclers → Brands/manufacture | Design & sourcing | Promotes a higher proportion of recycled material in components | Batch | ESPR Art. 5(1); ESPR Art. 7(5); Art.; Annex I |
| **10. B2B buyers / public procurers** | Activation of circular practices | Aggregated, comparable performance Data (based on BoM/BoC and on primary environmental performance data | (Procurement decisions & criteria) | > Brands/DPP<br>(→ Brands/manufacture) | Pre-purchase | Enables CEBM and further use | Model | |
| **11. Consumers (private customers)** | Activation of circular practices, decision to purchase or hire a product | Aggregated, comparable performance data (based on BoM/BoC and primary environmental performance data) | (Additional use data) | > Brands via DPP<br>(→Resale operator) | Purchase, use (incl. refurbishment), end-of-use | Enables CEBM and further use | Model/ Item | |

[32] For more information on how BoM-equivalent data interacts with BoC-equivalent chemical and environmental performance data, please refer to the explanatory note on the previous page.

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Each actor identified in Table 7 needs to give specific information to other actors at defined moments – during design, production, reuse, recycling or risk assessment – and in forms tailored to the decision context of the receiving actor. Circularity thus emerges not from uniform transparency requirements, but from purpose-specific information flows that are timely, credible and interoperable. By making these dependencies explicit, Chapter 2 provides a concrete answer to the first part of the research question – namely, which actors need to give which information, when, to whom and in what form, in order to enable Circular Economy Business Models aligned with the EU 'Textiles Strategy'.

The subsequent chapters address the second part of the research question set out in Section 1.3:

> Which governance aspects are relevant for closing data gaps and fostering mutual trust among actors in the textile sector with regard to the quality of DPP data?

In order to answer this question, it is essential to identify the actors primarily responsible for generating and maintaining the foundational data on which the DPP relies. These actors, summarised in Box 12, play a pivotal role in establishing the information base that enables the DPP to function as a trustworthy, future-oriented data infrastructure. Consequently, the following analysis focuses on these actors.

Box 12: Essential actors for a future CE textile ecosystem from a data management perspective.

**Raw material suppliers & Chemical producers/suppliers**
Actors who extract, process and supply raw materials or produce, formulate or supply chemical substances and mixtures.
They generate BoC-relevant data, which in turn feeds into BoM-equivalent structures, as well as primary environmental impact data, for example from production processes.

**Supplier of components/intermediate products, such as fibres / fabrics / trims (Tier 1–n)**
Actors who combine all upstream materials and process them further, for example in fibre production, yarn spinning, fabric production (weaving/knitting) and wet processing (dyeing/finishing/printing). They supply the aforementioned materials, trims and other 'components'/ 'intermediate products' to downstream actors in the 'supply chain'.
They obtain data from their sub-suppliers and generate additional bill of chemicals (BoC) and bill of materials (BoM) information, as well as environmental impact data from the production process.

**Brand/'manufacturer'/any other 'economic operator' placing finished textile products on the EU market**
Actor with the function of system integrator with regard to both physical components and information requirements. (Final DPP owner/operator)
They receive and integrate BoC and BoM-relevant information, as well as environmental impact data. They also generate additional data relating to production steps within their area of responsibility.

The subsequent chapters build on this foundation: Chapter 3 examines current data management practices in the textile value chain, focusing on existing routines, data gaps and barriers. Chapter 4 contrasts these current practices with the target state described in Chapter 2, identifying the most critical information gaps ("delta") and the behavioural patterns that prevent alignment with normative expectations. Chapter 5 then explores how missing data can be generated and which governance mechanisms are required to establish and maintain mutual trust in DPP data quality across the textile ecosystem.

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# 3. Data management in today's textile value chain: current practices, missing data and barriers

This chapter maps the current state of data management practices relevant to the DPP in the textile sector. It identifies missing data and structural barriers that prevent downstream actors from accessing reliable, verifiable and decision-relevant information along the value chain.
In doing so, the chapter provides the empirical basis for the second analytical step outlined in Section 1.1.2, which focuses on identifying data gaps and examining the conditions under which confidence in the quality of DPP data can be established across the textile sector.
To this end, the following analysis reviews how material, chemical and environmental performance information is currently generated, structured and communicated across supply chains and organisational boundaries, and where breakdowns in these information flows occur in practice.
Against this background, the chapter examines how key actors – including raw material suppliers and chemical producers/suppliers, component suppliers, and brands/manufacturers (see Box 12) – currently generate and communicate data within the textile supply chain.
The analysis focuses on three core information domains:

- Bill of Materials (BoM)-related practices, focusing on how material composition information is structured and shared (Section 3.1),
- Chemical transparency and the communication of substances of concern, corresponding to BoC-related practices (Section 3.2), and
- Environmental performance information, with particular attention to the availability, granularity and shareability of primary data (Section 3.3).

These domains correspond to the data foundation identified in Section 2.4as functionally necessary for enabling a circular textile ecosystem aligned with the EU 'Textiles Strategy'. This chapter examines the extent to which these requirements are met under current data management practices.

The analysis is structured along the following questions.

1. Which actors currently generate the relevant information?
2. In which forms does this information exist (e.g. declarations, certificates, datasets)?
3. How is the information shared, and with whom?
4. At which level of granularity (model, batch, item) is the information available, and how does this relate to decision-making needs?

Section 3.4 synthesises the findings across the three information domains by identifying cross-cutting structural patterns that characterise current data practices and explain their misalignment with DPP requirements. Section 3.5 concludes with an interim synthesis highlighting how these limitations constrain the structure, completeness and functional reliability of the DPP dataset.

## 3.1. Current state of BoM practices (bill of materials)

This section examines the current state of BoM (see Box 11, p. 42) practices in the textile value chain, focusing on who generates BoM-related information today, in which form it exists, how it is shared, and at which level of granularity. In line with the analytical separation introduced in Chapter 2, this section focuses on material and component-related BoM practices, while chemical (BoC-related) and environmental performance data are examined separately in Sections 3.2 and 3.3.

### 3.1.1. Which actors hold or generate BoM information today?

In the current textile ecosystem, BoM-like information is primarily generated at brand or manufacturer level, typically during product development and pre-production. For most garments, brands or manufacturers compile internal BoM documentation to support procurement, production planning and quality control. A BoM is therefore not new to the sector; it is an

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established element of apparel product development and cost control practices.[33] However, it is primarily designed as an internal production and sourcing instrument, not as a dataset intended for downstream circular applications.
At the same time, the completeness of BoM information available at brand or manufacturer level depends on upstream actors (see Box 12 on page 47), in particular:

- raw material suppliers as well as chemical producers and suppliers; and
- suppliers of components and intermediate products, such as fibres, fabrics and trims (Tier 1–n), who conduct the relevant production processes and therefore hold knowledge about input materials, chemicals and precise production parameters.

### 3.1.2. In what form does BoM information exist today?

In multi-stage supply chains, information is often fragmented, non-standardised and therefore incomplete, meaning no single party necessarily has an overview of all materials and components. Consequently, although BoM data does exist in practice, it is typically created for internal production, upstream communication and purchasing purposes rather than for downstream circular applications, such as sorting for recycling or fibre-to-fibre recycling. This functional orientation shapes both the structure and the accessibility of BoM information along the value chain.
As a result, current BoM practices are characterised by a clear distinction between internal technical BoMs and externally visible composition declarations.

**(a) Internal BoM datasets (enterprise documents)**

In many companies, BoM data are stored and managed

- as a technical document that includes detailed upstream instructions and specifications for accurate production,[34]
- in Product Lifecycle Management systems (PLM),
- in Enterprise Resource Planning tools (ERP), and
- in supplier portals or design documentation systems.

These datasets often contain richer information (e.g. trims, component identifiers, production variants); however, formats vary widely and are not aligned with machine-readable interoperability standards. As a result, the datasets are generally not interoperable across actors.

**(b) Downstream-facing material composition (label data)**

For customers and other downstream actors (such as recyclers), material composition is typically communicated through textile labelling, which focuses on fibres and percentages, not on full BoM structure (e.g., no data beyond fibres, no trim breakdown). This format supports basic customer information but does not meet the operational needs of actors. This becomes particularly visible at the interface between sorting and recycling, where operators depend on accurate fibre composition information to route textiles into recycling fractions.

The JRC preparatory study (JRC, 2025) highlights that even where fibre composition is theoretically available via labels, access and accuracy remain uncertain in practice. In particular, labels may be missing, unreadable or degraded over time, which limits the usability of fibre

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[33] See, e.g., https://www.onlineclothingstudy.com/2012/12/bill-of-material-bom-format.html or https://www.aprelix.com/blog/complete-guide-to-garment-bill-of-materials-bom-that-actually-works. For Lisa Schwarz (2025) "a BOM is actually a strategic element in apparel industry cost control, inventory management, and production planning". In this perspective a BoM "is a comprehensive, standardized list of all the items required to manufacture a finished product, including the packaging materials for shipping the product to customers. Treated as a living document, each BOM is a core page within a tech pack—the technical document that includes detailed instructions and specifications for accurate production. In the fashion business, the BOM covers the raw materials, trims, packaging, and anything else required to produce a garment that's ready for sale" (see https://www.netsuite.com/portal/resource/articles/erp/bill-of-materials-bom-fashion.shtml).

[34] See Schwarz 2025, fn. **Fehler! Textmarke nicht definiert.**: "Before sourcing begins or samples are cut, teams need a single shopping list of every component that goes into a garment: what they are, how many are needed, and the vendors supplying them."

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composition information for operational sorting decisions and recycling operations. As the study notes: “Information is not necessarily accurate or it could be even not accessible due to absence of the label or removal of the printed elements due to ageing processes (Cura et al., 2021). Consequently, the identification of the fibre composition sometimes challenges the sorting process.” Similarly, stakeholder evidence collected in different studies confirm that insufficient product composition information constitutes a structural bottleneck for circular business models. especially for sorting and recycling. This reduces the process efficiency and slows down scaling and innovation in recycling (Gaertner, 2024; Niinimäki et al., 2024).

#### 3.1.3. How is BoM information shared (and with whom)?

Current sharing practices remain limited and selective. Actors typically exchange BoM-relevant information via:

- product specification sheets (upstream),
- contractual supplier declarations, sometimes supported by certificates (downstream), and
- technical compliance documentation (in both directions).

However, the literature and sector analyses repeatedly highlight that information sharing is constrained by:[35]

- confidentiality and IP concerns,
- inconsistent terminology and formatting across tiers,
- lack of standardised data models and exchange routines, beyond bilateral cooperation.

Although some data exist internally, it is not transmitted in a form that downstream circular actors can use. Moreover, BoM information communicated downstream is often restricted to fabrics and fibre composition, excluding trims, accessories and other components that are critical for reuse, sorting and recycling decisions.

#### 3.1.4. What granularity is used (model, batch, item)?

Current BoM practices in the textile sector are predominantly organised at model level, reflecting product design styles and variants, and at batch level, corresponding to production orders and supplier lots. This aligns with how apparel products are developed, sourced and manufactured in practice, as well as with the structure of enterprise systems such as PLM and ERP. BoM information is therefore primarily used to support planning, procurement, quality control and supplier coordination, rather than downstream circular decision-making. The absence of consistently structured and shareable batch-level BoM data across actors therefore limits the reuse of material composition information in post-use contexts such as sorting, reuse qualification and recycling.

#### 3.1.5. Interim conclusion: relevance for DPP data foundations

Overall, the current textile system already generates BoM information as part of established production and product development practices. However, there are a number of limitations:

- Fragmentation across tiers: BoM information is collected in various applications in a wide variety of formats among the different actors.
- Inconsistent structures resulting in low interoperability: Even where BoM datasets are technically rich, they are not aligned with shared schemas or set up for machine-readable interoperability.
- Limited accessibility and usability for downstream actors: Material composition information, as currently provided through textile labelling and fragmented documentation practices, is

[35] See, e.g., Luoma et al. 2022, Technological Forecasting & Social Change 182 (2022) 121859, p. 9, Section 4.1.3: “respondents characterized the industry as afraid of how sharing of data might affect competition. Industry players were portrayed also as unprepared to share data unless required to do so.”

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frequently incomplete, inaccessible, and unreliable in downstream contexts and not designed to make circular decisions.

This results in a recurring structural problem: products reach sorting and recycling stages as heterogeneous material streams without reliable and verifiable composition information.

This makes BoM practices a central leverage point for DPP governance: strengthening BoM completeness, standardisation and exchange routines is a prerequisite for enabling reliable circular economy business models and for maintaining confidence in DPP-based claims across circular value chains.

### 3.2. Current state of BoC-related practices: chemical transparency and compliance

Chemical-related information (BoC, see Box 11, p. 42) constitutes one of the most critical and at the same time least transparent information domains in textile value chains (see Section 1.1). This Section therefore examines how chemical transparency is organised in the current state, and to what extent current practices provide a realistic foundation for DPP-enabled chemical traceability.

#### 3.2.1. Which actors generate and/or hold chemical information today?

Chemical-related information emerges at multiple points in the textile value chain, as actors generate different types of data depending on their function and their proximity to the use of chemicals in the supply chain. In today's practice, chemical information originates primarily from upstream and midstream production stages, while downstream actors often reconstruct chemical content indirectly through documentation and testing. Stakeholder knowledge and awareness regarding chemical usage, management practices and residual chemicals in textile articles vary substantially across the value chain, reinforcing fragmentation in chemical information flows.[36]

Key actors generating and/or holding chemical information include:

- Chemical producers/suppliers, who develop chemical formulations and therefore hold the most detailed substance-level knowledge. They generate ingredient-level data but treat it as commercially sensitive and typically disclose it only selectively, limiting communication to the minimum required for compliance or customer-specific demands.
- Suppliers of components and intermediate products, including fibre, fabric and trim producers, as well as wet-processing facilities (e.g. dyeing, printing, finishing), who apply chemical formulations in production and generate process-level chemical information through recipes, dosing records and chemical management documentation.
- Brands/manufacturers placing products on the EU market (economic operators), who consolidate supplier declarations, certifications and test reports to manage compliance and reputational risks, but typically do not have direct access to full formulation-level chemical information.

Moreover, testing laboratories generate an additional data stream through analytical measurement of selected substances in products they have tested. This chemical information does not represent upstream disclosure; rather, it serves as a verification method where actors either lack transparency or need evidence for compliance checks and enforcement.
Overall, chemical information is not produced by one actor in a complete and transferable way. Instead, each actor generates partial fragments, which only become meaningful when they are combined and through downstream consolidation and interpretation.

[36] Moch et al. 2026, p. 237: "*The stakeholders' contributions showed that knowledge of chemical usage and management, as well as awareness of the presence of chemicals remaining on the textile articles, ranged from very low to excellent*."

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### 3.2.2. In what form does BoC information exist today?

Unlike BoM-related information, which often exists as structured internal documentation (e.g. PLM systems), chemical information currently exists in multiple heterogeneous formats that rarely align with BoC logic. Chemical information also remains fragmented across tiers and processing stages. Wet-processing and finishing steps often take place in multiple facilities, frequently located in different countries, with heterogeneous documentation routines and uneven IT maturity.[37] In the current state, chemical transparency is typically operationalised through four dominant formats (JRC, 2025):

- Restricted Substance Lists (RSL) / Manufacturing Restricted Substance Lists (MRSL): Many brands and industry initiative's structure chemical compliance around RSL/MRSL frameworks. In this logic, actors do not disclose chemical content but provide assurances that certain substances are absent or below thresholds.
- Certificates and eco-label compliance documentation: Actors frequently rely on third-party certifications (e.g. OEKO-TEX, EU Ecolabel, bluesign[38] other sector labels) to communicate chemical compliance indirectly. In most cases, these schemes also rely on RSL/MRSL-based conformity logic rather than on disclosure of chemical composition.
- Supplier declarations and contractual conformity statements: Brands collect chemical-related information via contractual clauses requiring suppliers to confirm compliance with specific chemical requirements. This supports conformity declarations but often no transferable substance dataset.
- Testing reports and analytical evidence: Actors use laboratory testing to verify compliance, particularly for high-risk categories, imported products, or where trust in upstream disclosure remains limited.

Taken together, these formats do not constitute a BoC in the sense of a structured, traceable bill of chemicals. Instead, they create a compliance-oriented representation of chemical risk, where the dominant output is a binary "pass/fail" or conformity claim rather than a positive, product-linked inventory of chemical substances.
The limitations of this compliance-oriented approach become visible in market surveillance outcomes (see Box 13).

Box 13: Market surveillance signals persistent chemical non-compliance in textiles

Despite the widespread use of RSL/MRSL frameworks, certifications, supplier declarations and testing, market surveillance data indicate persistent chemical non-compliance in textile products placed on the EU market. Repeated notifications in the EU Rapid Alert System (Safety Gate/RAPEX) demonstrate that prohibited or restricted substances continue to be detected in textiles. [39]
Examining the results of the current practice in terms of actual performance reveals the following findings. According to a review of the EU Rapid Alert System by the European Environment Agency (EEA), 70 alerts regarding chemical risk for textiles were issued in 2023. The EEA provides the following explanation of the methodology:

> "The number of alerts is influenced by EU and national initiatives for market surveillance of specific products or substances since inspection campaigns often only target a small fraction of products on the market. The REACH4Textiles project, for example, found 16% of tested

[37] JRC (2025) reports that chemical information in textile supply chains is generated at multiple tiers and processing stages, in particular during wet-processing operations, but is rarely consolidated at product level. It further highlights heterogeneous documentation practices, process-specific data silos and uneven digital maturity across facilities and regions, which hampers the linkage of chemical use to specific production batches and final products (see esp. pp. 137–140; 145–148; 227–229).

[38] https://www.bluesign.com/

[39] Repeated RAPEX/Safety Gate notifications demonstrate that prohibited substances continue to be detected in textile products placed on the EU market. As of 26.02.2026 under the filter "textiles" and "chemical" almost 500 entries are displayed, https://ec.europa.eu/safety-gate-alerts/screen/search.

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products to be non-compliant with the REACH regulation, indicating that the problem goes way beyond what is currently detected.[40]
Stepping up enforcement activities at the EU level may increase the detection of hazardous chemicals in products sold on the EU market and thus increase the number of alerts."

These findings suggest that the dominant compliance-oriented strategies currently used in the textile sector do not ensure a consistently high level of chemical safety. When roughly one in six tested products fails to comply with chemical regulations, chemical risks associated with textile products emerge as a systemic concern rather than isolated incidents.

Even where actors seek to model chemical use more systematically, they frequently encounter missing or insufficiently granular information. Chemical assessment therefore often relies on approximations or proxy data rather than on process-specific, substance-level datasets (JRC, 2025). As a result, no single actor consistently consolidates chemical information into a structured dataset that could be transferred along the value chain.

These limitations significantly reduce the downstream usability of chemical information. Without structured chemical content information, sorting for recycling and fibre-to-fibre recycling cannot reliably assess reuse suitability or recycling feasibility making those processes unsafe and inefficient (Gaertner, 2024).

### 3.2.3. How is BoC information shared (and with whom)?

Actors share chemical information primarily through conformity assurance mechanisms rather than transparency mechanisms. In practice, chemical data flows tend to remain bilateral,[41] contract-bound, and fragmented.

Common documentation and exchange channels include:

- Supply chain compliance documentation: suppliers provide signed declarations, certificates, and RSL/MRSL conformity evidence to brands or tier-1 manufacturers.
- Safety Data Sheets (SDS): chemical suppliers provide SDS documentation for chemical formulations. In many cases, SDS-based data remain the most accessible formal chemical information source for production stages, albeit with limited relevance for product-level chemical traceability.[42]
- Internal chemical management systems: wet processors document chemical inputs internally (sometimes with ZDHC[43] tools), but these data seldom translate into product-specific datasets that can be shared downstream.

[40] The EEA provides a reference to the results of the REACH4textiles project coordinated by the TRUSTex partner Centexbel: https://www.centexbel.be/en/knowledge-hub/depth-articles/substances-concern/reach4textiles-project-results

[41] According to Moch et al. (Umweltbundesamt 2026, p. 221) the data management related to chemicals can be "described as follows: The company communicates its technical performance requirements to the finisher and the finisher implements these requirements on the raw material (e.g. yarn, fabric). It was highlighted that communication of information about chemicals is not integrated in currently used digital tools. Existing Product Lifecycle Management systems (PLM) and Enterprise Resource Planning (ERP) systems today do not offer options to set specific requirements for chemical usage during wet processing. Information on substances, performance and applications is provided by chemical manufacturers in the EU through REACH compliant Safety Data Sheets (SDS) and technical application information (TI) to the direct customers, which are the finishers. Knowledge of individual substances present in the textile chemical mixtures and chemical products used to achieve usability is rarely available to the textile company".

[42] According to ECHA (2020, p.9), safety data sheets are designed for substances and mixtures and are not adapted to most articles, even though the SDS format may in exceptional cases be used to convey safety information.

[43] Zero Discharge of Hazardous Chemicals Foundation (ZDHC): https://www.zdhc.org/. ZDHC tools are primarily designed to support MRSL-based chemical risk management at facility level. While they improve process control and upstream compliance, they do not aim to establish product-specific, transferable chemical inventories comparable to a BoC.

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While this approach can support conformity assessment at a given point of time, it does not generate a product-anchored chemical profile that downstream actors can use for circular decision-making.

#### 3.2.4. What granularity is used (model, batch, item)?

Chemical information is currently documented primarily at process or supplier level and only sporadically translated into product- or batch-specific datasets.

Most chemical compliance information is communicated at model level, for example through product-line certifications or conformity declarations. Batch-level chemical information may exist in isolated cases where wet-processing recipes and production runs are documented internally, but it is rarely structured or shared in a way that allows downstream reuse.

This granularity gap is highly relevant for circular practices. Textile production is inherently batch-based and chemically intensive: dyeing, finishing and functional treatments introduce unavoidable variability between production runs. As a result, two visually identical garments can exhibit substantially different chemical and material behaviours in recycling processes. This variability constitutes a major barrier to consistent recycling performance and stable, high-quality recyclate.[44]

#### 3.2.5. Interim conclusion: relevance for DPP data foundations

Several structural constraints currently prevent chemical information from functioning as a DPP-ready BoC foundation in the textile sector.

Most importantly, actors across the value chain continue to treat chemical formulation data as commercially sensitive. Chemical suppliers and processors therefore disclose substance-level information only selectively, typically limiting communication to the minimum needed for compliance or customer-specific requirements. This creates a systematic tension between chemical transparency and competitive business interests.

At the same time, chemical communication largely follows an indirect compliance logic rather than a traceability logic. Instead of disclosing which substances are present in products, actors more commonly communicate confirmation that restricted substances are absent (e.g. via RSL/MRSL conformity, certificates or declarations). While this approach can support conformity assessment at a given point of time, it does not generate a product-anchored chemical profile that downstream actors can use for circular decision-making. As a result, current chemical information practices remain fundamentally misaligned with the traceability and updateability requirements implied by the DPP.

### 3.3. Current state of environmental primary data practices

Environmental performance information differs fundamentally from BoM and BoC information. While BoM and BoC relate to what is physically contained in a product, environmental performance data reflect what happens during production and use. As such, they depend on quantifiable process information generated across multiple tiers of the value chain.

#### 3.3.1. Which actors generate environmental performance information today?

In the current textile value chain, several actors generate primary process data relevant to environmental performance. These include:

- raw material suppliers, who generate data on energy and water use, emissions and waste;
- chemical producers and suppliers, who track raw material inputs, utility consumption (such as energy and water use) and emissions from formulation processes;

[44] JRC (2025) document that dyes, finishes and other chemical treatments applied during wet-processing stages affect recyclability outcomes and recyclate quality, and that variability between production batches complicates sorting and recycling operations (see esp. sections on fibre-to-fibre recycling constraints and chemical additives; Tables 50–51; pp. 129–133; 145–148).

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- suppliers of components and intermediate products – including fibre producers, yarn spinners, fabric producers and wet processors – who generate data on energy and water use, chemical and auxiliary inputs, emissions, waste, and, in the case of wet processing, wastewater characteristics; and
- garment manufacturers and logistics actors, who collect operational data on energy use, packaging, production losses, waste, and transport-related emissions.

### 3.3.2. In what form does environmental performance information exist today?

Environmental performance information currently exists in a wide range of fragmented and heterogeneous formats. Typical forms of environmental data include:

- Primary operational process data, such as energy and water consumption, wastewater discharge, chemical input quantities or internal production KPIs. These data are typically used for internal management purposes and are rarely standardised or shared externally.
- Corporate sustainability reporting formats, which consolidate environmental metrics at site or company level. These include aggregated key performance indicators (KPIs) (e.g. annual $CO_2$ emissions) and Environmental, Social and Governance (ESG) disclosures.
- Environmental footprint metrics and carbon reporting, such as Product or Corporate Carbon Footprints (PCF/CCF), which rely heavily on modelling and secondary datasets.
- Certification and audit outputs, which confirm compliance with specific standards or processes but usually provide only qualitative information or limited quantitative inventories.
- LCA modelling inventories, which reconstruct environmental performance via external consultants or tools, often using proxies, generic averages or literature-based assumptions.

In practice, brands and manufacturers rarely have access to structured, company-specific primary environmental data from their suppliers, particularly for upstream and downstream processing stages.[45] Instead, they depend on selective disclosures, reporting templates, audit certificates or third-party tools. Sustainability analysts and LCA consultants therefore reconstruct product-level environmental performance largely on the basis of secondary databases (e.g. Ecoinvent, GaBi/Sphera) and default assumptions.

For chemical inputs in particular, product- and process-specific life cycle inventory (LCI) data are frequently unavailable. Many textile-relevant chemicals lack substance-specific environmental datasets at both primary source level and in commonly used LCA databases. As a result, environmental assessments often rely on generic datasets, proxy substances or average industry values, which limits the accuracy and comparability of product-level environmental performance results (Huber et al., 2022). This data gap is especially pronounced for auxiliaries, dyes, finishes and functional treatments, whose environmental profiles are rarely documented in a product- or batch-specific manner.

These reconstruction practices systematically introduce uncertainty, particularly where data are missing for upstream processes or use-phase activities (e.g. washing frequency or disposal routes). As a result, inconsistent system boundaries, insufficient data granularity and the lack of real, process-specific primary data prevent meaningful comparison of environmental performance across products, thereby limiting the credibility of footprint-based claims (Holzapfel, 2025).

[45] Moch et al. (2026, pp. 257–258) note that *"the use of company-specific primary data, especially from raw material provision and downstream processing steps in the production of textile surfaces, should preferably be used to determine possible differences between two products. However, such detailed information from the supply chain is typically not available to the distributor of a textile product. This means that at the data points where it matters, the requirements for data quality are not met, as is fundamentally required by the Product Environmental Footprint (PEF) under the principle of materiality."*

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### 3.3.3. How is environmental performance information shared (and with whom)?

Currently, actors share environmental performance information in a way that reflects compliance and reporting needs rather than the transparency of circular ecosystems. They do not communicate primary operational process data, as it is treated as internal operational information. As a result, brands often depend on what their suppliers are willing or able to disclose. Typical sharing patterns reflect the fragmented and selective nature of current practices. Suppliers share environmental performance information with brands and manufacturers primarily through questionnaires, ESG reporting templates, audit results, or certificates. This information is often partial. Brands and manufacturers, in turn, provide simplified metrics and narratives to customers and public or private procurers. These may take the form of footprint claims, labels or score-based messages, but rarely include traceable primary data, which makes meaningful benchmarking difficult.

This leads to environmental performance assessments that are often not comparable across products or suppliers, even when they nominally refer to the same footprint concept. Differences in system boundaries, data sources, allocation rules and modelling assumptions mean that two environmental footprint calculations for similar textile products can yield substantially different results depending on the provider and methodology used. This undermines the use of environmental performance information for benchmarking, procurement and decision-making, and limits the credibility of footprint-based claims in practice (EPRS, 2024).

Without reliable benchmarks, customers struggle to assess the relevance and credibility of the environmental performance data provided (Holzapfel 2025). Environmental information submitted to regulators is typically aligned with compliance frameworks and is often based on sector averages and secondary datasets to fill data gaps. Direct sharing of environmental performance data between supply chain actors – especially across tiers – remains limited. This is due to structural fragmentation, the absence of standardised formats, confidentiality concerns and a general lack of incentives for comprehensive disclosure.

### 3.3.4. What granularity is used (model, batch, item)?

Environmental performance information is typically not generated at product or item level, but at process, site or organisational level. Environmental impacts are measured per facility, production line or reporting period, rather than being allocated to specific product models, batches or functional units (e.g. per kilogram of a defined textile product). As a result, environmental performance data are rarely available in a form that can be directly linked to individual products, product models or production batches.

### 3.3.5. Interim conclusion: relevance for DPP data foundations

Many actors already measure operational parameters internally. However, since these measurements are typically used for internal operational control or to meet reporting obligations, they are not systematically linked to product-level identities. As a result, the status quo does not provide structured, shareable, comparable primary environmental datasets that can support DPP-enabled environmental performance assessment. Current practice therefore produces environmental metrics primarily through:

- incomplete supplier disclosures,
- aggregated reporting,
- secondary data defaults, and
- model assumptions and proxies.

This prevents robust benchmarking and limits comparability. For the governance-oriented delta analysis, this implies that the central gap is that primary data is not systematically generated, standardised, allocated and shared in forms that enable comparability and trust across actors. In particular, process-level environmental data is rarely allocated to specific product models or batches. Without this allocation, the DPP cannot serve as a credible basis for comparing

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environmental performance across products, motivating improvements, or supporting procurement and policy decisions.
Without systematic allocation of primary environmental data to product identities, the DPP cannot fulfil its intended function as a basis for comparable, decision-relevant environmental performance assessment across products and value chains.

### 3.4. Cross cutting patterns

Sections 3.1 to 3.3 analyses the current state of BoM-, BoC- and environmental primary data practices in the textile value chain. While these information domains differ in their substantive focus and in the way data are generated and structured along the value chain, the analysis reveals a set of recurring structural patterns that constrain the structure, completeness and functional reliability of the Digital Product Passport (DPP) dataset.

Across all three domains, the core issue is not the complete absence of data generation. Rather, relevant information is already produced at multiple points in the value chain. However, it is rarely maintained as transferable, interoperable and decision-relevant datasets that can be reused beyond the immediate context of production control or compliance.

Two cross-cutting patterns are particularly relevant in explaining the mismatch between current information practices and the data foundations required for a circular textile ecosystem enabled by the DPP. First, a structural asymmetry between data generation and data dependency can be observed: upstream actors generate most primary information, while downstream actors depend on this data for circular decision-making but lack access to it in usable form (Section 3.4.1). Second, current practices remain shaped by linear supply-chain information logics, in which information exchange is bilateral, selective and compliance-oriented, rather than lifecycle-based and product-linked (Section 3.4.2).

#### 3.4.1. Structural asymmetry between data generation and data dependency

The first pattern is a persistent asymmetry between where data are generated and where they are most urgently needed for circular decision-making.
Upstream actors – such as chemical producers, wet-processing facilities and component suppliers – hold much of the primary information required for BoM-, BoC- and environmental performance assessment. These actors generate detailed process data, formulation information and operational metrics as part of their day-to-day activities. However, this information is primarily documented for internal operational purposes or for meeting minimum regulatory compliance requirements (e.g. safety data sheets, conformity declarations).
In contrast, downstream actors – including brands and manufacturers in their capacity as system integrators, as well as circular actors such as sorters, reuse operators and recyclers – depend on structured, traceable, and reusable datasets in order to make operational decisions. Yet they have limited leverage to obtain upstream data in a form that is decision-relevant and interoperable. This asymmetry manifests differently across actor groups:

**Upstream suppliers as information originators, but not as circular data providers**

Although upstream suppliers possess relevant primary data, information provision is constrained by limited digital infrastructure (especially among SMEs and lower-tier suppliers), commercial confidentiality concerns regarding formulations and process chemistry, and the absence of shared sector-wide expectations for structured, machine-readable data provision. As a result, relevant data often remain locked in local documentation systems and are not translated into BoM-, BoC- or product-linked environmental datasets.

**Brands and manufacturers as systems integrators under conditions of fragmented disclosure**

Brands and manufacturers function as the central aggregation point for supply-chain information. However, their current practices are dominated by risk management under uncertainty

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rather than by systematic transparency. Chemical management relies largely on RSL/MRSL frameworks, certifications, contractual assurances and selective testing strategies. These mechanisms are designed to demonstrate the absence of restricted substances, not to ensure the availability of reusable substance-level data. Fragmented documentation formats, weak batch-level linkage and limited verifiability further constrain the integration of upstream data into coherent DPP-ready datasets.

**Downstream circular actors facing the strongest information constraints**

Actors operating at end-of-use – collectors, sorters, reuse operators and recyclers – are structurally disadvantaged. Even basic composition information is often incomplete, inaccurate or unavailable at end-of-use. For fibre-to-fibre recycling, the lack of traceable chemical and material data prevents predictable process selection and undermines the quality of recycled material. Thus, actors who most depend on reliable information have the least access to it.

Overall, the current data ecosystem reproduces a structural imbalance: actors who generate primary data upstream lack incentives and frameworks to provide it as reusable datasets, while downstream actors who depend on such data lack the institutional means to demand it. In response to limited access to upstream primary data, downstream actors increasingly rely on third-party substitutes (certifications, restricted-substance conformance schemes, testing and footprint service providers) to manage risk and demonstrate due diligence – without resolving the underlying data dependency. Auditing remains a dominant monitoring practice, yet extending audits upstream is constrained by geographic dispersion and supply chain fragmentation, reinforcing an "arm's length" approach rather than persistent, product-linked lifecycle data flows (Karaosman et al. 2020).

### 3.4.2. Persistence of linear supply-chain information logics

The second cross-cutting pattern is the persistence of linear supply-chain information logics that are incompatible with circular data requirements.

Information exchange in today's textile value chain is predominantly organised as bilateral, contractual and selective documentation. Data flows are designed to support linear production and market entry, not to accompany products across their full life cycle. Even where information exists, it is rarely maintained as a persistent dataset linked to product identities (model or batch) and accessible for reuse, repair, sorting or recycling decisions.

This is particularly evident in chemical transparency practices, where information is mainly communicated through indirect 'negative' assurances, i.e. confirmation that restricted substances are absent, rather than through the structured disclosure of material content.

Environmental performance information follows a similar logic: instead of being grounded in traceable primary data, it is often reconstructed through modelling, averages and default datasets. This undermines comparability, credibility and decision relevance.

Current product-related certificates and the wide range of ecolabels[46] in the textile sector also incorporate linear supply-chain information logics. These approaches do not take a systemic approach to cross-tier data management. Instead, they perpetuate the business logic of "third parties" acting as "data gatekeepers". In this role, they are not interested in contributing to the establishment of transparency and traceability, as this would jeopardise their business model.

As a result, current information practices remain fundamentally misaligned with the traceability, updateability and interoperability requirements implied by the DPP.

## 3.5. Conclusions

The analysis in Sections 3.1 to 3.4 shows that the data gaps relevant to the DPP in the textile sector are not are not simply a matter of missing IT solutions or data formats, but rooted in long-

[46] For a perspective focussing on future ecolabels see Moch et al. (Umweltbundesamt 2026), pp. 282 et seq.

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standing social and organisational information practices. While actors already generate BoM-, BoC- and environmental performance data, these data are rarely structured, retained and shared in ways that support circular decision-making across the product life cycle.

Current practices – shaped by linear supply-chain logics, indirect compliance communication and third-party verification – systematically limit data completeness, interoperability, traceability and credibility across all three information domains. As a consequence, the DPP cannot rely on existing practices alone to function as a trustworthy, decision-relevant data infrastructure.

Building on this baseline, Chapter 4 systematically contrasts the target state developed in Chapter 2 with the current practices (Chapter 3) to identify the most critical data gaps and the behavioural and organisational factors that maintain them. Chapter 5 then examines governance mechanisms for generating missing data and establishing and sustaining mutual trust in DPP data quality across the textile ecosystem.

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## 4. Delta analysis: target state versus current data practices

For a circular textile ecosystem (Figure 1 on page 12) aligned with the EU 'Textile Strategy', data must be generated and maintained as accurate, complete, updated, verifiable and interoperable datasets,[47] on which downstream and cross-chain actors can rely for operational and strategic decision-making (Section 2.4). In other words, the target state requires data practices that support circular pathways on a large scale, including durability and repair, reuse, fibre-to-fibre recycling, quality and risk management, and comparable environmental performance assessment.

Building on Chapter 3, which mapped how BoM-, BoC- and environmental primary data are currently generated, documented and shared in today's textile value chain, this chapter identifies the differences ("delta") between current practices and the target state requirements (Chapter 2), to make explicit where and why current practices fail to support DPP-enabled circular pathways.

In analytical terms, the delta is conceptualised as a mismatch between (i) the way information flows would need to function to reliably enable circular practices at scale, and (ii) the everyday routines through which actors currently generate, structure, verify and share DPP-relevant information. The analysis shows that this mismatch is not sufficiently explained by technical barriers alone. Instead, persistent gaps are stabilised by behavioural patterns and organisational conditions that reproduce existing routines across the textile value chain.

In this respect, the three categories formulated by Ashford (2000; see Section 1.3) – capabilities, opportunities and willingness (shaped by incentives and disincentives) – provide a useful framework for explaining why actors do not act as required in the target state. With regard to the topic of this report, the analytical focus on Ashford's three categories can be formulated as follows:

- What is the personal skill base of the actors within companies in the value chain and to what extent are stakeholders capable of using existing data and data management tools (*capabilities*)?
- In how far does an actor have the actual possibility, based on their position within an organisation (or a value chain), to shape data management decisions and processes within the organisation or in cooperation with other organisations (*opportunities*)?
- To which extent are they willing to generate and share data in view of the organisation's reward system, the expected benefits, and perceived hurdles (*willingness* in the context of incentives and disincentives)?

These behaviour-related factors are a key to explaining the discrepancy (delta) between current data practices and the requirements of DPP-enabled circular textile pathways. Sections 4.1 to 4.3 highlight these discrepancies, by comparing current and target social practices with regard to:

- Data on the components and their material composition (BoM-related information, see Section 4.1);
- Data on chemical composition of the materials and substances of concern transparency (BoC-related information, see Section 4.2); and
- Data enabling to compare the environmental performance in design, purchasing and product related decisions (environmental primary data metrics, see Section 4.3).

The findings of each domain-specific analysis are synthesised in a concluding comparative table (Table 8 – Table 10). These tables are structured in a consistent manner across all three domains:

- The first two columns highlight the current practice, as described in Chapter 3. Firstly, they cover the dominant practices for generating and documenting information. Secondly, they cover the dominant practices for sharing data, including who shared with and how.

[47] See Annex I in Chapter 8 for a structured compilation of the ESPR requirements in this regard.

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- The following two columns outlining the target practices are structured in the same way. One column describes how actors generate and document information according to the vision set out in the 'Textile Strategy'. The next column highlights how they share this data along the value chain, i.e. with whom and in what way.
- Comparing the above entries reveals gaps in the data, as well as issues regarding verification and trust (what exactly is not traceable or credible?).
- This raises the question of which behavioural factors are primarily responsible for the identified delta. These factors are characterised in the final column based on the three categories introduced by Ashford (see the introduction above).

Section 4.4 synthesises behavioural patterns across the three domains using Ashford's categories (capabilities, opportunities and willingness), highlighting recurring constraints that explain why the target state is not reached under current conditions. Section 4.5 concludes with interim implications for governance, providing the bridge to Chapter 5, which examines mechanisms for closing priority data gaps and fostering mutual trust in DPP data quality across the textile ecosystem.

### 4.1. Data on the components and their material composition (BoM-related practices)

In the textile sector, material composition information forms the most basic layer of a functional DPP data foundation, as it enables decisions relating to durability, operational routing (reuse vs. recycling) and, the feasibility of fibre-to-fibre recycling. In the target state, market participants would need to be able to rely on a structured and comprehensive Bill of Materials (BoM) that remains accessible beyond market entry and can be interpreted consistently by all participants and across all life-cycle stages.

Currently, the sector already generates BoM-like information primarily to support product development, supply chain procurement, and manufacturing coordination. However, these BoM practices remain shaped by internal production logics rather than downstream circular decision contexts. BoM information is often incomplete, non-standardised and difficult to transfer. Consequently, downstream circular actors frequently lack access to reliable composition information when it becomes operationally relevant (e.g. during sorting, reuse preparation, and recycling process selection).

Table 8 compares current and target BoM-related social practices across key upstream actors, identifying the resulting BoM-related data gaps, trust and verification problems, and explanatory behavioural factors, such as capabilities, opportunities, and willingness shaped by the perception of incentives and disincentives (see Section 1.3).

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Table 8: Delta analysis (BoM-related practices): Actor-based data management in the current vs. target state

| **Actor** (from Box 12) | **Current practice: generate & document (BoM)** | **Current practice: share (to whom/how)** | **Target practice: generate & document (BoM)** | **Target practice: share (to whom/how)** | **Data gaps** | **Verification/trust issue (what exactly is not traceable and/or credible?)** | **Behavioural factors (Capabilities/ Opportunities/ Incentives)** |
|---|---|---|---|---|---|---|---|
| **Raw material suppliers & Chemical producer/suppliers** | No BoM generation role: Generate material- and substance-related information primarily for internal quality control and regulatory compliance, but do not document it as product-linked BoM information. | Share limited technical and compliance information bilaterally to direct customers (processors/Tier 1–2), typically not further downstream. | Only an indirect BoM role: Document BoC-relevant substance information in a way that becomes traceable to material/component batches. | Provide machine-readable BoC data to next tier actors (wet processors/material suppliers) and, via structured handover rules, enable that brands can integrate this into product-level BoC for DPP use (with tiered access rights of the subsequent actors on a need-to-know basis). | Missing structured, transferable substance-level information that can be integrated into a product BoM or BoC which later supports<br>(i) brand/manufacturer design & risk decisions and<br>(ii) recycler process selection/exclusion.<br>Current data flows stop at SDS / compliance confirmation. Limited automation. | This supply chain stage lays the foundation for subsequent traceability and trust. It provides SDS for chemical substances and mixtures insofar as CLP substances are included above the threshold. Normally not the full composition is disclosed, thus the downstream users cannot fully trace chemical inputs. | Capability: Data exists often internally but other business units can't easily utilise it.<br>Opportunities: No standardised data sharing structure, thus no interoperability with DPP data set.<br>(Dis-) Incentives: Weak economic incentive to disclose beyond compliance. Anxiety about IP protection, fear of competitive disadvantages and liability concerns. |
| **Supplier of components: fibres/fabrics/trims… (Tier 1–n)** | Generate component-level composition data (spec sheets; partly: input chemicals per batch). Document BoM for their own outputs (e.g. fibre ratios/blends for yarn/fabric batches; component specs for trims). Do not consolidate into a full product BoM. | Share BoM fragments selectively via technical datasheets, supplier declarations, certificates, contractual documentation; often buyer-specific and non-standardised. | Generate structured, component composition datasets that are DPP-ready and interoperable (where relevant at batch-level): blends and proportions; component identifiers; trim material specs; link to batch IDs; (where relevant) finishing/attachment information affecting composition. | Provide a fully-fledged DPP dataset with BoM-derived product composition information,<br>with differentiated levels of information disclosure tailored to downstream decision-making needs,<br>e.g. simplified composition and component information for repair and resale actors,<br>and full BoM-level structures for recyclers where required for material routing and processing. | Missing structured and transferable BoM datasets that enable<br>(i) brand/manufacturer integration into a final product BoM and<br>(ii) reliable downstream routing/recycling decisions. Current downstream formats are fragmented, often incomplete (especially trims), and not interoperable. | Brands and downstream actors cannot verify which substances were actually used (only declarations against RSL/MRSL-lists) nor the accuracy, completeness and up-todateness (esp. across sub-suppliers), nor trace composition reliably across tiers. Weak linkage between declared composition and physical batch/material identity. | Capabilities: uneven IT maturity; reliance on PDFs/manual declarations.<br>Opportunities: no harmonised BoM schema and weak interoperability requirements.<br>(Dis-) Incentives: limited reward for transparency; fear of being replaced; competitive concerns. |
| **Brands / manufacturer: economic operators placing products on the EU market** | Compile internal BoM-like datasets in PLM/ERP for design, procurement and production planning. The BoM is typically optimised for sourcing and manufacturing coordination (style/model and supplier orders), not for downstream circular decision-making. | Share limited BoM outputs externally: primarily label-level fibre composition, plus selected technical and compliance documentation (e.g. supplier declarations, certificates), exchanged bilaterally in B2B relations. | Maintain a complete product BoM as a structured dataset that persists across the lifecycle (design → production → use/post-use), including weight shares, trims/accessories and relevant component identifiers; link BoM to batch and, where needed, item identifiers. | Provide a fully-fledged DPP dataset, including BoM-derived product composition information, with differentiated levels of information disclosure tailored to downstream decision-making needs, e.g. simplified composition and component information for repair and resale actors, and full BoM-level structures for recyclers where required for material routing and processing. | BoM data exists internally, but current BoM-related information practices remain<br>(i) incomplete,<br>(ii) non-standardised and non-interoperable, and<br>(iii) insufficiently persistent and accessible across the product lifecycle. | Downstream actors cannot trust BoM-based information because it is often not complete, not persistent, and not reliably linked to physical products over time (e.g. missing labels, limited traceability from batch specs to post-use items). In addition, brands often cannot verify the completeness of upstream BoM fragments across tiers. (Chemical completeness issues are analysed separately under BoC in Section 4.2.) | Capabilities: BoM systems exist, but legacy PLM/ERP structures are not built for DPP interoperability and lifecycle persistence.<br>Opportunities: brands often lack full upstream visibility due to tiered supplier structures and uneven reporting capacities<br>(Dis-) Incentives: Benefits in terms of quality and risk management (reputational and legal risks) are not seen or appear not achievable under the given framework conditions; thus, no business case for broader disclosure since investments in advanced ERP-systems and in capacity building internally and on the supplier side. In some cases, brands see they could achieve a competitive advantage by setting higher quality standards. |

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### 4.2. Chemical transparency and BoC-related data practices

In the textile sector, chemical composition information is a critical component of a functional DPP data foundation, as it enables chemical risk management and supports safe reuse and sorting decisions. It is also indispensable for high-quality fibre-to-fibre recycling, as recyclers require reliable information on chemical content both to determine appropriate recycling routes and processing conditions and to avoid the reintroduction of hazardous substances. In the target state, stakeholders would need to rely on a structured, comprehensive bill of chemicals (BoC) that allows the chemical content of products and batches to be traced and evaluated consistently throughout the supply chain and across life-cycle stages. This evaluation must take into account the most recent regulatory framework, as the requirements may have changed since the product was first placed on the market. Furthermore, any foreseeable changes to legislation must be considered to ensure ongoing market access.

Currently, actors already generate a wide range of chemical-related information. This applies especially to upstream actors, where chemical formulations are produced and applied. However, chemical transparency practices from chemical suppliers are still limited to Safety Data Sheets (SDS) and not by traceability-oriented disclosure. The traditional perception pattern that the composition of the formulations placed on the market must be kept confidential is still predominant.

When moving to downstream users of chemicals, such as wet processing, chemical information usually circulates in the form of restricted substances conformity (RSL/MRSL) certificates, audits, and pass/fail declarations, supplemented by targeted product testing, rather than interoperable substance-level datasets which would allow to track SoC in a coherent manner. Consequently, chemical information is rarely consolidated into a structured BoC dataset that could be used by downstream actors for routing, exclusion decisions or recycling process selection. Therefore, downstream circular economy actors face systematic uncertainty about chemical content, while brands and suppliers rely on indirect assurances that are costly to verify and difficult to translate into reusable digital product passport (DPP) data.

Table 9 compares current and target BoC-related social practices across key upstream actors, identifying the resulting chemical-data gaps, trust and verification problems, and behavioural explanatory factors (capabilities, opportunities, and willingness influenced by incentives and disadvantages).

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Table 9: Delta analysis (BoC-related practices): Actor-based data management in the current vs. target state

| Actor (from Box 12) | Current practice: generate & document (BoC) | Current practice: share (to whom/how) | Target practice: generate & document (BoC) | Target practice: share (to whom/how) | Data gaps | Verification/trust issue (what is not traceable and/or credible/?) | Behavioural factors (Capabilities/ Opportunities/ Incentives) |
|---|---|---|---|---|---|---|---|
| **Raw material suppliers/Chemical producers/ suppliers** | Maintain full formulation-level chemical information internally (incl. substance identity such as CAS, concentration ranges, and relevant impurities), primarily for compliance and quality management. | Share only limited information externally (e.g. SDS, compliance statements, RSL/MRSL conformity), typically only to direct customers; no structured chemical disclosure linked to product outputs. | Maintain full formulation-level chemical information in structured digital form in a way that allows downstream traceability (i.e. fit for data transfer, not only internal compliance/QM documentation). | Provide interoperable, machine-readable BoC input disclosure to direct downstream processors and/or the brand/manufacturer, enabling consolidation into a product-level BoC by the economic operator placing the product on the market. | Chemical information exists but is not made available as structured, traceable BoC data that can be integrated into product-level datasets (DPP) and reused for downstream decision-making, including reuse, recycling and due diligence. | Downstream actors cannot verify chemical presence/absence based on supplier information; confidentiality restrictions and non-standardised disclosure formats prevent traceability and evidentiary quality. | Capabilities: Data exists internally but is not structured for transfer.<br>Opportunities: lack of harmonised disclosure schema beyond SDS.<br>(Dis-) Incentives: Strong IP protection norms and perceived liability risks; no business case perceived for structured downstream disclosure beyond compliance. |
| **Supplier of component: fibres/fabrics/trims… (Tier 1–n)** | Maintain internal process documentation on chemical use where applicable (e.g. dyeing/finishing recipes, auxiliary inputs), but typically do not generate a structured product-linked BoC dataset.<br>Rely primarily on restricted substance management practices (RSL/MRSL compliance routines), certifications and supplier declarations instead of substance-level documentation. | Do not transmit upstream BoC content from chemical suppliers as product-linked chemical transparency.<br>Share chemical-related information mainly as compliance confirmation (pass/fail), certificates, audit results and contractual declarations to direct business partners (typically brands or Tier-1 customers), rather than transferring substance-level chemical data in a structured format. | Compile and maintain a complete, product- and batch-linked BoC dataset for the produced component (e.g. fabric, trim), integrating chemical formulation data from upstream chemical suppliers with own process-use data (recipes, application stage, quantities where feasible), including emission data. | Provide the BoC dataset in interoperable, machine-readable form to the brand/manufacturer (economic operator), enabling consolidation into a product-level BoC and controlled downstream access via the DPP. | Missing formulation-level input data from chemical suppliers beyond SDS prevents the generation of a complete component-level BoC. | Downstream actors cannot assess the completeness of chemical information because the underlying substance-level data is not available; verification would require costly and selective analytical testing. | Capabilities: Chemical management systems exist in many facilities, but they are not designed for a batchwise product-linked BoC datasets and often remain facility- or process-specific.<br>Opportunities: Component suppliers lack upstream formulation-level input data needed to compile a full BoC. Lack of interoperable data standards and cross-tier digital infrastructure prevents the consolidation of BoC contributions.<br>(Dis-) Incentives: No business case seen for broader disclosure. Actors optimise for compliance and auditability, while commercial sensitivity and low contractual demand discourage full substance-level disclosure. |
| **Brands / manufacturers: economic operators placing products on the EU market** | Consolidate chemical-related information primarily through unspecific supplier declarations, contractual RSL/MRSL requirements, certification schemes (e.g. compliance labels) and selective product testing.<br>Rarely obtain formulation-level substance disclosure from upstream chemical supply chains; therefore, they do not maintain a structured full BoC dataset at product level. | Communicate chemical information mainly via consumer-facing assurances (e.g. “compliant”, “certified”, “free from”) and certificates.<br>Often lack the ability to validate regulatory information requests (e.g. REACH Article 33(2)) due to missing upstream substance-level data. | Maintain and continuously update a product-linked BoC dataset that is integrated with the product BoM, enabling a full material and chemical reference basis for each product model and (where relevant) production batch. | Provide differentiated chemical information via the DPP: BoC-derived signals for reuse, sorting and resale actors (e.g. SoC presence flags, exclusion criteria, safety warnings); and controlled full disclosure of BoC information (governed by contractual and access rules) to recyclers and competent authorities where required for fibre-to-fibre recycling feasibility, safe processing and compliance assurance. | Cannot compile a complete and verifiable product-level BoC/BoM because upstream chemical formulation and process-use data are not transferred in a structured way. This creates cascading data gaps for downstream actors, who cannot reliably assess SoC risks, reuse eligibility or recycling feasibility. | Chemical traceability breaks across tiers because chemical and process data are not consistently linked to identifiable product components and batches.<br>Without upstream disclosure, brands rely on indirect compliance logic (certificates, declarations) that downstream actors cannot independently verify without costly testing. | Capabilities: Brands can specify data requirements contractually and operate digital product data systems, but remain dependent on supplier willingness and upstream data availability (see above).<br>Opportunities: Lack of interoperable disclosure standards hinder systematic BoC consolidation. The current ERP-systems to not support BoC traceability.<br>(Dis-) Incentives: Benefits in terms of quality and risk management (reputational and legal risks) are not seen or appear not achievable under the given framework conditions; thus, no business case for broader disclosure since investments in advanced ERP-systems and in capacity building internally and on the supplier side.<br>In some cases, brands see a competitive advantage by setting higher quality standards. |

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### 4.3. Environmental primary data practices and comparability issues

In the textile sector, information on environmental performance indicators is a key component of a functional data foundation for the DPP whenever actors need to compare products, processes or suppliers, or make decisions based on sustainability objectives. In the target state, these actors would need to rely on standardised, allocatable and traceable primary environmental data sets (e.g. energy, water, emissions, process waste and other relevant inputs), which are linked to products and batches, and translated into comparable environmental performance indicators through rule-based aggregation. The economic operator responsible for the final DPP must "ensure that actors along the value chain can easily access and understand product information relevant to them" (Art. 9(3)(a) ESPR).

Currently, the textile sector already generates environmental process data at many production sites, primarily for internal operations, cost control, reporting and audits. However, these data rarely are shared in a form that supports comparability across tiers. Instead, environmental performance metrics are typically constructed downstream through a combination of fragmented supplier disclosures, aggregated corporate reporting and database-based modelling (LCA-type metrics), which rely on proxies, defaults and assumptions. This creates a persistent discrepancy between the increasing demand for comparable environmental information based on the actual impacts, and the limited availability of standardised primary datasets that can be reused across supply chain boundaries. Consequently, actors cannot reliably benchmark products or suppliers and struggle to justify environmental performance claims with traceable, verifiable evidence.

Table 10 compares current and target social practices relating to the generation, documentation and communication of primary environmental data across key upstream actors, identifying the resulting data gaps, trust and verification problems, and explanatory factors (capabilities, opportunities and incentives).

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Table 10: Delta analysis (environmental performance data-related practices): Actor-based data management in the current vs. target state

| Actor (see Box 12) | Current practice: generate & document | Current practice: share (to whom/how) | Target practice: generate & document | Target practice: share (to whom/how) | Data gaps | Verification/trust issue (what is not traceable and/or credible/?) | Behavioural factors (Capabilities/ Opportunities/ Incentives) |
|---|---|---|---|---|---|---|---|
| **Raw material supplier/ Chemical producer or supplier** | Measure environmental process data internally (e.g. energy use, water use, emissions, waste) mainly for site operations, internal reporting and compliance; data coverage and granularity vary widely. Some actors generate LCAs/PCFs/ EPDs for chemical products, but these are often based on mixed primary and secondary datasets and are not designed for downstream product-linked allocation. | Share environmental information selectively (e.g. EPDs, audit evidence, ESG disclosures, customer-specific questionnaires). Rarely provide interoperable, allocatable primary datasets enabling batch-/product-linked environmental integration by downstream textile actors. | Use harmonised measurement parameters (energy, water, relevant emissions, process waste, chemical inputs where relevant), aligned system boundaries and allocation rules to generate allocatable primary process datasets linked to product batches (or representative product groups). | → Downstream actors: Provide interoperable, machine-readable primary datasets to Tier actors and brands/manufacturers, enabling traceable integration of chemical-input impacts into batch-/product-linked environmental datasets and subsequent rule-based aggregation. | Missing standardised and transferable primary datasets that can be integrated into batch-/product-linked environmental assessments; downstream actors therefore rely on databases, proxies and generic emission factors. | Environmental performance claims cannot be traced back to verifiable process data; modelling choices and secondary datasets dominate, limiting comparability and reproducibility. | Capabilities: primary measurement exists but is heterogeneous and not designed for exchange.<br>Opportunities: lack of harmonised schemas and allocation logic to link site/process data to product batches.<br>(Dis-)Incentives: low perceived ROI of disclosure, confidentiality and competitiveness concerns; external LCA databases act as functional substitutes. |
| **Supplier of component: fibres/fabrics/trims… (Tier 1–n)** | Generate operational environmental process data in production (energy, water, emissions, waste, chemical inputs), mainly managed at site/process level for internal control, compliance and audits. Product-/batch-level allocation and documentation remain limited. | Share environmental information selectively through audit outputs, certificates, ESG questionnaires or customer templates. Primary data sets are rarely provided, nor they are linked to products or batches; information remains fragmented and non-interoperable. | Use harmonised measurement parameters (energy, water, relevant emissions, process waste, chemical inputs where relevant), aligned system boundaries and allocation rules to generate allocatable primary process datasets linked to product batches (or representative product groups). | → Sub-suppliers: order specifications based on design decisions considering environmental performance data<br>→ Downstream actors, based on upstream data: Provide interoperable, machine-readable primary datasets to downstream tier actors brands/manufacturers via DPP dataset (where relevant: with access levels) enabling consistent aggregation and comparability. | Primary datasets exist in fragments but are not allocatable, standardised or transferable; environmental assessments therefore remain proxy-based and do not reflect factual process differences. | Environmental performance claims cannot be traced back to verifiable process data; modelling choices and secondary datasets dominate, limiting comparability and reproducibility | Capabilities: uneven metering and data literacy; diverse IT maturity.<br>Opportunities: no harmonised EU-wide allocation rules and no operational linkage mechanism to product identity.<br>(Dis-) Incentives: Fear of benchmarking and cost-based comparison once comparable data are disclosed; limited contractual rewards for transparency; high implementation effort; and limited bargaining power to negotiate data-related compensation in buyer-driven supply chains. |
| **Brand / manufacturer or other economic operator that places products on the EU market** | Compile environmental performance information mainly through reporting, modelling and database-based LCA/footprint calculations; integrate supplier fragments where available. Results remain assumption-heavy and weakly traceable across tiers. | Share simplified environmental indicators through labels, claims, tender documentation or ESG reporting; rarely disclose traceable datasets or underlying primary data. | Consolidate supplier primary datasets with additional data from own production processes into product-linked environmental datasets, applying harmonised allocation and aggregation rules to create comparable indicators across products and suppliers. | → Sub-suppliers: order specifications based on design decisions considering environmental performance data<br>→ Customers, based on upstream data: Provide decision-relevant, comparable aggregated indicators (rule-based) for customers/procurers/investors, while maintaining traceable primary-data layers for verification and auditability (tiered access), while ensuring that all subsequent actors can easily access and understand product information relevant to them. | Missing comparable, product-linked environmental performance data based on standardised primary datasets. As a result, brands/ manufacturers cannot provide decision-relevant and defensible environmental indicators for downstream actors (e.g. procurers, resale systems, recyclers), and environmental claims remain largely proxy- and assumption-based. | Environmental performance claims cannot be traced back to verifiable process data; modelling choices and secondary datasets dominate, limiting comparability and reproducibility | Capabilities: dependency on suppliers; limited internal process visibility.<br>Opportunities: ISO LCA standards flexibility and lack of binding aggregation rules prevent comparability.<br>(Dis-) Incentives: Reputational incentives favour simplified “green claims” and aggregated indicators, while business considerations discourage full transparency due to increased liability exposure, comparability risks and high transaction costs for supplier data integration. |

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### 4.4. Behaviour-influencing factors for data management in the current textile ecosystem

The persistence of the priority data gaps identified in the sections above cannot be explained by a single technical deficit or by a lack of awareness. As shown in Section 3.4, current data practices are instead characterised by recurring cross-cutting structural patterns – in particular a structural asymmetry between data generation and data dependency, and the persistence of linear, compliance-oriented information logics.

Building on these cross-cutting patterns, the delta analysis indicates that data gaps persist because current data practices remain stabilised by behavioural and organisational conditions that shape actor behaviour across the textile value chain.

By structuring the findings described above on the three data domains along the behavioural categories developed by Ashford (2000), it is possible to understand more precisely how these structural patterns translate into everyday organisational behaviour, and why individuals within particular organisational functions act as they do, rather than as the target state requires.

#### 4.4.1. Capabilities: heterogeneous digital maturity and limited data readiness

Across the textile value chain, actors operate with highly heterogeneous documentation routines and IT infrastructures. While some brands and large suppliers use advanced PLM/ERP systems, many Tier 2–n suppliers rely on spreadsheets, fragmented documentation or paper-based records. This limits the feasibility of generating structured and interoperable datasets, even where information exists internally. These capability constraints reinforce the structural asymmetry between data generation and data dependency identified in Section 3.4.1: while upstream actors generate large volumes of primary information, they lack the means to transform it into interoperable datasets usable by downstream actors.

- For BoM information, some brands and manufacturers place orders based on a BoM structure. However, the suppliers often document composition fragments in local formats that do not align with common schemas. Thus, the tier-1 assembler and consequently the brands rarely receive full component-level datasets in a machine-readable form.
- For BoC information, chemical suppliers and processors often maintain formulation-level knowledge internally, but they do not translate this knowledge into downstream-compatible datasets linked to textile products and components.
- For environmental primary data, process operators may measure energy, water, emissions or waste parameters, but they frequently lack mechanisms to allocate these measurements to specific product batches or to document them in a form suitable for cross-company data exchange.

In the overall view, capability constraints do not primarily concern the absence of relevant data, but the limited sector-wide ability to transform information into datasets that are structured, standardised, allocatable and interoperable.

#### 4.4.2. Opportunities: Constrained spheres of influence and limited organisational outreach

Even where actors possess the capability to document relevant data, they often lack the opportunity to make this information usable beyond local operational contexts. In the current textile ecosystem, organisational and contractual structures define narrow "spheres of influence" that restrict how far actors can require, consolidate or onward-share decision-relevant information. In practice, the value chain is characterised by multi-tier outsourcing, fragmented supplier networks, and globally distributed production stages. These structural conditions reduce continuity and make data practices dependent on bilateral procurement relationships rather than ecosystem-oriented information governance. As a result, actors rarely operate within an organisational context that enables the stable and routinised exchange of interoperable datasets across tiers. This becomes visible in all three information domains analysed in Table 8 to Table 10:

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- For BoM-related practices, component suppliers and manufacturing partners often document composition information locally, but they cannot reliably integrate this information into an interoperable dataset that remains linked to the final product across life-cycle stages. Their opportunity to support cross-tier data flow is constrained by
  (i) missing shared data models,
  (ii) inconsistent documentation formats across tiers, and
  (iii) weak organisational routines for onward transfer beyond the direct buyer.
- For BoC-related practices, the opportunity structure is even more restrictive. Chemical suppliers hold formulation information, but they do not to disclose data beyond minimum requirements (e.g. SDS). Since key upstream inputs remain undisclosed, textile processors and material suppliers, cannot create a complete BoC. Brands and manufacturers often lack the contractual leverage required to enforce systematic chemical transparency throughout the entire production process, especially in the lower tiers.
  This creates an opportunity gap: while actors may be aware of circular information needs, they remain unable to compel full, structured disclosure.
- For primary environmental data, process operators generate operational measurements (energy, water, waste, emissions), yet they rarely have the opportunity to allocate these measurements in a rule-compatible and product-linked way. Allocation requires shared methodological rules and stable digital linkage between facilities, batches and product identities. In the status quo, these enabling conditions remain weak. Actors therefore continue to operate with footprint-by-proxy logic, where database modelling substitutes for actual cross-tier primary data exchange.

Overall, opportunity constraints in the textile ecosystem are driven by structural fragmentation and governance absence: actors do not simply "fail to share data"; they operate in organisational and institutional contexts in which data sharing remains non-standardised, discontinuous and difficult to operationalise. Even where direct contractual interaction takes places, the traditional pattern of trade secrets and missing infrastructure hinder data sharing.
This structurally limits the feasibility of creating the traceable and interoperable data chain required in the target state.

In addition, the opportunity gap is reinforced by information asymmetry: downstream actors (including brands) cannot reliably ascertain which data exist upstream, what format they are in, or under what conditions they could be made accessible. This limits the perceived scope for action and entrenches reliance on indirect compliance mechanisms rather than proactive, dataset-based transparency.

#### 4.4.3. Willingness: (Dis-) incentives as factors influencing behaviour

Beyond capability and opportunity constraints, the delta analysis in in this chapter shows that current data practices remain stabilised by incentive structures that rarely reward transparency-oriented behaviour. In the status quo, actors often perceive structured data disclosure as a cost and risk factor rather than as a source of value creation.

The incentive structure across BoM, BoC and environmental primary data follows a common pattern: actors disclose only what is mandatory, rather than what is required for downstream circular decision-making. This leads to selective sharing, minimal compliance confirmation, and risk-avoidance strategies, rather than to the creation of shared datasets.

- Chemical disclosure illustrates this logic most clearly (see Table 9). Chemical suppliers regard the composition of formulations placed on the market as intellectual property, so they see full BoC disclosure as a direct threat to their competitiveness and market position.
  Textile processors and component suppliers lack incentives to invest in chemical traceability if brands mainly demand RSL/MRSL conformity and certificates.
  Brands/manufacturers, in turn, face reputational and liability exposure: requesting and holding detailed chemical data may increase accountability and legal risk. This creates a

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structural disincentive to pursue full disclosure even where circularity-related needs would justify it.

- For BoM information (see Table 8), the incentive structure is less driven by perceived confidentiality needs and more by transaction cost logic. Brands and suppliers already maintain BoM fragments for internal operations. However, they rarely perceive a sufficient return on investment in completing, standardising and maintaining BoM datasets for external circular uses. Where disclosure may enable supplier benchmarking or loss of bargaining power, actors rationally limit transparency.
- For environmental primary data (Table 10), incentives again favour minimal disclosure. Process operators measure parameters for internal control, but they rarely invest in standardised product-linked datasets because they expect limited operational benefit. Therefore, downstream actors have to rely on generic databases and proxy modelling as a functional substitute. This approach reduces immediate costs and avoids the risks associated with comparability (e.g. external benchmarking, supplier ranking, or competitive disadvantage). At the same time, the absence of an established infrastructure for sharing data discourages investment in production processes that have a lower environmental impact.

In summary, the persistence of data gaps reflects a rational behavioural equilibrium in which actors behave consistently with the current incentive structures that prioritise procurement efficiency, risk minimisation and confidentiality over transparency, interoperability and the long-term readiness of circular data. Information sharing is further constrained by a perception of competitive risks within fragmented, buyer-driven supply chains. Suppliers may be reluctant to disclose details of their sub-contractors and suppliers because such transparency could allow powerful buyers to bypass intermediaries and approach lower-tier suppliers directly. This would threaten their established market positions and margins (Karaosman et al., 2020).

A further stabilising mechanism concerns verification and trust dynamics. Because actors do not systematically disclose structured datasets, downstream actors must rely on certificates, audits and targeted testing. This shifts verification costs downstream, reinforces selective compliance checks, and further reduces upstream incentives for proactive transparency. The system therefore reproduces a circular loop: limited disclosure generates mistrust; mistrust increases verification costs; high verification costs favour compliance confirmation rather than dataset-based exchange; and datasets remain insufficient for circular decision-making.

### 4.5. Conclusions

The above analysis shows that data gaps relevant to the Digital Product Passport (DPP) in the textile sector are rarely caused by isolated shortcomings at the level of individual actors or data domains. Instead, they reflect structurally stabilised patterns of data generation, use and exchange across the value chain, as identified in Chapter 3.4, and can be explained by the interplay of behavioural and institutional conditions analysed in this chapter.

From a capability perspective, the findings confirm that the dominant data gaps do not primarily result from a lack of data generation as such. Across BoM, BoC and environmental primary data (see Box 11, p. 42) relevant information is already produced at multiple points in the value chain. However, this information is rarely maintained as a transferable, interoperable and decision-relevant dataset. Existing data typically remain distributed across business units, documented in heterogeneous formats, and insufficiently structured for allocation to products, batches or models. The central capability deficit therefore concerns dataset capability: the ability to translate existing information into structured, allocatable and interoperable datasets that can be reused across organisational and value-chain boundaries.

Opportunity-related constraints emerge as the central bottleneck underlying the structural asymmetries described in Chapter 3.4.1. Even where actors possess relevant data and technical capacity, they often lack institutionally secured routines, rights and standards for data provision, access and onward sharing. Product-linked data infrastructures, harmonised schemas

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and allocation logics are largely absent, and data exchange remains confined to bilateral, contract-specific arrangements. As a result, actors who depend on upstream information for circular decision-making frequently lack the institutional means to require, consolidate or reuse it in practice. This disconnects between data availability and data usability reinforces fragmented information flows and prevents the emergence of shared, lifecycle-oriented datasets.

At the same time, the persistence of data gaps reflects rational behaviour under current incentive structures. As shown across all three data domains, actors' willingness to invest in structured, product-linked datasets is constrained by the availability of functional substitutes. Certificates, declarations, audits and proxy-based modelling are widely accepted mechanisms to demonstrate compliance, manage risk and meet reporting obligations.

These substitutes are not accidental workarounds but are deeply embedded in the persistence of linear, compliance-oriented supply-chain information logics (see Section 3.4.2). Information exchange remains predominantly bilateral, selective and focused on market access rather than on lifecycle-oriented data reuse. As long as such linear information practices remain institutionally sufficient, investments in comprehensive, interoperable datasets appear costly, risky and of uncertain benefit. Concerns about confidentiality, competitive disadvantage and potential liability exposure further reinforce this rational preference for selective disclosure over systematic data sharing.

Taken together, these findings explain why the cross-cutting patterns identified in Chapter 3.4 persist across actor groups and data categories. The current data ecosystem reproduces a rational equilibrium in which selective disclosure, compliance-oriented documentation and proxy-based substitutes prevail, while structured, interoperable datasets remain the exception. This equilibrium cannot be explained by technical factors alone. While technical standards, data architectures and digital tools – such as interoperable schemas, DPP infrastructures or emerging standardisation efforts – constitute necessary preconditions, they are insufficient to change data practices unless embedded in supportive organisational, contractual and regulatory frameworks.

Against this background, the dominant data gaps identified in this chapter must be understood as a governance challenge rather than an implementation deficit. The findings provide the analytical basis for the subsequent governance discussion. Chapter 5 builds on this diagnosis to examine which regulatory, institutional and organisational mechanisms are required to overcome capability, opportunity and willingness constraints, to close priority data gaps, and to foster mutual trust in DPP data quality across the textile ecosystem.

Table 11 provides a consolidated overview of the behavioural factors identified across the three data domains, synthesising the delta analyses in Table 8 to Table 10 and serving as a reference point for the governance discussion in Chapter 5.

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Table 11: Consolidation of behavioural factors for BoM, BoC and primary environmental data

| **Behavioural factors Actor** (from Box 12) | **BoM-data** (Section 4.1) | **BoC-data** (Section 4.2) | **Environmental primary data** (Section 4.3) | **Consolidated behavioural factors** |
|---|---|---|---|---|
| **Raw material supplier & Chemical producer/supplier** | Capability: Data exists often internally but is not structured for transfer.<br>Opportunities: No standardised data sharing structure, thus no interoperability with DPP data set.<br>(Dis-) Incentives: Weak economic incentive to disclose beyond compliance. Anxiety about IP protection, fear of competitive disadvantages and liability concerns.;. | Capabilities: Data exists internally but is not structured for transfer.<br>Opportunities: lack of harmonised disclosure schema beyond SDS.<br>(Dis-) Incentives: Traditional behaviour pattern considers IP protection necessary, no business case seen for broader disclosure. | Capabilities: Measurements of primary data do exist, but they are heterogeneous and not designed for exchange.<br>Opportunities: lack of harmonised schemas and allocation logic to link site/process data to product batches.<br>(Dis-)Incentives: No business case perceived for disclosure, confidentiality and competitiveness concerns; external LCA databases act as functional substitutes. | Capability: Data exists often internally but not in a structured manner designed for exchange with other actors.<br>Opportunities: lack of harmonised disclosure schema; no allocation logic to link site/process data to product batches.<br>(Dis-) Incentives: Weak economic incentives to disclose beyond compliance Anxiety about IP protection, fear of competitive disadvantages and liability claims |
| **Supplier of components: fibres/fabrics/trims… (Tier 1–n)** | Capabilities: Uneven IT maturity; reliance on PDFs/manual declarations.<br>Opportunities: No harmonised BoM schema and weak interoperability requirements.<br>(Dis-) Incentives: Limited reward for transparency; fear of being replaced; competitive concerns. | Capabilities: Chemical management systems exist in many facilities, but they are not designed for a batchwise product-linked BoC datasets and often remain facility- or process-specific.<br>Opportunities: Component suppliers lack upstream formulation-level input data needed to compile a full BoC. Lack of interoperable data standards and digital infrastructure across tiers prevents consolidation of BoC contributions.<br>(Dis-) Incentives: No business case seen for broader disclosure. Actors optimise for compliance and auditability, while commercial sensitivity and low contractual demand discourage full substance-level disclosure. | Capabilities: Uneven metering and data literacy; diverse IT maturity.<br>Opportunities: No harmonised EU-wide allocation rules and no operational linkage mechanism to product identity.<br>(Dis-) Incentives: Limited contractual rewards; implementation efforts are perceived as high, fear of benchmarking-against competitors. | Capabilities: Data exists often internally, but not in a structured manner designed for exchange with other actors. Uneven IT maturity/metering and data literacy; reliance on PDFs/manual declarations.<br>Opportunities: No operational linkage mechanism to product identity established in production processes yet; no harmonised BoM schema and weak interoperability requirements.<br>(Dis-) Incentives: Limited reward for transparency; fear of being replaced and competitiveness concerns. |
| **Brand / manufacturer: economic operators placing products on the EU market** | Capabilities: BoM systems exist, but legacy PLM/ERP structures are not built for DPP interoperability.<br>Opportunities: brands often lack full upstream visibility due to tiered supplier structures and uneven reporting capacities<br>(Dis-) Incentives: Benefits in terms of quality and risk management (reputational and legal risks) are not seen or appear not achievable under the given framework conditions; thus, no business case for broader disclosure since investments in advanced ERP-systems and in capacity building internally and on the supplier side. In some cases, brands see they could achieve a competitive advantage by setting higher quality standards. | Capabilities: Brands can specify data requirements contractually and operate digital product data systems, but remain dependent on supplier willingness and upstream data availability (see above).<br>Opportunities: Lack of interoperable disclosure standards hinder systematic BoC consolidation. The current ERP-systems to not support BoC traceability.<br>(Dis-) Incentives: Benefits in terms of quality and risk management (reputational and legal risks) are not seen or appear not achievable under the given framework conditions; thus, no business case for broader disclosure since investments in advanced ERP-systems and in capacity building internally and on the supplier side. In some cases, brands see they could achieve a competitive advantage by setting higher quality standards. | Capabilities: dependency on suppliers; limited internal process visibility.<br>Opportunities: ISO LCA standards flexibility and lack of binding aggregation rules prevent comparability.<br>(Dis-) Incentives: reputational incentives favour “claims”, but commercial logic discourages full transparency; transaction costs for supplier integration remain high. | Capabilities: Dependency on supplier data. BoM systems exist, but legacy PLM/ERP structures are not built for DPP interoperability and lifecycle data coverage.<br>Opportunities: Brands often lack full upstream visibility due to tiered supplier structures and uneven reporting capacities<br>(Dis-) Incentives: Benefits in terms of quality and risk management (reputational and legal risks) are not seen or appear not achievable under the given framework conditions; thus, no business case for broader disclosure since investments in advanced ERP-systems and in capacity building internally and on the supplier side. In some cases, brands see they could achieve a competitive advantage by setting higher quality standards and better environmental performance. |

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## 5. Governance aspects

This chapter addresses the second research question set out in the methodological approach (see Section 1.1.2):

> Which governance aspects are relevant for closing data gaps and fostering mutual trust among actors in the textile sector with regard to the quality of DPP data?

Building on the conclusions of Chapter 4, this chapter approaches DPP-related data gaps as a governance problem that unfolds across multiple levels and cannot be resolved through isolated interventions. The analysis therefore proceeds in three steps that correspond to the analytical progression from problem diagnosis to governance design and implementation. Section 5.1 consolidates the empirical findings from Chapters 4 into a governance-oriented problem definition. Section 5.2 then derives core governance requirements directly from the behavioural constraints identified in the delta analysis. Finally, Section 5.3 discusses how these governance requirements can be operationalised across different governance levels (see Box 14, p. 76). This multi-level perspective clarifies where and by whom the identified governance aspects must be addressed in practice in order to enable coordinated change in data practices across the textile ecosystem.

### 5.1. Governance challenge: enabling coordinated change in data practices

Building on the conclusions of Section 4.5, this section reframes the identified data gaps relevant to the DPP as a governance challenge. Chapter 4 has demonstrated that these discrepancies are not the result of isolated implementation failures or purely technical shortcomings alone, but rather reflect a structurally stabilised constellation in which existing data generation practices, linear information logics and functional substitutes for structured datasets persist throughout the textile value chain. Capability, opportunity and willingness constraints interact in a way that makes selective disclosure, certificates and proxy-based modelling rational under current framework conditions, while comprehensive, product-linked datasets remain the exception.

From a governance perspective, this diagnosis implies that current data management practices in the textile sector are highly stable across actors and tiers. Documentation routines, procurement relationships, verification practices and disclosure disincentives reinforce each other in a way that reproduces existing information flows over time. As a result, priority data gaps persist even where individual actors invest in improved data collection, digital tools or traceability solutions.

This stability indicates that DPP-related data challenges cannot be addressed as isolated technical or organisational tasks at firm level. Instead, they constitute a coordination problem involving multiple interdependent actors whose data practices are structurally linked. Changes implemented by individual firms remain ineffective as long as complementary adjustments by upstream and downstream actors do not occur. The coordination problem becomes particularly visible where DPP-compatible data exchange depends on sequential contributions along the supply chain: Upstream actors generate primary information. Midstream actors then consolidate and allocate it to products or batches. Responsible economic operators further downstream rely on these datasets for compliance, circular decision-making and market communication. If any part of this process continues to rely on certificates, declarations or proxy-based modelling, investments made elsewhere will not result in system-level improvements. This means that downstream decision-making remains fragmented and driven by defensive strategies that minimise perceived compliance risks.

Importantly, the persistence of these patterns does not indicate dysfunctional behaviour at the level of individual actors. On the contrary, existing data practices represent a rational equilibrium under current regulatory and market conditions. Selective disclosure, bilateral data exchange and functional substitutes for structured datasets allow actors to meet compliance

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obligations and manage risks without incurring the costs and uncertainties associated with full data transparency. In this context, unilateral moves towards comprehensive, product-linked datasets are difficult to justify economically and strategically.
Consequently, enabling DPP-compatible data practices requires an intervention that addresses the systemic conditions under which data are generated, structured, verified and shared.[48] The altered framework conditions must not only specify information requirements, but also align expectations, responsibilities and incentives across actors and tiers. In line with the ESPR's objective to "make sustainable products the norm" (Article 1(1)), this implies a shift from fragmented, compliance-oriented information flows towards coordinated, lifecycle-oriented data practices. Although the ESPR and its delegated acts are essential for this transformation, regulatory obligations alone are unlikely to resolve the underlying coordination challenges. Additional governance arrangements are required to translate regulatory principles into operational data exchange practices and stabilise trust in data quality. These arrangements will also support collective transitions away from established substitutes towards shared, interoperable datasets that actors can handle in a highly automated manner.

### 5.2. Governance requirements derived from behavioural constraints

Building on the governance challenges highlighted above, this section derives a set of functional requirements that a future data ecosystem must fulfil. These requirements do not prescribe specific instruments or governance levels. Rather, they define what governance must achieve in order to overcome the behavioural constraints identified across the textile value chain.

To translate the behavioural constraints identified in the delta analysis into governance-relevant problem constellations, it is necessary to examine how data dependencies materialise between concrete actor groups along the textile value chain.  , the following Table 12contrasts the target state description, highlighting the information dependencies in a future circular textile ecosystem for the three key actor groups (see Section 2.4.7 with Table 7), with the delta-analysis findings provided in Chapter 4 and the conclusions drawn in Section 4.5 (with Table 11). The latter derived the consolidated behavioural factors relevant for data sharing regarding for BoM, BoC and primary environmental data. On this basis Table 12 structures these governance-relevant problem constellations by making visible how DPP-related data dependencies materialise between concrete actor groups along the textile value chain.

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[48] For this perspective see Section 1.1.2 with reference i.a. to Sahimaa et al. (2024).

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Table 12: Governance mechanisms addressing the behavioural factors (based on Table 7 actor based information dependencies [for CEBM]) and the synthesis in Table 11)

| **Actor (see Box 12) and 'definitions' in Art. 2 ESPR** | **Core role in CE textile data ecosystem** | **Information the actor needs** | **Information the actor must provide** | **From: > To whom: →** | **Granularity** | **Consolidated behavioural factors ...** (for BoM, BoC and primary env. data) | **... addressed** i.a. through these **measures (supported by governance mechanisms)** | **Regulatory anchor (sections 2.1 / 2.2)** |
|---|---|---|---|---|---|---|---|---|
| **1. Raw material supplier/ Chemical producer and supplier; Art. 3(9)/(11)/(14) REACH: 'manufacturer'/'importer'/ 'distributor'** | Supplying data on raw material/ chemical substances/ mixtures: safe handling and environmental performance | SDS, composition data of supplied raw materials or mixtures, and primary environ-mental performance data from own processes, including upstream environmental performance data where applicable | BoC-equivalent chemical composition data for raw materials and mixtures, linked to primary environ-mental performance data from production processes | > Chemical sub-suppliers (if applicable)<br>→ Supplier of components | Batch | Capability: Data exists often internally but not in a structured manner designed for exchange with other actors.<br>Opportunities: lack of harmonised disclosure schema; no allocation logic to link site/process data to product batches.<br>(Dis-) Incentives: Weak economic incentive to disclose beyond compliance Anxiety about IP protection, fear of competitive disadvantages and liability concerns.;. | Capability: Standardised and interoperable data formats; internal systems to be aligned with ESPR requirements (if necessary)<br>Opportunities: Harmonised allocation logic to link site/process data to batches delivered to the downstream actors.<br>(Dis-) Incentives: Contractual agreements with downstream actors, including provisions on access levels on a "need to know"-basis in cases where confidentiality claims are justified. | ESPR Art. 7(5); Art. 5(14); Annex I |
| **2. Supplier of components/intermediate products: yarn/fabrics/trims etc. (Tier 1-n)** | Supplying compliant and performance-relevant inputs | BoM-equivalent component data, incl. linked BoC-equivalent chemical information and primary environmental performance data | BoM (material properties); BoC (substances, treatments) and primary environmental performance data, batch specific as well as accurate, complete and up to date. | Sub-suppliers: order specifications<br>> Chemical suppliers / other sup-suppliers<br>→ Brands / manufacturers | Batch | Capabilities: Data exists often internally, but not in a structured manner designed for exchange with other actors. Uneven IT maturity/metering and data literacy; reliance on PDFs/manual declarations.<br>Opportunities: no operational linkage mechanism to product identity established in production processes yet; no harmonised BoM schema and weak interoperability requirements.<br>(Dis-) Incentives: limited reward for transparency; fear of being replaced/competitive concerns. | Capability: Standardised and interoperable data formats. Automated data exchange, e.g. via ERP-systems.<br>Opportunities: Harmonised allocation logic to link site/process data to product batches.<br>(Dis-) Incentives: Contractual agreements with upstream and downstream actors, including provisions on access levels on a "need to know"-basis. | ESPR Art. 5(1); Art. 7(5); Annex I |
| **3. Brand / manufacturer or other economic operator that places products on the EU market** | Integration of upstream data and channel downstream information flows | BoM (incl. BoC) and environmental performance data | Product-linked information, derived from BoM/BoC and primary environmental performance data, batch specific as well as accurate, complete and up to date.; Instructions for care, repair, reuse, and end of use | → Suppliers: order specs<br>> Suppliers: data set<br>→ Customers, repairers, resale actors, sorters, recyclers | Model/ batch | Capabilities: Dependency on supplier data. BoM systems exist, but legacy PLM/ERP structures are not built for DPP interoperability and lifecycle data coverage.<br>Opportunities: Brands often lack full upstream visibility due to tiered supplier structures and uneven reporting capacities<br>(Dis-) Incentives: Benefits in terms of quality and risk management (reputational and legal risks) are not seen or appear not achievable under the given framework conditions; thus, no business case for broader disclosure since investments in advanced ERP-systems and in capacity building internally and on the supplier side. In some cases, brands see they could achieve a competitive advantage by setting higher quality standards and better environmental performance. | Capability: Standardised and interoperable data formats for the data sets from upstream actors as well as towards the actors in the use- and after use phases.<br>Opportunities: Harmonised allocation logic to link site/process data to product batches.<br>(Dis-) Incentives: Contractual agreements with upstream actors, including provisions on access levels on a "need to know"-basis. | Recitals 16, 32; ESPR Art. 5; Art. 7; Art. 9.; Annex I |

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The analysis shows that capability, opportunity and willingness constraints are closely interlinked. As a result, governance requirements cannot be addressed in isolation but must jointly enable the generation, consolidation, verification and reuse of product-linked datasets across organisational and tier boundaries.

The future Governance Framework must respond to the challenges associated with the differing needs of the various actors in future business relationships in the textile sector. Mechanisms to enhance capacities (see Section 5.2.1) and opportunities (see Section 5.2.2) as well as measures to align incentives and access conditions (see Section 5.2.3).

In their interplay, those requirements linked to data quality shall foster permanent performance of data providers (e.g. data maintenance, update in case of supplier/material change). In this perspective, Section 5.2.4 discusses the interdependences of governance aspects that must be addressed to stipulate the contributions of the various stakeholders to the DPP, thereby satisfying the data needs throughout the value chain.

### 5.2.1. Capability dimension: Enable the generation of meaningful, reusable datasets ()

From a capability perspective, the dominant constraint identified in Chapter 4 is not the absence of data generation as such. Relevant information on materials, chemicals and environmental performance is already produced at multiple points in the value chain, yet it is rarely structured, allocated and documented in a way that allows interoperable exchange and reuse beyond the immediate organisational context.

Governance must therefore ensure that data are generated and documented as meaningful datasets rather than as isolated records or compliance artefacts. This implies that information must be

- structured according to harmonised schemas,
- allocatable to products, batches or models,
- machine-readable and interoperable across systems, and
- sufficiently granular to support downstream decision-making.

Without such dataset capability, downstream actors cannot consolidate upstream contributions, and product-linked DPP data layers remain incomplete or unverifiable. Governance must therefore define minimum expectations regarding dataset structure, granularity and linkage to product identity as a prerequisite for meaningful data exchange.

### 5.2.2. Opportunity dimension: Enable trustworthy, verifiable and reusable data flows

Opportunity-related constraints emerge as the central bottleneck underlying the structural asymmetries identified in Section 3.4. Even where actors possess relevant data and technical capacity, they frequently lack institutionally secured routines, rights and standards that would allow them to request, provide, access and reuse data. This applies to data sharing within one organisation, but even more soacross tiers.

Governance must therefore establish conditions under which data exchange becomes institutionally possible and reliable. This includes

- shared allocation logics linking site- or process-level data to product-level datasets,
- product-linked data infrastructures that support onward data sharing across life-cycle stages,
- clear expectations regarding documentation integrity, updateability and traceability, and
- mechanisms that allow data to be reused beyond bilateral buyer–supplier relationships.

Crucially, governance must ensure that trust in data quality is embedded in datasets themselves rather than substituted by certificates, audits or proxy-based modelling. Without such opportunity-enabling conditions, actors remain structurally unable to rely on upstream data for circular decision-making, even if they are willing to do so.

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### 5.2.3. Willingness dimension: Align incentives and access conditions to make dataset provision rational

The persistence of data gaps also reflects the rational behaviour that results from existing incentive structures and impediments. As shown in Chapter 4, certificates, declarations, audits and proxy-based models function as accepted substitutes for structured datasets. They allow actors to manage risk and demonstrate compliance without incurring the costs, uncertainties and exposure associated with full transparency.

The Governance Framework must therefore alter the incentive environment in which data-related decisions are made. This does not imply eliminating all substitutes, but ensuring that reliance on them no longer undermines investment in product-linked datasets. To this end, the Governance Framework must

- clarify data provision obligations and accountability,
- define access conditions that balance transparency with legitimate confidentiality concerns,
- reduce transaction costs through standardisation and automation, as well as
- create credible expectations that structured datasets will be required, used and valued over time.

Only if actors can expect that investments in dataset provision translate into regulatory certainty, reduced risk and strategic benefits will willingness constraints be overcome.

### 5.2.4. Interdependence of governance requirements

The three aforementioned requirements are mutually reinforcing. Dataset capability without institutionalised data exchange remains unused; trust-enabling conditions without meaningful datasets remain empty; and incentive alignment without operational feasibility remains ineffective. The future legal and Governance Framework must therefore address all three dimensions simultaneously in order to shift the current equilibrium away from selective disclosure and functional substitutes towards shared, interoperable and verifiable datasets.

## 5.3. Operationalising governance requirements across governance levels

The requirements derived in Section 5.2 need to be operationalised across different governance levels in order to enable coordinated change in data practices throughout the textile value chain. These requirements do not map one-to-one onto a single level of governance (see Box 14). Instead, they require a complementary division of labour across macro-, meso-, micro- and nano-levels, each addressing different aspects of capability, opportunity and willingness constraints.

Box 14: Governance levels and their functional roles in enabling DPP-compatible data exchange

**Macro-level:** Defines binding regulatory obligations and minimum dataset structures through the ESPR and its delegated acts. Establishes which data must be provided, how core dataset components relate to each other in terms of verifiability (e.g. BoM, including BoC, and product-linked primary environmental data), and which baseline criteria apply regarding accuracy, updateability, granularity and linkage to product identity.
**Meso-level:** Operationalises macro-level obligations through sector-specific Governance Frameworks. Translates abstract requirements into shared conventions, including harmonised dataset schemas, allocation logics, tiered access models and trust-building mechanisms that enable data exchange beyond bilateral relationships.
**Micro-level:** Implements regulatory and sectoral requirements within companies and other organisations. Integrates data obligations into organisational processes, contractual arrangements and internal data management systems, thereby reducing transaction costs and clarifying responsibilities across supply-chain relationships.
**Nano-level:** Shapes how governance requirements are enacted in daily practice. Individual capabilities, roles and routines determine how data are collected, consolidated, validated and updated, requiring targeted capacity-building measures and practical guidance.

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This multi-level perspective reflects the core insight of the preceding analysis: DPP-compatible data exchange cannot be stabilised through isolated interventions. Binding obligations without operational frameworks remain ineffective; sectoral coordination without regulatory anchoring lacks authority; micro-level efforts without shared conventions remain fragmented; and individual capacity without institutional support cannot be embedded in routine practice. Effective governance therefore depends on the coherent interaction of governance levels (Figure 3).

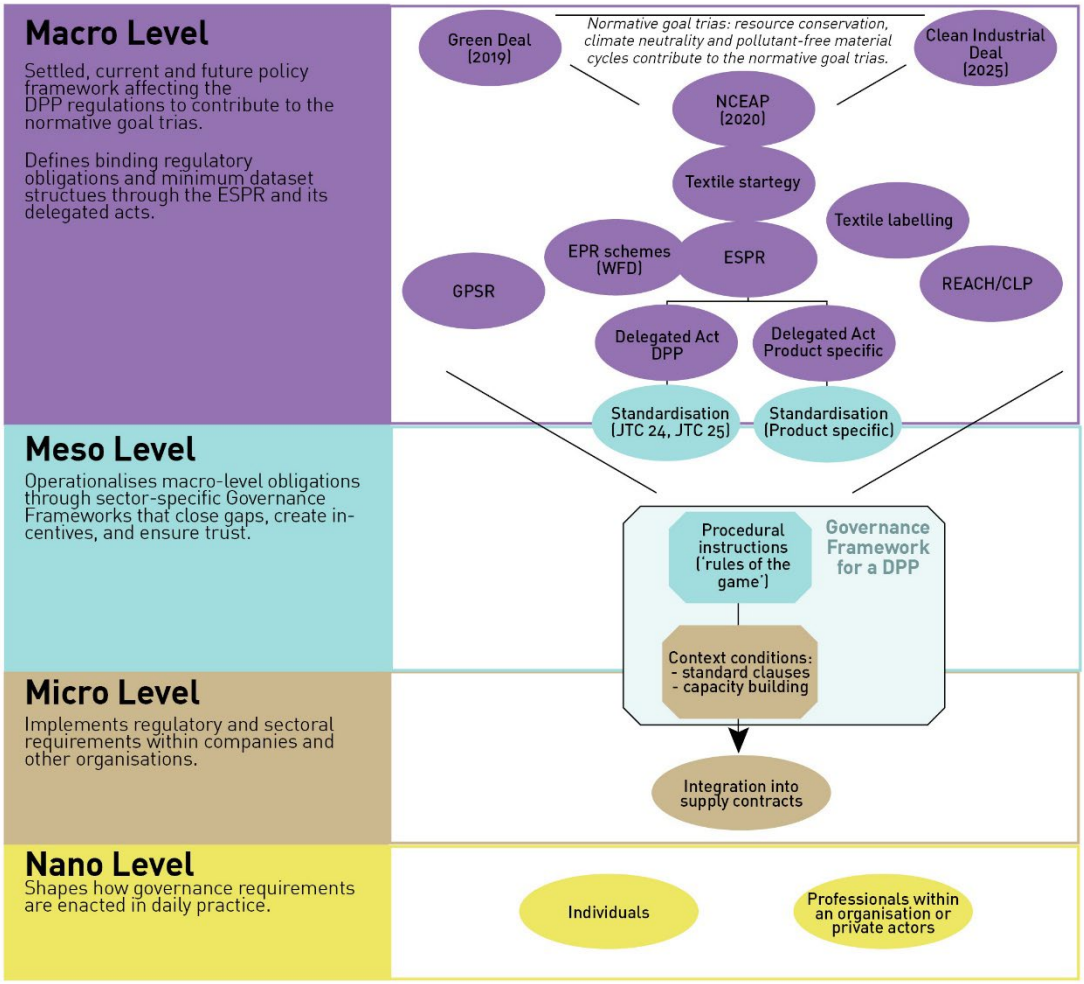


Figure 3: Governance levels relevant for DPP-enabled data exchange

### 5.3.1. Macro level: defining binding obligations and minimum dataset structures

At the macro-level, governance is anchored in the ESPR and its delegated acts, including both the horizontal Digital Product Passport (DPP) framework and the sector-specific delegated act for textiles. This is embedded into a broader 'regulatory landscape' on EU-level, but also on national and international level.[49] In terms of data management, the core function of this level is to establish binding obligations and minimum dataset structures that apply uniformly across the internal market and create a common regulatory baseline for DPP-compatible data exchange. From a capability perspective, macro-level governance must define which data categories are mandatory and how they are structurally related within a product-level dataset.

For textiles, this implies the explicit integration of

- the bill of materials (BoM),
- including the bill of chemicals (BoC) covering intentionally added substances and relevant chemical information, and

[49] For details see Führ et al., Regulatory Landscape Analysis, TRUSTex Deliverable 1.2.

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- product-linked primary environmental performance data,

as interdependent components of a single dataset (see Box 11, p. 42).
Crucially, macro-level provisions must go beyond listing information items and specify minimum structural requirements that enable dataset capability across the sector. This includes baseline criteria regarding:

- linkage to product identity (model, batch or item),
- minimum data granularity,
- update obligations,
- accuracy and completeness requirements.

These elements define the minimum conditions under which data can function as a reusable dataset, rather than remaining isolated records or compliance artefacts.
From an opportunity perspective, macro-level governance provides legal certainty by defining data provision obligations, responsibilities and accountability. By clarifying what information must be made available, by whom, and for which regulatory purposes, it establishes the preconditions for data exchange beyond voluntary or purely bilateral arrangements. In this sense, macro-level rules transform data provision from a discretionary practice into a regulated expectation.
At the same time, macro-level governance necessarily remains abstract. It cannot specify the operational details required for implementation in complex, multi-tier textile supply chains, nor can it resolve questions of allocation logic, access differentiation or sector-specific workflows. Its role is therefore not to prescribe concrete solutions, but to define a binding framework within which such solutions must be developed.
Taken together, macro-level governance sets the non-negotiable baseline for DPP-compatible data exchange: it defines the dataset architecture that must exist, the obligations that apply across the market, and the legal certainty necessary for downstream governance arrangements.

Box 15: Data management issues to be addressed at the macro-level (delegated acts under the ESPR)

In terms of data management, the regulatory framework established at the macro-level, particularly the delegated acts under the ESPR, must ensure that each supply chain actor generates and shares meaningful datasets. To this end, the issues mentioned above in this section have to be specified. Accordingly, the delegated act has to spell out the content wise data points (see Annex II in Chapter 9). Regarding high-quality sorting and recycling, the data points set out in Annex III should be included (see Chapter 10 highlighting also the benefits to be gained).
To the highest extent possible, the delegated act shall specify the formal data quality and usability requirements set out by the ESPR (see Annex I in Chapter 8, Sections 8.1 and 8.3 for details).
Furthermore, the Governance Framework should establish tiered access rights on a need-to-know basis for all actors in the value chain (see Section 8.2). In this respect, the criteria by which data access levels are determined must be specified. The case study findings regarding actor specific data needs in Chapter 2 can be used as a starting point for setting up the access specifications. The identified data needs can be found in the respective tables (see Table 1 to Table 6).
In combination, those specifications have to ensure that the DPP is fully operational.

Without this regulatory baseline established at the macro-level, the meso-level coordination lacks authority, and company-level investments in structured datasets remain exposed to regulatory and strategic uncertainty.

### 5.3.2. Meso level: operationalising data exchange and building sectoral trust

While the delegated acts at macro-level define binding obligations and minimum dataset requirements, meso-level governance is indispensable for translating these obligations into operational data exchange practices across the textile ecosystem.
The meso-level comprises cross-sector as well as sector-specific arrangements developed and maintained by industry associations, standardisation bodies, multi-stakeholder initiatives or other collective coordination mechanisms.

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In this context, ongoing standardisation efforts, particularly those developed within CEN/CENELEC JTC 24 and JTC 25, play a supporting role. JTC 24 standards translate regulatory principles into technical reference frameworks for data exchange, interoperability, storage, access control and user rights management. JTC 25 deals with "Data management, Dataspaces, Cloud and Edge".[50] However, they do not define which data are required or for which governance objectives. Their effectiveness therefore depends on clear macro-level decisions regarding dataset scope, structure and obligations.

Beyond the standardisation processes, the central function of meso-level governance is to address the opportunity constraints identified in Chapter 4. Even where actors possess relevant data and technical capacity, effective data exchange remains unlikely in the absence of institutionally secured routines, rights and expectations governing data provision, access and onward sharing. Without a shared understanding of the key elements and functions of the DPP, which is underpinned by sectoral conventions, actors lack the institutional means to rely on upstream data, consolidate datasets across tiers or reuse information beyond bilateral buyer–supplier relationships.

Meso-level Governance Frameworks therefore operationalise macro-level requirements by establishing common interpretations of regulatory obligations, harmonised dataset schemas, allocation logics linking site- or process-level data to products or batches, and tiered access models that balance transparency with legitimate confidentiality concerns. By doing so, they transform abstract legal requirements into workable, collectively stabilised practices that can be applied across heterogeneous supply chains.

Importantly, meso-level governance does not emerge automatically from technological possibilities or shared sustainability objectives. From the perspective of individual actors, initiating or maintaining sector-wide coordination entails costs, risks and uncertainties that are difficult to justify unilaterally. As a result, meso-level governance requires institutional inducement. Macro-level regulation plays a critical role in this regard by defining binding data obligations while deliberately leaving key operational questions open. This combination creates both the necessity and the space for sectoral coordination, as compliance responsibilities placed on economic operators generate demand for collectively agreed solutions that cannot be achieved through isolated firm-level action.

In this context, meso-level Governance Frameworks can encourage the formation of communities of practice. These communities allow participants to collectively interpret regulatory requirements, develop shared conventions, and encourage trust in data exchange. Thus, meso-level governance helps create a CE-aligned 'thought collective', where similar 'styles of thought'[51] facilitate the development of new data management practices. Scenario-based research on data futures in the textile circular economy emphasises the importance of this approach. Luoma et al. (2022), drawing on expert insights, demonstrate that increased traceability and data availability do not necessarily result in new circular practices. One envisioned future describes a system in which traceability is widely implemented but used primarily as a compliance and reporting instrument, leaving dominant production and consumption patterns largely unchanged. This finding underlines that data infrastructures alone are insufficient to trigger systemic change.

Whether DPP-enabled traceability supports circular economy objectives or merely stabilises existing linear logics depends on how responsibilities, incentives and access conditions are governed at sector level. Without meso-level coordination, traceability risks becoming a procedural endpoint rather than an enabler of circular decision-making. Meso-level governance therefore plays a dual role: it operationalises data exchange and simultaneously shapes how DPP data are used, valued and trusted across the textile ecosystem.

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[50] For details see work programme of JTC 25.

[51] See Section 1.1.2 for more the relevance of these topics in terms of system innovation.

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Box 16: Governance issues to be addressed at the meso-level

The precise scope and level of detail covered by the Governance Framework at the meso-level depends on the level of detail set out in the delegated act at the macro-level. Furthermore, it can be assumed that sectoral stakeholders will only establish an effective Governance Framework if the delegated act clearly encourages them to do so.
Under these preconditions, governance mechanisms at meso-level must cover all the content-wise and formal aspects listed in Box 15. Where further specification is required, related issues must be addressed at the meso-level. It can be assumed that the delegated act will not specify all requirements in a way that meets the data needs of the actors in the value chain. Therefore, meso-level governance is essential to establish a joint understanding of the data management tasks and the potential benefits to be gained. Meso-level governance transforms abstract legal requirements (see, e.g., the data quality specifications listed in Section 8.1 or the usability issue in Section 8.3) into workable, collectively stabilised practices that can be applied across heterogeneous supply chains. This might include access rights specified on a need-to-know basis (see Section 8.2). In this respect, the related tasks would be easier to carry out at a micro-level if the Governance Framework included standard clauses that could be incorporated into supplier contracts (see Section 5.3.3).In terms of capacity building the Governance Framework should provide guidance on value chain data exchange (for details see Section 5.3.4).

Since textile products are used in other sectors too, such as furniture, the data structure and related templates should be aligned as closely as possible. Ideally, these aspects would be dealt with in the respective delegated acts.[52] If the specifications remain vague in certain areas, the sectoral governance should offer functional alternatives. To this end, sector organisations at the meso-level should collaborate to find harmonised solutions.

### 5.3.3. Micro level: translating governance requirements into organisational practice

At the micro-level, governance requirements are translated into organisational practices and contractual arrangements within firms. Economic operators placing products on the EU market remain responsible for compliance with ecodesign and information requirements and must therefore organise their internal data management systems and supply-chain relationships accordingly.
From a capability perspective, firms need to align internal data infrastructures – such as ERP, PLM and compliance management systems – with DPP requirements and sectoral conventions established at macro-and meso-levels. This includes the ability to integrate upstream datasets, to allocate information to products, batches or models, and to maintain data quality over time. Legacy systems that are not designed for interoperable, lifecycle-oriented data exchange constitute a key bottleneck at this level.
From an opportunity perspective, contractual arrangements play a central role in operationalising data exchange. Contracts define who is required to provide which data, in which format, at which points in time and under which access conditions. Standardised contractual clauses on data provision, update cycles, access rights, confidentiality and quality assurance reduce transaction costs, clarify expectations and stabilise data flows across tiers. When aligned with meso-level Governance Frameworks, such arrangements help move data exchange beyond ad hoc or bilateral solutions.
Micro-level governance is also critical for addressing willingness constraints. Clear contractual obligations, predictable data requirements and alignment with sector-wide conventions reduce uncertainty and mitigate perceived risks associated with dataset provision. Firms are more likely to invest in structured, product-linked datasets when they can rely on stable expectations regarding data use, access and regulatory relevance, and when they do not fear unilateral competitive disadvantages arising from increased transparency.

[52] Presumably with a reference to the standardisation documents adopted in CEN/CENELEC JTC 24 and JTC 25.

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Box 17: Governance issues to be addressed at the micro-level (contractual agreements)

The economic operator which places a product on the market is responsible for data quality of the DPP. He has to assure that the products he intends to put on the market "comply with the ecodesign requirements applicable to those products, set out in the delegated acts adopted pursuant to Article 4", as stipulated by Article 3(1). Therefore, he is well advised to organise his supply chain in a manner that both the performance requirements as well as the information requirements are met. As outlined in case study on 'preparedness' (see Section 2.3.7) this applies not only to the current ecodesign requirements. From a future-oriented perspective, he must ensure that data management throughout the supply chain already anticipates tomorrow's potential data requirements.

As a consequence, the final economic operator as well as any other recipient of DPP data in the supply chain has to start well before the delegated acts enter into force to reorganise the data management in the supply chain in preparation of the future regulatory framework. In practice, this implies that he has to integrate appropriate clauses into his order forms or purchasing contracts. The standard clauses provided by the meso-level Governance Framework (see Section 5.3.2) would simplify data management for suppliers, by ensuring highly aligned communication formats. This would improve data quality and, consequently, the trustworthiness of the data provided. To this end, the obligation of the supplier to meet the data quality requirements should be underpinned by contractual enforcement mechanisms.

This approach would benefit all actors along the supply chain, as well as those in the use phases and at the end of life, by providing a higher level of traceability and transparency. This effect is particularly apparent for those actors that have aligned their business models with the aims of the 'Circular Economy'.

### 5.3.4. Nano level: enabling individual capabilities and routines

At the nano-level, governance requirements materialise in the daily practices of individuals responsible for data management tasks within firms and across supply-chain interfaces. These actors are required to collect, consolidate, validate and update information originating from different organisational units, IT systems and external partners, often under conditions of limited resources, heterogeneous data quality and high coordination complexity.

Effective implementation of DPP-compatible data practices therefore depends not only on formal obligations or organisational arrangements, but also on the practical ability of individuals to understand, interpret and apply data requirements consistently. This includes the capability to work with harmonised data schemas, to allocate information correctly to products or batches, to manage update cycles and to handle access rights in line with sectoral conventions.

Targeted capacity-building measures are thus essential to support nano-level implementation. Such measures should include guidance documents, training schemes and practical tools that address both content-related aspects (e.g. understanding BoM-, BoC- and environmental data requirements) and procedural aspects (e.g. documentation routines, data validation workflows and use of supporting IT systems). In addition, learning-oriented elements are required to support actors during the transition from compliance-oriented documentation towards lifecycle-oriented, product-linked dataset management.

Importantly, deficits at the nano-level should not be interpreted as a lack of willingness on the part of individuals. Rather, they typically reflect missing or insufficient institutional support, unclear expectations or inconsistent conventions across governance levels. Without adequate capacity-building and guidance, even motivated actors remain structurally constrained in their ability to implement DPP requirements in practice.

Although capacity building targets individuals, it cannot be organised effectively at the individual level alone. Coordinated initiatives at the meso-level are indispensable to ensure consistency, avoid duplication and provide scalable support across firms of different sizes, tiers and geographic contexts. In this sense, nano-level governance is tightly coupled to meso-level frameworks, translating shared sectoral rules and conventions into stable routines of everyday data practice.

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### 5.3.5. Supporting role of IT infrastructures across governance levels

Across all governance levels, IT infrastructures play a supporting role in enabling DPP-compatible data exchange. They provide the technical means to operationalise requirements related to interoperability, access control, verification and updateability, but they do not constitute governance in themselves.

At the operational level, IT systems can support data quality and reliability through automated completeness checks, plausibility controls and consistency validations. They can facilitate update mechanisms by enabling periodic confirmation requests or event-triggered updates, and they can implement tiered access rights in line with governance and contractual rules. Such functionalities reduce transaction costs and support actors in meeting formal data quality requirements.

However, IT infrastructures can only operationalise decisions taken elsewhere. They reflect choices made at macro, meso, micro and nano-levels regarding dataset structure, access rights, verification logic and accountability. In the absence of clear governance rules, aligned incentives or shared conventions, IT solutions remain underutilised or are applied in fragmented and inconsistent ways.

Consequently, IT infrastructures should be understood as enabling instruments rather than drivers of change. Their effectiveness depends on the coherence of governance arrangements across levels and on the extent to which technical functionalities are aligned with regulatory obligations, sectoral frameworks and organisational routines.

## 5.4. Synthesis

Taken together, the analysis in this section demonstrates that effective DPP governance requires a coherent and complementary division of labour across governance levels. No single level can resolve the identified capability, opportunity and willingness constraints in isolation. Macro-level regulation defines binding obligations and minimum dataset structures, providing legal certainty and a common baseline across the internal market. Meso-level governance operationalises these obligations by establishing shared sectoral conventions, routines and trust mechanisms that enable data exchange beyond bilateral relationships. Micro-level arrangements translate regulatory and sectoral expectations into organisational practices and contractual commitments, while nano-level measures enable individuals to implement these requirements consistently in daily data management routines. IT infrastructures support these processes by providing the technical means for interoperability, verification and access control. Only the coordinated interaction of these governance levels can shift the current equilibrium away from selective disclosure and functional substitutes towards shared, interoperable and verifiable datasets. Such a shift is a necessary precondition for the circular textile ecosystem envisioned in this study, in which DPP-enabled data practices support not only compliance, but also circular decision-making across the full product life cycle.

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## 6. Outlook and next steps

This report marks the completion of Task 2.1. The governance aspects discussed in this document provide the conceptual framework for the technical developments within subsequent tasks in Work Package 2 of the TRUSTex project.

The purpose of this document is not to provide a comprehensive Governance Framework. Such a framework would have to define the structures, roles and mechanisms that guide the implementation of Digital Product Passport (DPP) data governance in the textile sector in detail. In any case, it would fulfil only a complementary role in relation to the delegated acts on the DPP and on textiles. Until the main elements of the delegated acts have been clarified, the regulatory context at the macro-level will remain unclear. Consequently, a Governance Framework located at the meso-level would lack the necessary foundation.

The next steps towards the European Commission adopting the delegated act are the JRC's milestone reports and ongoing impact assessment work. This report may contribute to these efforts.

Consequently, this report is intended to be a living document. Its assumptions and design elements will be tested and refined through the upcoming TRUSTex work packages: WP3 (Pilots and Demonstrators): Empirical validation of governance concepts through real-world data exchange, verification and access scenarios; WP4 (EPR and Policy Integration): Aligning DPP governance mechanisms with Extended Producer Responsibility (EPR) reporting, fee modulation criteria and compliance architectures. WP5 (Stakeholder Engagement): Co-creation workshops and feedback loops to adapt the design of governance to the needs and capabilities of stakeholders. This iterative process across the work packages will result in an updated, consolidated governance model that integrates insights from pilots and stakeholder perspectives.

At the same time, the external policy and standardisation environment is evolving rapidly. Throughout 2026, the European Commission is expected to finalise the horizontal Delegated Act on the Digital Product Passport (DPP) under the Ecodesign for Sustainable Products Regulation (ESPR), with the textile-specific Delegated Act expected to follow in 2027. Meanwhile, CEN/CENELEC JTC 24 and JTC 25 are developing complementary standards for DPP data models, interoperability protocols and verification procedures, while the Joint Research Centre (JRC) is conducting methodological work on data quality metrics, material identifiers and product-level harmonisation. These parallel developments form the regulatory and technical baseline against which the TRUSTex Governance Framework must remain aligned.

To ensure coherence, Task 2.1 will maintain close coordination with these EU-level processes, enabling the framework to evolve in synchrony with official guidance, delegated acts and standardisation outputs.

The refined Governance Framework will be documented in:

- D4.4: Governance Best-Practice Framework, synthesising pilot and EPR insights and
- D7.4 and D7.6: Final Policy and Industry Recommendations, linking DPP governance to broader ESPR implementation guidance.

In this sense, Task 2.1 provides both the analytical foundation and the coordination compass for TRUSTex – ensuring that the project's technical, regulatory, and stakeholder dimensions converge toward a coherent, inclusive, and verifiable DPP governance ecosystem that is fully interoperable with the evolving EU policy and standardisation landscape.

The Policy Brief on the regulatory landscape, EPR policy, and governance (D4.3, M18) will draw on the interim findings of the work packages related to the aforementioned deliverables. Furthermore, it will be based on D1.2 on the regulatory landscape and on the findings documented in this report.

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**Figure sources**

Figure 1: Own Illustration.

Figure 2: UNECE (2025): Recommendation No. 49: Transparency at Scale – Fostering Sustainable Value Chains, p. 7 [ECE, 2025]. ECE/TRADE/C/CEFACT/2025/3. ECE-TRADE-C-CEFACT-2025-03E_0.pdf

Figure 3: Own Illustration.

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## 8. Annex I: Normative Criteria for the Data Management in the ESPR

Building on the regulatory requirements outlined in Section 2.1, the following framework groups the normative requirements for DPP data management in the European textile sector into four interrelated categories.[53] These categories capture both what data must be generated, collected, updated, and shared, and how these tasks must be carried out to achieve the objectives of the ESPR and complementary EU legislation.[54] These normative requirements determine the vast majority of data quality specifications. However, additional substantial requirements can be derived from the actors' needs in the use cases set out in Chapter 2 and their contributions to the R-Strategies in Art. 5(1) ESPR.

The categories are designed to encompass content and process requirements, ensuring that the DPP supports circular economy objectives under Art. 5(1) ESPR, meets all applicable data-related legal obligations, and remains functional and reliable across the product life cycle. They are:

1. **Data Quality Specifications (DQ):** All required DPP information must be accurate, complete, up to date, and verifiable, covering product aspects under Article 5(1) ESPR and additional data obligations from related legislation. This includes clear standards for formats, measurement units, and evidence requirements, as well as defined update routines and quality control processes. (Section 8.1).
2. **Data Access Specifications (DA)**: Authorised actors must be able to retrieve the right data at the right time under clear, secure, and interoperable access arrangements. Access rules should be consistent with legal provisions on confidentiality, intellectual property, and data protection, while enabling compliance checks, due diligence and circular value chain collaboration. (Section 8.2).
3. **Overarching Usability Features (OU):** DPP data must be structured and interoperable with relevant EU databases and reporting systems (e.g., due diligence statements under EUDR, substance reporting under REACH/POPs, EPR registers). Usability requirements extend across the product life cycle, from design and manufacturing to end-of-life processing (Section 8.38.2.1).
4. **Inclusivity & Capability Support in Data Processes (IC)**: All relevant actors, including SMEs and lower-tier suppliers, must be able to meet their DPP data obligations. This requires capacity-building measures, and non-discriminatory access to supporting tools or services (Section 8.4).

These categories translate the legal "what" into a structured description of the target state for DPP data management. They provide the reference framework for assessing the case studies in Chapter 2. Based on the findings from these case studies can then be used to clarify the legal "what" more precisely (see Section 2.4.7).

### 8.1. Data Quality Specifications (DQ)

In the target state, all mandatory and relevant voluntary DPP data fields are populated with information that is factually correct, complete, up to date, and verifiable. Data quality in this sense means that the DPP accurately reflects the product as placed on the market and remains

[53] The text in this is Annex is based on the results of the HORIZON project R-evolve (Führ et al., D2.1).

[54] In the regulatory context the following legal acts appear relevant: EUDR, REACH, RoHS, POPs, Waste Framework Directive, and Extended Producer Responsibility schemes. Art. 10(2) ESPR stipulates: "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 adopted pursuant to Article 4." In this respect, the DPP might function as a 'digital container'. However, the following analysis mainly addresses to the information requirements under the ESPR.

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so throughout its life cycle, using harmonised terminology, agreed data formats, and sufficient granularity to fulfil the performance objectives of Art. 5(1) ESPR and related EU provisions.

This category also includes provisions on the scope of the data set (completeness, see Section 8.1.1), its accuracy (Section 8.1.2) and verifiability (Section 8.1.3), including the tracking substances of concern throughout the life cycle of the products (Section 8.1.4). From a time-wise perspective, Section 8.1.5 addresses the question of which actor is responsible for introducing and updating the DPP data.

Moreover, the DPP might contain– on a voluntary basis – additional transparency elements such as Safe and Sustainable by Design (SSbD) evidence (see Section 8.1.6) or life-cycle performance data (see Section 8.1.7).

### 8.1.1. DQ1: Completeness

The articles 7 and 9 et seq. ESPR list a number of data that are foreseen to be part of the DPP dataset. Art. 7(2)(b)(i) refer to the "performance of the product in relation to one or more of the product parameters referred to in Annex I, including a repairability score, a durability score, a carbon footprint or an environmental footprint". Annex I specifies parameters that form the "basis for improving the product aspects" as defined in Art. 5(1); including the R-Strategies.

Art. 9(2)a ESPR ask the Commission to specify in the delegated act "the data to be included in the digital product passport pursuant to Annex III". Paragraph 1 of the latter provides "what data are to or can be included in the digital product passport from among the following elements:"

(e) compliance documentation and information required under this Regulation or other Union law applicable to the product, such as the declaration of conformity, technical documentation or conformity certificates;
(f) user manuals, instructions, warnings or safety information, as required by other Union law applicable to the product;
(g) information related to the manufacturer, such as its unique operator identifier and the information referred to in Article 27(7);
(h) unique operator identifiers other than that of the manufacturer;
(i) unique facility identifiers;
(j) information related to the importer, including the information referred to in Article 29(3) and its Economic Operators Registration and Identification (EORI) number;
(k) the name, contact details and unique operator identifier of the economic operator established in the Union responsible for carrying out the tasks set out in Article 4 of Regulation (EU) 2019/1020 or Article 15 of Regulation (EU) 2023/988, or similar tasks pursuant to other Union law applicable to the product;
(l) the reference of the digital product passport service provider hosting the back-up copy of the digital product passport.

Furthermore, Annex III para 3 stipulates that the delegated act "shall identify information relevant to ecodesign requirements that manufacturers may include in the digital product passport in addition to the information required pursuant to Article 9(2), point (a), including information on specific voluntary labels applicable to the product. That shall include whether an EU Ecolabel has been awarded to the product in line with Regulation (EC) No 66/2010."

It is to be expected that the sectoral delegated act addressing the individual product category as well as the horizontal delegated act on DPP will include the (vast) majority of the above-mentioned elements; most likely as obligatory elements, some – as the fact that the product has gained an EU (or national) Ecolabel – as voluntary data field.

### 8.1.2. DQ2: Accuracy

All elements discussed in the previous section ask for accurate data in the DPP.

This holds true in particular for the date element stipulated in Art. 9(2)d ESPR on batch or item level, and the definition of such levels.

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### 8.1.3. DQ3: Verifiability

According to Art. 5(12) the data representing "[e]codesign requirements shall be verifiable". In this respect, Art. 8 empowers the Commission to specify in a delegated act, i.a., "at least"

(g) the format, manner and order in which the information necessary for the verification of compliance is to be made available; (...)

(i) the requirements concerning information to be provided by manufacturers, including on the elements of the technical documentation that are necessary to enable the verification of compliance of the product with the ecodesign requirements;

Art. 9(3) stipulates that the

requirements referred to in paragraph 2 shall:

(a) ensure that actors along the value chain can easily access and understand product information relevant to them;

(b) facilitate the verification of product compliance by competent national authorities; and

(c) improve the traceability of products along the value chain.

Against this backdrop, the criterium 'verifiability' is relevant for every manufacturer, in particular with a view to his obligation stipulated in Art. 27(2) to 'carry out the conformity assessment procedure": It is applicable for all steps in the production process that he enacts in his facilities. Insofar as he integrates chemicals, material or components he received from suppliers these data have also be verifiable. To this end, Art. 38(a) sets out that supply chain actors have to provide the manufacturers "with available relevant information related to the products they supply or the services they provide". When this is not the case, the manufacturer lacks a proper basis for his conformity assessment and the subsequent 'declaration of conformity' (see Art. 27(2) subpara 2).

This implies, that authorship for each data entry (including updates) is IT-wise ensured via digital traceability. Each manufacturer placing a product (including components and intermediate products)[55] has be identifiable as well as any other rEO with access rights to the DPP dataset allowing to change entries to the DPP.

### 8.1.4. DQ4: Tracking substances of concern throughout the life cycle of the products

Art. 7(5) ESPR stipulates "information requirements shall make it possible to track the substances of concern, throughout the life cycle of the products concerned".[56] To this end, Art. 7(5) ESPR provides that the delegated act includes "at least the following" information requirements

(a) the name or numerical code of the substances of concern present in the product, as follows:

(i) name in the International Union of Pure and Applied Chemistry (IUPAC) nomenclature, or another international name when IUPAC name is not available;

(ii) other names, including usual name, trade name, abbreviation;

(iii) 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;

(iv) the Chemical Abstract Service (CAS) name and number, if available;

(b) the location of the substances of concern within the product

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[55] See the definitions in Art. 2 (2) and (3).

[56] This requirement is not applicable when a functional equivalent is available; in this sense the quote continues as follows: "unless such tracking is already possible pursuant to information requirements laid down in another delegated act adopted pursuant to Article 4 covering the products concerned". Art. 7 (5) ESPR starts with the following reference: "Unless otherwise provided for under paragraph 6, point (b)" allowing the Commission to "provide duly justified exemptions for substances of concern or information elements from such information requirements referred to in the first subparagraph of paragraph 5, based on the technical feasibility or relevance of tracking substances of concern, the existence of analytical methods to detect and quantify them, the need to protect confidential business information or in other duly justified cases; 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".

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(c) 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) ESPR already contains detailed information requirements that stipulate a minimum standard. However, the requirements that are ultimately binding must be set out in the relevant delegated acts.

In order to identify 'the location of the substances of concern within the product', as required by point (b), and the concentration data required by point (c), the DPP dataset has to be structured in a manner that allows to identify those SoC in the product. In practical terms, the data have to be structured in a manner that allows to identify the component where the SoC is located. Thus, this requires a structure of the dataset that follows the logic of a "Bill of Material" (BoM). Otherwise, the tracking intended by Art. 7(5) ESPR would not be possible.

#### 8.1.5. DQ5: Introducing and updating DPP data in a timely manner

Art. 9(2)(g) ESPR ask the Commission to specify in the delegated acts "the actors that are to create a digital product passport or update the data in a digital product passport and what data they may introduce or update", whilst Art. 9(2)(h) provide the detailed arrangements for introducing or updating data.

With a view of the overall functionality of the DPP system, the specifications set out in the delegated acts with regard to the aforementioned elements have to consider who, beside of the original manufacturer is in a position to create a DPP. This might include refurbished items, composed of reused components from different sources.

In practical terms, however, the more relevant question is who is obliged or entitled to update the dataset in the DPP. In this respect, changes to the sourcing of materials or sub-components, as well as altered production processes, would lead to a new version of the dataset on the part of the suppliers. For the OEM, it must be specified under which conditions altered components constitute a new batch within a serial product.

Moreover, the extent to which repairers are entitled or even obliged to reflect the repair results in the DPP has also to be defined.

In both cases, it is essential to integrate the new data in a timely manner, ensuring it is complete (see Section 8.1.1) and accurate (Section 8.1.2). Both updating events affect specific components regularly. Therefore, the dataset must be structured on a component-by-component basis. This is also important for verifiability (Section 8.1.3).

Another criterion that arises from the aforementioned normative requirements is the need to adapt the dataset as soon as possible after a change occurs.[57] In short, updating the DPP in a timely manner is the additional criterion.

#### 8.1.6. DQ6(v): Transparency of the considerations regarding the SSbD-principles

The substances and mixtures used in the production process of the furniture items are placed on the market in compliance with REACH/CLP. In addition, the ESPR aims to ensure "that chemicals, materials and products have to be safe and sustainable by design and during their life cycle, leading to non-toxic material cycles"[58] Thus, the SSbD-principles which are also mentioned in Annex II[59] perform as a reference system for the performance requirements.

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[57] Insofar as this is not specified in the delegate act, the DPP governance mechanisms thus have to clarify what is meant by timeliness and who has access for introducing and updating data to the DPP. This would include not only the manufacturer (e.g., in a case when new spare parts or upgrading options are available) but also for independent operators, that repair or refurbish a product.

[58] Wording from Recital 10.

[59] Annex II para 6 sets out in sentence 2: "Any performance requirement concerning substances as referred to in Annex I, point (f), shall take into consideration existing chemical safety assessments performed by the relevant

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Once a performance requirement has been defined in a delegated act, the product may only be placed on the market if it complies with these requirements. In terms of data quality, the mandatory part of the DPP must cover data confirming compliance. However, proactive companies may wish to adopt a more ambitious approach to applying SSbD principles. While the ESPR also aims to enhance innovation, the DPP should allow SSbD considerations to be integrated on a voluntary basis. Thus, a quality criterion DQ6(v) covering these aspects can be derived.

#### 8.1.7. DQ7(v): Additional data on lifecycle performance

Annex I of the ESPR contains a long list of data on product parameters describing the environmental impact of the product during its 'life cycle'. In this respect, Annex III broadens the scope of the DPP data set in its third paragraph to all "information relevant to ecodesign requirements" as follows:

> The delegated acts adopted pursuant to Article 4 shall identify information relevant to ecodesign requirements that manufacturers *may include* in the digital product passport in addition to the information required pursuant to Article 9(2), point (a), including information on specific voluntary labels applicable to the product. That shall include whether an EU Ecolabel has been awarded to the product in line with Regulation (EC) No 66/2010.

This option is not limited to voluntary labels. It gives the DPP data the potential to enable new business models (see also sections 8.1.6). This is particularly true with regard to the provisions in Art. 65 of the ESPR on 'green public procurement'.

Based on this option, it seems feasible to include data relevant to the development and uptake of CEBM. This could apply to a repairability or durability score, for instance, or to the carbon or environmental footprint, provided these are not part of the mandatory data set. These additional data provided by the delegated act can realise their transformative potential if they are sufficiently trustful and presented in a way that meets the audience's perception patterns and needs (see Section 8.3.1).

Insofar as those data are not an obligatory part of the DPP (und thus a covered by the completeness criterium; see sections 8.1.1) they may as well be subject to non-mandatory data sharing. If a DPP dataset contains such data on a voluntary basis, they still have to be accurate, up to date and verifiable (see sections 8.1.2, 8.1.3, and 8.1.5).

A manufacturer placing a product on the market with these additional data has to assure that they fulfil the data quality criteria mentioned above.

#### 8.1.8. Criteria for data quality specifications (DQ)

The following table summarises the criteria for the seven subcategories to data quality specifications (DQ).

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> Union bodies for the substances concerned, as well as safe and sustainable by design criteria for chemicals and materials developed by the Commission."

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Table 13: Criteria for data quality specifications (DQ)

| Subcategories | Definition | Legal basis | Evidence / Indicators | Primary responsibility |
|---|---|---|---|---|
| DQ1 Completeness | All mandatory data elements are present and systematically checked for gaps, with procedures for correction. | Art. 7(2)(b); Art. 9(2)(a); Annex III | Data model conformance reports; fill rate of mandatory fields; validation logs | Manufacturer / rEO; upstream suppliers |
| DQ2 Accuracy | Data is factually correct and consistent with the product as placed on the market, verified through structured quality control and supplier attestations. | Art. 9(1) 2; Art. 9(2)(d); Art. 10(1)(f) | Error rates; sampling protocols; calibration records | rEO; component suppliers; QC/compliance |
| DQ3 Verifiability | Data representing "ecodesign requirements shall be verifiable" | Art. 5(12) | Traceability of authorship for each data entry (including updates) is IT-wise ensured, based on a BoM structure. | Manufacturer / rEO; ll change-making actors |
| DQ4 SoC Traceability | SoC are identified and tracked at component level, with change control to maintain accuracy. | Art. 7(5)(a)–(c) | BoM structure for supplier declaration | rEO; chemical/material suppliers |
| DQ5 Introduce and update | Data is updated promptly when relevant changes occur, following defined triggers and service levels, and retaining a traceable history. | Art. 9(2)(g)–(h) | update frequency; version history, expired-entry rate; reminder logs | rEO; all change-making actors |
| DQ6v SSbD Transparency (voluntary) | Voluntary inclusion of Safe and Sustainable by Design evidence beyond the legal minimum. | Recitals; Annex III para 3 | Design documentation; voluntary labels | Manufacturer / rEO |
| DQ7v Lifecycle Performance Data (voluntary) | Voluntary inclusion of life-cycle assessment data aligned with Annex I parameters. This includes a wide range of non-mandatory data (e.g., repairability score, environmental footprint, voluntary labels) | Art. 10(2), Annex I; Annex III para 3 | Presence of additional fields; method notes; data quality checks; verification reports | Manufacturer / rEO |

To the extent that the delegated act does not sufficiently determine the interaction in the value chain by specifying the requirements for the different quality criteria, the Governance Framework should provide supplementary guidance.

### 8.2. Data Access Specifications (DA)

The ESPR stipulates a data management system through which authorised users can reliably retrieve the specific DPP data they require at precisely the moment they need it, in a form that can be used for legal, operational and circular economy-related tasks. This includes the scope of the accessible data (Section 8.2.1) and when access to data is available before product related decisions are made (timewise dimension, see Section 8.2.2).

#### 8.2.1. DA1: Scope of access

Art. 9(2)f asks the Commission to specify in the delegated act "the actors that are to have access to data in the digital product passport and to what data they are to have access".

According to Recital 33

> 'the digital product passport needs to be designed and implemented in a manner that allows differentiated access to the data in the digital product passport depending on the type of data and the typology of stakeholders' in order to 'optimise access to the resulting data while also protecting intellectual property rights'.

Depending on the CEBM some manufacturers or distributors would like to provide additional data on a voluntary basis (see Section 8.1.7). The governance mechanisms have to offer options to define different levels of access also for these data, insofar that the delegated act does not specify this.

Practically speaking, it has to be ensured that each actor can access exactly those DPP data fields necessary for their role, based on clearly defined access rights and purpose limitations.

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Access rights incorporate safeguards for justified confidentiality claims and intellectual property. This includes secure and authenticated access mechanisms to prevent unauthorised use.

### 8.2.2. DA2: Accessibility prior to contractual agreements or other product related decisions

Art. 9(2)e asks the Commission to specify in the delegated act "the manner in which the digital product passport is to be made accessible to customers before they are bound by a contract for sale, hire or hire purchase, including in the event of distance selling". This implies that the potential customers are in position to compare different options considering the implications on the R-strategies.

In cases where specific labels are required, Recital 68 explains:

> To ensure that the labels are accessible to customers when considering a purchase, both the dealer and the responsible economic operator should display them whenever advertising the product, also in cases of distance selling, including online.

According to the 'Single Market Strategy' it is envisaged that those "labels will form part of the Digital Product Passport (DPP) as the digital container for product-related information".[60]

The DPP should in user-friendly manner allow a structured comparison of the features of alternative products or services (see Section 8.3.1).

### 8.2.3. Criteria for data access specifications (DA)

Data access arrangements must be clear, secure, and technically interoperable across the diverse IT systems in the furniture ecosystem (for a visualisation of the value-creating meshwork see Figure 1 on page 12). The aim is to ensure that access management supports both mandatory compliance checks and voluntary value-adding activities, without compromising justified claims for data protection or confidentiality.

The following table summarises define the essential dimensions of data access in the target state.

Table 14: Criteria for data access specifications (DA)

| Subcategories | Definition | Legal basis | Evidence / Indicators | Primary responsibility |
|---|---|---|---|---|
| DA1 Scope of Access | Ensure that each actor can access exactly those DPP data fields necessary for their role, based on clearly defined access rights and purpose limitations. Access rights incorporate safeguards for justified confidentiality claims and intellectual property. This includes secure and authenticated access mechanisms to prevent unauthorised use. | Art. 9(2)f | Access control lists; user authentication logs; role-based permission settings | rEO; data platform operators |
| DA2: Accessibility prior to product related decisions | The DPP is accessible to customers before they are bound by a contract for sale, hire or hire purchase, including in the event of distance selling. | Art. 9(2)e | Visibility of the DPP data set and the additional services applied to the product itself for customers. | rEO; data platform operators |

As many other DPP features the access mechanisms are to defined in the delegated acts. However, most likely not all practical issues can be foreseen and addressed in the delegated acts in a comprehensive and sufficient manner. Thus, the governance mechanisms have to stipulate data access mechanisms laying down rules for a differentiated access to the data, depending on the type of data and the type of stakeholder.

[60] COM(2025) 500 as of 21.5.2025, The Single Market: our European home market in an uncertain world - A Strategy for making the Single Market simple, seamless and strong, p. 10 (p. 11 in the pdf-version).

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### 8.3. Overarching Usability (OU)

According to Art. 1(1) the ESPR aims at

> 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.

According to Recital 6 the ESPR therefore strives for

> production and consumption patterns that are aligned with the Union's overall sustainability targets, including climate, environmental, energy, resource-use and biodiversity targets, while staying within planetary boundaries.

To achieve this aim, a wide range of actors have to transform traditional "production and consumption patterns" and to align their product related decisions with the R-strategies set out in the 'product aspects' of Art. 5(1). Consequently, the dataset in Digital Product Passport (DPP) does not only comply with the data quality and access specifications (see sections 8.1 and 8.2), but the data context is also designed for effective and meaningful use throughout the product life cycle.

Overarching usability features define how data are structured, presented, and maintained so that all authorised actors can work with them efficiently and without unnecessary transaction costs. This includes making data comprehensible to intended audiences (Section 8.3.1), keeping them available for the legally required period (Section 8.3.2), enabling the addition of relevant voluntary information (Section 8.3.3), and ensuring reliable communication channels with the responsible economic operator (Section 8.3.4).

#### 8.3.1. OU1: Clear, easily understandable and user-friendly structure

A core overarching usability feature to be met by the information requirements is set out in Art. 7(2)(c). According to the provision they should be 'clear, easily understandable, and tailored to the particular characteristics of the product groups concerned and the intended recipients of the information'. Thus, the data points provided by the DPP have to be defined in the delegated act in a manner that those actors who collect the data for the DPP have a clear and easily understandable indication which data in which format are to be included.
On the other hand, the data set have to be structured in a manner that the 'intended recipients' can easily compare alternative options supported by IT-solution, such as dedicated online comparison portals. In this context Recital 42 states

> The Commission should set up and maintain a user-friendly and publicly available web portal where stakeholders, such as customers, economic operators and other relevant actors, have access to data included in the digital product passports and the possibility of searching for and comparing data included in those passports in line with their respective access rights specified in the delegated acts setting ecodesign requirements. The web portal should provide links to data already stored by the economic operator in its decentralised digital product passport.

With a view to CEBM the ESPR requirements aim at to support 'informed decisions' not only for (potential) customers (see Section 8.2.2) but as well for any other actor in the value chain. To this end, user-friendly search functions and options to compare alternative products or services have to be established. In particular, services supporting the R-Strategies set in Art. 5(1) points (a) – (f), i.e. durability, reliability, reusability, upgradability, repairability, the possibility of maintenance and refurbishment, should be transparent to those customers that might order those life-prolonging services.

In a similar manner Art. 11(1)b stipulates that all 'relevant actors' have the possibility to make use of the DPP data:

> customers, manufacturers, importers, distributors, dealers, professional repairers, independent operators, refurbishers, remanufacturers, recyclers, market surveillance authorities and customs authorities, civil society organisations, trade unions and other relevant actors shall have free of charge and easy access to the digital product passport based on their respective access rights set out in the applicable delegated act adopted pursuant to Article 4

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From a systematic perspective, the term 'relevant actors' refers to all individuals or organisations who can contribute to meeting performance requirements. These functions should be supported by the specific access rights in a way that incurs the lowest possible transaction costs, while also allowing the relevant actors to contribute to the R-strategies and the related CEBM.

In addition to the user-friendly structure specified in the delegated act, the Governance Framework may also define as user-tailored design of the different data layers, to guide potential users smoothly to the information they are looking for.

### 8.3.2. OU2: Lifetime availability

According to Art. 9(2)(i) the delegated act shall specify 'the period during which the digital product passport is to remain available, which shall correspond to at least the expected lifetime of a specific product.'

Part of the DPP data set are the 'digital instructions' which according to Art. 27(7) subpara 1 'include at least the information set out in Article 7(2), point (b)(ii)'. This provision reads as follows:

> information for customers and other actors on how to install, use, maintain and repair the product, in order to minimise its impact on the environment and to ensure optimum durability, on how to install third-party operating systems where relevant, as well as on collection for refurbishment or remanufacture, and on how to return or handle the product at end-of-life;

According to Art. 27(7) subpara 4

> 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 least 10 years after the placing on the market or putting into service of the product.

Combining the aforementioned two requirements with the definitions in Art. 2(40) and (41), the obligation arises to keep the DPP data set accessible for at least 10 years after the product or service is first marketed. If the expected lifetime exceeds 10 years, as is the case for most furniture items, this determines the availability period of the DPP dataset.

### 8.3.3. OU3: Additional information based on other legislative frameworks

The delegated acts define which data are to be stored in the DPP on a mandatory basis. In combination with the technical specifications based on the standardisation request a wide range of obligatory DPP content is defined. Additionally, data on design considerations and lifecycle performance may be included on a voluntary basis (see Sections 8.1.6 and 8.1.7). Moreover, according to Article 10(2) other data might also be part of the data set linked to the DPP:

> 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 adopted pursuant to Article 4.

According to the 'Single Market Strategy' the function of the Digital Product Passport (DPP) as a digital container for product-related information, covers "other information required under EU law":[61]

> The Digital Product Passport (DPP) will become the main tool for disclosing and sharing product information across all new and revised product legislation. Introduced by the Ecodesign for Sustainable Products Regulation, the DPP will serve as a digital container for digital labels, conformity documentation, instructions and manuals, certain safety information, technical documentation, and other information required under EU law and has already been included in several new EU legal acts.

This includes, as highlighted in TRUSTex deliverable D1.2, also the information requirements set out be the forthcoming amendment of Textile Labelling Regulation.[62]

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[61] European Commission 2025, COM(2025) 500, p. 25 (p. 26 in the pdf-version).

[62] See Führ et. al. 2026, section 2.5.1., for further details.

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### 8.3.4. OU4: Reliable Communication with the actors responsible for the DPP (rEO)

All of the above specifications and features of the DPP dataset attached to the final product require communication among the supply chain actors. In practice, contributions are needed from the respective the responsible 'Economic Operator' (rEO).[63] The related provisions in Chapter VII[64] for manufacturers and imports contain the following clause "The contact details shall be clear, understandable and legible." They also have to provide "electronic means of communication through which they can be contacted."

During the usage phase, activities of 'independent operators'[65] are key for establishing the entire value chain and contribute to product longetivity. According to the ESPR framework, all of the aforementioned actors must contribute to, and can benefit from, the DPP-provided data set.

Due to the high number of potential stakeholders and their contributions to and requests for DPP data communication in this respect requires continuous interaction, in particular for the rEO.[66] The ESPR considers this to be a prerequisite for the DPP to fulfil its expected functions.

Looking to the future, data exchange along the supply chain should rely on highly automated processes (e.g. by means of ERP systems). However, manual checks and direct contact between those responsible will still be necessary. Therefore, reliable communication channels must be established and continuously maintained.

> An obvious option would be to use the contact details stored in the Global Trade Item Number (GTIN) system. This system is managed by the company GS1. At least in the recent years the system has not been fully operational in terms of communication. The AskREACH LIFE-project[67] (with the Scan4Chem app developed there) revealed problems when it came to using the GTIN managed by GS1 (with the associated barcodes and QR codes) to reach those responsible for product compliance: A significant proportion (up to a third) of the contact details stored by GS1 for the respective GTIN proved to be incorrect (e.g. because the email address or the person in the company no longer existed). This means that if you want to contact the responsible parties via the product identification issued by GS1 (e.g. to report a compliance or quality issue or to exercise your right to information), you end up in limbo. This may also be due to the fact that GS1 Europe does not manage GTIN contact data across Europe, but rather the respective national GS1 agencies.

For the Governance Framework a possible mitigation strategy could include the following provisions. The system only accepts functional addresses from the 'responsible Economic Operator' (rEO). Moreover, the technical specifications could entail a provision the obliges the 'DPP Service Provider' to tests – at least once a month – whether the addresses are still functional and respond to feedback requests.

Additionally, the 'distributor'[68] of the product carry certain obligations before making a product available on the market. According to the provisions in Article 30 they are assigned the role as a 'gate keeper' and have to "verify" the products conformity before making it available on the market. Where they "consider or have reason to believe that a product (…) is not in conformity, or its manufacturer is not complying, with the requirements set out in the applicable delegated acts

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63 According to Art. 2(46) 'economic operator' means "the manufacturer, the authorised representative, the importer, the distributor, the dealer and the fulfilment service provider".

64 See Articles 26(6)subpara2 and 29(3) subpara2.

65 According to Art. 2(47) 'independent operator' means "a natural or legal person that is independent of the manufacturer and is directly or indirectly involved in the refurbishment, repair, maintenance or repurposing of a product, and includes waste management operators, refurbishers, repairers, manufacturers or distributors of repair equipment, tools or spare parts, as well as publishers of technical information, operators offering inspection and testing services and operators offering training for installers, manufacturers and repairers of equipment".

66 For example, according to Article 27(9) the manufacturer has to set up "publicly available communication channels such as a telephone number, electronic address or dedicated section of their website (…) in order to allow customers to submit complaints or concerns regarding the potential non-conformity of products."

67 For details see https://www.askreach.eu/.

68 According to Art. 2(45) ESPR the term 'distributor' means "any natural or legal person in the supply chain, other than the manufacturer or the importer, who makes a product available on the market".

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adopted pursuant to Article 4, they shall not make the product available on the market until the product has been brought into conformity or the manufacturer complies" (Article 30(3)).

In essence, 'distributors' are assigned the role of a responsible 'Economic Operator' in cases in which the manufacturer or importer is not able or willing to fulfil its DPP related duties. This applies, e.g., to large retail chains or internet marketplace operators (see Article 35). Consequently, all aforementioned actors have to offer reliable means of communication with other actors in the supply chain. To assure smooth cooperation throughout the entire value chain the Governance Framework at meso-level

### 8.3.5. Criteria for Overarching Usability Features

The above-mentioned features are crucial for enabling the DPP to fulfil its role as both a compliance instrument and a facilitator of circular economy practices. They address the "fitness for purpose" of the DPP as a data environment, ensuring that information is not only present and accessible but also usable in real decision-making contexts with minimum transactions costs.

Table 15 translates subcategories (OU1–OU4) into concrete criteria.

Table 15: Criteria for overarching usability specifications (OU)

| Subcategories | Definition | Legal basis | Evidence / Indicators | Primary responsibility |
|---|---|---|---|---|
| OU1<br>Clear, easily understandable and user-friendly Structure | Information is clear, easily understandable, and adapted to the product group's characteristics and the intended recipients' perception patterns.<br>DPP data set easy to navigate, and tailored to the needs of authorised users, with clear data layers guiding them to the relevant information. | Art. 7(2)(c), 11(1)(b) | Readability scores; recipient feedback; User interface tests; user satisfaction surveys | Manufacturer/importer or other rEO; DPP service provider |
| OU2<br>Lifetime Availability | All DPP data remain accessible online for at least the legally required minimum (product lifetime or 10 years after placement on the market, whichever is longer). | Art. 27(3), Art. 27(7) subpara 4 | System availability logs; archival protocols | Manufacturer / rEO; DPP service provider |
| OU3<br>Additional Information | System allows for and supports inclusion of relevant addtional information . | Art. 10(2), | Presence of additional fields; | Manufacturer / rEO |
| OU4<br>Reliable Communication with rEO | Contact details for the rEO are correct, functional, and regularly tested; communication channels allow timely response to DPP-related queries. | Art. 26(6)(2) and 29(3)(2) | Contact test logs; bounce rate; response time metrics | rEO, DPP service provider |

As with the other categories, the function of the Governance Framework at the meso-level is to supplement the requirements defined by the future delegated act in order to reduce transaction costs for all parties involved.

## 8.4. Inclusivity and Capability Support in Data Processes (IC)

According to Recital 2, the aim of the ESPR is to "accelerate the transition to a circular economy model". Legislators have identified "the need to move away from traditional models, and revolutionise the way we design, make, use and dispose of products, as well as the need for a secure supply of raw materials" Recital 4). They envisage "production and consumption patterns" in which "the performance of frontrunners in sustainability progressively becomes the norm" (Recital 6), i.e., "that sustainable, circular, safe and non-toxic products and materials should become the norm" (Recital 8).

In terms of data management, this means that all relevant actors involved in the value creating meshwork (see Figure 1) – including SMEs, micro-enterprises, and upstream suppliers in the EU and in third countries – must have the personal competence as well as the technical, organisational and financial expertise, to meet their DPP data-related obligations. This includes compliance with mandatory requirements, as well as the ability to provide additional information that improves circularity and transparency. Here, inclusivity means that no actor is excluded from participating in the DPP due to a lack of resources, expertise or interoperability tools.

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In addition to the criteria discussed in the previous sections, two subcategories can be identified. The first is the various capacity-building and mutual-learning mechanisms (Section 8.4.1), and the second is the accessibility of tailor-made tools is essential (Section 8.4.2).

### 8.4.1. IC1: Capacity building and learning mechanisms

Experience shows that effective interaction within the value chain requires a shared understanding of the tasks to be performed and the challenges involved. The internal distribution of tasks within each organisation certainly contributes to this. However, the mindset of those responsible is even more important. Direct communication between those involved is essential in order to arrive at "shared mental models".[69] Therefore, it is the task of the institutional context provided Governance Framework to provide impetus for this. For example, it could do so by providing guidelines that illustrate the importance of direct communication.

In addition, a broad range of capacity-building measures must be established at the meso-level. These include training opportunities ranging from short videos and webinars to face-to-face events.

Naturally, capacity building is not the subject of the actual legal act. However, the recitals point to a need for support services. Recital 52 formulates as task für the Ecodesign Forum (Art. 19) and the Member States Expert Group established therein (Art. 20) to organise

> the exchange of information and best practices between Member States on measures to enhance compliance with this Regulation, such as education and information campaigns or provision of support to SMEs.

Recital 54 also emphasises the importance of various support mechanisms for SMEs.[70]

In a timewise perspective, mutual learning processes among all actors in the value chain contribute to the overarching goals. For instance, the product development and design unit of the manufacturer would benefit from DPP-enabled feedback of end-users or other actors in the value meshwork (e.g. maintenance and repair services) in term of sustainability-oriented design or improvements in the production process.[71]

### 8.4.2. IC2: Technical capability and implementation

To achieve the envisaged 'twin transition' (Recital 4), in which the European Union not only transform the "production and consumption patterns" towards the SDG´s and gains 'digital leadership', highly automated data exchange is essential for the flow of data within the supply chain. This would substantially reduce the transaction costs for those involved in the value chain.

Therefore, alongside the general conceptual capacity building measures (outlined in Section 8.4.1), the technical capabilities of the actors involved are to be supported in order to establish a fully functional data flow. To this end, not only the technical infrastructure as set out in the horizontal DPP delegated act[72] is relevant. Instead, support measures are to be put in place. These will include training and guidance, as well as the provision of standardised data templates. These are necessary to ensure consistent data quality and availability across the value chain.

These technical support mechanisms should be facilitated at the meso-level to ensure consistency. Furthermore, this would ease the additional burden on all those involved.

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[69] For this approach to enable the cooperation of actors with different professional backgrounds see Pearce/Ejderyan (Sustainability Science (2020) 15:683–698).

[70] Recital 54 states: "The Member States and the Commission should, in their respective areas of responsibility, provide adequate information including guidance, provide targeted and specialised training, and provide specific assistance and support, including financial support, to SMEs active in the manufacturing of products for which ecodesign requirements are set."

[71] See Saenz et al. 2024 for further details.

[72] With references to the results of the related standardisation request (C(2024) 5423 final as of 31.7.2024).

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At least during the initial phase, manufacturers should consider cost-sharing mechanisms for the tools to be used. This would enable smaller suppliers to fully participate in the IT solution that supports the generation, collection and sharing of relevant data.

### 8.4.3. Criteria for inclusivity and capability support in data management processes

Table 16 summarises the two subcategories defined above.

Table 16: Criteria for inclusivity and capability support in data management processes (IC)

| Subcategory | Definition | Legal basis | Evidence / Indicators | Primary responsibility |
|---|---|---|---|---|
| IC1 Capacity Building and Learning Mechanisms | Training, guidance and responsive support are available, as well as feedback channels, with the aim of building and maintaining the capability of actors to meet their data-related obligations. | Derived from ESPR implementation needs; Recitals 52 and 54 | Coherence of training material, number of training sessions; helpdesk usage stats; satisfaction surveys | Industry associations, supported by manufacturer experts; rEO; competent authorities |
| IC2 Technical Capability and Implementation | Provision of standardised data structures as well as related tools, templates, and interfaces that allow all actors to generate and share required DPP data efficiently. | Derived from ESPR implementation needs; Recitals 52 and 54 | Availability of open-source tools; interoperability testing | Standardisation bodies; manufacturers and DPP service providers |

These criteria, along with those relating to the other three categories, are relevant for the governance aspects discussed in Chapter 5.

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## 9. Annex II: List of content wise data points explicitly mentioned in the ESPR

In addition to the general normative criteria set out in Annex I, 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 17). 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 18).

Table 17: List of data points explicitly mentioned in Art. 7(2)a and (5) as minimum information requirements

| Nr. | Information requirements | ESPR | Further information/Definitions |
|---|---|---|---|
| **Art. 7(2)a and (5) ESPR: Minimum information requirements - Substances of Concern** | | | |
| 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:<br>(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;<br>(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:<br>(i) carcinogenicity categories 1 and 2;<br>(ii) germ cell mutagenicity categories 1 and 2;<br>(iii) reproductive toxicity categories 1 and 2;<br>(iv) endocrine disruption for human health categories 1 and 2;<br>(v) endocrine disruption for the environment categories 1 and 2;<br>(vi) persistent, mobile and toxic or very persistent, very mobile properties;<br>(vii) persistent, bioaccumulative and toxic or very persistent, very bioaccumulative properties;<br>(viii) respiratory sensitisation category 1;<br>(ix) skin sensitisation category 1;<br>(x) hazardous to the aquatic environment – categories chronic 1 to 4;<br>(xi) hazardous to the ozone layer;<br>(xii) specific target organ toxicity – repeated exposure categories 1 and 2;<br>(xiii) specific target organ toxicity – single exposure categories 1 and 2;<br>(c) is regulated under Regulation (EU) 2019/1021 (POP); or<br>(d) negatively affects the reuse and recycling of materials in the product in which it is present; |
| 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) | |
| 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) | |

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Table 18: List of data points explicitly mentioned in the ESPR to be specified "as appropriate" in the delegated acts

| Nr. | Information requirements | ESPR | Further information/Definitions | |
|---|---|---|---|---|
| **Information requirement "as appropriate" – to be specified in the delegated acts** | | | | |
| 13 | Repairability score | Art. 7 (2) (b) (i) | Recital 30: Information requirements concerning repairability and durability play a key role in enabling consumers to engage in sustainable consumption. This Regulation should enable the establishment of repairability or durability scores for products where such scores are deemed appropriate for the purpose of providing environmental benefits and clearer information for consumers. In order to allow consumers to effectively assess and compare products, it is important that the format, content and display of such repairability and durability scores include easy-to-understand language and pictograms and that the repairability score be based on a harmonised methodology specified for the product or product group and which aggregates parameters, such as the availability and price of spare parts, the ease of disassembly and the availability of tools, into a single score. | Annex I: (c) 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: (a) 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 | 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.<br>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.<br>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.<br>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 least 10 years after the placing on the market or putting into service of the product.<br>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. | |
| 17 | Information for customers about usage | Art. 7 (2) (b) (ii) | | |
| 18 | Information for customers about maintenance | Art. 7 (2) (b) (ii) | | |
| 19 | Information for customers about repair | Art. 7 (2) (b) (ii) | | |
| 20 | If relevant, information for customers about installing third-party operating systems | Art. 7 (2) (b) (ii) | | |
| 21 | Information for customers about the collection for refurbishment/remanufacture | Art. 7 (2) (b) (ii) | | |
| 22 | Information for customers on how to return or handle the product at end-of-life | Art. 7 (2) (b) (ii) | | |
| 23 | Information for treatment facilities on disassembly | Art. 7 (2) (b) (iii) | | |
| 24 | Information for treatment facilities on reuse | Art. 7 (2) (b) (iii) | | |
| 25 | Information for treatment facilities on refurbishment | Art. 7 (2) (b) (iii) | | |

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| | | | |
|---|---|---|---|
| 26 | Information for treatment facilities on recycling | Art. 7 (2) (b) (iii) | |
| 27 | Information for treatment facilities on disposal at end-of-life | Art. 7 (2) (b) (iii) | |
| 28 | 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; |
| 29 | GTIN (Global Trade Identification Number) | ANNEX III (c) | |
| 30 | TARIC-Code | ANNEX III (d) | |
| 31 | 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; |
| 32 | User manuals (if required by other Union law) | ANNEX III (f) | |
| 33 | Instructions (if required by other Union law) | ANNEX III (f) | |
| 34 | Warnings or safety information (if required by other Union law) | ANNEX III (f) | |
| 35 | 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; |
| 36 | Unique operator identifiers other than that of the manufacturer | ANNEX III (h) | |
| 37 | 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; |
| 38 | 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; |
| 39 | The name of the economic operator established in the Union | ANNEX III (k) | |
| 40 | Contact details of the economic operator established in the Union | ANNEX III (k) | |
| 41 | Unique operator identifier of the economic operator established in the Union | ANNEX III (k) | |
| 42 | 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; |
| 43 | 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;<br>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.<br>The contact details shall be clear, understandable and legible. |
| 44 | Registered trade name or trade mark of importer | Art. 29 (3) | |
| 45 | Postal address at which importer can be contacted | Art. 29 (3) | |
| 46 | Electronic means of communication through which importer can be contacted | Art. 29 (3) | |

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## 10. Annex III: DPP data points for high-quality sorting, disassembly and recycling

Based on feedback from TRUSTex partners involved in the relevant sorting and reuse processes, the data points and entry categories presented in Table 19 would support high-quality sorting, disassembly and recycling as outlined in case 3 (see Section 2.3.4). Table 19 also lists the expected contributions to the 'product aspects' set out in Article 5(1) the relevant data point would support. All data points enable specific technical solutions that would increase (j) resource use and resource efficiency; and in this way at the same time contribute indirectly to a higher level of (h) energy use and energy efficiency and (i) water use and water efficiency as well as reducing (o) environmental impacts, including carbon footprint and environmental footprint and (p) expected generation of waste. These benefits contribute to 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" as set out in Article 1(1). However, this impact can only be realised when the data points are included in the DPP dataset on a mandatory basis. Otherwise, the effectiveness of the related sorting mechanisms would be undermined.

In addition to the expected impact on product aspects, the industry partners in TRUSTex responded to a questionnaire in which they provided their assessment of the following impact categories:

- business model,
- preserving resources
- reducing the toxicity of the material streams and
- improving the climate friendliness of the textile value chain.

Table 20 summarises the respondents' replies for each proposed data point. The relevance of the impacts is assessed using a five-step scale:

- very positive impact (++)
- positive impact (+)
- no impact (0)
- negative impact (-)
- very negative impact (--)

Respondents generally view the impact on the business model very positively (++). Only for the first two data points (brand name and manufacturing year) the impact is considered as simply positive (+).

The same ranking can be found regarding effects on reducing resources consumption and negative climate impacts.

As for the reduction of problematic substances in the material streams, the respondents see a very positive (++) impact for the data points material composition (BoM) and chemical composition (BoC). The same positive impact is seen for temperature-sensitive threads that dissolve when garments are exposed to a certain temperature. Here, the assessment assumes that these garments are eco-designed from the outset. Furthermore, complete disassembly facilitated by Smart Stitch™ threads enables certain fabrics or trims to be excluded, the classification of which as SoC at a later stage would trigger the need to remove those components from the material streams.

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Table 19: DPP data points and entries enabling high-quality sorting, disassembling and recycling processes contribution to the R-strategies (Art. 5(1)) (Overview)

| No | Data point (DP) | Entries for the data point | Technical solution based on the data point | Impact in terms of R-strategies (Art. 5(1)) | Additional remarks |
|---|---|---|---|---|---|
| 1 | Brand name | Name | Automated sorting of garments according to DP entry | (a) durability;<br>(b) reliability;<br>(c) reusability | Brands reputation stimulates trust in second hand market<br>Counterfeit clothing prevention |
| 2 | Manufacturing year | Date | Automated sorting of garments according to DP entry | (a) durability;<br>(b) reliability;<br>(c) reusability;<br>(g) presence of substances of concern | Indicator for durability and compliance with the requirements of first placing on the market;<br>better second hand uptake making CEBM more attractive |
| 3 | Material composition: Fabrics shares | BoM of fabric (%) | Supports automated sorting based on fiber composition, enabling better recycling routes. | (k) recycled content;<br>(l) the possibility of remanufacturing;<br>(m) recyclability;<br>(n) the possibility of the recovery of materials | Improves ability to recycle material fractions (Recycle / Repurpose) and to sort it after the disassembly process. |
| 4 | Material composition: Trims material | BoM of trims (%) | Facilitates separation of components with different materials, improving recyclability and traceability. | | Allows removal of non-textile components to improve purity of recycled fabrics stream. Trims might be reused, e.g. as spare parts. |
| 5 | Chemical composition | BoC: List of chemicals and % per component[73] | Automated sorting of garments according to DP entry | (g) the presence of substances of concern; | Exclude components with SoC´s;<br>Comply with legislation |
| 6 | Garments contains Smart Stitch™ threads | Yes/No | Automated sorting of garments according to DP entry | (k) recycled content;<br>(l) the possibility of remanufacturing;<br>(m) recyclability;<br>(n) the possibility of the recovery of materials | The garments with Smart StichTM are sent to a separate treatment route. Dissolution of threads allow to completely dissassemble garments with more than one component . |
| 7 | Smart Stitch™ information | Disassembly temperature of the thread used | Automated sorting of garments according to DP entry | | Choose the most efficent temperature.[74]<br>Ensures optimal disassembly conditions, supporting reuse and recycling efficiency. |
| This table is based on feedback from TRUSTex partners | | | | all: (j) resource use and resource efficiency; and indirectly:<br>(h) energy use and energy efficiency;<br>(i) water use and water efficiency;<br>(o) environmental impacts, including carbon footprint and environmental footprint;<br>(p) expected generation of waste. | |

[73] In the terminology of REACH a component would be an 'article' (according to the definition in Article 3(3) REACH). For components containing SVHC above 0,1% the information obligations set out in Article 33 REACH apply.

[74] The wrong temperature can damage the product and the machinery and, in some cases, can also prevent the disassembly process.

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Table 20: DPP data points and impacts on business models as well as benefits in terms of the 'Textile Strategy': preserving resource, low-toxicity and climate friendly value chain

| | | 2040: Impact in terms of contribution to overarching goals (Textile Strategy) on ... | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **No** | **Data point** | **business model** | **explanation** | **preserve resources** | **explanation** | **low-toxicity** | **explanation** | **climate friendly** | **explanation** |
| 1 | Brand name | positive impact (+) | Important to only sell authentic products in our shops | positive impact (+) | Higher reuse rate based on trust in the authenticity of the origin | no impact (0) | | positive impact (+) | A positive impact will only be achieved if garments from of brands can be traced and co terfeit items eradicated with DPP |
| 2 | Manufacturing year | positive impact (+) | This insight is valuable from both an economic and a sales perspective | positive impact (+) | Increasing the local/national reuse of clothes could lead to producing fewer new garments and being less reliant on export | no impact (0) | | positive impact (+) | Know garments durability |
| 3 | Material composition: Material shares | very positive impact (++) | Tailoring machinery needs and increasing feedstock purity therefore selling price | very positive impact (++) | Enables data-driven sorting and material recovery, supporting EU circular economy targets. | very positive impact (++) | Knowing material composition can allow for chemical composition and % too | very positive impact (++) | Better recycling leads to redu virgin material production an lower $CO_2$ emissions. |
| 4 | Material composition: Trims material | very positive impact (++) | Tailoring machinery needs and increasing feedstock purity therefore selling price | very positive impact (++) | Facilitates removal of incompatible trims, improving material quality for recycling. | no impact (0) | No impact estimated | very positive impact (++) | Reduced need for new trims/ terials and more efficient rec cling chain. |
| 5 | Chemical composition | very positive impact (++) | Ensure compliance by verifying that no garments sold contain prohibited or illegal substances | very positive impact (++) | Use fewer substances when making a garment | very positive impact (++) | Garments containing banned chemicals will be prevented from being sold in shops or exported, and will be properly treated by an authorised waste manager | very positive impact (++) | Avoid using and selling bann harmful quimicals on textiles |
| 6 | Garments contains Smart Stitch™ threads | very positive impact (++) | Automatic sorting on DP entry saves significantly over manual inspection | very positive impact (++) | Enables pre-processing with eco-designed garments incorporating recyclable materials | very positive impact (++) | Tagged garments are eco-designed from the outset. Easy disassembly enables certain fabrics or trims to be excluded | very positive impact (++) | Tagged garments lead to a hi recycling rate + higher quality secondary raw material |
| 7 | Smart Stitch™ information | very positive impact (++) | Energy savings impacts business model | very positive impact (++) | Optimizes resource use and reduces energy required during disassembly. | no impact (0) | No impact estimated | very positive impact (++) | Controlled disassembly mini mizes waste and reduces ca footprint during processing. |

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