

CEN

CWA 18291

WORKSHOP

October 2025

AGREEMENT

ICS 35.240.63; 59.080.01

English version

TRICK - Guidelines on data collection from Textile supply chains for the Digital Product Passport

This CEN Workshop Agreement has been drafted and approved by a Workshop of representatives of interested parties, the constitution of which is indicated in the foreword of this Workshop Agreement.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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Foreword

This CEN Workshop Agreement (CWA 18291:2025) has been developed in accordance with the CEN-CENELEC Guide 29 “CEN/CENELEC Workshop Agreements – A rapid way to standardization” and with the relevant provisions of CEN/CENELEC Internal Regulations - Part 2. It was approved by the CEN Workshop “TRICK - Product data traceability from cradle to cradle by blockchains interoperability and sustainability service marketplace”, the secretariat of which is held by UNI Ente Italiano di Normazione consisting of representatives of interested parties on 2025-09-26, the constitution of which was supported by CEN following the public call for participation made on 2024-10-30. However, this CEN Workshop Agreement does not necessarily include all relevant stakeholders.

The final text of this CEN Workshop Agreement was provided to CEN for publication on 2025-10-01.

Results incorporated in this CWA received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 958352.

The following organizations and individuals developed and approved this CEN Workshop Agreement:

- Gessica Ciaccio – ENEA, Chairperson
- Carla Fité Galan – Reverse Resources, Vice-Chairperson
- Piero De Sabbata – C Solutions – Main Contributor
- Fabio Rossi – UNI Ente Italiano di Normazione, Secretary
- Arianna Brutti – ENEA – Main Contributor
- Emma Enebog – RISE – CISUTAC – Main Contributor
- Catrine Marchall – RISE – CISUTAC – Main Contributor
- Traci Kinden – Stichting TEXroad – PESCO UP – Main Contributor
- Lor Albrighi – Smart Products Infrastructure Network
- Andrea Ausili – GS1 Italy
- Alessia Azzini – Temera
- Bridget Baker – NEN
- Raffaele Bini – 1Trueid
- Alessandro Canepa – Fratelli Piacenza
- Claudio Capuzzimati – SUPSI
- Emanuela Casalini – GS1 Italy
- Sara Casini – Manifattura Maiano
- Ana Carolina Chaves – INESC TEC

- Helen Colebourn – Bureau Veritas CPS
- Joao Correia – INESC TEC
- Thiago Costa – CITEVE
- Elizabeth Dakin – UK Fashion and Textile Association
- Quan Deng – BIBA - Bremer Institut für Produktion und Logistik
- Robby Dubus – Textil'IA
- Karin Eufinger – CENTEXBEL
- Thomas Fischer – DITF - Deutsche Institute für Textil- und Faserforschung Denkendorf
- Sabrina Frontini – ICEC Quality Certification Institute for the Leather Sector
- Gabriella Alberti Fusi – Centro Tessile Cotoniero
- Miriam Geelhoed – Modint
- Alessio Gnaccarini – COSMOB
- Miguel Gonçalves – Macwin.Tek
- Marius Jurt – Toshiba Europe Limited, Bristol Research & Innovation Laboratory
- Ava Kenny-Colwell - UK Fashion and Textile Association
- Rembrandt Koppelaar – EcoWise Ekodenge
- Eliana Kuo – Smart Products Infrastructure Network
- Lorenzo Landi – Dataset
- Anaïs Le Bas – Textil'IA
- Edwin Maes – CENTEXBEL – Convenor of CEN/TC 248/WG 39
- Jan Merckx – CIRPASS
- Francesco Merlino – Univerlab
- Francesca Michelini – SAIT
- Nunzio Modesto – Dataset
- Maria Flavia Mogos – SINTEF Manufacturing
- Marta Montanari – UNIC – Concerie Italiane
- Bruno Gabriel Mota – Inforcávado – Informática
- Davide Oliveira – Macwin.Tek

CWA 18291:2025 (E)

- Joao Oliveira – CITEVE
- Elisabetta Scaglia – UNIC – Concerie Italiane
- Andreas Schneider – Global Textile Scheme
- Ana Semedo – IL Expansions
- Lorenzo Sforzini – ONIT Smart
- Viktoriia Shiraeva – Deda Stealth
- Marta Sobocinska – Marina Textil
- Olaf Stecken – VDMA Textile Machinery
- Dieter Stellmach – Deutsche Institute für Textil- und Faserforschung Denkendorf
- Riccardo Stronati – Temera
- Cesar Toscano – INESC TEC
- Davide Uberti – Fedabo
- Marco Valtolina – Univerlab
- Linda Vezzani – GS1 Italy
- Aletta Westra – Ministry of Defence (NL)
- Ariane Yonta – Domina

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Introduction

This CEN Workshop Agreement (CWA) addresses the issues of data collection along textile supply chains in order to facilitate the whole industrial ecosystem (manufacturers, brands, it and service providers, etc.) to meet the increasing needs for faithful information collected along the whole supply chains originated by the evolution of the normative and of the consumers sensibility.

This CWA has an important starting point in the results and the activities of some European projects dedicated to circularity, in the textile sector but not only. It is therefore useful to briefly report their characteristics. Furthermore, Annex E reports the standardization baseline of the European projects that contributes to this CWA: TRICK, PESCO-UP and CISUTAC.

Presentation of the TRICK project and of the other contributing projects

TRICK project

This CWA was initiated within the framework of the TRICK project, a 3,5-year project funded under the Horizon 2020 program (Grant Agreement No. 958352), ended in 2024.

The project consisted of providing a complete, reliable, SME affordable and standard-aware platform to support the adoption, tracing, and demonstration of sustainable and circular approaches, secured by blockchain enabling the enterprises to collect product-secured data. The concept arose from the objective of fighting false green claims of productions within the supply chain: that made necessary and mandatory, looking for a solution that could give traceability validations taking advantage of the benefits of blockchain to promote traceability on textiles.

Its uniqueness lies in the innovative solutions developed and validated through real-world industrial use cases, addressing critical sectoral needs. The project's main achievements include:

- An event-based open data model presented in this CEN CWA process,
- A Blockchain-enabled platform developed for supply chain data collection, ensuring data immutability and trustworthiness,
- A Portfolio of Business Services comprising six key services to address diverse industry requirements, including:
 - The Preferential Certificate of Origin (PCO), co-developed with the Italian Customs Agency (ADM);
 - The Product Environmental Footprint (PEF) service;
 - The Circular Assessment service;
 - The Health Protection service;
 - The Social Lifecycle Assessment (SLCA) service;
 - An Anti-Counterfeiting service.

In the TRICK project, not all actors within the value chain were directly represented, particularly those in the downstream segment, such as collectors and sorters. To address this gap, ECOSYSTEX¹ projects played a pivotal role in supporting the CWA initiative. Notably, direct collaborations were established

¹ The European Community of Practice for a Sustainable Textile Ecosystem, coordinated by the Textile ETP, <https://www.ecosystex.eu/>

with CISUTAC, PESCO-UP, and CIRPASS 1 and 2, facilitating the integration of insights and expertise from these projects. The collaborations carried out with these projects is further described in [1].

PESCO-UP project

PESCO-UP² is an ongoing Horizon Europe initiative (Grant Agreement No. 101138367) dedicated to developing sustainable and economically viable processes for upcycling mixed polyester/cotton (PES/CO) textile waste into high-quality cotton and polyester products. With the European Union mandating textile waste collection by 2025, PESCO-UP transforms this challenge into an opportunity by enhancing textile recycling capabilities across the value chain.

The project focuses on overcoming key barriers in textile recycling by:

- **Creating a digital Marketplace powered by the Digital product Passport** to facilitate seamless information exchange among stakeholders, improving supply-demand alignment for recycled materials.
- **Establishing industry-wide standards for recycling technologies**, considering the chemical structures, physical properties, and textile finishing attributes to ensure efficiency and scalability.
- **Developing systematic sorting, purification, and separation processes** that enhance the recovery of high-quality fibres from mixed textile waste, maximizing resource efficiency.
- **Ensuring social and technological alignment** by fostering a skilled workforce and supporting sustainable employment opportunities in textile recycling.

By integrating these strategies, PESCO-UP aims to advance circularity in the textile sector, reduce reliance on virgin materials, and contribute to greener, more resilient European textile industry.

CISUTAC project

CISUTAC³ is an ongoing Horizon Europe project, under the grant agreement No. 101060375, aimed at enhancing circularity and sustainability in the European textile and clothing sectors, focusing on fashion garments, workwear, personal protective equipment (PPE), and active goods such as outdoor gear.

The project seeks to improve sorting processes for reuse and repair, promote efficient management and recycling of textile waste, and establish fully circular value chains, particularly for complex products like protective workwear.

By addressing key challenges such as dismantling, repairability, and sustainable design, CISUTAC aims to remove bottlenecks and develop inclusive, large-scale European value chains to minimize the environmental impact of the textile industry.

An open-source solution for post-consumer textile waste management developed by the project is available online⁴. The tool empowers the textile ecosystem to make informed decisions, driving a digital change in line with the upcoming digital product passport legislation, and enable a more accurate feedstock for the recycling industry and unlock potential for the reuse market. With the tool, CISUTAC explored the current and future potential to channel waste, to reuse and recycling supported by Digital Product Passport (DPP) and complementing technology. The most prioritised datapoints to channel post-consumer waste are identified to be condition (one of the key datapoints that channel waste from either reuse or recycling), product construction, multilayer, chemical content, fibre composition, recycled content, textile finishing, fabric colour and disruptors.

By helping stakeholders understand the main datapoints and principles for channelling routes and the potential of the Digital Product Passport in the sorting process, the tool empowers them to take next steps

² <https://www.pesco-up.eu/>

³ <https://www.cisutac.eu/>

⁴ <https://www.cisutac.eu/solution-post-consumer-textile-waste>

with testing how technology can improve channelling of waste to reuse and recycling. It also underscores the imperative of granular information on item-level to drive fibre-to-fibre recycling initiatives forward, and to harmonise datapoints definition on a European (or global) level, considering some could be difficultly handled with the DPP (i.e. condition).

CIRPASS project

The CIRPASS project⁵ is a collaborative initiative funded by European Union aimed at laying the groundwork for the gradual piloting and deployment of a standards-based DPP in alignment with 1 - the requirements outlined in the Proposal for Ecodesign for Sustainable Product Regulations (ESPR), 2 – with the needs of industry and 3 – with international DPP initiatives. The project focuses on the electronics, batteries, and textile sectors. The primary objective is to build a common understanding of a cross-sectoral DPP and to build stakeholders consensus on the DPP adoption scenarios and descriptions including agreements and recommendations across various domains, including data, technical specifications, semantics, organizational structures, and legal frameworks. Cirpass-1 (2022-2024) focused on the DPP roadmap within electronics, batteries, and textile sectors. The sequential Cirpass-2 (2024-2027) brings together different pilot projects from within textiles, electronics, construction and tyres, while supporting DPP deployment in many other sectors thanks to its extensive expert network.

CIRPASS assumes a pivotal role in implementing the DPP for the ESPR implementation. It is responsible for deploying the necessary technical infrastructure in parallel with the definition of standards for the DPP system carried out by JTC 24 CEN/CENELEC. Together with determination of the requisite data to be collected done by the Joint Research Centre (JRC) of the European Commission, these three pillars are expected to offer input to the delegated acts concerning textiles, which are expected to be released between 2026 and later.

State of the art of the traceability approaches in Textile

The current situation of the traceability approaches for the textile value chain is described in the following SWOT analysis [2]. This analysis reflects the value chain internal motivation and challenges and the external enablers and barriers coming from the current framework, shown in Table 1 and Table 2.

⁵ <https://cirpassproject.eu/>

Table 1 — SWOT analysis – Strengths and Weaknesses

STRENGTHS	WEAKNESSES
Motivations	Challenges
• The Sustainable Development Goals (SDGs) launched by the Agenda for Sustainable Development • Traceability as key enabler for sustainability, assuring verifiability and accessibility to accurate and reliable information for the reliability of sustainability claims • Green claims validation and anti-counterfeiting efforts	• Sector fragmentation, opacity, and complexity of the textile supply chain • High environmental and social impacts • Limited transparency and data sharing due to the fear among stakeholders about sharing sensitive or confidential information • Increasing effort for adapting to certification schemes and addressing harmonization in data metrics and procedures • Need for enhancing intrinsic sustainability, including the control of all the external stakeholders • Reduce reluctance to technological and organizational changes

Table 2 — SWOT analysis – Opportunities and Threats

OPPORTUNITIES	THREATS
Enablers	Barriers
• Upcoming EU legislation should drive innovation in supply chain mapping, traceability, and verification • Emerging technologies such as Blockchain, IoT, RFID, NIR, XRF, and AI • Increasing consumer awareness of the environmental impact of the post-consumer phases and demand towards environmentally and socially responsible products • Addressing environmental and social challenges	• Lack of Harmonization and Standardization in data collection and sharing • Consumer mistrust • Limited availability of trustworthy and reliable data sources • Lack of traceability tools that cover the entire product lifecycle from a sustainability and circularity perspective • Greenwashing accusations • Regulatory Pressure

The regulatory context and the role of this CWA

The latest update on the Digital Product Passport indicates that it will become mandatory for the clothing industry by, probably, 2027. Market, business operators, consumers, and evolving regulations are all pushing the fashion sector toward increased transparency and sustainability, calling for a transition to a more circular, ethical and sustainable model. The European Green Deal and the European Strategy for

circular textiles⁶ have marked a turning point towards this transformation. According to EURATEX, more than 16 regulations will directly or indirectly impact the sector in Europe in the coming years. To cope with these regulatory changes, the industry should implement a range of adaptations to ensure preparedness.

As a result, companies throughout the supply chain will be required to provide accurate and faithful data to brands. This will require significant effort to ensure that textile and clothing companies, particularly SMEs, are equipped to meet the upcoming customer requirements.

One of the key challenges to address is the lack of standardization across various areas, including data semantics, product identification, and data collection protocols. Some of the main outcomes of the TRICK project could play a crucial role in aligning with upcoming EU regulations. Table 3 below is a summary of the regulations that could benefit from the open data model presented in this CWA.

Table 3 — Potential impact on the upcoming regulations and directives

Regulation	CWA potential impact
Ecodesign for Sustainable Products Regulation (ESPR) ⁷	Supporting the collection of trustful, reliable and well-organized data from the value chain, offering proof of its truthfulness to enable the companies to fill the Digital Product Passport (DPP) with the required data.
Extended Producer Responsibility (EPR) ⁸	The information flows modelled in the data model could support the EPR schemes for eco modulation, in line with the framework directive on waste needs of traceability and transparency. One of the benefits could be enabling a more informed and efficient sorting process that will impact on the quality of the recycled feedstock.
Corporate Sustainability Due Diligence Directive (CSDDD) ^{9,10}	The data model and architecture for traceability support the collection of supply chain data which could support due diligence throughout the supply chain, including primary data and environmental and social impacts within a company and its value chain.
REACH Regulation Review ¹¹	This CWA proposes an expert-based pattern of collaboration processes between companies and experts and data flows and an open data model that supports the collection of data related to chemical composition or substances of concern in textiles, with a dialogue that preserves confidentiality of the information but also efficacy in the assessment activities.
Directive on Green Claims ¹²	The data model supports the provision of verifiable and trustworthy sustainability data for brands. As well as helping in the declaration of data ownership.

⁶ EU strategy for sustainable and circular textiles (COM(2022) 141 final), <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022DC0141>

⁷ https://www.europarl.europa.eu/doceo/document/TA-9-2024-0303_EN.html

⁸ <https://www.oecd.org/en/topics/extended-producer-responsibility-and-economic-instruments.html#:~:text=Extended%20producer%20responsibility%20is%20a,goals%20such%20as%20recycling%20targets>.

⁹ https://commission.europa.eu/business-economy-euro/doing-business-eu/sustainability-due-diligence-responsible-business/corporate-sustainability-due-diligence_en

¹⁰ Taking into account the Omnibus simplification package

¹¹ https://environment.ec.europa.eu/topics/chemicals/reach-regulation_en

¹² https://environment.ec.europa.eu/topics/circular-economy/green-claims_en

Regulation	CWA potential impact
The Corporate Sustainability Reporting Directive (CSRD) ¹³	The data model for transparency and traceability enables the collection of trustful and verified environmental, social, and governance data in a structured way to support audits preparation.

The driver of this document is the adaptation of standardized models to the requirements that arise from a fragmented and volatile supply chain, providing general guidelines validated on real industrial pilots, that provide the way to keep the costs to comply with the upcoming regulations low and affordable, particularly for SMEs. The solution could be the creation of a standardized and open language to collect data across the layers of the supply chain.

The risk of false claims and the lack of transparency (and control) throughout the entire supply chain should be minimized, and traceability can play a crucial role in enabling this. However, gathering data from the entire supply chain and ensuring its faithfulness is not a simple task for the industry. To address this, standardized event-based models for tracking and representing the history of traced items jointly with product sustainability data reporting can provide a potential solution.

The terminology used in this document is aligned with the ones of the following official documents:

- Commission Implementing Decision on a standardisation request to the European Committee for Standardisation, the European Committee for Electrotechnical Standardisation, and the European Telecommunications Standards Institute as regards Digital Product Passports in support of Union policy on Ecodesign requirements for sustainable products and on batteries and waste batteries, ANNEXES 1 to 2 [D096100/01].
- ISO 59004:2024 Circular Economy – Vocabulary, Principles and Guidance for Implementation
- CEN CWA 16667:2013 (withdrawn), referred to as “eBIZ specification”.

¹³ https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en

1 Scope

This CEN Workshop Agreement (CWA) establishes a set of guidelines for data collection along textile and textile products supply chains to support the collection of validated information both for the purpose of traceability of goods as well as of transparency and sustainability claims.

The CWA is based on the TRICK project outcomes and includes contributions from other European projects, to provide a comprehensive view of the circular approach required by the implementation of the textile strategy of the European Commission¹⁴. It addresses processes related to traceability and transparency but also, transversally, addresses the need to collect blockchain references and footprints of the information to guarantee their source and integrity. The primary purpose of this CWA is to assist companies in gathering information across the supply chain, on which the statements to be published on the Digital Product Passport (DPP) should be based. It is not designed for data upload towards the DPP services or for representing information within the DPP as outlined by the ESPR regulations (which will be regulated by the outcomes of the CEN JTC24).

The overall goals of the developed CEN Workshop CWA are:

- Supporting companies in the approach to the traceability and sustainability data collection necessary to fill the Digital Product Passport, providing guidelines and open resources;
- Proposing a common semantics and a common language to enhance the interoperability of the solutions along the supply chain, reducing the costs of setting up new collaborations within fragmented and interweaved supply chains;
- Providing stakeholders and policy makers with a view of the results coming from experimentations carried out on industry pilots, focusing on the approaches adopted to overcome barriers and criticalities related to the compliance to the upcoming European regulations.

Furthermore, the CWA is intended to be used by any industry in textile and textile products sector, along the whole supply chain, with 'ready to use' specifications and references to related documentation and resources that can be freely adopted either by internal IT offices of the industry or by IT providers involved in the textile and textile products data ecosystem. That includes developers of:

- ERPs,
- PLMs,
- Traceability Systems,
- Customs Operation software,
- Sustainability and Impact evaluation tools,
- providers of services for traceability and sustainability impact evaluation (both for software on premises as well as third party platforms).

The final outcome attended is to offer public, common, sectorial reference guidelines for the textile and textile products industry based on existing sectorial specifications but built upon a cross-sectorial paradigm.

¹⁴ EU strategy for sustainable and circular textiles (COM(2022) 141 final), <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022DC0141>

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <http://www.iso.org/obp/>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

claim

high-level statement about a characteristic of a product, or about a process or an organization associated with that product (traceable asset). A sustainability claim is a claim that covers one or multiple sustainability dimensions (economic, environmental, social)

[SOURCE: UNECE Recommendation N.46][3].

Note 1 to entry: In this document “sustainability claims” are referred to as just “claims”

3.2

traceable asset

traceable asset is any product or material (individually, in batches, or in trade units) that needs to be tracked along a value chain

[SOURCE: UNECE Recommendation N.46] [3]

3.3

Unique Identifier

identifier which is guaranteed to be unique among all identifiers used for those objects and for a specific purpose

Note 1 to entry: For more information, see ISO/IEC 15459-1.

[SOURCE: ISO 29404:2015, 3.26]

3.4

textile product – product

product made mainly of textile fibres, yarns and/or fabrics and intended to be used, as such or in conjunction with other textile or non-textile elements

Note 1 to entry: These articles can contain non-textile parts, such as plastics (e.g. buttons and membrane or coatings) or metals.

[SOURCE: ISO 5157:2023]

3.5

eService platform

platform for eBusiness centralized services

3.6

traceability platform

platform dedicated to traceability services

3.7

sustainability management platform

platform dedicated to sustainability data collection, management and reporting

3.8

expert

expert in charge of performing a study

3.9

reviewer

expert in charge of reviewing a study

3.10

exporter

name and address of the person who makes, or on whose behalf the "export declaration" is made, and who is the owner of the goods or has similar right of disposal over them at the time when the declaration is accepted

[SOURCE: ISO/TS 24533:2012]

3.11

seller

company or company function that sells a product

3.12

subcontractor

company or company function that performs activities as a sub-contractor (for example cutting/sewing operations but also dyeing)

3.13

buyer

individual or entity purchasing goods or services

[SOURCE: ISO 24533-2:2022]

3.14

producer

company or company function that produces final or non-final fashion products (yarns, fabrics, garments, accessories, footwear, etc.); its industrial process has in input materials and in output components or final fashion goods for the business customers or final customers

3.15

supplier

company or company function that produces non final products (accessories, fabrics, yarns...); its industrial process has in input materials and in output components for the business customers

3.16

yarn producer

company or company function that produces yarns from raw material; it has mainly Fabric and Knitwear producers as customers (Apparel Producers sometimes)

3.17

retailer

company or company function that sells garments to the Consumer. It is a client of Apparel Producer, Knitwear Producer, and Yarn Producer

3.18

apparel producer

company or company function that organizes manufacturing and material supplying to obtain finished garments from fabrics. It is a client of Fabric Producer and partially of Yarn Producer

3.19

sorter

person or a system that categorizes discarded textile materials by their fibre composition, color, and condition to determine their potential for reuse, repair, or recycling

3.20

textile collector

actor involved in separate collection of textiles

[SOURCE: ISO 5157:2023]

3.21

collection

process of gathering and transporting used textile products or waste materials to a sorting facility for further processing such as reuse, repair, *remanufacturing*, or recycling

[SOURCE: ISO 5157:2023]

3.22

recycler

company or company function that performs activities to obtain recovered resources for use in a process or a product, excluding energy recovery

Note 1: activities to obtain resources include activities such as recovery, collection, transport, sorting, cleaning, and re-processing.

Note 2: Recycling does not include reuse.

[SOURCE: ISO 59004:2024]

3.23

customer

organization or person that receives a product

Note 1 to entry: The customer may be the user or a distributor [SOURCE:ISO 9000].

3.24

consumer

individual member of the general public purchasing or using goods, property or services for private purposes

[SOURCE: ISO 14025:2006]

3.25**closed loop system**

system by which products or resources are used and then recovered and turned into new products or recovered resources, without losing their inherent properties

[SOURCE: ISO 59004:2024]

3.26**end-of-use**

point in time during the life cycle at which a product or resource is transferred by the holder to some other holder

Example: When an organization (e.g., shop or retailer) in possession of the product considers it to be a waste since it hasn't or can't be sold.

[SOURCE: ISO 59004:2024]

3.27**end-of-life**

point in time during the life cycle at which a product or resource is taken out of use and is disposed

Note 1 to entry: Disposal could be in the form of incineration, deposit to landfill, or composting.

[SOURCE: ISO 59004:2024]

3.28**mass balance model**

chain of custody model in which materials or products with a set of specified characteristics are mixed according to defined criteria with materials or products without that set of characteristics

Note 1 to entry: The proportion of the input with specified characteristics can only match the initial proportions on average and will typically vary across different outputs.

[SOURCE: ISO 22095:2020, 3.3.4]

3.29**traceability**

ability to trace the history, application or location of an object in a value chain

[SOURCE: ECE/TRADE/C/CEFACT/2021/10]

3.30**traceability system**

practical system of processes, procedures and information exchanges that implements traceability

[SOURCE: ECE/TRADE/C/CEFACT/2021/10]

4 Needs and approach to traceability and sustainability data collection along the supply chain towards the DPP

4.1 Introduction to the textile supply chain

4.1.1 General

The textile supply chain is characterized by its fragmentation, opaqueness, and complexity due to the number of actors involved in the whole textile processes. Interoperable and scalable traceability and transparency are critical for enabling responsible production and consumption; standardisation, interoperability and scalability are necessary to allow seamless data collection through many different organisations at a reasonable cost.

Furthermore, as noted by the UN Economic and Social Council, despite growing consumer interest in sustainable products and manufacturing processes, the lack of accurate information undermines trust in brands. The identified key stakeholders across the value chain are: Manufacturer, Consumer, Retailer, Researcher, Authority, Service Provider Waster manager and Recycler [4].

4.1.2 Representations of the textile supply chain

The textile value chain can be categorized into different tiers, as outlined by the World Resources Institute, representing the various actors involved in the industry (see Figure 1). However, each tier can encompass multiple sub-suppliers and sub-contractors, reflecting the complexity and interconnectedness of the supply chain.

This CWA assumes that each of them should be considered as equal in a community and addresses both the consensus-building and confidentiality needs necessary to initiate a fruitful partnership in supply chains.



Figure 1 — The textile value chain [5]

Figure 1 provides a general representation of the main tiers of the linear textile value chain, while Figure 2 shows a declination of the previous image in the context of circular textile supply chains.

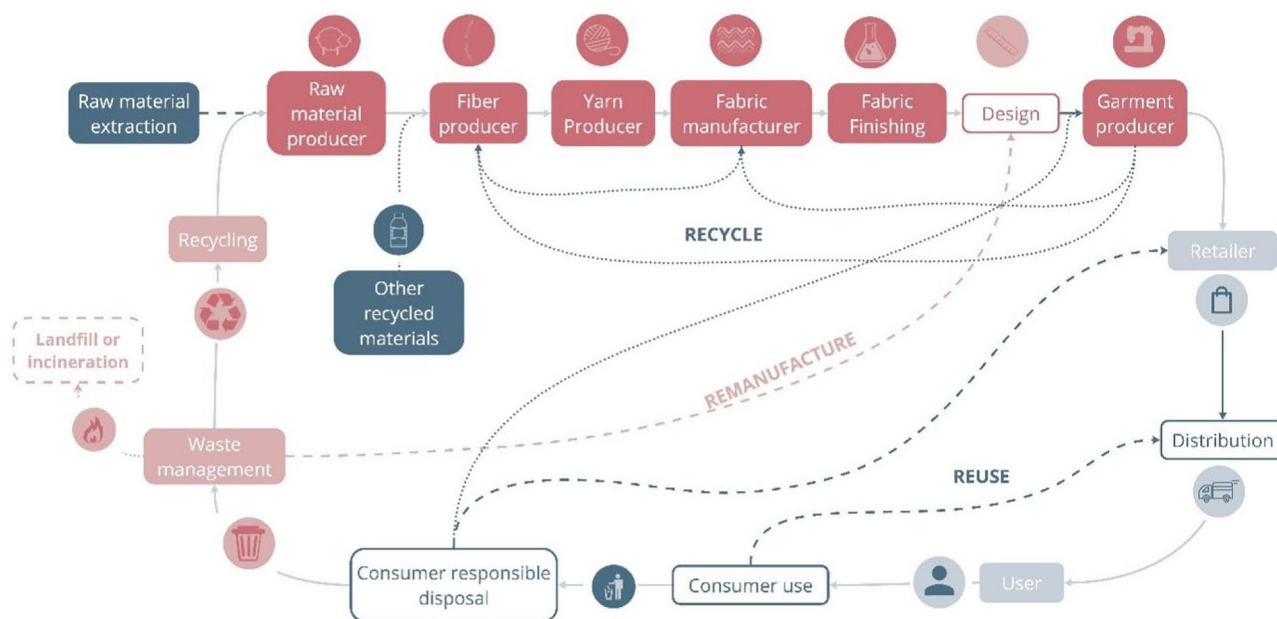


Figure 2 — Representation of the circular textile value chain

4.1.3 Main barriers to the data collection and mitigation actions

The main barriers for data collection along the supply chain for each stakeholder group are outlined below, along with the proposed potential mitigation actions [6] that this CWA identifies.

NOTE Topics related to the post-industrial part of the supply chain are still under discussion in current practices and research and innovation activities, thus they will require subsequent adjustments (not within the time frame of this CWA).

Table 4 — Main barriers for the implementation of circularity and sustainability and related potential mitigations through the implementation of traceability approaches

Use Case Scenario	Main Barriers	Potential mitigation proposed
Manufacturers	- Lack of traceability data from suppliers. - Poor quality data (reliability, and source verification). - Confidentiality challenges. - Lack of integration between systems, data interoperability, and data portability for enhanced circularity.	- Adoption of a standardized data model. - Identification of data sources and linkage to product batches. - Reliable product composition data available at end-of-life to optimize sorting through various services. - Data portability and ownership functions to facilitate management and transfer across the value chain. - Affordable storage solutions for confidential data with small granularity disclosure policies and access for authorized bodies. - clear and formalised information disclosure policies

Use Case Scenario	Main Barriers	Potential mitigation proposed
Consumers	- Lack of comprehensive sustainability information. - Lack of transparency and reliable data. - Insufficient information about value chain processes and steps. - Lack of standardized impact measurement systems. - Limited systems for managing used clothing, repairing and maintenance.	- Transparent data collection ensuring reliable information for textile products. - Support for environmental claims to enable responsible purchasing decisions. - Support to facilitate impact indices calculation - Reliable data on product composition and history. - Critical information for manufacturers, service providers, and consumers for optimal maintenance and end-of-life management.
Researchers	- Limited technology transfer between research and industrial needs. - Lack of clear indicators for circularity implementation in the industry. - Lack of available reference data sets.	- Provision of reliable, standardized datasets. - Use of standardized data models for regulation compliance, facilitating data collection. - Ensuring data confidentiality while maintaining data sovereignty unless mandated for public availability.
Retailers	- Lack of product and supplier data (e.g., material origin, environmental/social impacts, production processes, contaminants, usage recommendations). - Lack of reliable supply chain data. - Limited support for post-consumer lifecycle phases and maintenance.	- Accessible batch-level textile production tracing. - Full transparency identifying parties and their data in each phase. - Blockchain technology to mitigate fraudulent claims. - Data portability for seamless sharing among stakeholders. - User-friendly interfaces for public data disclosure under standardized frameworks.
Service Providers	- Lack of systems ensuring data quality, reliability, and trust. - Risk of data manipulation before collection. - Lack of user-friendly interfaces and affordable and interoperable blockchain solutions.	- Alignment of data to certification schema and impact assessment methodologies for sustainability, circularity and ethical assessments to minimize false declarations. - Use of widely adopted data standards to support public policies. - Affordable, energy-efficient solutions.

Use Case Scenario	Main Barriers	Potential mitigation proposed
		- Immutable traceability data solutions to prevent manipulation as blockchain
Authorities (National, Notified Bodies, European Commission)	- Lack of machine-to-machine access to reliable and trustworthy data. - Few tools for checking compliance between formal documentation and physical goods - Difficulty in quantifying the real impact of adopted policies.	- Reliable, transparent batch-level data leveraging blockchain for certifications, traceability, and circularity. - Standardized data models for regulatory compliance, ensuring policy relevance. - Tools to fight counterfeiting and support reliable data management. - Advanced insights into traceability and sustainability for evidence-based policymaking.
Waste Managers and Sorters	- Lack of product data, granular data points important to scale automatic sorting for fibre-to-fibre recycling - Lack of technology solutions (at scale) to manage more granular sorting for both repair, reuse and recycling. Technology can manage 3 data points at scale today: colour, material composition and disrupters - Lack of harmonized standardized language, for example the term multi-layer. - Possibilities to scale up textile sorting both with little data and more data.	- Reliable, transparent product-level data leveraging technology like RFID (or similar), that can enable massive data reading. In other words, suitable for industrial effective sorting or management for circular business models. - Testing of technology like RFID and AI in combination with existing technology, such as NIR, to make it more efficient. - Standardized terminology to integrate solutions with stakeholders' systems like PLM services and label companies. - Affordable, energy-efficient solutions.
Recyclers	- Lack of reliable data on textile composition and treatments (e.g., fibre blends, chemical coating, dyes, additives). - Difficulty in sorting due to inconsistent labelling or missing product traceability. - Limited access to product lifecycle data for assessing material suitability for recycling. - Uncertainty in supply consistency due to fluctuating volumes of collected textile waste.	- Implementation of Digital Product Passport (DPP) to provide real-time, reliable composition data for textiles. - Standardized data models, enabling material tracing and batch-level sorting to improve input quality for recyclers. - Development of automated sorting systems utilizing traceability data for material classification and separation. - Improved data interoperability and integration across textile waste handlers and recyclers to predict

Use Case Scenario	Main Barriers	Potential mitigation proposed
	- Lack of standardization in recycling technologies, leading to inefficiencies in fibre-to-fibre recovery.	- waste volumes and ensure steady input supply. - Collaboration with policymakers and industry stakeholder to establish harmonized recycling standards for fibre recovery processes. - Support for advanced chemical and mechanical recycling techniques through enhanced traceability of fabric composition.

4.2 Role of traceability and sustainability data for the creation of the DPP and consequent needs

According to the approved ESPR regulation the Digital Product Passport is expected to include the following categories of information (ESPR, annex III, art.8¹⁵):

- identification, classification and contact information about the product and the economic operators involved in its design, production and deployment or importing on the market;
- information about its manufacturing (facilities and manufacturers);
- documentation about usage, maintenance, etc.;
- product parameters (article 7(2)¹⁶ and Annex I of ESPR¹⁷), namely eco-design information (like, for example, durability, energy and water consumption for the production, recycled content, etc).

The concrete sectorial implementation of the DPP will be defined in a sectorial delegated act expected by 2026. These delegated acts will define, among other aspects, the granularity level of the DPP for each product category: it can be associated to the model, or to each product batch or to a single item.

Independently from such decision it is evident that the largest part of the required data will be related to the model and its components and suppliers; furthermore it is evident that some of them, like for example energy consumption for producing an item, cannot be evaluated without considering the contribution of many different phases of the manufacturing process, performed by different manufacturers in the supply chain (in case of energy or water consumption figures from dyers, spinners, etc. should be considered).

Thus, it is reasonable to assume that companies may want to reduce the risk for their reputation and non-conformance by exploring good practices or procedures for sustainability data collection from the whole supply chain and traceability methodologies:

- **Providing primary data for sustainability.** At least a subset of data about product sustainability should be mandatory in the DPP; thus the creation of a channel for collecting trustable primary sustainability data on core activities is necessary (on the other side primary data specifically allow companies to monitor and fuel their sustainability policies); a flow from the supply chain of updated

¹⁵ <https://eur-lex.europa.eu/eli/reg/2024/1781/oj/eng>

¹⁶ <https://eur-lex.europa.eu/eli/reg/2024/1781/oj/eng>

¹⁷ https://eur-lex.europa.eu/resource.html?uri=cellar:bb8539b7-b1b5-11ec-9d96-01aa75ed71a1.0001.02/DOC_2&format=PDF

primary data, jointly with secondary data from literature or data banks, allows companies to safely fulfil the DPP declarations at model level.

- **Real processes compliance.** Product traceability can be explicitly required in the DPP (for example the identifiers of the facilities of the whole or part of the supply chain) or not; in fact, the delegated acts are expected to leave such information out of the scope of the DPP for the textile and textile product sector. In both cases, traceability is the tool available to companies to ensure control over the compliance at product batch level of the real supply chain and production processes (operations) with what is declared to calculate sustainability indicators.

Despite the details of the Digital Product Passport still to be defined by the sectorial delegated act, it is possible to identify some needs to be taken in account while tackling the problem of data gathering from the textile supply chains.

Firstly, ESPR and DPP require company to declare properties and features of every product they put on the European market, that means that it is an extensive exercise of data collection (not only for flagship or niche products).

Secondly, the legal framework of declaration to be released require high reliability and demonstrability of any statement.

Thirdly, the new regulation also aims at stimulating companies to face the phases after the product sales, up to the end-of-life and circular management of the materials.

As already mentioned, a relevant contextual factor that companies have to face is the fragmentation of the textile and textile product production chains and the heterogeneity of the subjects active in them; consequently companies have to face difficulties in finding data, manage different methods of collection and detection between different business partners; all this certainly complicates the path from the simple collection of primary data to their evaluation in order to extract homogeneous indices that allow companies to comply with the new ESPR and DPP regulations.

Thus, the following needs have to be considered for data gathering:

- **Holistic data model.** Traceability reports, sustainability information and operations records should be in an integrated view that allows also fuelling new services and digital applications.
- **Data granularity level.** Sustainability and traceability data collection may happen at different levels: organisation, plant, product model and production batch, up to the single item (only for traceability, of course).
- **Identifiers.** Supporting multiple product identification method across the different organisations is necessary: both ISO/IEC 14549 identifiers (required for final products with a DPP) as well as non-ISO 14549/IEC (i.e. based on <country><fiscal code><internalID>).
- **Confidentiality levels.** Confidential/sensitive information related to products or processes or companies should be managed with the possibility to decide disclosure policies at very detailed level along the whole supply chain.
- **Data responsibility.** Clear responsibility and ownership on the inserted data and methods and technology to assure truthfulness of all the supporting records are necessary. The ability to assign clear responsibility for data with a very low level of detail should reduce disputes and strengthen trust in any information but also allow for the replacement of actors who are unable to provide data without introducing failures in the information chain.
- **Plurality of actors.** Many roles have to be managed with different features and responsibility: manufacturers, suppliers and subcontractors, logistic operators, recyclers, raw material importer to the retailer, etc., including a multiplicity of platforms and service providers.

- **Data accuracy.** Faithfulness, immutability and integrity of both primary data (i.e. used energy) and daily business documents (i.e. invoices, certificates, self-declarations) and any other evidence in case of audit or inspection should be assured; the same also for the capability to explicitate sources and different degrees of reliability and precision of the calculation method (for example, a sustainability primary data, like energy consumption per kilogram, can be measured on site, estimated by an expert or simply found on literature; in all these cases the value can be valid but with different capabilities to represent the reality of the product).
- **Blockchain neutral.** Identification and management of information to be stored on different kinds of Blockchain (public or private ones, agnostic to the specific blockchain system, when this technology is adopted).
- **Incremental data collection,** with different levels of granularity and faithfulness (i.e. same data could be simply collected or revised by experts and become part of an assessment study).

The previous list does not consider the need about data retention period as it is expected to be regulated in specific sectorial delegated acts.

4.3 Steps for setting up the data gathering

This CWA identifies six main steps that a company should follow to set up the data gathering supporting the filling of the DPP:

- Step 1: Identification of objectives and of legal value of data to be gathered and definition of a strategy for supply chain involvement;
- Step 2: Description of the actual supply chain;
- Step 3: Setting up of the Traceability system;
- Step 4: Sustainability data gathering;
- Step 5: Reference collaborative processes for data gathering;
- Step 6: Data model for traceability and sustainability data gathering.

To set up comprehensive and effective data gathering along the supply chain, it is essential to identify the components of the traceability system, listed in the following and largely detailed in Clause 5 within the six steps identified for setting up the data gathering (list elaborated from UNECE Recommendation N.46 [3] enriched thanks to the TRICK project's experience):

- Policy claim¹⁸ (the statement companies want to support with the traceability system),
- Traceable asset (the object of the data collection),
- Logistic units, which contain the traceable assets for transport or storage,
- Identifiers management system, for product, location, batch, serial,

¹⁸ A policy claim describes Product characteristics not identifiable by a simple physical inspection (e.g. "Made of organic cotton" or "The markers of this dress implement good labour practices"), from UNECE "The analysis process toward standardized data exchange structures, available at: <https://uncefact.unece.org/download/attachments/52985918/Detailed%20analysis%20of%20traceability%20process%20teleconf%20of%2011-03-2020%20Rev%20SEC.pdf?version=1&modificationDate=1583943921153&api=v2>

- Traceability models for organizing the value chain's processes,
- Events, activities that involves the traceable asset and produced relevant traceability data,
- System entry and exit points, between which data needs to be collected,
- Verification criteria, which define the areas and values that are subject to verification,
- Verification process, method (and actors) through which compliance with the verification criteria is confirmed,
- System of data collection and storage,
- Tools/channel to communicate traceability information to the recipients (Customers, Consumers, B2B partners, etc.)

5 Guidelines for traceability and sustainability data gathering

5.1 Step 1: Identification of objectives and of legal value of data to be gathered and definition of a strategy for supply chain involvement

At the beginning of the process to set up the framework for the data gathering along a supply chain, the objectives and the legal value of the data to be gathered should be clear.

Several example can be done on the objectives of the data gathering:

- Social and environmental reputation (i.e. no child labor),
- Customer safety/health (i.e. no hazardous chemicals used),
- Transparency as a value for the Customer (i.e. organic product),
- Logistics Tracking/Monitoring,
- Anti-counterfeiting (black market),
- Anti-parallel markets (grey market),
- Regulatory or Customs Support (i.e. Preferential Certification of Origin or just conformity to a regulation, like ESPR),
- Conformance support (i.e. operations compliant with a certification).

Once the data collection objectives have been identified, it is possible to define the claims that should be satisfied. According to the UNECE methodology developed in the project “Enhancing Traceability and Transparency for Sustainable Value Chains in the Garment and Footwear Sector”¹⁹, it is recommended that the claims definition follows this structure:

- Traceable asset (i.e., yarn),
- Claimed state (i.e., free of gender discrimination factory or 40% of organic cotton),
- Verification criteria (i.e. SA8000 certification or GRS certification),

¹⁹ <https://unece.org/trade/traceability-sustainable-garment-and-footwear>

- Objective (i.e., prevention of gender discrimination and sexual harassment or reduced environmental impact),
- Macro category (origin, circularity, environmental sustainability),
- Main claim target (Customs, Consumers, Recyclers, etc.).

It is also important to clarify the legal framework of the collected data, strictly related to the identified objectives of the data gathering. It is important to define the level of legal credibility of collected evidence, depending on the use scenario. For example, signed and original documents are needed for Customs procedures, while simple pdf versions of evidence are enough in case of internal logistics monitoring.

See Annex A, clause A.1 for an example of objectives, claims and identification of data legal value.

After or in parallel to the definition of the strategic objectives and related claims, it is important that a strategy is defined for engaging the supply chain actors to be involved: an early involvement facilitates the identification of the criticalities and creates better engagement in the activities.

5.2 Step 2: Description of the actual supply chain with actors and roles

To proceed with the setup of an effective and focused data gathering, it is important to have a complete vision of the supply chain as it appears at the time of designing the traceability system in relation with the objectives or claims, providing its main features. The analysis of the current situation of the supply chain allows to identify opportunities and critical issues and to make decisions about the traceability system.

Actors and roles should be identified, highlighting the kind of interactions they have. Each actor can play different roles along the supply chain, as shown in Table A.2 of Annex A, depending on the scenario and on the supply chain under analysis. Identifying the actors that exchange data and information and their roles is fundamental to understand the source and the owners of the data to be collected. In this way it is possible to define the level of availability and the requirements in terms of confidentiality of data, highlighting potential barriers (i.e. lack of digitization of some suppliers) or needs for disclosure policies. In parallel, the first draft list of the data to be gathered can be retrieved.

In summary, to obtain a complete description of the current supply chain it is necessary to:

- Identify actors and roles;
- Detect physical assets and information exchanged;
- Describe key operations and actors within the boundaries of the traceability system, for example through use case diagrams;
- Describe information exchanged between actors, for example through activity diagrams.

An example of the description of the “as is” supply chain and the identified actors and roles can be found in Annex A, clause A.2.

Depending on the objectives of the data collection, it should be verified whether the supply chain provides evidence that can support them, identify it and describe it (a supporting evidence is any type of documentation that can be used to confirm and testify to the veracity of the declared events and activities).

Two types of evidence can be collected: direct evidence or indirect evidence.

Examples of direct evidence:

- Passage through a gate (RFID),

- Transport (transport document),
- Transformation (on-board machine detection),
- An administrative step (order, invoice),
- A photo (with time reference and geolocalization).

Examples of indirect evidence:

- The number of cotton seeds of a particular variety per hectare I bought,
- The quantity of production per hectare,
- The quantity of bought fertilizer,
- The quantity of machines of a specific type (production capacity),
- The number of employees in relation to the declared turnover.

The evidence can be data automatically gathered (IOT): data with time, place and author references, administrative structured documents (eCMR, electronic invoice), other XML/JSON structured documents (catalogue, orders), other pdf documents, georeferenced and timestamped photos (EXIFF, ECW, GeoTIFF, JP2). Moreover, the documents can be digitally signed, registered with issuer, or scanned with manual signature.

5.3 Step 3: Setting up of the Traceability system

5.3.1 General

The traceability system has the objectives to collect information and supporting evidence regarding [7]:

- the map of the actors involved in the supply chain (supply chain traceability);
- the list of the components, subcomponents and raw materials necessary for the transformation from raw material up to the final product and their features (product traceability);
- the history of all the traceable assets involved, like batches of raw material and components and final product (material traceability, at batch level).

Although not required by the ESPR and DPP normative, it is advisable to have the capacity of monitoring and controlling the supply chain and its processes in order to reduce the risks for the companies and to facilitate the verification of the claimed statement. Furthermore, the data collection about supply chain participants and components is the basis for any assessment study on the product and related processes.

In the following the list of the topics to be tackled:

- Identification of traceable assets and their identifiers,
- Traceability system boundaries,
- Verification criteria and method,
- Definition of “to be” scenario, with expected functionalities and use cases:
 - o Identification of relevant manufacturing steps along the supply chain in relation with the objectives or claims;

- o Identification of the data responsible/owner;
- o Identification of the adopted supply chain governance (where and how to collect operational data, where and how to collect supporting evidence);
- o Choice of Events to trace at each phase of the supply chain and of related evidence;
- o Identification of technical and organizational characteristics for supporting tools (IT systems, procedures, etc.);
- o Evaluation of traceability barriers and criticalities with mitigation actions;
- Identification of categories of information and of data flows.

See Annex A, clause A.3.1 for the example of the TRICK project choices to set up its traceability system.

5.3.2 Identification of traceable assets and their identifiers

The choice of the traceable assets (i.e. single item, production batch or logistic unit) should be related to the objectives/claims to be supported and the scenario analyzed. The identification of the features of the traceable asset allows to understand which kind of information or documentation on its history are needed to reach the objectives, who is the owner or responsible for this data along the supply chain, who is in charge of its verification.

It is also important at this stage to define the types of identifiers of the traceable assets. Each traceable asset should be associated with a unique identifier and with a data carrier (i.e. QR code, numeric label, tag RFID or NFC).

According to ESPR, the final product object of the DPP should be associated with a global unique identifier, required to be compliant with ISO/IEC 15459-6²⁰ (for example GS1 GTIN²¹). Regarding components there is not such an obligation, but a globally univocal identifying system should be preferred.

See Annex A, clause A.3.2 for the example in TRICK project.

5.3.3 Traceability system boundaries

To start the setting up of the traceability system, the system boundaries should be defined. They identify the part of the supply chain and of the manufacturing activities that should be object of the traceability data collection. If necessary, information external to the boundaries can be documented through third-part certifications or declarations (it can be the case of the fibres or raw materials certifications).

For example, it can be decided that the traceability system starts from the fibres receiving and ends at the finished product warehouses or including the retail channels up to the consumers.

Similarly, subcontractors can be included or not within the boundaries of the traceability system.

The choice of the system entry points, between which data and evidence need to be collected, depends on the following considerations:

- The objectives of the traceability system and the relevance of data to be collected for the company objectives and for the DPP according to the upcoming delegated acts;

²⁰ [ISO/IEC 15459-6:2014 Information technology – Automatic identification and data capture techniques – Unique identification, https://www.iso.org/standard/54786.html](https://www.iso.org/standard/54786.html)

²¹ <https://www.gs1.org/standards/id-keys/gtin>

- The adopted traceability model (for example, some raw material certification schemes require segregated models²²);
- The role of suppliers and subcontractors in the data collection (active or surrogated by their customer);
- The availability of automatic detection systems.

For example, the entry points of the traceability system can be located at:

- The “borders” of each factory or warehouse, to monitor what is going inbound and outbound, both physically and virtually;
- the ERP (Enterprise Resource Planning) and MES (Manufacturing Execution System) systems, because a second source of information are commission orders and internal processing orders, with a special care for product transformations (like yarns into fabrics). When a transformation happens, it is important to get information about the features of the new goods (like technical sheet).

The management of logistic units (like pallets, boxes or envelopes, etc.) can be relevant in this scenario: a way to reconnect production batches and logistic units should be available when the goods are sent from one site to another one.

See Annex A, clause A.4.3 for an example in TRICK project.

5.3.4 Verification criteria and method

The verification methods are chosen depending on the objectives; they should ensure the conformity of virtual evidence with physical reality.

Verification methods may rely on certifications, third-party audits, assessment studies, or the achievement of Key Performance Indicators (KPIs), for example. What matters most is the availability of supporting evidence. To this aim, reference should be made to:

- Third- party Certifications with physical audit or test,
- Third-party documentation, like waybill,
- Self-declarations,
- IoT devices with automatic detection,
- Other technologies that can be integrated, like chemical tracers.

Furthermore, from the operations other supporting internal documentation should be chosen:

- transaction documents (preferably in standardised formats) produced during the business activities (despatch advice, receiving advice, commission orders, report of activities, invoices, etc.);

²² “Product Segregation refers to the process of physically separating certified materials from non-certified materials throughout the entire supply chain. In the case of the organic cotton t-shirts, using Product Segregation, an organic cotton farm’s harvest would be processed alongside conventional cotton in the same factory, but you could guarantee that the finished product contained a certain amount of organic fibers”. <https://trutrace.com/knowledge-hub/chain-of-custody-models-product-segregation-vs.-mass-balance#:~:text=Product%20Segregation%20refers%20to%20the.ability%20to%20enforce%20supplier%20participation>

- technical information sheets (for example: laboratory tests, technical sheets, bill of treatments and materials).

The relevant point of such documents is that they are exchanged between the parties at a certain time and, from the point of view of a traceability system, they should be consistent with each other. The documents at the base of the verification method should be structured in order to be automatically managed (XML or JSON) and standardized (eBIZ, UN/CEFACT, etc.).

The required trustability of the collected evidence can vary, and it is expected to be related to the defined claims.

The adoption of blockchain technologies, document footprint through hashing algorithms, or electronic signatures may ensure reliability, integrity, non-repudiation of collected information when exchanged among the supply chain actors.

See Annex A, clause A.4.4 for an example in TRICK project.

5.3.5 Definition of “to be” scenario, with expected functionalities and use cases

5.3.5.1 General

Starting from the “as is” supply chain and from the set objectives or claims, the “to be” picture of the supply chain can be defined, providing the flows of data and the most relevant documents and information for the expected scenario. The definition of the “to be” scenario is based on the following steps:

- Identification of relevant manufacturing steps along the supply chain in relation with the objectives or claims;
- Identification of the data responsible/owner;
- Definition of activity diagrams of the new scenario (where and how to collect operational data, where and how to collect supporting evidence);
- Choice of Events to trace at each phase of the supply chain and of related evidence;
- Identification of technical and organizational requirements characteristics for supporting tools (IT systems, procedures, etc.);
- Evaluation of traceability barriers and criticalities with mitigation action.

5.3.5.2 Identification of relevant manufacturing steps along the supply chain in relation with the objectives or claims

The relevant manufacturing steps for the data gathering should be chosen in relation to the objectives.

It is important to highlight where and how to gather operational data and related supporting evidence and also putting in evidence if they are internal or if they come from external sources.

It is advisable to keep a “reserve” with a multi-objective approach, i.e. to think about future developments to be gradually implemented.

The different levels of aggregation of the manufacturing steps are relevant to effectively support the management of information to gather. Table 5 shows a snapshot of a taxonomy of manufacturing

operation types, available on eBIZ Document Factory²³, pointing out the different levels of aggregation of the manufacturing operations. See Annex A, clause A.3.5.1 for the example in TRICK project.

Table 5 — Example of a hierarchical taxonomy of manufacturing operation types in textiles²⁴

Code	Table values
0	Fibres production
0.1	Animal fibres production
0.2	Plant fibres production
0.3	Production of man-made filaments and fibres
0.3.1	Raw materials for man-made filaments and fibres
0.3.2	Extruders
1	Yarn manufacture
1.1	Spinning Preparation for cotton fibres
1.1.1	Opening for cotton
1.1.2	Cards
1.1.3	Drawing machines for cotton
1.1.4	Lap winders
1.1.5	Combing machines for cotton
1.1.6	Roving frames
1.2	Spinning Preparation for wool fibres
1.2.1	Opening lines for raw wool
1.2.2	Raw wool scouring lines
1.2.3	Carbonising lines
1.2.4	Opening for wool
1.2.5	Worsted cards
...	...
1.3	Spinning preparation for blended fibres
1.3.1	Blending
1.3.2	Mechanical Blending
1.4	Spinning
1.4.1	Mechanical Spinning

²³ The eBIZ Document Factory is the set of open instruments, artifacts and resources organized available online. It has three main components: 1) a database, which collects and manages all the knowledge that is the core of eBIZ specification; 2) a web site, which provides all the specification elements and get their related documentation and resources; 3) a set of software tools. <https://www.ebiz.enea.it/eBIZ/imple/ebiztcu-draft.asp?lingua=en&modo=idm&nomenu=4&css=TRICK&sito=TRICK&contestoScelto=Tutti>

²⁴ <https://www.ebiz.enea.it/eBIZ/imple/eBIZTCU-Draft.asp?lingua=en&pag=6&nomenu=4&modo=d&tabe=139&sito=TRICK&css=EBIZ&contestoscelto=TRICK>

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5.3.5.3 Identification of the data responsible/owner

The data ownership is a pillar of the traceability system, to always take under control the data flows and related data sources. Data confidentiality and responsibility are key requirements to facilitate data exchange along the supply chain. Furthermore, data responsibility is a key concept of the incoming regulations.

It is important to define the entities (roles, organizations, departments, etc.) that are in charge of the data gathering for each of the entry points of the supply chain. The data owners should be clearly identified and enabled to define data disclosure policies applied to their own data.

In particular, it is advisable to highlight when the customer inserts data and documentation on behalf of its suppliers or subcontractors.

Moreover, a data disclosure mechanism should be identified to be activated when a supplier recognizes to its customer or potential customer the right to access to a set of data (e.g. to provide access to some product data during the negotiation phase or after the sale has taken place). This mechanism is functional to the supplier activation phase (see Figure 3).

See Annex A, clause A.4.5.2 for the example in TRICK project.

5.3.5.4 Identification of the adopted supply chain governance (where and how to collect operational data, where and how to collect supporting evidence)

The proposed approach to the traceability activities is based on the following assumptions:

- 1) any supply chain participant is committed to insert/upload its own data and should be able to define a disclosure policy for sharing them;
- 2) multiple uploads of the same data on different platforms should be avoided;
- 3) two mechanisms should exist:
 - a) interoperable traceability reporting from one organization/system to another one; the transfer of a summary of the traceability data about a batch or item of component or product should be facilitated so that the customer is able to recollect all the past history of its product and related components even if collected through different systems/platforms (in this way potential solutions lock-in can be averted);
 - b) dialogues between suppliers/subcontractors and (B2B) customers; on one side suppliers should be requested to provide data about supplied products; on the other side they should be able to authorize or acknowledge their customers for selective data disclosure, as a consequence of the supplier activation phase (see Figure 3).

In the following, the two kinds of approaches to traceability data gathering, depending on the involvement of each actor in the supply chain in the data collection:

- **Producer managed supply chain data gathering:** the actor responsible for the production or placing on the market (producer or Responsible Economic Operator, in the case of DPP) identifies and has a relationship with each actor of the supply chain to be traced (can be it has a subcontracting relationship with many of them). When the actor responsible for placing the finished product on the market (the producer or the Responsible Economic Operator) asks for the information each company is responsible for its own data and evidence and can share them according to established disclosure policies. Everyone involved in the productive process collects and registers somewhere its own product and process's traceability data (and sustainability data when the case).

- **Single tier managed data gathering:** the actor responsible for the production or placing the finished product on the market (the producer or the Responsible Economic Operator) or responsible for one phase (Tier-X) collects its own data and asks all the remaining to its direct suppliers (Tier X-1). The direct suppliers are in charge for providing all the information from their sub-suppliers and subcontractors.

In the following Figure 3 a very high-level representation of the required activities for these two approaches is provided.

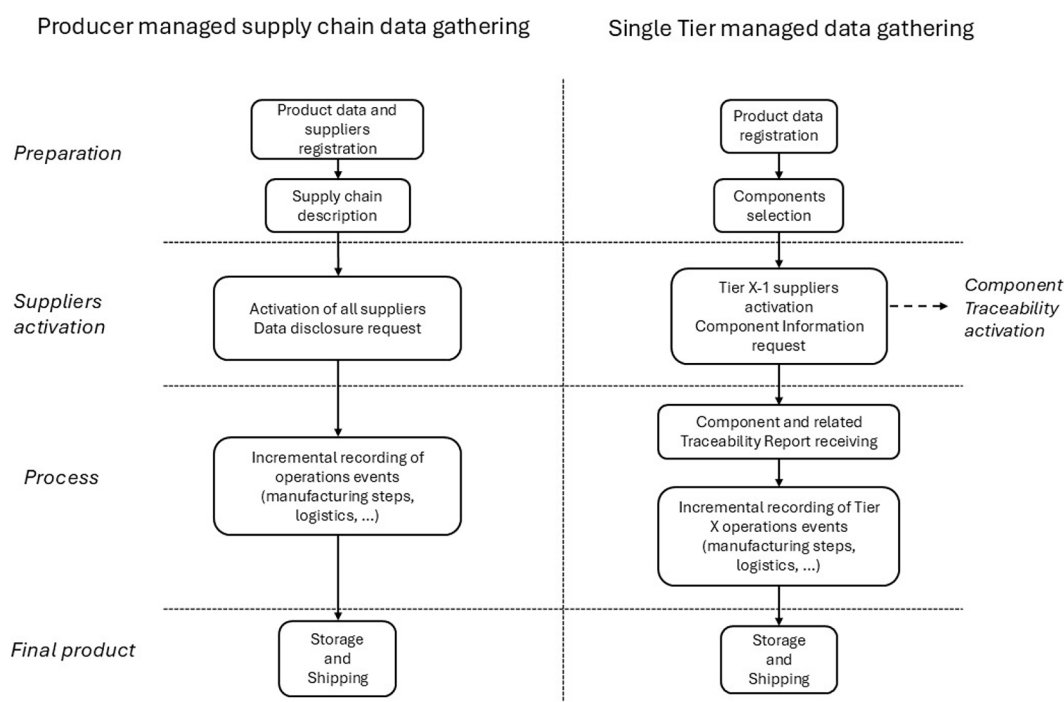


Figure 3 — Approaches to traceability data gathering related to supply chain actor involvement

Furthermore, there are two kinds of traceability topologies in the textile and clothing supply chains ecosystem (see Figure 4 and Figure 5):

- Mono-platform, when one platform collects all the data and is in charge for all the data exchanges.
- Multi-platform, when data can be collected through different platforms that are asked to co-operate by exchanging data on behalf of their customers. In this case the interoperability between the different traceability platforms is mandatory. Supporting this scenario is the only way to avoid that one supplier is forced to connect and insert the same data on different platforms.

See Annex A, clause A.4.5.3 for the example in TRICK project.

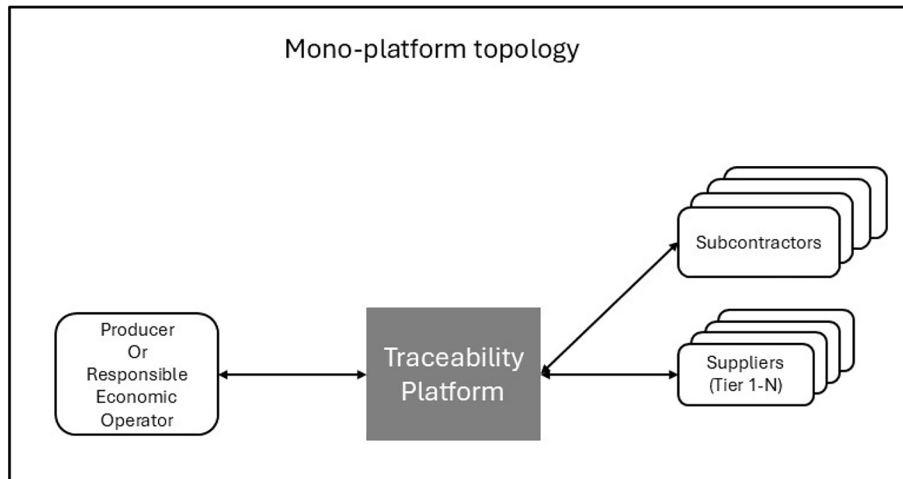


Figure 4 — Mono-platform topology

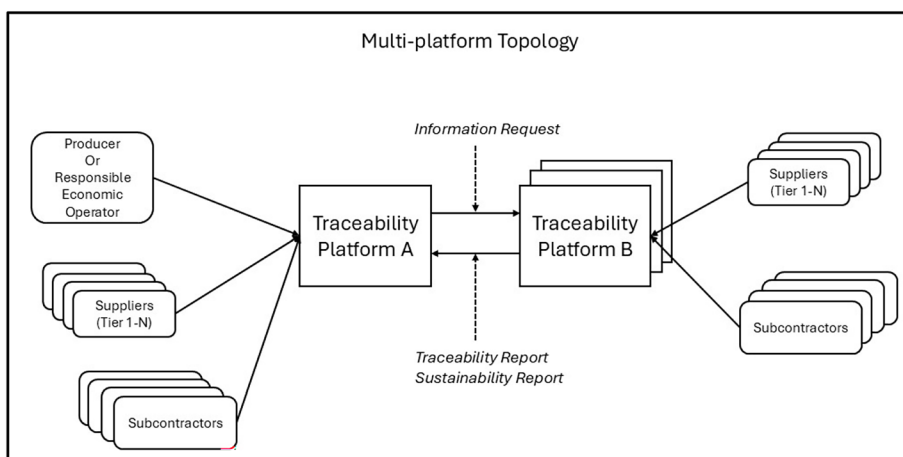


Figure 5 — Multi-platform topology

5.3.5.5 Choice of Events to trace at each phase of the supply chain and of related evidence

Once the supply chain has been analyzed and the traceable asset, the objectives, the actors, and the most relevant manufacturing steps have been identified, it is necessary to define the Events to be traced for each step and determine the related evidence to be collected (primary data, secondary data, certifications, logistic documentation, etc.).

Specifically, it is recommended to identify and track:

- at least one Event for each selected manufacturing step, and in any case, at least those involving a transformation of the product;
- at least one Event for each logistical transfer from one company to another.

It is important to emphasize that the evidence collected should be associated with each of the Events chosen to be traced. The concept of supply chain Event is very relevant in a traceability system: it was defined at first by GS1 EPCIS specification (see Annex E, clause E.3 for more details), then implemented by ISO (ISO/IEC 19987:2024), UNECE and eBIZ in their models. When approaching the Events choice, it is advisable to refer to this model.

See Clause A.4.5.4 in Annex A for a practical example of Events chosen for the experimentation in TRICK project pilots.

5.3.5.6 Identification of technical and organizational characteristics for supporting tools (IT systems, procedures, etc.)

The characteristics of the tools to consider for the setting up of a traceability system supporting the data collection for the DPP are strictly related to the objectives, the topology of the supply chain, and the level of digitization of the actors involved.

The characteristics can be organized in the following groups [8]:

- Functional characteristics:
 - Supply chain management,
 - Raw material certifications,
 - Logistic tracking,
 - Process and supply chain events (product material traceability),
 - Trustful sustainability (sustainability evidence and certification management),
 - Product authentication functionality,
 - Consumer engagement (basic/evolute²⁵),
 - Waste match making.
- Technological features for data ecosystem integration:
 - Blockchain data notarization,
 - API for massive automatic data input (product/events),
 - API for massive automatic data retrieval and/or consultation (system),
 - Support of multiple kinds of Unique product ID (GS1, GTS, proprietary format, others ISO 15459-6 compliant),
 - Granularity of the traced asset (model, batch, serial, logistic unit),
 - GS1 Digital Links web interface,
 - GS1 event XML format,
 - UNECE traceability reporting XML format,
 - Customizable data disclosure policy,
 - Certification management support.

²⁵ Basic: Landing page with information from the QRCode; Evolute: Engaging the consumer to give feedback, others (analysis of the consumer behaviour, etc.)

- Physical traceability features:
 - QRCode,
 - NFC,
 - Pigment and other chemical tracer,
 - Other physical tracer,
 - Proprietary scanning device required.
- Value chain characteristics:
 - Management of tier subcontractor,
 - Raw material extraction,
 - Raw material processing,
 - Material production,
 - Finished production assembly,
 - Office, retail, distribution center,
 - Consumer use,
 - Waste management collection and sorting,
 - Reuse, repair, repurpose,
 - End-of-life, Downcycle, incineration, landfill.

See Annex A, clause A.3.5.5 for the example in TRICK project.

5.3.5.7 Evaluation of traceability barriers and criticalities with mitigation actions

Starting from the analysis of the supply chain, with a focus on the roles and its main characteristics, it is important to highlight the main barriers and critical issues by preparing mitigation actions.

In a context of fragmented supply chains with a high level of opacity such as those of the Textile and Clothing sector, the strategies for involving suppliers and subcontractors should be evaluated very carefully.

Some examples of barriers and mitigation actions have been reported in Table 4.

See Annex A, clause A.4.5.6 for the example in TRICK project.

5.3.6 Identification of categories of information and of data flows

5.3.6.1 Overview of the categories of the information

Figure 6 shows the relationships among the most relevant traceability entities: it can be observed that the Event plays a central role in the schema, putting in relation information related to the Product and its Component, the Traceable Asset, the Process Step and its Location, and the related Supporting documentation, if any.

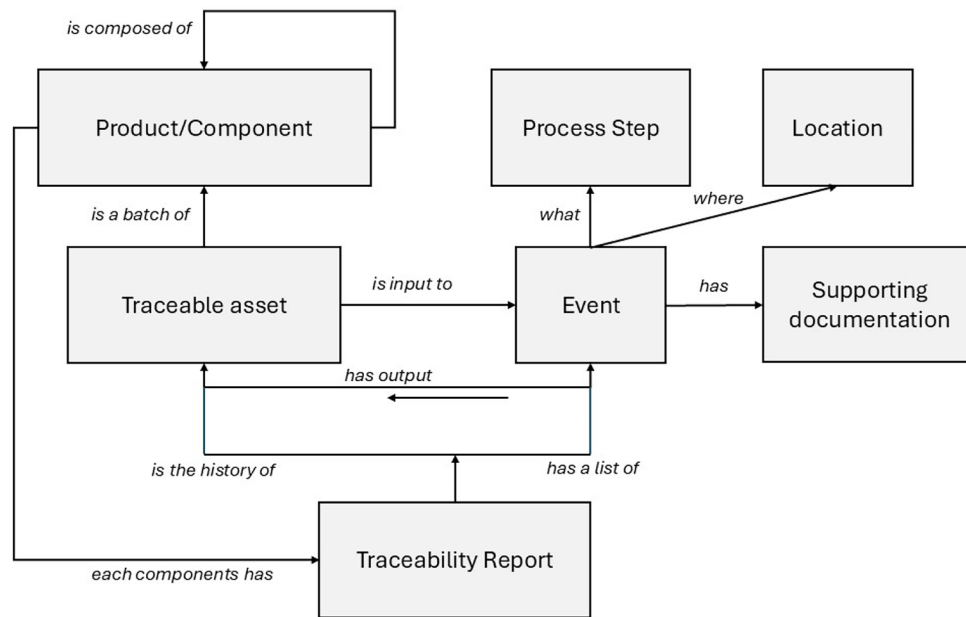


Figure 6 — The most relevant traceability entities and their relationships

An important role in the setup of a traceability system is played by the Traceability Report. It is a structured document (for example XML or JSON) that transfers in a structured way the complete set of the product traceability data.

More details about the Traceability Report can be found in Clause 5.6.3.1.

An example of the Traceability Report can be found in Annex C.

5.3.6.2 Data Flows

Once the supply chain has been analyzed and all the previous steps defined, it is necessary to identify the interfaces between the various actors, that is, those interactions between the various actors functional for the purposes of collecting traceability data. For each of the interfaces, it is necessary to identify the types of documents or information that are exchanged between the parties, indicating who sends the activation messages to the other party.

For further details, see the example in Clause A.4.6.2 of Annex A. Moreover, Annex B provides the activity diagram of the traceability workflow in TRICK pilot.

5.4 Step 4: Sustainability data gathering

5.4.1 A common pattern for many expert-based sustainability domain processes

The collection of sustainability data related to a product is often driven by the need to meet certification requirements or conduct assessments based on specific methodologies, such as PEF or LCA. This process typically requires the involvement of a third party — such as experts, auditors, or reviewers — to validate the data and verify the results of the evaluation study (e.g., SA8000, PEF, circularity indicators).

A structured process pattern, referred to as the “consultancy pattern,” can be defined for sustainability data collection. It involves one or more external parties outside the supply chain and includes the main actors responsible for providing the data — typically the producer and their suppliers or subcontractors.

Particular attention should be paid to the **quality of the data** (primary vs. secondary, measured vs. estimated, complete vs. partial) and the method used to obtain and validate it. **Data granularity** should align with the intended goal of the assessment. Furthermore, when multiple actors across a supply chain

are involved, **data disclosure** can be limited to the designated third party based on a need-to-know principle, with only summary indicators shared between the parties (indicators declarations).

Figure 7 illustrates an application scenario of the consultancy pattern for data collection aimed at producing an assessment study, involving both an Expert and a Reviewer. The process includes iterative data collection steps for submission to the third party. It can be observed that Expert is allowed to access disclosed suppliers' data only after that Supplier activation phase happens.

The example in TRICK project can be found in Clause A.5.1 of Annex A.

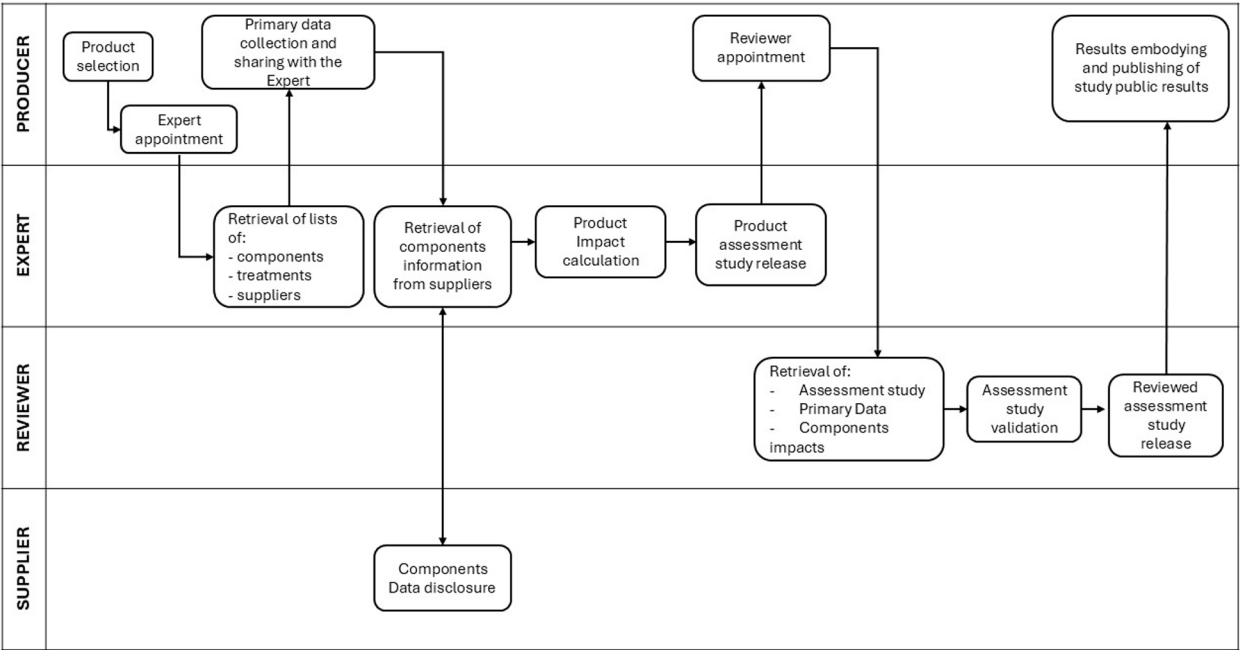


Figure 7 — Example of consultancy pattern scenario

5.4.2 Workflow

Figure 7 can be further detailed following the example provided in Annex A, Clause A.5.2. Figure A.7, which is its specialization.

A relevant instrument to collect and organize the gathered sustainability data is the Transparency and Sustainability Report, which structure and functions are detailed in Clause 5.6.3.2.

5.4.3 Overview of the categories of the information

The main entities related to sustainability are shown in Figure 8, together with their relationships.

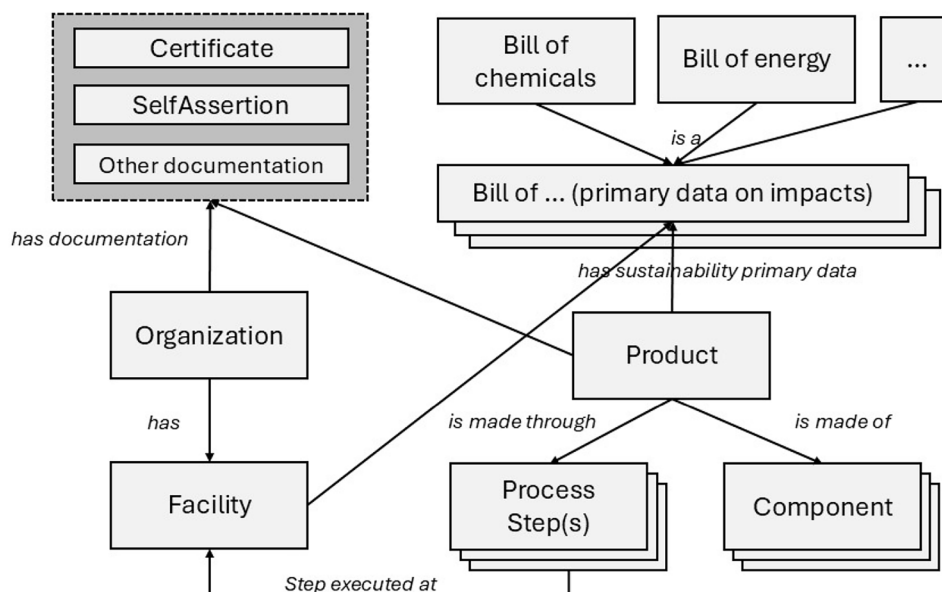


Figure 8 — The most relevant entities on sustainability and their relationships

It can be noticed that some entities are the same as the ones related to traceability shown in Figure 6. As a result, the two sets of categories of information have been modelled to be harmonized and reused for different purposes.

As an example, the identified main concepts and entities presented in the following Table 6 come from TRICK project domain, where the data structure was designed with the aim to reuse the entities in different contexts and for different purposes (i.e. for circularity assessment of the material or for the request of the Preferential Certification of Origin).

Table 6 — Usage of main defined entities for traceability and sustainability at different levels (product, organization, facility)

Category of information	Traceability	Circularity and Sustainability
PRODUCT		
Product identification	X	X
Bill of components	X	X
Composition	X	X
Origin	X	-
Process step list	X	X
(scope) certificate	-	X
Self-Assertion	X	X
Assessment study document	X	X
PRODUCT SUSTAINABILITY CHARACTERISTICS		
Bill of material	-	X
Bill of chemical	-	X

Bill of waste	-	X
Bill of direct emissions	-	X
Bill of energy	-	X
Bill of used water	-	X
Bill of treatments	X	X
Bill of transport	X	X
Internal wastewater treatment plant	-	X
ORGANIZATION		
General data	X	X
Self-Assertion	-	-
(scope) certificate	-	-
List of Facilities	X	-
FACILITY		
General data	X	X
Process step list	X	X
Self-Assertion	-	X
(scope) certificate	-	X
Assessment study document	-	X
Bill of waste	-	X
Bill of direct emissions	-	X
Bill of energy	-	X
Bill of Used Water	-	X

5.5 Step 5: Reference collaborative processes for data gathering

5.5.1 General

In this section the descriptions of the reference collaborative processes for traceability and sustainability data gathering are provided. They are not intended as mandatory specifications but as indication of the relevant collaborative processes for the traceability and sustainability data gathering.

5.5.2 Upstream processes (Data collection from the suppliers)

5.5.2.1 General

The representation of the inter-company collaborative processes proposed in the following is based on the most recent draft of CEN CWA eBIZ Upstream model, developed during the TRICK project.

Having a shared understanding of collaborative processes (referred to as a *scenario*), including the related activities (composed of transactions that correspond to documents or messages) and messages to be exchanged, simplifies the setup of collaborations and helps reduce misalignments and misunderstandings.

The main reference process “Traceability for Sustainability” is presented together with its activities in the following tables and figures. It can be considered as an example on how the process of traceability and sustainability data gathering can be implemented: based on these models, companies and their technology providers can choose to adopt them fully or partially, or develop custom variants tailored to their specific needs (according to eBIZ). This process representation can be encoded in XML or JSON format.

5.5.2.2 Traceability for Sustainability process

The collaborative process “Traceability for Sustainability” has the aim of supporting the data collection from the activities of a supply chain with several actors on a common IT infrastructure, starting from the supply of the raw material up to the Consumer.

The process is composed by the following activities, which define the interaction between two or more actors and identify the kind of data exchanged among the parties, providing the related business documents (available in XML and JSON formats):

1. Products, processes and facilities static data collection,
2. Incoming material,
3. Outsourcing of processing to Subcontractor,
4. Subcontracted activity notification,
5. Supply of component or product,
6. Synchronizing APP for Consumer.

In the following tables and figures the characteristics of the listed main activities of Traceability for Sustainability process are presented. The links in the tables, where present, provide the representation proposed by the last draft of CEN CWA eBIZ specification for each transaction.

Table 7 — “Product, processes and facilities static data collection” activity

Process activity	Product, processes and facilities static data collection
Description	Collection of all the static data that are data related to the Product, Processes and Facilities (related to the model, not to the single batch or item). The data can be uploaded with an incremental approach. The data is sent from the Producer and collected on an eService Platform. <u>Precondition:</u> A product to be tracked has been identified and its features and processes are known.
Transactions	1. Party information 2. Fashion Catalogue 3. Transparency and Sustainability Report

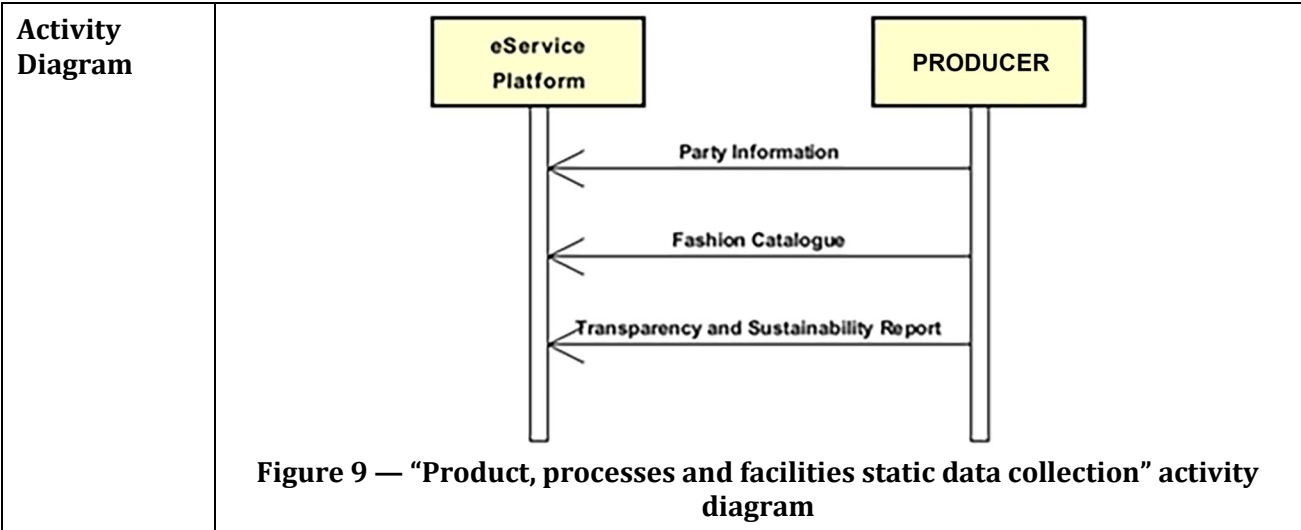


Table 8 — “Incoming material” activity

Process activity	Incoming material
Description	Data exchange between Material Producer, the eService Platform and the Producer (for example Fabric producer or Yarn supplier) related to the information of the supplied material. <u>Precondition:</u> A supply order should exist. The supplied material should be known by the recipient system
Transactions	1. Traceability Receiving advice 2. Document availability advice 3. Traceability Despatching advice 4. Traceability Despatching advice 5. Traceability Report 6. Document availability advice

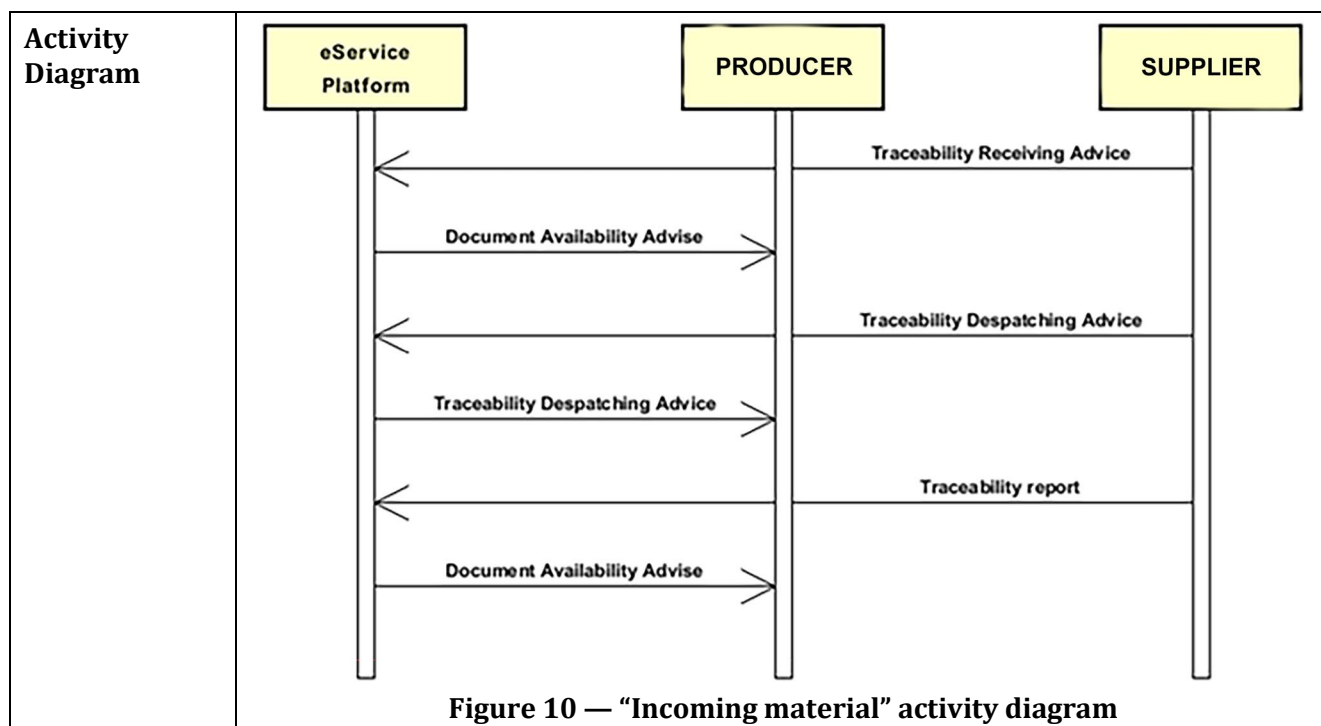


Table 9 — “Outsourcing of processing to subcontractor” activity

Process activity	Outsourcing of processing to subcontractor
Description	Information and document exchange among Subcontractor, eService Platform and Producer <u>Precondition:</u> A commission order should exist. Both components and product should be already known by the recipient systems.
Transactions	1. Traceability Despatching advice 2. Traceability Despatching advice 3. Traceability Receiving advice 4. Traceability Report 5. Document availability advice 6. Traceability Despatching advice 7. Traceability Despatching advice 8. Traceability Receiving advice 9. Textile Invoice 10. Document availability advice

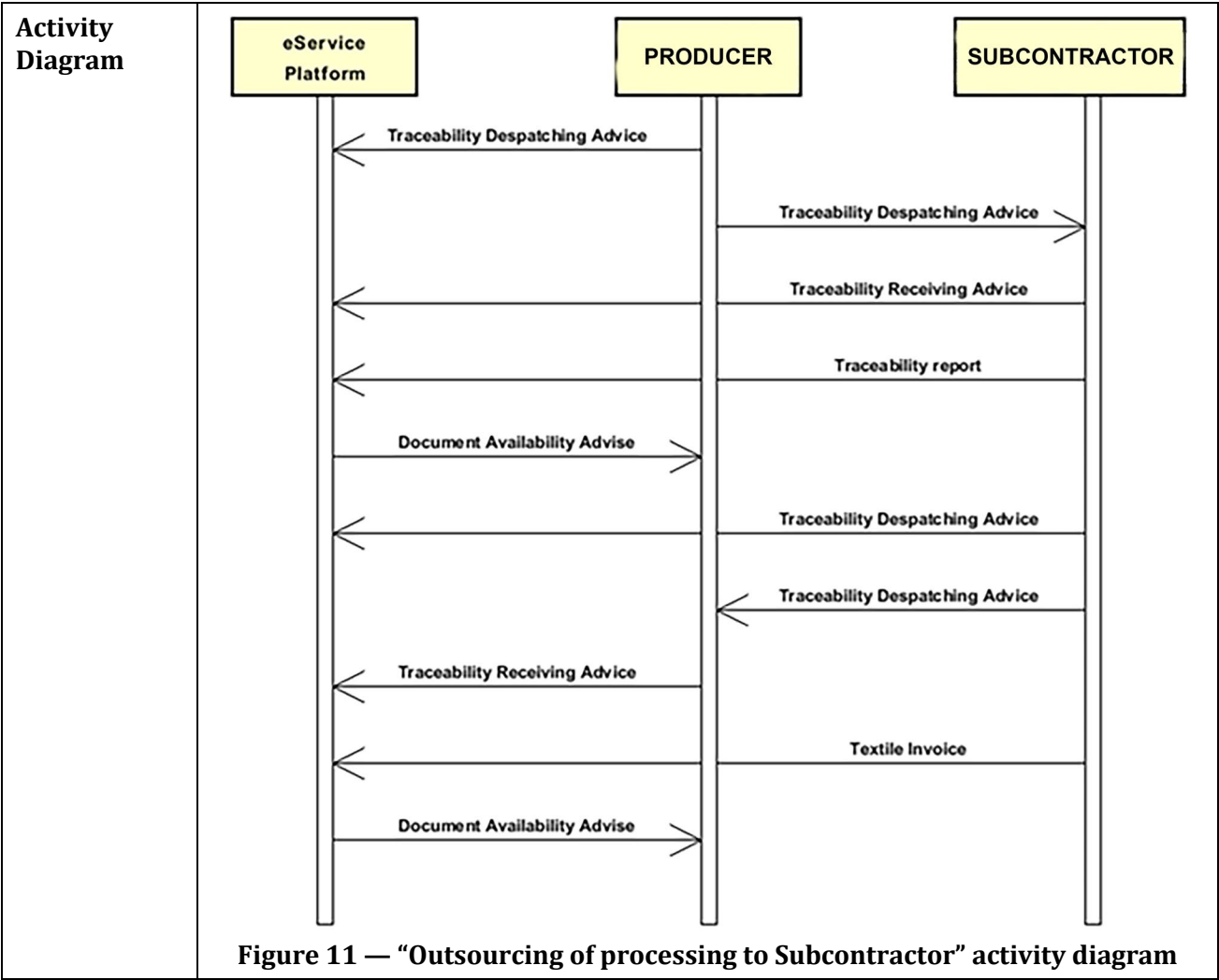


Table 10 — “Subcontracted activity notification” activity

Process activity	Subcontracted activity notification
Description	Information and document exchange between the Producer and the eService Platform related to Subcontractors’ activities. Subcontractors, in this case, are external to the platform, and the Producer notifies the platform on their behalf. <u>Precondition:</u> The Producer knows components data. Both components and product should be already known by the recipient systems.
Transactions	1. Traceability Despatching advice 2. Traceability Receiving advice 3. Traceability Report 4. Textile Invoice

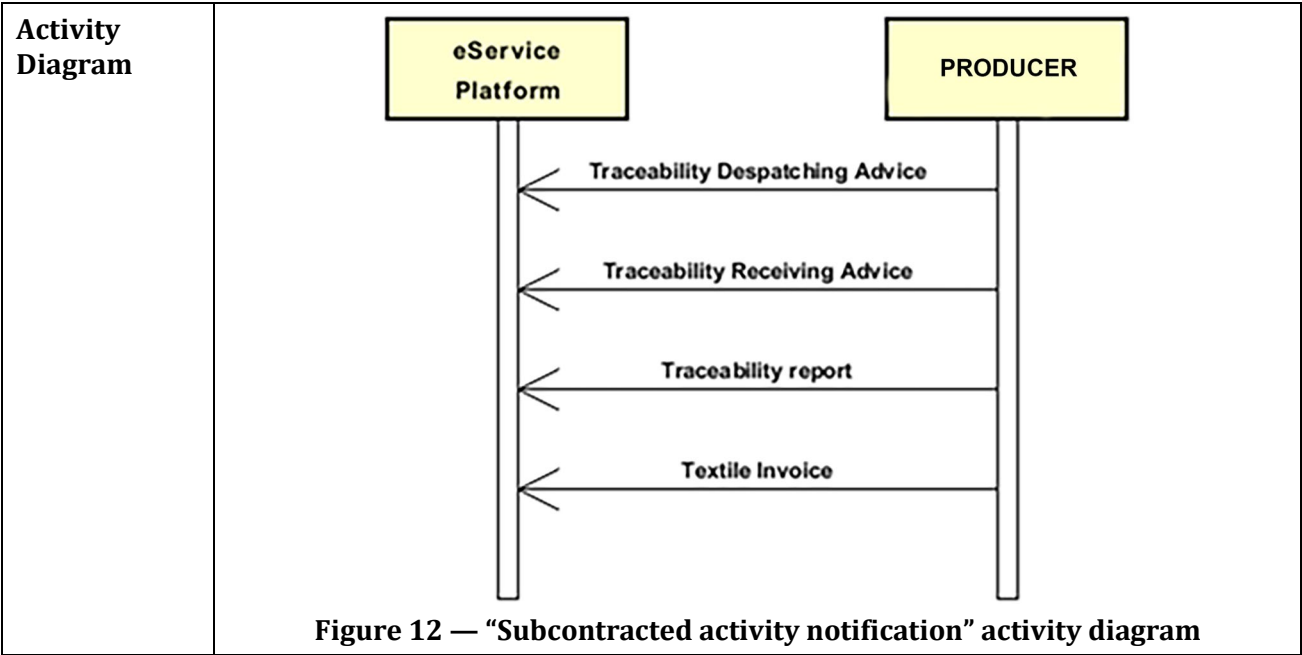


Table 11 — “Supply of component or product” activity

Process activity	Supply of component or product
Description	A product (for example yarn or fabric) is supplied to a Buyer that, in turn, is a Producer of something (for example fabric or garment). <u>Precondition:</u> The product should be already known by the recipient system.
Transaction	1. Traceability Report 2. Document availability advice 3. Traceability Despatching advice 4. Traceability Despatching advice 5. Traceability Receiving advice 6. Textile Invoice 7. Document availability advice

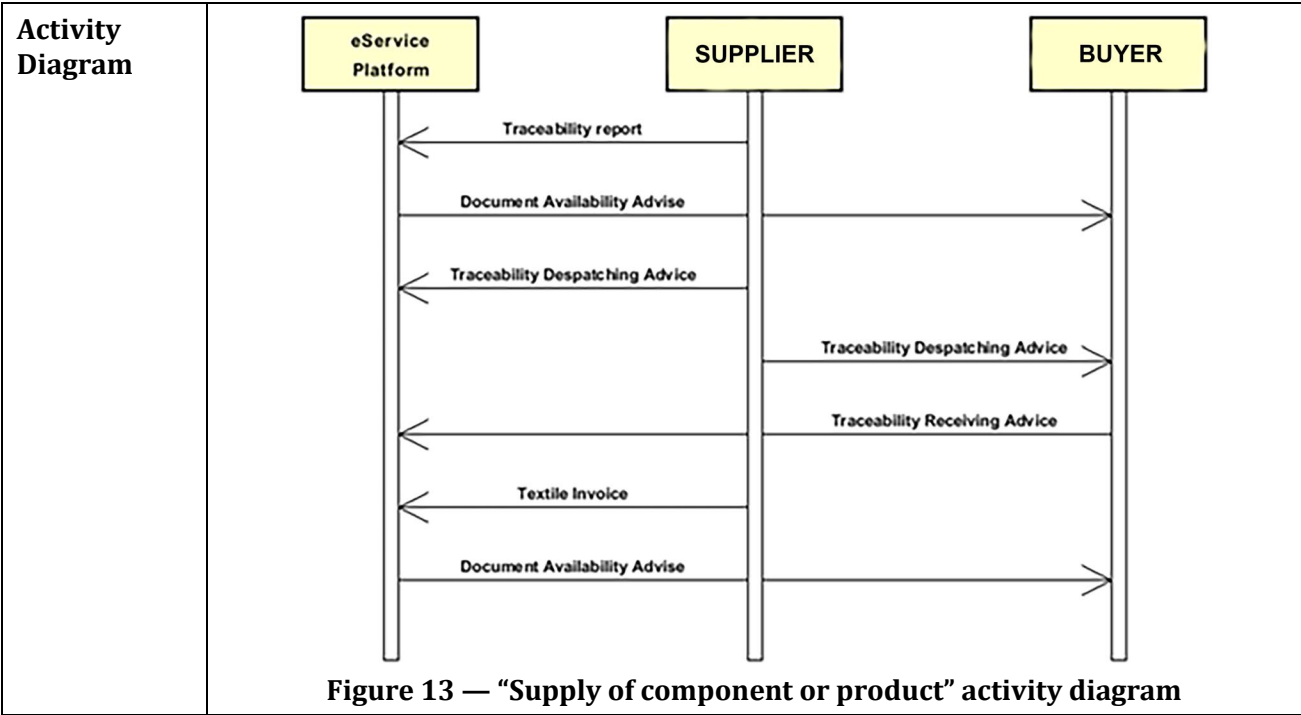


Table 12 — “Synchronizing APP for Consumer” activity

Process activity	Synchronizing APP for Consumer
Description	The traceability and sustainability data relating to a product are synchronized between the eService platform and the Consumer APP <u>Precondition:</u> All the data related to the product should have been collected and the product is ready for the Consumer.
Transaction	1. Information for consumer
Activity Diagram	Presently Not available

5.5.3 Downstream processes and closing the cycle

5.5.3.1 Downstream reference processes

The following diagram illustrates the downstream processes for post-consumer textile waste, beginning when a finished product is disposed of and collected.

Before reaching its end-of-life, an item may remain in the use phase through repair or reuse. Once disposed, the first sorting stage determines whether the product can be reintroduced into the reuse value chain or directed to recycling, landfill, or incineration.

For the recyclable share, fibre sorting and pre-treatment are crucial steps to ensure the materials meet recyclers’ specifications. Circular value chains aim to keep textiles in circulation for as long as possible, in line with the waste hierarchy.

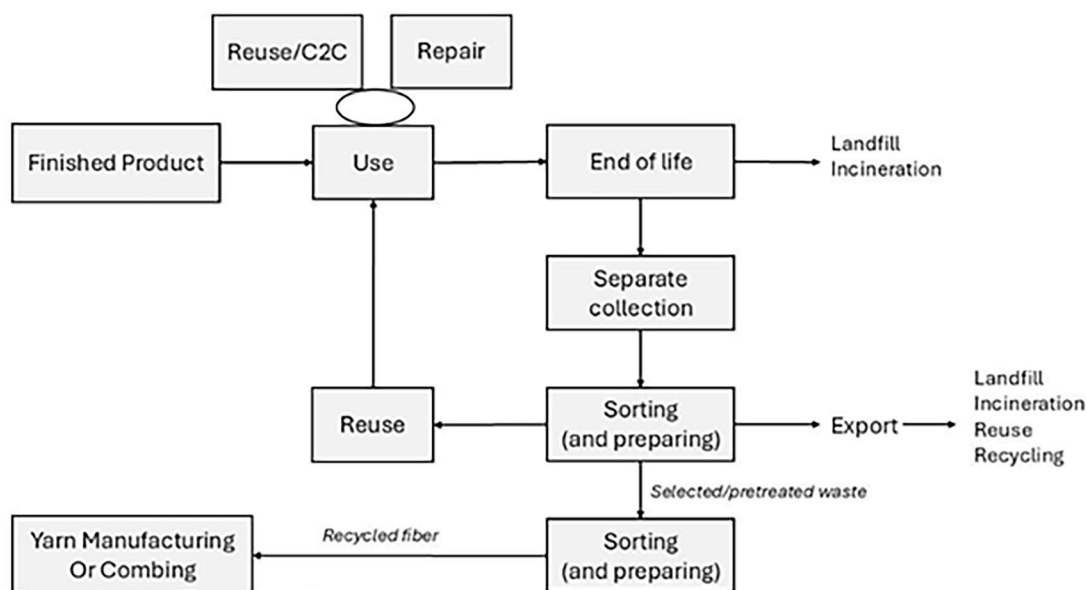


Figure 14 — Post-consumption scenario (an elaboration on Cisutac project’s system boundaries scenario post-consumer textiles)²⁶

5.5.3.2 Recycled fibre from waste supply process

This is the process that occurs after the Use phase. It has been modelled with two activities involving the actors of the supply chain involved in transforming textile waste into recycled fibre. The model is assumed to be demand-driven, with the selection of fiber for recycling based on a request from the Brand/Yarn producer or the Recycler.

The processes from Finished product to Use (sales, retail, consumption patterns, end-of-use, end-of-life) are beyond the scope of this CWA.

In the following Table 13 and Table 14 the main activities of Recycled fibre from waste supply reference process, with related transactions and activity diagrams, are described.

Table 13 — “Supply of recycled fibre” activity

Process activity	Supply of recycled fibre
Description	The Brand/Yarn Producer requests a quantity of recycled fibre from the Recycler. The Recycler requests the feedstock from the Sorter. The parties exchange pieces of advice related to acceptance/refusal of the requests and to the dispatching of the feedstock and of the recycled fiber. If the Brand is not the Yarn Producer, then the Recycler should send a dispatching advice and the information of the recycled fiber also to the Yarn Producer. <u>Precondition:</u> The Brand/Yarn Producer should have defined the characteristics of the feedstock and should have identified the Recycler.
Transaction	1. Recycled fibre request 2. Request Acceptance/refusal advice

²⁶ Cisutac Deliverable D2.1 Circular transition scenarios and software for post-consumer textile waste channelling, <https://www.cisutac.eu/deliverables>

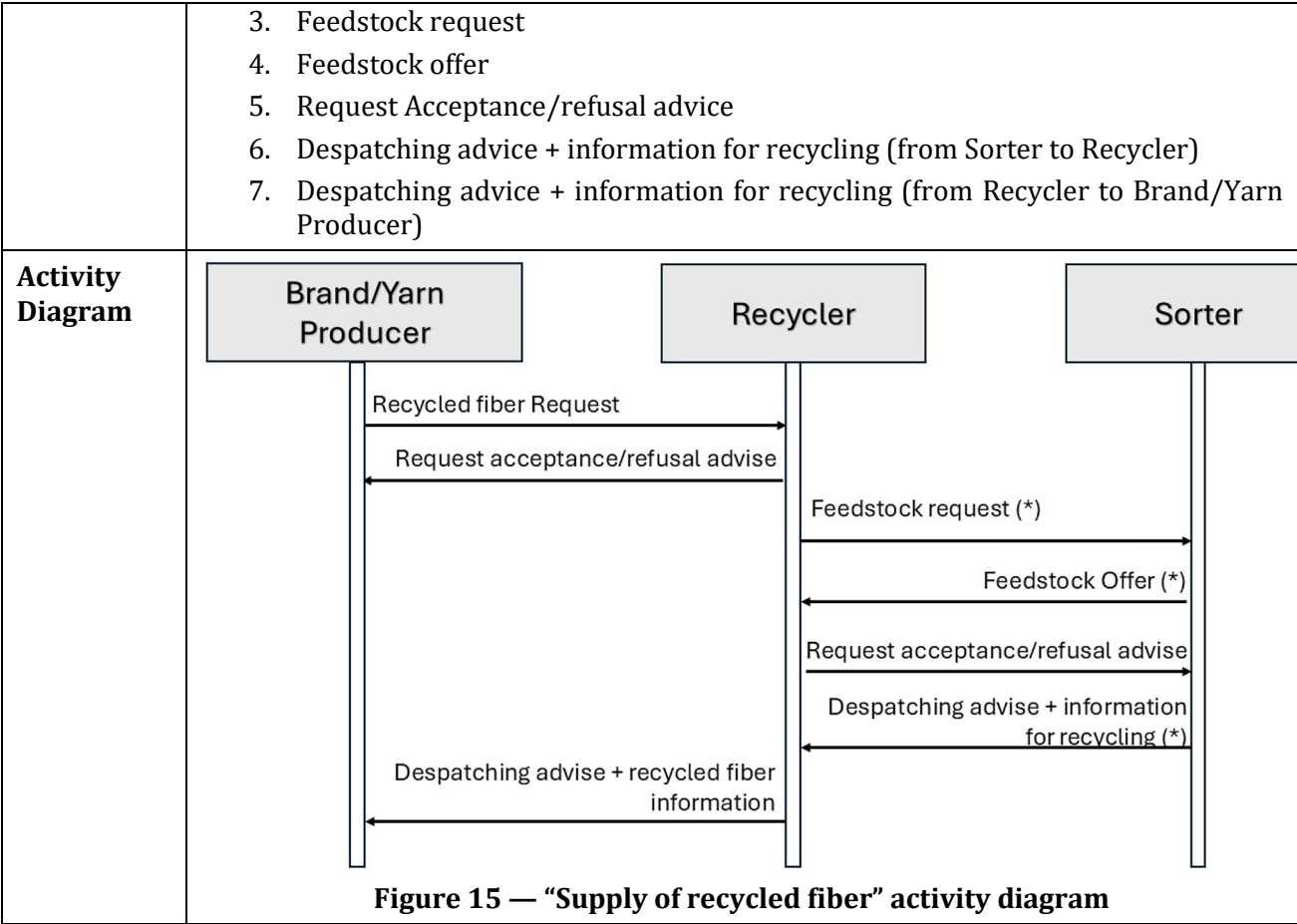
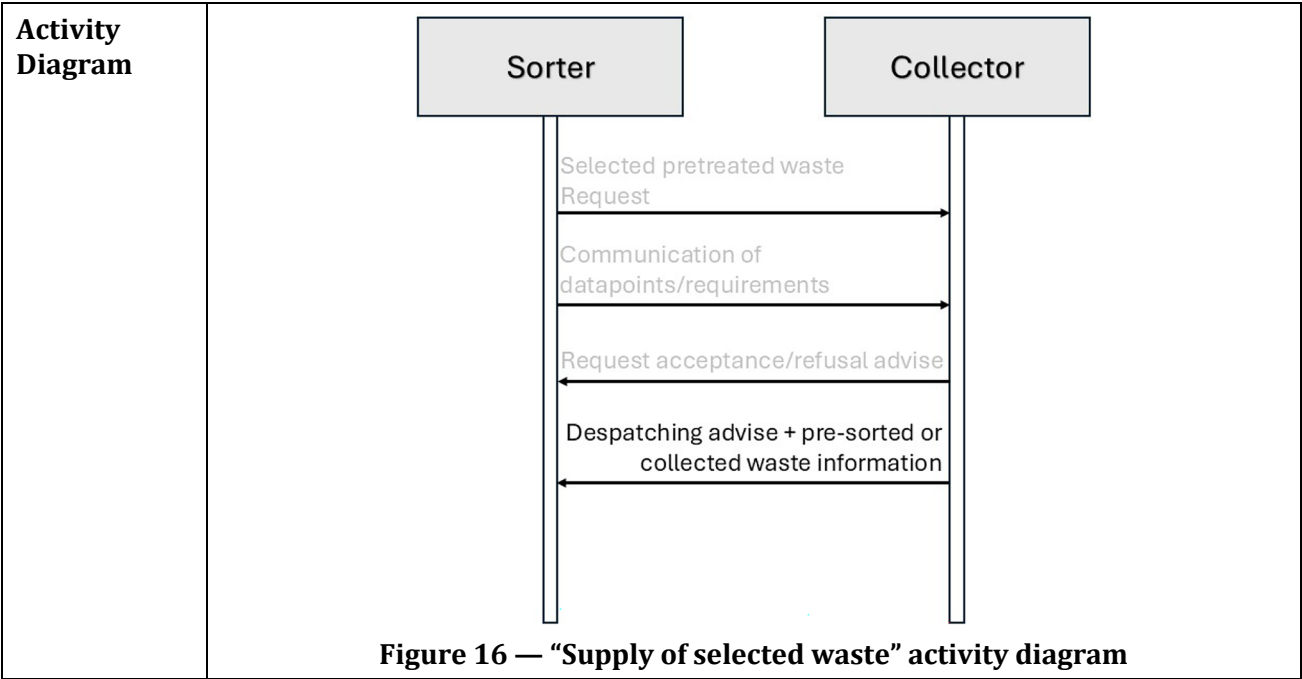


Table 14 — “Supply of selected waste” activity

Process activity	Supply of selected waste
Description	Data exchange between Sorter and Collector, assuming that they are different parties. In this case they should exchange at least the Despatching advice plus information about pre-sorted or collected waste.
Transaction	Despatching advice plus pre-sorted or collected waste information



5.5.3.3 Cisutac data point for reuse, repair and recycling

The CISUTAC Decision Support Tool has identified a wide range of data points important to enable circularity. In fact, up to 22 specific data points have the potential to improve and accelerate the transition of post-consumer textile waste into reuse, repair, and recycling markets (see Table 15 below).

The relevance of specific data points varies across reuse, repair, and recycling, though some input data are universally important. For reuse and repair, access to data like price and brand that can enhance the sector's ability to respond to market dynamics and shifting trends. These data points support the development of targeted take-back schemes and more effective resale and repair models, particularly in e-commerce.

In contrast, recycling processes - especially high-quality mechanical or chemical recycling - require detailed and technically specific information. Key data points include full fibre composition, recycled content, and textile finishing; the details are essential to support the scalability and efficiency of textile recycling systems.

The example below in Figure 17 shows how complex a textile product can be. To determine if a wind jacket is suitable for recycling, a recycler would need at least 8 specific data points to sort it correctly.



Figure 17 — An example of a complex textile product is one where a sorter would need at least eight specific data points to properly sort it for recycling.

Table 15 — CISUTAC 22 data points for reuse, repair and recycling

Data Points	Description	REUSE Recommended datapoints for scaling	REPAIR Recommended data points for scaling	Recycle Recommended datapoints for scaling
Condition	Setting the quality levels for the post-consumer textile waste	x	x	x
Product construction (mono material and multi material)	Describes if it is one or more materials in the product; 2 options: mono or multi			x
Multilayer (coating or membrane)	Describes if it is a coated or laminated material			x
Chemical content	Yes or No option with focus on SVHC substances	x	x	x
Production year	Relevant for reuse, trend and chemical legislation	x		
Production type	14 different type of products that follows the code system from import	x	x	
Brand	Important for second hand and durability as well as trend	x	x	

Price	Relevant for second hand market, focus on recommended market price	x		
Product gender	Relevant for second hand market, we used women, men, unisex, junior and kids	x		
Repairability	Information on how to repair and if it is possible on certain products		x	
Durability	Relevant and measurable data on pilling, abrasion and tearing	x	x	
Fiber composition	The blend of fibres in the fabric, the tool focus on 2 main fabrics	x		x
Recycle content	Percentage of recycle fibre in the yarn, focus on cotton and polyester			x
Recycle method	Type of recycle method that is used for the fibre			
Textile Finishing	All treatments of the textile such as dyeing, chemicals for function, finishing	x	x	x
Fabric construction	Construction of the fabric that indicates the surface that can affect recycling			
Fabric colour	4 types of groups such as bright, dark, light and multi	x		x
Textile Fiber	Construction of the fibres such as length and fineness			
Fabric weight	Weight in gsm, useful data for some recycle methods			

Disruptors	Yes or No option for hard parts or trim on product			x
Product disassembly	Indicates if the product can be taken apart or have an easy way to take away		x	x
Certificate	Different levels of verified certifications to be used for traceability			

5.5.3.4 Increase Knowledge on Circularity Data

The Cisutac tool identified 22 data points in total. Up to 17 specific data points have the potential to significantly improve and accelerate the transition of post-consumer textile waste into reuse, repair, and recycling markets. Additional 5 data points are good to have for future improvements. See more in Table 16 below.

Table 16 — Recommended 17 datapoints for scaling - Reuse, Repair, Recycling

Condition	Repairability	Recycle content
Product construction	Durability	Textile finishing
Multilayer	Fiber composition	Fabric colour
Chemical content	Product type	Disruptors
Production year	Brand, Price	Product disassembly
	Product gender	

Further insights from the CISUTAC tool and project is that access along the value chain of 10 data points are good as a starting point to increase reuse, repair and recycling.

Table 17 — CISUTAC insights on starting point

Condition Chemical content Production year Product type Brand Price Product gender Fiber composition Textile finishing Fabric colour

5.5.3.5 PESCO-UP data model for recycling

The PESCO-UP project has developed a dedicated data model aiming to improve the efficiency of textile-to-textile recycling. Its purpose is to define harmonized way of presenting information on non-reusable

post-consumer textiles, excluding shoes and accessories, that go through a series of processes including sorting, feedstock preparation and recycling. The model builds on existing standards where possible to ensure consistency and interoperability across the recycling value chain.

It focuses on data relevant to the identification, sorting, and processing of textile materials, while also addressing requirements for sensor-based technologies that can automatically detect and record material characteristics. The model will be integrated into a marketplace service designed to enhance traceability and verification of recycling feedstock.

The PESCO-UP data model structures information across the main processes involved in preparing non-reusable textiles for recycling, including:

- **Sorting for recycling:** Captures data on fibre composition, colour, textile structure, and contaminants that should be controlled or kept under a specific limit. At this stage, the use of digital and automated technologies is crucial to generate precise and consistent inputs.
- **Feedstock preparation:** Covers the intermediate steps between sorting and textile-to-textile recycling. The focus here is on ensuring that materials meet the required recycling specifications before entering the recycling process.
- **Recycling:** Involves the separation and breakdown of textiles into fibres, other raw materials and output streams. Recycling input specifications define the materials characteristics and minimum data requirements, which should be met at the previous stages to ensure compatibility.

Across all stages, the data model facilitates digital information exchange between actors in the value chain. By standardizing material characteristics and process requirements, it ensures that input specifications consistently match the needs for recycling feedstock.

The data models co-developed by PESCO-UP partners, both within and beyond the project, are designed to support each step of the recycling value chain and provide crucial information for priority circular use cases in textiles. For the purposes of the PESCO-UP use cases, the required data is divided into four groups:

- **Entity and facility data**
- **Batch data**
- **Input and output specification data**
- **Interpreted sensor data**

Examples of the data points per data group are detailed on Figure 18.

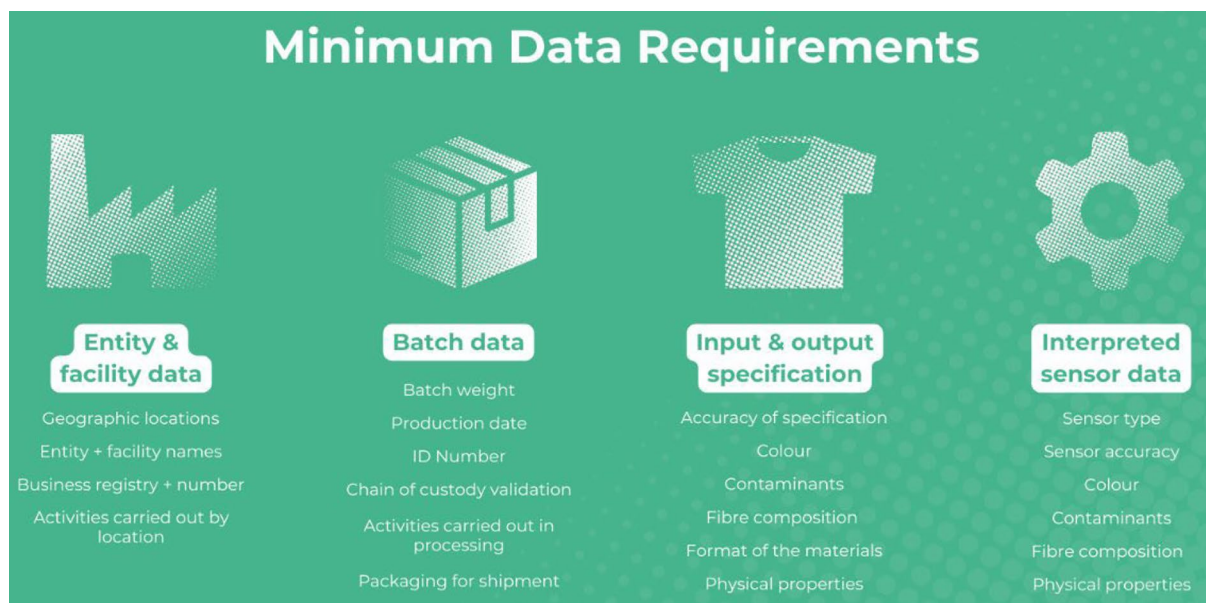


Figure 18 — PESCO-UP minimum data requirements

At the time of writing this document, the detailed results were not yet publicly disclosed. However, they will be made available in the project deliverable **D2.1 “Requirements for Imaging and Data Technologies**.

5.5.3.6 PESCO-UP and TRICK data model comparison

In the context of the TRICK project, the PESCO-UP data model was mapped against the TRICK data model to explore complementarities and potential synergies. The outcomes of this mapping exercise are publicly available in the Deliverable D7.8 “Relation and exchange with other projects” [9].

The comparative analysis between the two models, as documented in D7.5 and summarized in the annexes, provides insights into how process-oriented and actor-oriented approaches can be aligned to strengthen data interoperability across the textile recycling value chain.

The PESCO-UP and TRICK projects address textile recycling data from different yet complementary perspectives. PESCO-UP adopts a process-oriented approach, focusing on the technical steps of material transformation and the associated data flows, particularly the transmission of batch-level information on sorted and prepared feedstocks supplied to recyclers. In contrast, TRICK emphasizes an actor-oriented perspective, grouping technical operations under the roles of entities such as waste managers and recyclers, and modelling the exchange of information between them. In this framework, recyclers request prepared feedstocks with specific characteristics, while waste managers provide the corresponding materials. A comparative analysis of these approaches highlights potential synergies, combining the process-based focus of PESCO-UP with the actor-based dynamics of TRICK to more comprehensively represent data flows across the secondary material supply chain.

The result of this comparison will be used to complement the work of the ECOSYSTEX working group TG5 Circular Textile Data, which first results will be publicly available by 2026.

Regarding the collaboration between both data models, a first conclusion is that the TRICK dictionary could be revised to include some new terms and groups in the feedstock request process, that has happened with the last updates of the dictionary and data structures. On the other side the infrastructure of TRICK could provide the PESCO-UP project with a well-documented and structured framework for data flows between the actors, with a hierarchical and multilevel data structure that could support the exchange of the same information foreseen for PESCO-UP. Such data structures can be represented indifferently as XML Schema or JSON Schema.

5.6 Step 6: Data model for traceability and sustainability data gathering

5.6.1 Answering the needs

The data structures defined in the data model proposed by this CWA had been thought to comply with the specifications and needs identified in clause 4.2 and support the transmission of extensive and detailed information collected from the various actors of the supply chain. These structures should enable data reuse for multiple purposes and facilitate sharing across different organizations and systems, thereby ensuring semantic interoperability among heterogeneous environments. Furthermore, the data structures should support the provision of information necessary for Digital Product Passport (DPP) data collection, in line with emerging regulatory and industry requirements.

It is essential that the structures also incorporate mechanisms for clearly defining data ownership and responsibility throughout the data gathering process. This is particularly relevant in complex supply chains, where, for instance, a subcontracting organization may enter data on behalf of subcontracted entities.

Referring to the needs introduced in clause 4.2, the characteristics of the data model proposed in this CWA that respond to them are illustrated in the table below:

Table 18 — Characteristics of the proposed data model to deal with the identified needs

Need	Solution
Holistic Data Model	The proposed data model has been designed to be holistic. It manages traceability and sustainability data gathering structured to be reused for different purposes (PEF, circularity assessment, S-LCA, health protection assessment, PCO). The data structure is designed to support every actor of the supply chain in approaching an effective traceability and sustainability data gathering.
Data granularity level	The proposed data structure is able to manage information at different levels, thanks to the approach based on eBIZ specification, which rules message exchange between the different actors of the supply chain
Identifiers	Multiple identifiers are allowed when different identifiers come from different numbering organizations for the same product ²⁷ (max 2)
Confidentiality levels	The proposed data structure allows specific statements to declare the policies to apply to the data at different granularity levels. These statements concern operational instructions for storage, disclosure, and data interpretation. For example, the "disclosureLevel" statement indicates the disclosure policy for each block of information; the "limitedByDisclosureIndicator" statement indicates whether the content has been restricted by the enforcement of accessibility rights (i.e. it might be not complete).
Data responsibility	Description of the entity responsible for data uploading, even in case of subsidiary filling (for example by a Producer on behalf of its Subcontractor)

²⁷ <https://www.ebiz.enea.it/moda-ml/repository/dizionarioNEW/detail.asp?contestoScelto=TRICK&css=EBIZ&sito=TRICK&lingua=en&idtipo=2197&idtag=1199&tagName=ProductIdentification&ti=Element&dsn=moda-ml-diz-Draft>

Plurality of actors	The data model is thought to manage several manufacturing party roles (as shown in the eBIZ T310 decoding table ²⁸)
Data accuracy	When reporting data that includes quantitative values (e.g., energy consumption, waste generation, etc.), the option to qualify the data is provided. This includes specifying not only the unit of measurement, but also the reference year and the “validation method”, that is the type of method used to obtain the quantity to which it refers. For example, it indicates whether it was measured in the field, estimated indirectly, approved by an expert or taken from the literature.
Blockchain neutral	Data integrity and immutability through neutral support to blockchain technology: the data model foresees specific data structures to manage the proof of data on the blockchain. This happens through the registration on-chain of few factual data and in large part Hash codes of XML documents stored off-chain. Blockchain neutrality is assured by a mechanism of interoperability between different blockchain implementations [10][11]
Incremental data collection	The Traceability report and the Transparency and Sustainability report are built to be filled with an incremental approach (see clause 5.6.3.1 and 5.6.3.2)

5.6.2 Main data structures

5.6.2.1 General

The data model introduced in this CWA is an abstract event-based data model, represented through automatically generated XML and JSON Schemas associated with business documents that can be exchanged within transactions between the different parties involved in the supply chain.

The starting point for the approach to the analysis and definition of the data structures presented in the following had been the reference to existing specifications (CEN CWA eBIZ, UNECE/UNCEFACT, EPCIS event-based model promoted by GS1) and their key points relevant for the objectives of this CWA. In details:

- eBIZ supports ordinary technical sheets and catalogues, business operations (supplying, subcontracting, etc.). Thanks to the activities carried out mainly during two European projects (eBIZ-4.0 and TRICK) its new draft version has been enriched with aspects related to traceability and sustainability, providing specification representation through XML Schemas and JSON Schemas.
- UNECE/UNCEFACT has not been published traceability sectorial XML Schemas²⁹, but sector-agnostic resources based on EPCIS 1.2 events, instruments of Recommendation 46 [3].
- An enriched event-based model for the traceability data collection based on EPCIS paradigm and formalized through eBIZ specification has been proposed and tested on industrial pilots by TRICK project³⁰.

Starting from the overview of the categories of information for traceability and sustainability data gathering (Figure 6 and Figure 8), in the following tables the main data structures (elements and related attributes), formalized in eBIZ specification elements, are provided. These tables are taken from the new

²⁸ <https://www.ebiz.enea.it/eBIZ/implement/eBIZTCU-Draft.asp?lingua=en&pag=6&nomenu=4&modo=d&tabe=136&sito=TRICK&css=TRICK&contestoscelto=Tutti>

²⁹ See the contents available under the section 9.1 Traceability & Transparency in Textile and Leather sector at the following UNECE official web page: <https://unece.org/trade/uncefact/mainstandards>

³⁰ See Annex A, clause A.3.5.4 for more details

draft version of CWA 16667:2013 (withdrawn), developed during TRICK project, available online³¹ and open to feedback and contributes.

To support the reader, an introductory legend on table fields is provided in the following:

- **Element:** a concept that collects a group of related business information; it is composed by other elements (called child elements) and it can have one or more properties (called attributes). The child elements are listed in the first table, the attributes (when available) are listed in the second one.
- **Attribute:** an element property that allows it to be qualified or characterized.

The tables showing the data structure of the elements contain the list of the child elements and are composed of the following columns:

- **Child element(s):** the name of the child element (element that makes up another element);
- **Min/Max:** Min/Max the number of times that the child element may occur (minimum and maximum number of occurrences). Minimum equal zero indicates that the element is optional, minimum greater than zero indicates that is mandatory;
- **Description:** textual description of the business information represented by the child element.

The tables that describe the list of the elements' attributes, if any, are composed of the following columns:

- **Attribute:** the name of the attribute;
- **Use:** rule on the occurrence of the attribute; it can be: 1) *optional*: the use of the attribute is not mandatory; 2) *required*: the use of the attribute is mandatory; 3) *prohibited*: the use of the attribute is forbidden;
- **Description:** textual description of the property represented by the attribute.

5.6.2.2 Element: <TRCProduct>

The <TRCProduct> is the starting point entity: it describes the transparency and sustainability features of a product.

Table 19 shows the first level of information that details the element <TRCProduct>: identification, composition, list of its components, origin, certificates, list of manufacturing operation required to produce it, and its sustainability characteristics. Precisely, the set of information managed by the element <productSustainabilityCharacteristics> is the one thought to model all the product information related to its transparency and sustainability characteristics (see clause 5.6.2.11).

Table 19 — <TRCProduct> data structure

Child	Min	Max	Description
ProductIdentification	1	1	Identifies the product whose transparency and sustainability characteristics are reported
billOfComponents	0	1	Bill of components used to create the product
productCompos	0	1	Quantitative composition of a product
productStepsList	0	1	List of manufacturing operations required to produce the product

³¹ <https://www.ebiz.enea.it/eBIZ/imple/eBIZTCU-Draft.asp?lingua=en&nomenu=4&sito=TRICK&contestoscelto=TRICK&pag=1>

productOrigin	0	99	Origin of the product according to Customs regulations
customsStat	0	1	Statistic code assigned by Customs to a specified product (TARIC code)
certificate	0	999	Reference and details related to a document containing a certification issued by a third party who is entitled to issue it. Any certificate related to the product itself
selfAssertion	0	9	A self-declared statement that the issuer is able to support with detailed descriptions or documentation. It can comply with standards about assertions (it is the case for example of ISO 14021 for environmental assertions).
PEFStudyDocument	0	9	PEF study document: it could be both the dataset saved by an analysis tool and the resulting report drawn up by an expert. It depends on the @isStudyDataset attribute.
assessmentStudyDocument	0	9	Resulting study document (e.g. an LCA study). It can be related to a component or a product. It can be a dataset (in any format) or a report (according to @isStudyDataset attribute). In the case of PEF study, prefer <PEFStudyDocument> if possible.
productSustainabilityCharacteristics	0	999	Transparency information about product sustainability characteristics

Table 20 — <TRCProduct> attributes

Attribute	Use	Description
externalProviderIndicator	Optional	indicates if the product is supplied by an external supplier: - value true = supplied by external supplier - false value = made internally. Indicate true only if the product is made entirely externally to the company

5.6.2.3 Element: <tracedObject>

The element <tracedObject> represents the traceable asset (product instance or batch). Typically, a production bath is homogeneous, meaning it's made up of identical items. But sometimes it could be composed of different variants of the same product, for example dyeing a batch of knitwear containing products of different sizes. Only in this case multiple instances of the <productIDandQty> are required.

Table 21 — <tracedObject> data structure

Child	Min	Max	Description
objectInstanceIdentification	1	1	Identification of an object instance. It could contain more than one identifier of the same object as long as they refer to different identification schemas. It is the unique identifier of the traced object

productIDandQty	1	99	Used inside an Event, it should indicate the effectively used (input) or resulting (output) quantity of the batch as a consequence of the event. Max cardinality is 1 when <i>@objectInstanceTypeCode="IST"</i>
objectTypeCode	1	1	Code that identifies the type of object.

5.6.2.4 Element: <productComponent>

The element [<productComponent>](#) is the descriptor of one of the elements (one raw material, or one yarn or textile product, or one fashion article or part of it) used to create the product. It indicates the codes of the component, the quantity for final product unit, the supplier and any documentation.

Table 22 — <productComponent> data structure

Child	Min	Max	Description
uniqueProductID	1	2	Unique product identifier. It identifies the product completely, differentiating any variants, sizes, colors, etc. It should be unique throughout the whole value chain (it can be the GTIN). This element can have two instances only IF the <i>@schemeID</i> are different OR different codes are assigned to the product by the buyer and the supplier according to the rules of the same <i>@schemeID</i> .
<i>Choose -</i>			
- rawCode	0	2	Full codification of a raw material This element can have two instances only if the numbering organisations are different
<i>or</i>			
- yarnCode	0	2	Full codification of a yarn product This element can have two instances only if the numbering organisation are different
<i>or</i>			
- texCode	0	2	Full codification of a textile product This element can have two instances only if the numbering organisation are different
<i>or</i>			
- acsCode	0	2	Full codification identifying any accessory product usually coupled with garment or other fashion product This element can have two instances only if the numbering organisation are different
<i>or</i>			
- garmentPartCode	0	2	Codification of the component or part of a fashion article This element can have two instances only if the numbering organisation are different

or			
- garmentCode	0	2	Codification of the garment product This element can have two instances only if the numbering organisation are different
End choice			
refDoc	0	9	Identification of a document and of an item thereof, to which the message makes reference
certificate	0	9	Reference and details related to a document containing a certification issued by a third party who is entitled to issue it. Scope certificate of the component
selfAssertion	0	99	A self-declared statement that issuer is able to support with detailed descriptions or documentation. It can comply with standards about assertions (it is the case for example of ISO 14021 for environmental assertions).
objectTypeCode	0	1	Code that identifies the type of object
qty	0	2	Net quantity of the article or object correlated, qualified by the function of the document (ordering, delivering, ...) and by the context. This value is referred to the unit of measure of the product declared in the <i><billOfComponents></i>
supplier	0	9	Details of the Supplier (party that supplies the good or service that is object of the current collaborative process) It is the supplier of the entire component when <i>@internallyPerformed=FALSE</i>

Table 23 — *<productComponent>* attributes

Attribute	Use	Description
internallyPerformed	Required	It indicates if the operation to realize the entire component is carried out internally (value TRUE) of the organization or at a subcontractor or other subject (value FALSE).

5.6.2.5 Element *<billOfComponents>*

The element *<billOfComponents>* represents the list of components used to create the product, detailed with the code of each component, the quantity for final product unity, the supplier and related documentation if any (certificate, self-assertion, etc.). It makes the link between the product and its components. It is important to underline that the information about the product is provided by the Producer, while the information about the components is provided by the Suppliers to the Producer.

Moreover, for each component it can be indicated if the operation to produce it is performed internally or not (*@internallyPerformed* attribute).

This element could be used not only for the final product, but also to detail the components used in a single product processing phase (i.e., the components used to produce the fabric).

Table 24 — <billOfComponents> data structure

Child	Min	Max	Description
productReferenceQty	0	1	Net reference quantity of the product When filled, all the quantities indicated in <productComponent> are relative to the realization of this quantity of product.
productComponent	0	999	Descriptor of one of the elements used to create the product; it indicates the codes of the component, the quantity for final product unit, supplier and any documentation

Table 25 — <billOfComponent> attributes

Attribute	Use	Description
exhaustiveInformation	Required	Indicates that the provided information is guaranteed as exhaustive (all the information is mentioned, with the only limitations due to the access rights) or non-exhaustive (the list contains just some foreseen elements): - value TRUE = exhaustive - value FALSE = non-exhaustive
limitedByDisclosureIndicator	Optional	Indicates whether the content has been restricted by the enforcement of accessibility rights (i.e. it may not be complete): - value TRUE = restricted - value FALSE = not restricted To be used when it is necessary to indicate that the content provided is only a part of what is actually stored
disclosureLevel	Required	Indicates the level of disclosure permitted for the information it is associated with
storageAction	Required	Indicates how to insert the information to which it refers into an archive, also specifying what should happen to the pre-existing information

5.6.2.6 Element: <processStep>

A <processStep> is the single manufacturing operation needed to produce the product. It is detailed by the progressive number of the step in the sequence of a production phase (@*progr*); in fact, the insertion in the correct sequence is recommended. Moreover, it is possible to specify if the operation is carried out internally of the organization and not at a subcontractor or other subject facility (@*internallyPerformed*).

The nomenclature adopted for the manufacturing operations is based on a taxonomy developed thanks to the activities carried out during several European projects³², available and accessible through the online resources of the eBIZ Document Factory³³.

³² [MODA-ML](#), [eBIZ-TCF](#), [eBIZ-4.0](#), [TRICK](#)

³³ [eBIZ decoding table T305](#)

Table 26 — <processStep> data structure

Child	Min	Max	Description
processStepID	1	1	Internal identifier of the single manufacturing operation needed to produce the product
manufacturingOperationCode	1	1	Single manufacturing operation type
description	0	9	Free text description. The content of the element should be unique, it can be translated and repeated into more languages (thus no more than one instance for each language). Only one instance of this element for each different value of “In” attribute (language)
activityLocation	0	99	Data relating to a place where activities take place (indicate at least element location or address, city and country). Here filling location, country and subcountry is enough. When the activity is carried out in more than one location, indicate what percentage of the total is carried out at each one.
note	0	99	Free text structured (computer processing) note. For note structuring use the attributes @noteLabel and @codelist.

Table 27 — <processStep> attributes

Attribute	Use	Description
progr	Required	progressive number in the sequence Indicates the sequence of operations necessary to make the product. In the case of repeated operations, assign different values of @progr.
internallyPerformed	Optional	indicates that the operation is carried out internally (value TRUE) of the organization and not at a subcontractor or other subject (value FALSE)

5.6.2.7 Element <processStepList>

The element [<processStepsList>](#) provides the list of manufacturing operations required to produce the product.

Table 28 — <processStepList> data structure

Child	Min	Max	Description
processStep	1	999	Single manufacturing operation needed to produce the product

Table 29 — <processStepList> attributes

Attribute	Use	Description
exhaustiveInformation	Required	Indicates that the provided information is guaranteed as exhaustive (all the information is mentioned, with the only limitations due to the access rights) or non-exhaustive (the list contains just some foreseen elements): - value TRUE = exhaustive - value FALSE = non-exhaustive
limitedByDisclosureIndicator	Optional	Indicates whether the content has been restricted by the enforcement of accessibility rights (i.e. it may not be complete): - value TRUE = restricted - value FALSE = not restricted To be used when it is necessary to indicate that the content provided is only a part of what is actually stored
disclosureLevel	Required	Indicates the level of disclosure permitted for the information it is associated with
storageAction	Required	Indicates how to insert the information to which it refers into an archive, also specifying what should happen to the pre-existing information

5.6.2.8 Element <organisationDescriptor>

The information used to describe an organization through the element [<organisationDescriptor>](#) are the usual ones (identifier, legal name, address, contact person). Certificates and self-assertions can be associated with the whole organization.

Furthermore, as an organization can have more than one facility, located in different countries, it is possible specify a list of facilities containing the details of each one (see the element [<facilityDescriptor>](#) in clause 5.6.2.9).

Table 30 — <organisationDescriptor> data structure

Child	Min	Max	Description
id	1	1	Primary identification code of a party. It is recommended to use an EORI number (with <i>@numberingORG="EO"</i>) or the format: nation code (ISO 3166) + national tax code (i.e. VAT identification number) with <i>@numberingORG="MF"</i>
legalName	1	1	Legal name
organisationAddress	0	1	Organisation legal address
person	0	99	Name and contacts of a person (e.g. contact person within an organisation)
activityStatisticalCode	0	1	Statistical classification of economic activity (NACE is suggested)

certificate	0	99	Reference and details related to a document containing a certification issued by a third party who is entitled to issue it. Certificates that apply to the whole organisation
selfAssertion	0	99	A self-declared statement that issuer is able to support with detailed descriptions or documentation. It can comply with standards about assertions (it is the case for example of ISO 14021 for environmental assertions). Self-assertions that apply to the whole organisation
socialAndEthicalSpecificInformation	0	1	Social and ethical specific information list
listOfFacilities	0	1	List of facilities of the organisation
note	0	99	Free text structured (computer processing) note. For note structuring use the attributes <i>@noteLabel</i> and <i>@codelist</i> .

5.6.2.9 Element: <facilityDescriptor>

The element [<facilityDescriptor>](#) is thought to collect the information of a specific facility. Certificates and self-assertions can be associated to the whole organization but also to its facilities, as the list of the manufacturing operations carried out in each one of them. The data related to the sustainability characteristics can be provided also at facility level through the element [<facilitySustainabilityCharacteristics>](#); in this case the associated data is a subset of the ones requested for the product and are aggregated on annual base.

Table 31 — <facilityDescriptor> data structure

Child	Min	Max	Description
facilityLocation	1	1	Data relating to a place of a facility (indicate at least element location or address, city and country)
description	0	9	Free text description. The content of the element should be unique, it can be translated and repeated into more languages (thus no more than one instance for each language).
processStepsList	0	1	List of manufacturing operations required to produce the product Activities performed in the facility
certificate	0	99	Reference and details related to a document containing a certification issued by a third party who is entitled to issue it. Certificates related to the facility
selfAssertion	0	99	A self-declared statement that issuer is able to support with detailed descriptions or documentation. It can comply with standards about assertions (it is the case for example of ISO 14021 for environmental assertions). Self-assertions related to the facility

assessmentStudyDocument	0	9	Resulting study document (e.g. an LCA study). It can be related to a component or a product. It can be a dataset (in any format) or a report according to <i>@isStudyDataset</i> attribute. In the case of PEF study, prefer <i><PEFStudyDocument></i> if possible.
facilityYearlyProductionMass	0	9	Rough volume of production (by product type and not by single article) in a specific facility, usually expressed as weight. When more instances are present, they should differ for value of object type code.
facilitySustainabilityCharacteristics	0	1	Facility sustainability characteristics
internalWastewaterTreatmentPlant	0	9	Descriptor of the internal wastewater treatment plant. Indicate if it serves the entire production cycle or just some phases. Indicate the plants separately when more than one or data are related to different years. It is possible to associate them to the single phases of the production cycle or to different locations.

5.6.2.10 Element:<certificate>

The element [<certificate>](#) provides reference and details relating to a document containing a certification issued by a third party who is entitled to issue it. It can be related to the whole organization, a facility, a procedure, a product component or to the product itself.

Table 32 — <certificate> data structure

Child	Min	Max	Description
docID	1	1	Identification number of the referenced document. Reference to the internal certificate to the systems of the participants in the supply chain
certificateID	1	1	Identifier of the certificate assigned by the issuer
certificationStandardName	1	1	Indicates the specification that has been used as normative basis of the certificate. (for example: “GRS-global recycling standard” or “Standard 100 OEKO-TEX”)
docDate	1	1	Date of issue of the referenced document, according to one of the patterns YYYY-MM-DD, YYYY-MM-DD:HH-MM or YYYY-WW.
title	0	999	Document title Only one instance of this element for each different value of 'ln' attribute (language)
description	0	999	Free text description. The content of the element should be unique, it can be translated and repeated into more languages (thus no more than one instance for each language).

			Only one instance of this element for each different value of 'ln' attribute (language)
validityStart	0	1	Date by which the validity starts, according to one of the patterns YYYY-MM-DD, YYYY-MM-DD:HH-MM or YYYY-WW.
validityEnd	0	1	Date by which the validity ends, according to one of the patterns YYYY-MM-DD, YYYY-MM-DD:HH-MM or YYYY-WW.
validityExtensionDate	0	1	End date of validity resulting from extension, according to one of the patterns YYYY-MM-DD, YYYY-MM-DD:HH-MM or YYYY-WW
sustainabilityCharacteristicText	0	99	Text that describes a single sustainability characteristic (for example a claim). The content of the element should be unique. It can be translated and repeated into more languages (thus, no more than one instance for each language).
issuerParty	0	1	Details of the party that issued the document.
certifiedParty	0	1	Identification and details of the party to whom the certificate has been issued
certifiedEntity	0	999	The entity (organisation, process, product, etc.) for which the certification is valid.
attachment	0	1	An attached document. An attachment can refer to an external document or be included with the document being exchanged. Indicates where to find the document or contains it as a binary object (the second option is not recommended for practical reasons)
note	0	99	Free text or structured (computer processing) note. For note structuring use the attributes <i>@noteLabel</i> and <i>@codelist</i>

Table 33 — <certificate> attributes

Attribute	Use	Description
docStatusCode	Required	Current status of the document
docValidity	Required	Document current validity indicator

5.6.2.11 Elements: <productSustainabilityCharacteristics> and <facilitySustainabilityCharacteristics>

The elements [<productSustainabilityCharacteristics>](#) and [<facilitySustainabilityCharacteristics>](#) have been modelled to collect all the information that describes the transparency and the sustainability features of a product or a facility. In the case of the facility, the data collected is a subset of the ones requested for the product and is aggregated on annual basis.

As shown in Tables 34 and 35, the two elements contain several sub-elements, that group information related to:

- the chemicals used in the production processes (<billOfChemical>)

- the waste produced during the production processes, excluding the wastewater (<billOfWaste>)
- the generated direct emission (<billOfDirectEmissions>)
- the kind of the produced wastewater and its treatment (<billOfWasteWater>, <internalWasteWaterTreatmentPlant>)
- the energy consumed to make the product (<billOfEnergy>)
- the list of the manufacturing operations related to the product (<billOfTreatments>)
- the usage of the various type of water in the production process (<billOfUsedWater>)

Several of these sub-elements adopt predefined lists of codes (enumerations). In the case of <billOfWaste>, for example, there is a reference to a net quantity of the produced item and the list of all the types of waste generated for its production; for each type of waste there are one or more codes, taken from enumerations like EWC (European Waste Catalogue) with additional information like the quantity and the type of treatment. In the case of <billOfUsedWater>, the use of the list of allowed codes (table NT318³⁴) is mandatory, while in case of <billOfWaste> the use is only recommended.

At this stage the <productSustainabilityCharacteristics> is a data structure related to the product itself. The information related to the organization and to its facilities, such as the Social Accountability evidence, are described in an ad-hoc descriptor (<organisationDescriptor>).

Table 34 — <productSustainabilityCharacteristics> data structure

Child	Min	Max	Description
productReferenceQty	0	1	Net reference quantity of the product If present, each <i>bill of...</i> element contained refers to this quantity of product / material.
billOfTreatments	0	1	List of the treatments necessary to make the product
billOfMaterials	0	1	Quantitative bill of used materials
billOfChemical	0	1	List of chemicals used to make the product.
billOfUsedWater	0	9	Breakdown of used water relating to quantities of the reference product or to yearly data of a facility/plant. Data from different years goes into different <i>bill of...</i> elements.
billOfEnergy	0	9	Breakdown of used or produced energy relating to quantities of the reference product or to yearly data of a facility/plant. Data from different years goes into different <i>bill of...</i> elements.
billOfWaste	0	9	List of waste generated to make the product, excluding wastewater, relating to quantities of the reference product or to yearly data of a facility/plant. Data from different years goes into different <i>bill of...</i> elements.

³⁴ <https://www.ebiz.enea.it/eBIZ/imple/eBIZTCU-Draft.asp?lingua=en&pag=6&nomenu=4&modo=d&tabe=149&sito=TRICK&css=EBIZ&contestoscelto=TRICK>

billOfWasteWater	0	9	Breakdown of wastewater generated to make the product relating to quantities of the reference product or to yearly data of a facility/plant Data from different years goes into different <i>bill of...</i> elements.
billOfDirectEmissions	0	9	Bill of direct emissions generated to make the product, excluding wastewater, relating to quantities of the reference product or to yearly data of a facility/plant Data from different years goes into different <i>bill of...</i> elements.
internalWasteWaterTreatmentPlant	0	9	Descriptor of the internal wastewater treatment plant. It indicates if it serves the entire production cycle or just some phases. It also indicates the plants separately when more than one or data are related to different years. It is possible to associate them to the single phases of the production cycle or to different locations.
productUsageCharacteristics	0	1	Transparency information about the usage product characteristics
endOfLifePerformance	0	1	Information on what is expected to happen at the end of the product's life with respect to reuse, recycling and composting

Table 35 — <facilitySustainabilityCharacteristics> data structure

Child	Min	Max	Description
billOfUsedWater	0	9	Breakdown of used water relating to quantities of the reference product or to yearly data of a facility/plant. Quantity related to the yearly consumption of the facility
billOfEnergy	0	9	Breakdown of used or produced energy relating to quantities of the reference product or to yearly data of a facility/plant. Quantity related to the yearly consumption of the facility.
billOfWaste	0	9	List of waste generated to make the product, excluding wastewater, relating to quantities of the reference product or to yearly data of a facility/plant. Quantity related to the yearly consumption of the facility.
billOfWasteWater	0	9	Breakdown of wastewater generated to make the product relating to quantities of the reference product or to yearly data of a facility/plant. Quantity related to the yearly consumption of the facility.

billOfDirectEmissions	0	9	Bill of direct emissions generated to make the product, excluding wastewater, relating to quantities of the reference product or to yearly data of a facility/plant Quantity related to the yearly consumption of the facility.
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5.6.2.12 Elements: <bill of something>

The data model includes several elements named <billOfSomething>, where "Something" can be "Chemical", "Energy", etc. (the full list is below). These elements share a common structure that depicts the information related to the list or bill of items relating to quantities of the reference product or to yearly data of a facility/plant. This list can be used to indicate data relating to a quantity of product or to a facility in a specific year.

In the following the full list of these elements:

- [<billOfChemical>](#)
- [<billOfDirectEmissions>](#)
- [<billOfEnergy>](#)
- [<billOfMaterials>](#)
- [<billOfUsedWater>](#)
- [<billOfWaste>](#)
- [<billOfWasteWater>](#)

Each element shares the same structure and attributes, with in addition specific fields: for example, <dyesDescriptor> and <chemicalItem> for the <billOfChemicals>, or <wasteDescriptor> for the <billOfWaste>. Table 36 and Table 37 show the common structure (child elements and attribute).

Table 36 — <bill of something> data structure

Child	Min	Max	Description
productReferenceQty	0	1	Net reference quantity of the product. When present, each contained input/output figure refers to this quantity of product / material. It can be ignored when <facilityLocation> is filled
year	0	1	Reference year. When filled indicates that collected figures are related to a specific year
facilityLocation	0	1	Data relating to a place of a facility (it indicates at least element location or address, city and country). When filled indicates that collected figures are related to a specific facility. Usually, it indicates the reference year for the collected figures. On the other side

			<productReferenceQty> should be ignored when figures are related to a facility.
externalRefDoc	0	99	External document, used to refer generic office documents (like pdf, docx, xls, for example shop window instructions). Any supporting information.
note	0	9	Free text or structured (computer processing) note. For note structuring use the attributes <i>@noteLabel</i> and <i>@codelist</i> .

Table 37 — <bill of something> attributes

Attribute	Use	Description
exhaustiveInformation	Required	Indicates that the provided information is guaranteed as exhaustive (all the information is mentioned, with the only limitations due to the access rights) or non-exhaustive (the list contains just some foreseen elements): - value TRUE = exhaustive - value FALSE = non-exhaustive
limitedByDisclosureIndicator	Optional	Indicates whether the content has been restricted by the enforcement of accessibility rights (i.e. it may not be complete): - value TRUE = restricted - value FALSE = not restricted To be used when it is necessary to indicate that the content provided is only a part of what is actually stored
disclosureLevel	Optional	Indicates the level of disclosure permitted for the information it is associated with
storageAction	Required	Indicates how to insert the information to which it refers into an archive, also specifying what should happen to the pre-existing information

5.6.2.13 Element: <sustainabilityIndicator>

The element [<sustainabilityIndicator>](#) presents the set of data related to a sustainability indicator. It can have an issuer and a reviewer, and it is characterized by a status (*@indicatorStatusCode*) that highlights if the indicator is for example issued or expired or pending. Usually, it is part of a group of indicators resulting from the same assessment activity (see <sustainabilityIndicatorGroup> in clause 5.6.2.14).

Table 38 — <sustainabilityIndicator> data structure

Child	Min	Max	Description
sustainabilityIndicatorName	1	1	Name of the sustainability indicator
sustainabilityIndicatorValue	0	1	Value of sustainability indicator (unit of measure included in the definition of the type of indicator)
issuerParty	0	1	Details of the party that issued the indicator. Usually the subject (person or organization) that calculated the indicator value
reviewerParty	0	1	Details of the party that reviewed the conformance of the adopted methodology
note			Free text or structured (computer processing) note. For note structuring use the attributes <i>@noteLabel</i> and <i>@odelist</i>

Table 39 — <sustainabilityIndicator> attributes

Attribute	Use	Description
indicatorStatusCode	Required	Current status of the indicator value
disclosureLevel	Optional	Indicates the level of disclosure permitted for the information it is associated with
validationMethod	Optional	Type of method used to obtain the quantity to which it refers. For example, it indicates whether it was measured in the field, estimated indirectly, approved by an expert or taken from literature. Optional but recommended.

5.6.2.14 Element: <sustainabilityIndicatorsGroup>

The element [<sustainabilityIndicatorsGroup>](#) groups sustainability indicators ([<sustainabilityIndicator>](#)) resulting from the same study or activity. The values of a group should come from the same methodology, for example Product Environmental Footprint impact categories or SA8000 indicators.

Table 40 — <sustainabilityIndicatorsGroup> data structure

Child	Min	Max	Description
sustainabilityIndicatorsGroupName	1	1	Name of the group of sustainability indicators (short description allowed)
sustainabilityIndicatorMethodology	1	1	Methodology for sustainability indicator calculation
methodologicalNote	0	99	The methodological note describes the methodology followed to obtain the indicator or indicators, the reference functional units, the boundaries of the system. Usually, it is a public text as well as the indicators. Only one instance of this element for each different value of 'ln' attribute (language)
sustainabilityIndicator	0	99	Set of data related to a sustainability indicator

- Choose -			
assessmentStudyDocument	0	9	Resulting study document (e.g. an LCA study). It can be related to a component or a product. It can be a dataset (in any format) or a report according to <i>@isStudyDataset</i> attribute. In the case of PEF study, prefer <PEFStudyDocument> if possible.
- Or -			
PEFStudyDocument	0	9	PEF study document. It could be both the dataset saved by an analysis tool and the resulting report drawn up by an expert, it depends on the <i>@isStudyDataset</i> attribute.
- End choice -			
externalRefDoc	0	99	External document, used to refer generic office documents (like pdf, docx, xls, for example shop window instructions). Supporting documentation: anything else than the study document (study evidence such as public reporting, brochure, etc.) Usually only the reference to the supporting study is reported and not its content which is confidential.
note			Free text or structured (computer processing) note. For note structuring use the attributes <i>@noteLabel</i> and <i>@odelist</i>

Table 41 — <sustainabilityIndicatorsGroup> attributes

Attribute	Use	Description
disclosureLevel	Optional	Indicates the level of disclosure permitted for the information it is associated with

5.6.2.15 Element <TRCEventList>

The element [<TRCEventList>](#) represents the list of the traceability events occurred to a traceable asset.

Table 42 — <TRCEventList> data structure

Child	Min	Max	Description
- Choose -			
TRCObjectEvent	1	1	Information about an event concerning one or more physical or digital objects declared at item or event level. The object identifiers do not change due to this event. For example, dyeing or dispatching of a product batch.
- Or -			
TRCTransformationEvent	1	1	Information about an event regarding the transformation of one or more components to obtain one or more new physical or digital objects

			declared at the item or event level. For example, weaving of yarn to obtain fabric.
- <i>Or</i> -			
TRCAggregationEvent	1	1	Information on an event concerning the aggregation/disaggregation of one or more components into one or more new physical or digital objects declared at the item or event level. For example, the assembly of a garment or the creation of a batch.
- <i>Or</i> -			
TRCTransactionEvent	1	1	Information on an event that associates / disassociates one or more physical or digital objects - at level of <TRCTransactionEvent> or <TRCTraReplItem> - to a <TradeTransaction>. For example, a batch of products associated with an order confirmation or an invoice.
- <i>End choice</i> -			
note			Free text or structured (computer processing) note. For note structuring use the attributes @noteLabel and @codelist

5.6.3 The example of TRICK project

5.6.3.1 The Traceability Report

The Traceability Report is the most relevant data structure proposed by the TRICK project, defined to be the core of any standardized data flow for traceability. It represents the data structure of the traceability system, approaching the traceability data collection through an enriched event-based model as response to the requirements emerged from the pilot supply chains to overcome the barriers, criticalities and needs highlighted by industrial partners involved in the project.

It reports all the traceability information collected by the system related to a single traceable asset (batch, single item, etc.) and its history and references to its components/raw materials.

The Traceability Report has two main uses:

- to provide the entire history of a traceable asset starting from its unique identifier (in this case all the events that occurred to the traceable asset are contained in the document since the beginning of its history; events related to components may be or not included according to the requested/allowed level of detail), and
- to create or update the history of a traceable asset by adding one or more events and related information and documents (in this case the events contained in the document are a part of the history of the traceable asset and should be added to the whole history).

It can be used to share information between companies, or companies and eService platforms or between eService platforms, to achieve better interoperability among systems.

An example of Traceability Report can be found in Annex C.

[≤TRCTRARReport>](#) is the element that represents the Traceability Report on the eBIZ Document Factory.

The Traceability report is delivered by the TRICK platform upon request or is a declaration from a manufacturer. It has a date of emission and evolves upon the time when new events happen. It is made

of a list of events of the requested traceable asset plus events of the components (according to the level of authorization of the requester and purpose of the request for the report).

The report can be:

- a resume of the history of one traceable asset, an exhaustive report since the beginning of its history (in this case it can contain an item - with attribute *@primaryItemFlag=true* - that identifies the primary lot of the history, while the remaining ones are related to components), and
- an update on something –one or more new events- happened that has to be communicated to somebody (the platform, a B2B customer, etc.) (in this case it may include a mixed list of events; the attribute *@primaryItemFlag* is absent or false).

The Traceability Report is valid when it is issued (the past cannot be changed, but it can evolve with new events):

- Up to the finished product, we have a technical history of the product; after it is finished, the ‘technical history’ of a lot is ended;
- After the Retail step, changes may happen in logistics or ownership or usage between sales/delivery and recollection/dismantling.

5.6.3.2 The Transparency and Sustainability Report

The Transparency and Sustainability Report is a general structured document used to collect or to report on all the information about the production process, the facilities and the organization that are necessary to describe the sustainability characteristics of a product, enabling transparency within the supply chains and activating traceability.

The scope of this document is narrower than the specification of VSME³⁵ and ESRS³⁶ standards and is focused on the transfer and disclosure of some set of information among the actors of the supply chain.

The Transparency and Sustainability Report is the core of the Transparency and Sustainability data collection. It collects all the available non-operational data about Product, Organization or Facility and shares the data groups related to sustainability with specific schemas dedicated to different objectives (PEF, circularity assessment, etc.).

It may contain information related to either internally produced goods or provided ones by an external supplier (through the *@externalProviderIndicator* attribute). Furthermore, it can have two different functions (according to the *@TRCReportFunction* attribute):

- just report information, or
- ask for registration of the contained information.

This document can be possibly updated time by time, with an incremental approach, in relation to the objectives of the data gathering. In fact, for example, the report can be used at first to collect the product primary data to produce an assessment study on a specific product (i.e. PEF study), and afterwards to collect all the needed information to calculate a circularity indicator of the same product.

The structure of the document is built to support the collection of the information needed for different purposes (in the case of the TRICK project, it supports the data gathering for all six TRICK services).

³⁵ <https://www.efrag.org/en/projects/voluntary-reporting-standard-for-smes-vsme/concluded>

³⁶ Part of the directive CSRD: https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en#legislation

An example of the Transparency and Sustainability Report can be found following the QR Code in Figure 19. [≤TRCTRNReport>](#) is the element that represents the Transparency and Sustainability Report on the eBIZ document factory.



Figure 19 — Link to an example of Transparency and Sustainability report³⁷

5.6.3.3 Availability and aggregation level of data

Sustainability data collection along the supply chain, but also within the company, can be done differently, with varying degrees of granularity. It is important to maintain the information on the product quantities to which the given data refers, in order to better evaluate it and determine whether it's sufficient. For example, a measurement of energy consumed can refer to the company's entire annual production or to a certain quantity of product by weight. In the first case, when dealing with a specific process, having only this information may be insufficient, and a more detailed measurement can be required.

To obtain this type of information, the level of availability and aggregation of data are modelled according to their type of use, essentially focusing on the product level and the facility level.

Thanks to the [≤ReferenceProductQuantity>](#) element it is possible to manage the aggregation level of sustainability data in a flexible way: the collected information can be related to different product quantities, for example the product functional identified for PEF study (i.e., a coat).

The weight of product should be expressed to make comparable the data associated with it.

5.6.3.4 Cross-cutting aspects of the different types of documents

5.6.3.4.1 General

The cross-cutting aspects proposed in the following are designed to support some of the needs identified in clause 4.2: in particular, data confidentiality, data disclosure policies and incremental approach to data gathering. The key cross-cutting elements of the data model are provided in the following with an indication of their usage.

Starting from the approach to data storage and to the disclosure of the collected data, they also indicate how to manage the level of completeness of the set of information. The four attributes introduced are associated to several sets of information included in the Transparency and Sustainability Report and are modeled to manage the modality of data storage, their disclosure level and to point out their level of completeness. Along the supply chain all data are confidential by default, but they can be disclosed by the owner depending on their usage (i.e., to share with an expert the set of data required to do a PEF study).

5.6.3.4.2 Data storage actions

When registering data related to the first level set of product or organization data (for example Composition, Bill of Treatments, Facility, etc.), it is possible to indicate how to insert the information to

³⁷ The complete link is the following: <https://www.ebiz.enea.it/moda-ml/repository/istanze/trick/EN/TRCTRNreport%20%28TEST%20full%29.xml>

which it refers into an archive, also specifying what should happen to the pre-existing information, according to [@storageAction](#) attribute code list:

- **DW:** deleting existing elements (the non-explicitly mentioned ones) and writing new data (for example when within the organisation a facility is replaced by another one);
- **WU:** simply add new data and update, if necessary, the existing ones, without deleting the non-explicitly mentioned ones (for example when adding more information about chemicals or changing the [@disclosureLevel](#) of something);
- **AD:** add only lacking elements (no updates on pre-existing elements are allowed);
- **NA:** no action required.

5.6.3.4.3 Disclosure level of data

Through the attribute [@disclosureLevel](#), it is possible to declare the disclosure level of each group of information, when requested, according to the following options:

- public,
- disclosed to any commercial partner(s),
- disclosed to specific category of partner,
- disclosed upon an explicit authorisation,
- fully confidential.

Moreover, some contents can be restricted by the enforcement of accessibility rights through the attribute [@limitedByDisclosureIndicator](#).

5.6.3.4.4 Completeness of the set of information

Through the attribute [@exhaustiveInformation](#) it is possible to declare that a set of data can be guaranteed as :

- exhaustive (all the elements of the list are mentioned, with the only limitations due to the access rights);
- non-exhaustive (the list contains just some elements).

5.6.3.5 Other relevant documents

5.6.3.5.1 Traceability Despatch Advice and Traceability Receiving Advice documents

The Traceability Despatch Advice ([≤TRCDesAdvise≥](#)) and the Traceability Receiving Advice ([≤TRCRecAdvise≥](#)) are enriched variants of the usual dispatch advice and receiving advice. They are pieces of advice for dispatching/receiving goods (final product and components) between different parties and are complementary to the function of the Traceability Report because they contain references to the traceable asset, allowing the collection of evidence and information during the usual business operations.

Both contain information about:

- the origin and the destination (highlighting the countries),

- the means of transport (optional, but with the possibility to declare the type of propulsion, the route length),
- the list of goods to be transported (product identification and quantity, at least).

The Traceability Despatch Advice can also contain a packing list (<actualPackageUnit>), item list (single product units ids) or batch list. It is issued by the sender of the goods and in the attachment has transport documentation and different kinds of certificates (this part is expanded to allow, for example, the importer of a good to include all the documentation he received from the origin).

5.6.3.5.2 Indicators declaration

The document [Indicators declaration](#) (<SRVIndicatorsDeclaration>) is designed to present the results of a kind of sustainability assessment (PEF, material circularity, S-LCA, Health protection); it contains a public summary of the assessment study, a list of calculated indicators, possibly publishable, and the references (footprint) to the study itself.

It helps in sharing information about an assessment study without disclosing the confidential part of it, but guaranteeing its existence and immutability.

It is based on the elements <sustainabilityIndicatorsGroup> and <sustainabilityIndicators> presented in clauses 5.6.2.13 and 5.6.2.14.

An example can be found through the QR Code in Figure 20:



Figure 20 — Example of the document Indicators declaration from TRICK project³⁸

5.7 Relation between the relevant information for traceability and sustainability data gathering of this CWA and the DPP requirements

The Digital Product Passport (DPP) is the cornerstone of a regulatory evolution addressing the social and environmental sustainability of the production and consumption of textile products (and more). Moreover, it addresses the need to better control imports of non-compliant products and to engage consumers in a paradigm shift in consumption.

It is governed by the “Ecodesign for Sustainable Products Regulation” (ESPR) (proposed on 30 March 2022, approved in its final version in April 2024 and published in the Official Journal of the European Union in force from 18 July 2024 as Regulation (UE) 2024/1781).

The regulation provides for the adoption of eco-design requirements for consumer products, with minimum performance requirements (qualitative and quantitative) to be guaranteed, as well as information requirements for consumers and interested operators (the Digital Product Passport is the IT support for this requirement). Among the operators considered, both market control authorities (primarily customs) and product recycling and reuse operators should be highlighted.

³⁸ The complete link is the following: <https://www.ebiz.enea.it/moda-ml/repository/istanze/trick/EN/SRVindicatorsdeclaration.xml>

This regulatory evolution can have a significant short- to medium-term impact on the sector's prospects and on company priorities. The main implication of this strategy is to require greater **transparency**, and therefore more **reliable information** to be published in the Digital Product Passport and in other public documents to which companies are or can be required (for example, Sustainability Reports³⁹ and Due Diligence⁴⁰).

The sectorial implementation of the ESPR will be defined with specific Delegated Acts, one for each affected sector, which will complete its operational implementation (specifying the minimum performance levels expected of the product or the methodologies to be used to measure and communicate product performance).

It is essential for companies to identify the context within which to gather information, highlighting open issues, critical issues, and potential developments regarding the DPP, and attempting to position themselves with respect to these developments in order to identify a possible strategy to respond or prepare for them.

Since the legislation is still evolving, the following observations, even if attempting to be based on the most consolidated aspects, will inevitably require further refinement and updating.

Basically, from the non-sector specific ESPR requirements, DPPs require three main kinds of information:

1. **Eco-design requirements** relating to the intrinsic characteristics of the product,
2. **Identification information** for the product as such and for the operator responsible for placing it on the European market,
3. Information on the specific **history** of specific instances of the product placed on the market (production facilities, etc.; other information, like batches, can be required or not according to the delegated act to be published and the choice about the granularity of the DPP).

Thinking to the textile supply chains as supply chains substantially structured on different organizations for each main production phase (fiber production, yarn production, fabric production, dyeing and finishing and cutting and assembling), it is relevant, for the purpose of these guidelines, to understand which information is known/generated by the supply chain actors and which information by the final product producer.

The following Tables 43, 44 and 45 highlight the importance and necessity of the information that companies in the supply chain can provide (ranging from product/component durability certifications to maintenance instructions; but there may also be technical involvement regarding the potential for reuse or recycling of the product/component) for the three groups of information that will be most likely required for the DPP by the ESPR Regulation.

The table provides a rough indication of what information the supply chain companies may be required to provide. Particularly notable are the information relating to durability, the presence of chemical substances, energy and water consumption, maintenance, and environmental impact indicators (which include multiple types of information and will certainly be defined in the delegated act, although perhaps on a voluntary basis). It should be noted that environmental impact indicators may be optional.

Information relating to suppliers and subcontractors may or may not be required in the DPP, but it certainly is required to comply with Due Diligence regulations.

³⁹ The Corporate Sustainability Reporting Directive (CSRD)

https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en

⁴⁰ Corporate Sustainability Due Diligence Directive (CSDDD) https://commission.europa.eu/business-economy-euro/doing-business-eu/sustainability-due-diligence-responsible-business/corporate-sustainability-due-diligence_en

Table 43 — Ecodesign requirements and involvement of supply chain stakeholders

Ecodesign requirements	RELEVANCE of information from the supply chain	Note
<i>(a) durability</i>	High	Certifications/laboratory tests on components. Tests performed only on the finished product may be sufficient.
<i>(b) reliability</i>	High	Certifications/laboratory tests on components. Tests performed only on the finished product may be sufficient.
<i>(c) reusability</i>	Very low	
<i>(d) upgradability</i>	Very low	
<i>(e) reparability</i>	Very low	
<i>(f-1) possibility of maintenance</i>	High	Provide documentation for maintenance, such as fabrics
<i>(f-2) possibility of refurbishment</i>	Very low	
<i>(g) presence of substances of concern</i>	High	
<i>(h) energy use and energy efficiency</i>	High	Provide statements with quantitative data on the contribution of the different phases; alternatively, it is possible to use secondary data (derived from literature or databases, but this does not reward virtuous supply chains)
<i>(i) water use and water efficiency</i>	High	Provide statements with quantitative data on the contribution of the different phases; alternatively, it is possible to use secondary data (derived from literature or databases, but this does not reward virtuous supply chains)
<i>(j) resource use and resource efficiency</i>	High	Provide statements with quantitative data on the contribution of the different phases; alternatively, it is possible to use secondary data (derived from literature or databases, but this does not reward virtuous supply chains)
<i>(k) recycled content</i>	High	
<i>(l) possibility of remanufacturing</i>	Very low	
<i>(m) recyclability</i>	Low	

<i>(n) possibility of recovery of materials</i>	Low	
<i>(m) environmental impacts, including carbon and environmental footprint</i>	High	Provide declarations with quantitative data: PEF, GHG? It will establish by delegated act
<i>(p) expected generation of waste materials</i>	None	Provide declarations with quantitative data, see also PEFCR on calculation methods

Table 44 — Obligations and involvement of supply chain stakeholders related to Identification information

Identification information requirements⁴¹	RELEVANCE of information from the supply chain	Note
The unique product identifier	Not involved	
The Global Trade Identification Number as provided for in standard ISO/IEC 15459-6 or equivalent of products or their parts	Not involved	
Relevant commodity codes, such as a TARIC code as defined in Council Regulation (EEC) No 2658/87	Not involved	
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	To be defined	
User manuals, instructions, warnings or safety information, as required by other Union legislation applicable to the product	To be defined	
Information related to the manufacturer, such as its unique operator identifier and the information referred to in Article 21	Not involved	
Unique operator identifiers other than that of the manufacturer		
Unique facility identifiers	Partially involved	Information on component suppliers; only if the delegated act explicitly requires it
Information related to the importer, including the information referred to in Article 23(3) and its EORI number	Not involved	

⁴¹ COM2022-142- 1, ANNEX III <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52022PC0142>

The name, contact details and unique operator identifier code 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) [...] on general product safety, or similar tasks pursuant to other EU legislation applicable to the product.	Not involved	
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Table 45 — Traceability requirements potentially evaluated by the regulation and involvement of supply chain stakeholders

Traceability requirements (history of the product instance)	RELEVANCE of information from the supply chain	Note
The unique batch identifier	High	Mandatory if the DPP granularity is at batch level; otherwise, it is advisable to have the information only to facilitate checks.
Information related to the manufacturer	High	Necessary only if the delegated act requires traceability or for corporate due diligence; it is advisable to have this information available during the audit.
Information related to location or facility where the most important manufacturing operations took place	High	Necessary only if the delegated act requires traceability or for corporate due diligence; it is advisable to have this information available during the audit.

The purpose of this CWA is to provide guidelines for collecting traceability and sustainability data, aiming to support stakeholders in preparing to meet the requirements of the new regulatory framework and to address the increasingly stringent market demands for transparency and accountability in production chains.

The guidelines for collecting traceability and sustainability data across the entire supply chain, along with the supporting resources, are based on experiences from industrial pilot projects that have revealed the main critical issues typical of textile supply chains.

Table 46 offers a brief overview of how the data structures of the enriched event-based model proposed in this CWA align with the three data groups required by the DPP. Although traceability data cannot be directly regulated by the DPP, its collection remains essential to support declarations and facilitate any verifications by official authorities, such as customs.

Table 46 — DPP requirement vs this CWA data structures

Ecodesign	Product Identification	Traceability
<productComponent> <Certificate> <ProcessStepList> <BillOfChemical> <BillOfEnergy> <BillOfWaste> <BillOfDirectEmissions> <BillOfUsedWater> <BillOfTreatment> <BillOfTransport> <ProductSustainabilityCharacteristics> <FacilitySustainabilityCharacteristics> <sustainabilityIndicatorGroup>	<TRCProduct> <tracedObject> <organisationDescriptor> <facilityDescriptor> <ProcessStepList> <Certificate>	<TRCProduct> <tracedObject> <organisationDescriptor> <facilityDescriptor> <ProcessStepList> <TRCEventList>

Annex A (informative)

The TRICK project example: how to set up a data gathering for DPP

A.1 Step 1: Identification of objectives and of the legal value of data to be gathered

A.1.1 General

In TRICK project the objectives of the data collection along the pilots' supply chains are well defined:

- developing a platform able to collect, storage and manage traceability and sustainability data needed by the six business services, to obtain certifications (SA8000), to assess circularity and healthiness of the materials along the productive process, to comply with authority's procedures (PCO) and LCA methodologies (PEF);
- collect data needed to support companies in being able to fill the DPP in.

A legal framework was implemented in a dedicated project deliverable [12] defining the level of legal credibility of collected data related to the use scenarios: for example, for PCO service original and signed documents are needed in case of Customs inspections, while for PEF service pdf copies of energy or water bills can be enough to perform the assessment.

The approach of TRICK was based on the UNECE methodology developed in the project "Enhancing Traceability and Transparency for Sustainable Value Chains in the Garment and Footwear Sector"⁴², based on the Business Process Analysis (BPA) methodology for Sustainability and Circularity in supply chains⁴³.

According to the methodology proposed by UNECE to set up a traceability system the steps 1, 2 and 3 of the Generic Business Process Model related to a Generic Traceability Process have been implemented in the first phases of the TRICK project:

1. Decide claims and verification method to be supported,
2. Implementation method/systems to be used,
3. Process assets and traceability entry points.

The aim of such steps in the framework of TRICK project was to set up the common traceability backbone for the set of business services supported by the platform; specifically, in this phase, some of the main choices for the traceability systems are undertaken.

A.1.2 Decide claims and verification method to be supported

Table A.1 shows an extract of the list of Claims to be supported by the TRICK project business services, with an identification of the statements, the objective and the verification methods, following the methodological indications of UNECE.

⁴² <https://unece.org/trade/traceability-sustainable-garment-and-footwear>

⁴³ Business Process Analysis for Sustainability and Circularity in the Leather Value Chain, https://unece.org/sites/default/files/2021-04/E320_BPA-SVC-leather.pdf

Table A.1 — Claims supported by TRICK in TC scenario

Service ⁴⁴	Traceable asset (i.e., yarn)	Claimed state (i.e., free of gender discrimination factory or 40% of organic cotton)	Verification criteria ⁴⁵ (i.e. SA8000 certification or GRS certification ⁴⁶)	Objective (i.e., prevention of gender discrimination and sexual harassment or reduced environmental impact)	Macro category ⁴⁷	Main claim target ⁴⁸	Involved manufacturing operations ⁴⁹
PCO	Batch of Final product or Batch of Fabric or Yarn	Minimum two main manufacturing activities were done in Europe	PCO certificate	Obtain lower customs duties due to PCO when exporting	Origin	Customs	Spinning, Weaving, Finishing, Garment production
Circularity assessment	Batch of Final product or Batch of Fabric or Yarn or Fibre	This product is suitable for XYZ recycling treatment in order to obtain a secondary raw material XYZ	CA study, Fibre composition, Bill of chemicals, etc.	Encourage appropriate reuse of materials and products	Circularity	Industry customer, Recyclers	Fiber production, Spinning, Weaving, Finishing, Garment production, Usage Recycling
PEF	Batch of Final product	The PEF impacts of this product are x, y, z, etc..	Validated PEF study + Bill of treatments and of materials + primary PEF data	Demonstrate a low environmental impact though measurable and comparable indicators	Environmental Sustainability	Final user, Industry customer, Retail organisation	Fiber production, Spinning, Weaving, Finishing, Garment production, Recycling

⁴⁴ Service supporting the claim

⁴⁵ The largest part of the existing certificates has an identifier which can be manually checked on the related web sites (i.e OEKO-TEX Label Check <https://www.oeko-tex.com/en/label-check>)

⁴⁶ The Global Recycled Standard (GRS) is an international, voluntary, full product standard that sets requirements for third party certification of Content, chain of custody, Recycled social and environmental practices, and chemical restrictions. See <https://textileexchange.org/app/uploads/2021/02/Global-Recycled-Standard-v4.0.pdf>

⁴⁷ For example, Origin, Fibre content (e.g., organic, recycled cotton), Chemicals use, Product quality/safety, Social and environmental aspects (OECD due diligence requirements, circularity)

⁴⁸ For example, Customs, Consumer, Industry customer (Fibre Producer, Yarn Producer, Fabric Producer, Recyclers, etc.), Retail organisation, etc.

⁴⁹ For example, Fiber production, Spinning, Weaving, Finishing, Garment production, Usage, Recollection, Recycling, etc.

Health protection	Batch of Final product	This product is safe from a chemical point of view (it can be specified according to standard XYZ, like OEKO-TEX, GLOBALG.A.P., etc...)	Health protection report + Third party laboratory tests + Bill of treatments and of materials + Others or OEKO-TEX certificates	Demonstrate healthiness of the product	Product quality/safety Chemicals use	Consumer, Retail organisation, Recyclers	Fiber production, Spinning, Weaving, Finishing, Garment production
S-LCA	Batch of Final product or Batch of Fabric or Yarn or Fibre or Component	Made in factories that implement good labour practices (Child labour is not used, etc)	A checklist with supporting documents (for example a signed contract exists, and the company has a copy of the identity card of the employee) List of suppliers and subcontractors is known Or SA8000 certificates or SMETA or similar	Adequate working conditions are respected	Social and ethical sustainability	Consumer, Industry customer, Retail organisation	Fiber production, Spinning, Weaving, Finishing, Garment production

A.2 Step 2: Description of the actual supply chain with actors and roles

To evaluate the practical applications of the TRICK solution, including its open data model, two pilots were conducted. These pilots aimed to demonstrate the solution's potential in collecting and managing data for six business services, including traceability. Figure A.1 and Figure A.2 show simplified schemas of the two textile value chains and the main actors, including the liner and circular routes.

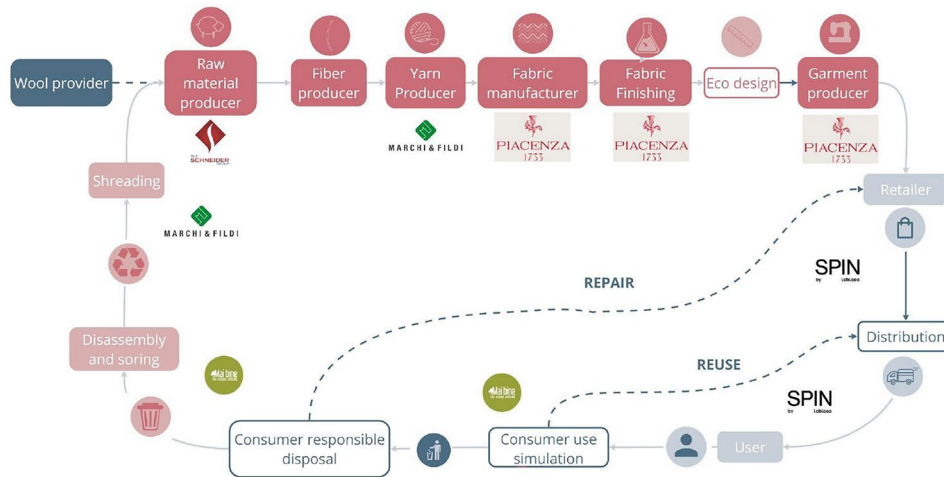


Figure A.1 — TRICK Fashion pilot

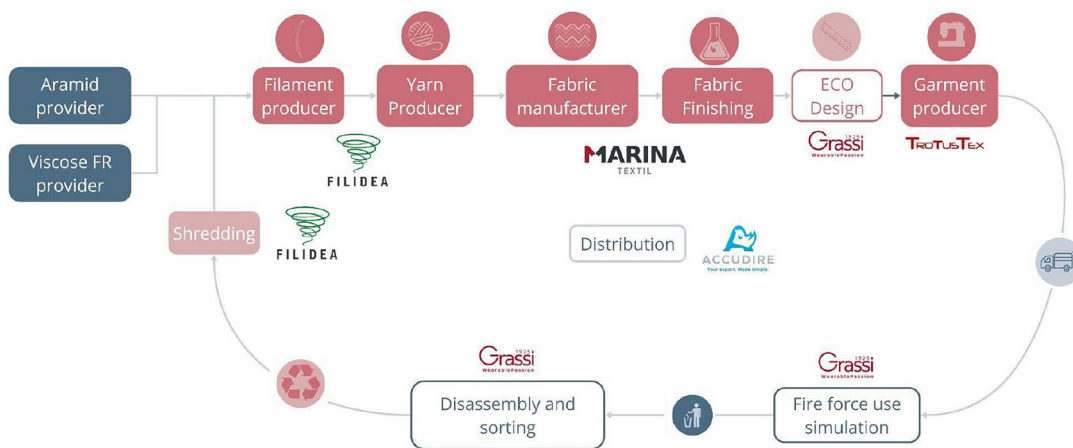


Figure A.2 — TRICK Technical pilot

One of the two pilots was focused on the fashion sector, the other one on the technical workwear sector. Both pilots addressed the challenges of obtaining data from fragmented supply chains. The process began with the production of goods using virgin raw materials. These garments, after undergoing simulated use, were mechanically recycled. The resulting secondary raw materials, which included a percentage of recycled content, were then used to produce garments of the same model, whose characteristics were subsequently analyzed. The different steps followed in the pilots are detailed on the Performance evaluation report of TC pilot [13].

The pilots followed a systematic process starting with the collection of initial data from the industrial users' internal systems. This was followed by data validation and mapping to the data model to facilitate its refinement. Traceability reports were generated by modelling the collected data and documenting the product's history.

Furthermore, eight use-case scenarios were identified based on the needs of various stakeholders addressing critical steps in the circular economy. These scenarios include Manufacturer, Consumer, Researcher, Service Provider, Authority, Retailer, Waste management, and Recycler and are shown in Table A.2.

Table A.2 — Mapping between the User roles and the Scenarios of use

	Scenarios of Use							
User Roles	Manufacturer	Consumer	Retailer	Researcher	Service Provider	Authority	Waste manager	Recycler
Exporter	x	x	x		x		x	x
Supplier	x	x	x				x	x
Customer	x	x	x				x	x
Producer	x	x					x	x
Recycler	x	x					x	x
Subcontractor	x	x	x				x	x
Expert				x	x	x		
Consumer	x	x	x				x	x
Reviewer / verifier	x		x	x	x	x		x

A.3 Step 3: Setting up of the Traceability System

A.3.1 General

The following Table A.3 reports a summary of the TRICK project choices for each element necessary for the setup of the traceability system. Further details are provided in the next subclauses.

Table A.3 — TRICK choices about traceability system set up

ELEMENT OF THE TRACEABILITY SYSTEM	TRICK CHOICE
Policy Claim , i.e. the statements I want to support with a Traceability system	Claims chosen referring to the objectives of the six business services
Traceable assets	Batches of yarn, greige fabric, finished fabric, single item
Logistic units containing the traceable assets for transport or storage	Batch level
Product, place, batch and serial identifier management system	Defined by TRICK
Traceability model (mass balance/segregation) applied to the traceable asset flows	Agnostic (both could be supported)
Events , activities that involve traceable assets and generate data relevant to the traceability system	Detailed in the following
Entry and exit points from the system	From importer of fibres up to the end-of-use and the recyclers

Verification criteria	Certifications and IT records/footprint coherence on the blockchain
Verification process	Verification of Customs services for the PCO service. Verification through experts and reviewers for the other service (i.e., PEF, Circularity assessment, etc.)

A.3.2 Identification of traceable assets and their identifiers

In the framework of the TRICK project, the traceable assets supporting the identified claims are the batches of fibres/raw materials, yarns, fabric and accessories and components of the final product. For high quality product it can happen that single trade unit (a fabric piece or some clothing) is identified and traced.

A production batch is intended as the result of transformation steps that occurs without changing machine settings. A batch can be made with a treatment or transformation of one or more batches of raw materials and components.

When a transformation happens (for example from Yarn into Fabric) it is mandatory to be able to retrieve the batches of the initial goods (for example yarn bobbins) that contributed to the final transformed goods (for example fabric pieces).

Thus, the batches of the initial goods are linked with the batches of final goods by a relationship that can be a M-2-N relationship: one or a set of batches are used to produce a batch of final goods; but it may happen that each batch of the initial goods is used to produce more than one batch of final goods.

It is important that, after the transformation, the batches of the final goods are unique and traceable and that to split them into shares produced by different initial goods is impossible.

The unique identifier associated with a product defined in TRICK has been built associating the EORI⁵⁰ code and the product internal code⁵¹.

See Table A.1 for some examples of identified traceable assets. Table A.4 shows the identification rules of an identification schema defined in the project to identify in a unique way any product, batch, facility and organization without affecting the internal company system with new elements.

Table A.4 — Example of identification schema rules in TRICK project

ENTITY	IDENTIFICATION RULE	EXAMPLE
Organization	EORI identifier: <country><vat code>	IT01606600029
Facility	<organisationID>\$<internal coding>	IT01606600029\$HEADQUARTER
Article	<organisationID>\$<internal article code>	IT01606600029\$W90
Batch	<organisationID>\$<internal batch code>	IT01606600029\$TR400

A.3.3 Traceability system boundaries

The system boundaries in TRICK come from the fibres receiving up to an end-to-end circular retail platform, including a pre-consumer waste recycling process.

⁵⁰ Economic Operator Registration and Identification, assigned by European Commission to the economic operators and used by Customs, it is mandatory for each customs procedure.

⁵¹ At the time of the implementation choice done in the TRICK project the indication about unique identifier for the DPP was not known.

The entry points of the traceability system in TRICK are identified:

- at the 'borders' of each factory of the two pilots, collecting the despatch advice documents (together with e-CMR⁵², the electronic waybill, when available, and with the Customs documentation);
- at the companies' ERP systems, collecting commission orders, and internal advancement records.

TRICK implements a mixed traceability model: while goods are transported, the despatching and receiving documents are collected with the list of the batches that are transported; in accordance with the regulation for goods transport, the documentation that justify the load of any transport is required. By this way, it is possible to have an indirect control of the goods through usual Customs and authorities' activity (a sort of segregation model is implemented in this way).

Inside the company, the control of each single batch movement and transformation is the optimal approach. Nevertheless, not all the manufacturing organisations are able to implement such monitoring; in this case it is important that a mass balance model is operated taking into account what is entering within the plant and what is leaving the plant.

The exit points of TRICK traceability system depend on the use scenario. They are:

- at the end of the production process, when considering the point of view of the finished product,
- on an end-to-end circular retail platform,
- at the end-of-use phase in the technical pilot.

A.3.4 Verification criteria and method

In the TRICK project the idea is to collect data and evidence exchanged mainly between the actors of the supply chain, in a standard format, store them or their footprint into the Blockchain to assure their consistency and authenticity and then process them to be able to reconcile information along the whole supply chain.

The traceability approach for the purpose of the project pilots was to obtain despatch advice documents, waybills, commission orders documentation and Custom Declarations.

Beyond traceability documentation, the six business services foreseen by the platform required further supporting evidence, listed in the following:

- PCO service: invoices, Certification of origin for the supplied components and raw materials, transport documents (waybill, bill of lading, delivery order, transport documents, packing list), documents of transformation or treatments related to the product object of PCO declaration, etc.;
- PEF service: product composition, bill of material, bill of components, bill of waste, bill of energy, bill of direct emissions, bill of used water product or factory certification, documents of transformation or treatments related to the product, etc.;
- Circularity assessment service: product composition, bill of material, bill of components, bill of waste, product or factory certification, documents of transformation or treatments related to the product, etc.;
- Health protection assessment: product composition, bill of components, bill of chemicals, product or factory certification, documents of transformation or treatments related to the product, etc.;

⁵² The acronym e-CMR stands for the electronic consignment note, which is the digital version of the traditional paper [CMR \(Convention on the Contract for the International Carriage of Goods by Road\)](#) consignment note.

- S-LCA(SA800) service: product origin, product or factory certification, information about the company and its facilities, etc.

The role of the blockchain in this approach is assuring integrity, authenticity, non-repudiation and proof of existence of this evidence so that in case of disputation of authority check it is proven the existence and integrity and coherence of the collected information. For this purpose, both the real files (of the evidence and of the traceability information) or their footprint are what it is necessary to TRICK when an efficient archive of such documents is in place.

Table A.1 contains verification criteria associated to the identified traceable assets.

A.3.5 Definition of “to be” scenario, with expected functionalities and use cases

A.3.5.1 Identification of relevant manufacturing steps along the supply chain in relation with the objectives or claims

This step within the TRICK project was facilitated by the project objectives and by the two supply chains underlying the two project pilots. The relevant manufacturing steps have been identified in relation with the business services scenario. Some business services, like PEF and Circularity assessment services, need data from almost each main manufacturing operation (fibre production, yarn production, fabric production, garment production, etc) with a deep level of data granularity. Others, like S-LCA service or PCO, don't need a deep detail related the single manufacturing step, but are based on evidence related to the product itself, the company or the facilities. On the contrary, a deep level of detail is needed for Health Protection service, where for example it is relevant to understand which kind of finishing activities have been carried out (like printing).

Figure A.1 and Figure A.2 shows the main manufacturing steps relevant for the two TRICK pilots, while more details can be found in the last column of Table A.1.

A.3.5.2 Identification of the data responsible/owner

In the project pilots in general each actor was responsible for its own data, but there were some situations where, for example, the customer has inserted data in the platform on behalf of one of its subcontractors (the apparel producer for its “cut and sew” and the fabric producer for its dyer); in this case the customer is the data responsible for the inserted data.

To manage the issue of data confidentiality, the functionality of definition of data disclosure policies at very detailed level was provided by the TRICK platform.

A.3.5.3 Identification of the adopted supply chain governance (where and how to collect operational data, where and how to collect supporting evidence)

The approach to traceability data gathering followed in TRICK project is of the "Producer managed supply chain data gathering" type. In fact, it involves all stakeholders in the supply chain in collecting data relating to the traceable asset, in a system in which each stakeholder is responsible for the data entered into the platform.

Furthermore, the traceability topology adopted is multi-platform. The TRICK platform is designed to be interoperable with other platforms: for example, interfaces have been developed and tested to allow data exchange with the Italian Custom system AIDA.

To comply with the objectives of the projects, and to deal with the topics and scope of the six TRICK business services, several activity diagrams have been designed, analysing the alternative approaches when available and searching for the best solutions to achieve the project goals with the available resources. An example is provided by Figure A.3 and Figure A.4 that shows the two alternative

approaches to the data gathering for the Preferential Certification of Origin, that involved the Exporter, the TRICK platform and the Italian Custom system AIDA⁵³.

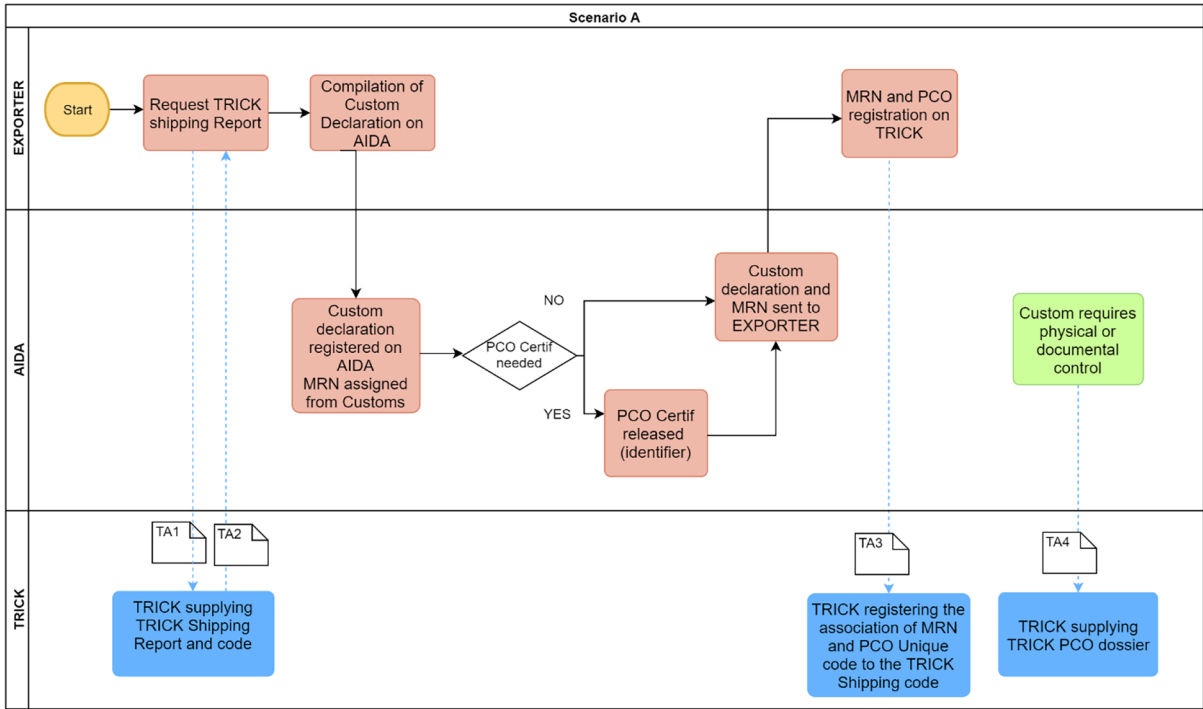


Figure A.3 — TRICK PCO Service - Activity diagram of Scenario A

⁵³ For more details, please refer to chapter 4.1 TRICK services data flow analysis in: Ciaccio, G., De Sabbata, P., Fantin, V., Scalbi, S., Massa, G., & Brutti, A. (2022). Harmonized set of semantic standards, ontologies, nomenclatures (2.0). Zenodo. <https://doi.org/10.5281/zenodo.14006995>

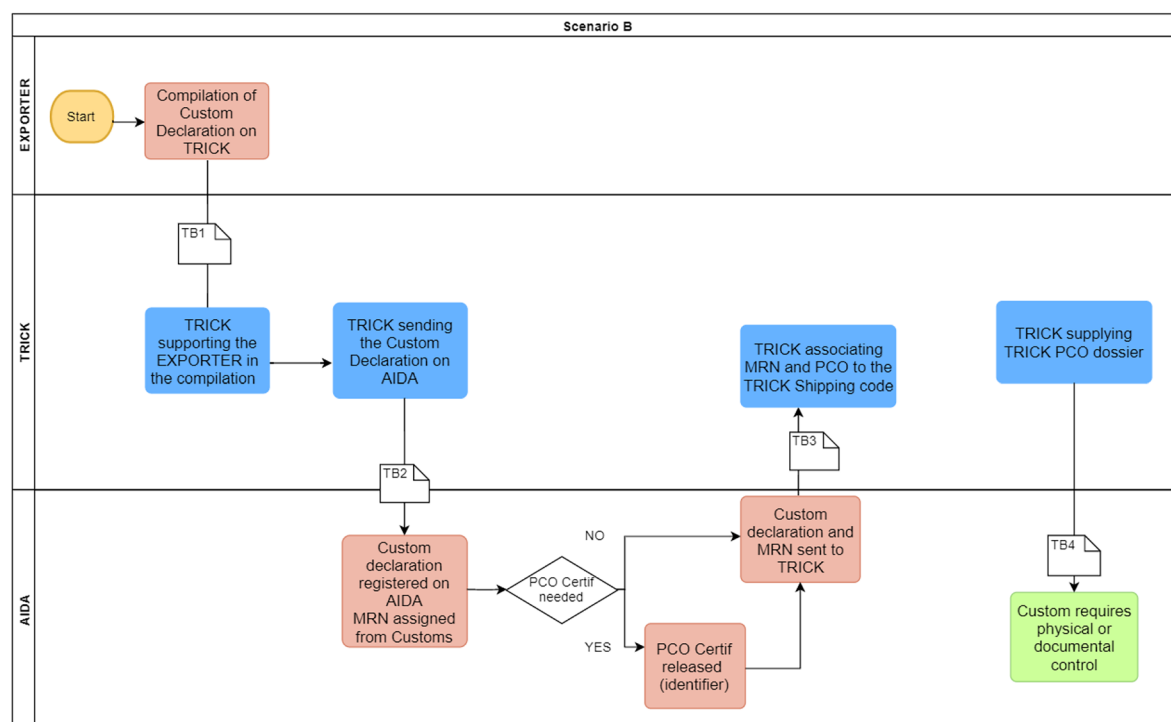


Figure A.4 — PCO Service - Activity diagram of Scenario B

A.3.5.4 Choice of Events to trace at each phase of the supply chain and of related evidence

One of the objectives of TRICK project was to set up a standardized and circular approach to data collection to enhance traceability, transparency and sustainability along the supply chains. The approach to the standardization was based on the improvement of the capacity of the eBIZ specifications (CEN CWA eBIZ and following⁵⁴) in order to support the project objectives with a mixed model including both the classical usual business transactions (EDI approach⁵⁵, i.e. GS1 EANCOM⁵⁶, UBL⁵⁷, eBIZ⁵⁸ and others) as well as the most recent event-based approaches (GS1 EPCIS 1.2⁵⁹).

First of all, the two main references, EPCIS from GS1 (ISO/IEC 19987:2024) and Event models from UNCEFACT were examined and compared to assess differences and the common elements, focusing on the common elements of the event models (ObjectEvent, TransformationEvent, AggregationEvent, TransactionEvent) proposed by the two frameworks.

Secondly, different aspects arose from the TRICK requirements that were difficult to meet by simply adopting the existing event models:

- Self-explicative and robust product and batch identification approach (requiring minimal changes in companies' internal ERP systems); the existence of a unique global number like GTIN, although

⁵⁴ CEN CWA:16667 and its last update in eBIZ4.0 project

⁵⁵ Electronic data interchange (EDI) is the concept of businesses electronically communicating information that was traditionally communicated on paper, such as purchase orders, advance ship notices, and invoices. Technical standards for EDI exist to facilitate parties transacting such instruments without having to make special arrangements. (Wikipedia)

⁵⁶ <https://www.gs1.org/standards/eancom>

⁵⁷ <https://www.oasis-open.org/standard/ublv2-1/>

⁵⁸ <https://www.ebiz.enea.it/>

⁵⁹ EPC Information Services (EPCIS) Standard, Release 1.2, Ratified, Sep 2016;

<https://www.gs1.org/standards/epcis-and-cbv-implementation-guideline/current-standard#Index+undefined>

advisable and well sounding for IT people, is a possibility but not a ‘must’ for the upper side of the pilots’ supply chains, where a multiplicity of coding systems had to been managed.

- Manufacturing step (beyond the more abstract process step) detailed description and support to documentation (transaction certificates included), as well as reference to a common shared sectorial nomenclature for the production steps.
- Supporting the possibility of actors of the supply chain that are unable to participate directly and that are virtualised by their contractors.
- Data structure without recursion of elements and too many degrees of freedom (and ambiguity).

For these reasons, an event class that implements an enriched event model for the events in TRICK was created. This class is specialized in four kinds of events that quite easily could be mapped into the EPCIS and UNECE models, as also shown in Figure A.5:

- **TRCObjectEvent.** Information about an event concerning one or more physical or digital objects declared at item or event level. The object identifiers do not change due to this event. Examples are dyeing or dispatching of a product batch.
- **TRCTransformationEvent.** Information about an event regarding the transformation of one or more components to obtain one or more new physical or digital objects declared at the item or event level. For example, weaving of yarn to obtain fabric.
- **TRCAggregationEvent.** Information on an event concerning the aggregation/disaggregation of one or more components into one or more new physical or digital objects declared at the item or event level. For example, the assembly of a garment or the creation of a batch.
- **TRCTransactionEvent.** Information on an event that associates / disassociates one or more physical or digital objects declared at the item or event level to a trade transaction. For example, a batch of products associated with an order confirmation or an invoice.

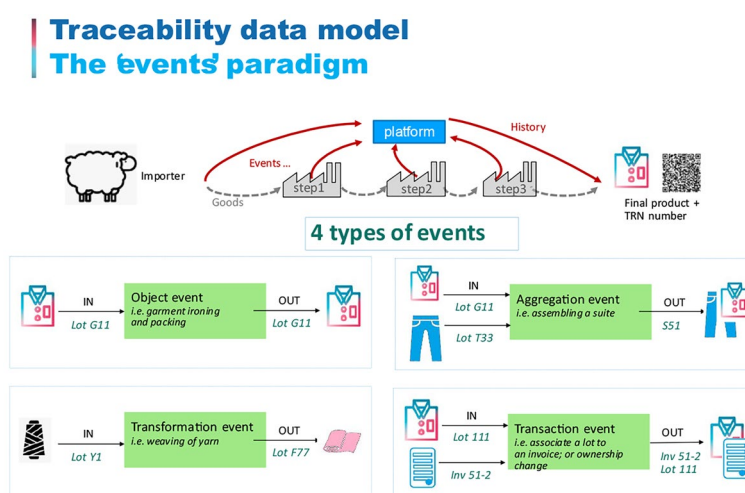


Figure A.5 — The four kinds of events in TRICK, mappable on EPCIS’ and UNECE’s events

Annex D provides a view on the type of events for each involved actor of the supply chain in the TRICK traditional textile pilot.

A.3.5.5 Identification of technical and organizational characteristics for supporting tools (IT systems, procedures, etc.)

In the following the characteristics of the TRICK platform, organized in the groups proposed in the clause 5.3.5.6:

Functional characteristics:

- Supply chain management,
- Raw material certifications,
- Logistic tracking,
- Process and supply chain events (product material traceability),
- Trustful sustainability (sustainability evidence and certification management),
- Product authentication functionality.

Technological features for data ecosystem integration:

- Blockchain data notarization,
- API for massive automatic data input (product/events),
- Customizable data disclosure policy,
- Certification management support.

Physical traceability features:

- None.

Value chain characteristics:

- Management of tier subcontractor,
- Tier 4 - Raw material extraction,
- Tier 3 - Raw material processing,
- Tier 2 - Material production,
- Tier 1 - Finished production assembly,
- Tier 0 - Office, retail, distribution center,
- End-of-life, Downcycle, incineration, landfill.

A.3.5.6 Evaluation of traceability barriers and criticalities with mitigation actions

A whole project report [4] was focused on the evaluation of the scenarios and related use cases in a circular production process from cradle to cradle. The report defined user needs starting from a set of requirements collected from the value chain stakeholders and analysed the technical feasibility of the whole traceability and transparency processes into the project pilots. Moreover, technological, economic, legal, and cultural barriers and recommends de-risking strategies to address them was identified.

A.3.6 Identification of categories of information and of data flows

A.3.6.1 Overview of the categories of information

The traceability categories of information identified by TRICK project correspond to the ones shown in Figure 6. A deeper level of detail is provided in the Table A.5, where a general overview of all the categories of information relevant for TRICK project is provided.

A.3.6.2 Data flows

The deep analysis of the TRICK pilots’ scenarios, with the identification of the role covered by each partner in the pilots’ supply chain, led to the definition of the interfaces between the roles, highlighting the ones covered by TRICK project partners, the ones covered by external supply chain’s subcontractors (i.e. partners’ subcontractors), and the TRICK platform. For each identified interface the main groups of information document that should be exchanged have been identified, refined and finalized.

Figure A.6 shows an example of the analysed interfaces, the Material incoming, with the list of information to exchange among the roles and the platform. The complete analysis can be found in the TRICK project deliverable D2.2 [14].

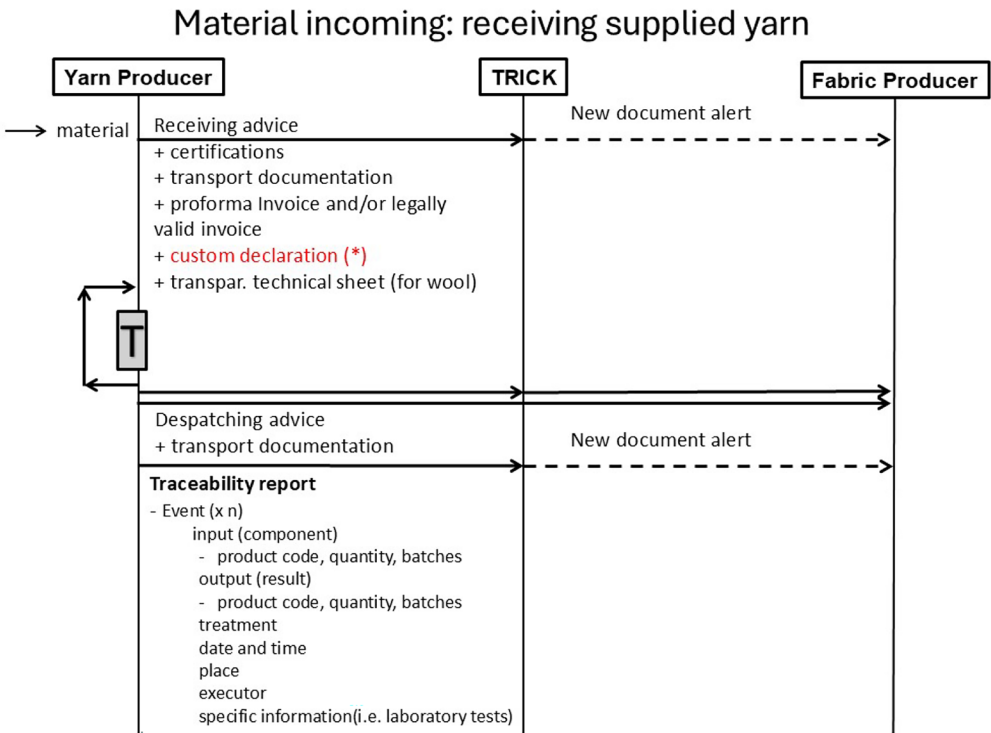


Figure A.6 — Example of interface definition in TRICK project with data to be exchanged among the involved actors

A.4 Step 4: Sustainability data gathering

A.4.1 A common pattern for many expert-based sustainability domain processes

In the framework of TRICK project, the data gathering along the pilots’ supply chains is designed and implemented to support the topics of specific business services: Product Environmental Footprint (PEF), Circularity Assessment (based on MCI indicator), Health Protection Assessment, S-LCA assessment (SA8000).

All these services are based on a “consultancy pattern”: they require the intervention of a human Expert or Reviewer, that should have access to the collected data on the TRICK platform to perform or evaluate assessment studies, according to well defined disclosure policies among the involved actors.

The platform is not designed to support collaborative interaction between multiple actors but, in any case, it supports a sequence of operations with steps to be performed that are common to all these types of services.

The platform supporting the services is allowed to receive and retrieve data that is common to different services and, when a new service is activated for the same facility or the same product, retrieves the already-known data from its archives. In fact, the platform approach is based on its traceability system, with the objective of reusing the defined data structures as much as possible and for different purposes.

For example, the composition of a product or the bill of chemicals can be useful for different services dealing with health and circularity or PEF. The same is for energy consumption or list of treatments.

An example of a consultancy pattern scenario inspired by the ones developed for TRICK project is shown in Figure 7.

A.4.2 Workflows

Figure A.7 shows the data flows defined for the PEF service execution on the TRICK platform. It put in evidence the interactions among the involved actors and the TRICK platform and the kind of exchanged data.

The data request mechanism is supported by a ticketing system, which enables the activation of the service by the Expert. An iterative process is then initiated, allowing the Expert to collect and validate the required data.

The service is designed to manage and support the appointment of third parties involved in the data validation or assessment process.

Moreover, as the last step of the process, a mechanism of publishing sharable indicators declarations is foreseen.

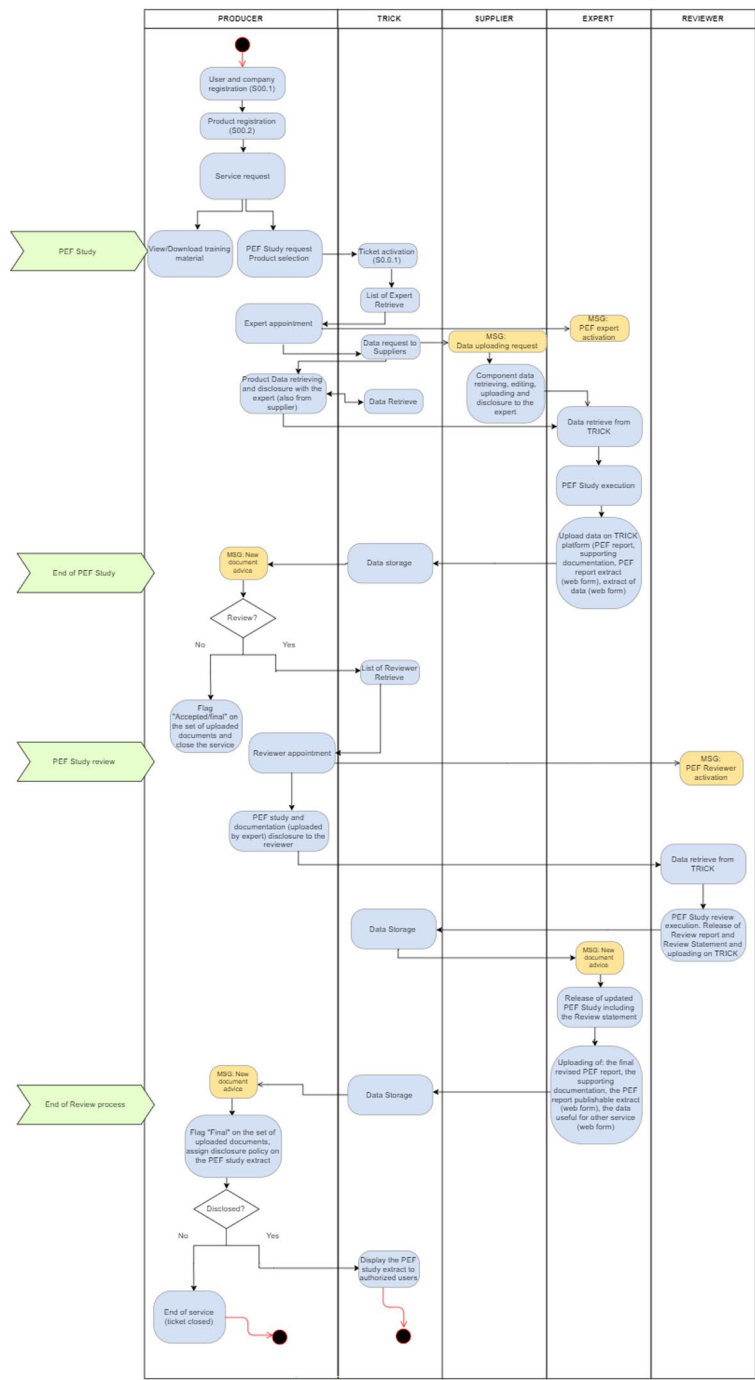


Figure A.7 — PEF service's workflow

A.4.3 Overview of the categories of information

The identification of the categories of information to consider for the sustainability data gathering in TRICK project was realized thanks to the contribution of Experts in PEF, SA8000, circularity and Reach regulation and a strong interaction with the partners involved in the project's pilots, to investigate the availability of those data. Data collected along the pilots' supply chains during the pilots execution and testing was mainly primary data.

Figure 8 shows the main categories of information for sustainability data gathering and their relationships considered for the sustainability data gathering in TRICK project.

The categories of information have been harmonized and structured following a holistic approach to data representation, with a mapping between them and the TRICK business services, obtaining a matrix of data blocks reused for the different purposes, shown in Table A.5.

Table A.5 — Mapping between the sustainability categories of information and a set of potential business services (developed for the TRICK project)

Category of information	Traceability	PCO	Circularity	PEF	HEALTH Protection	S-LCA (SA8000)	AI for Anti-counterfeiting
PRODUCT							
Product identification	x	x	x	x	x	x	x
Bill of components	x	x	x	x	x	-	-
Composition	x	x	x	x	x	-	x
Origin	x	x	-	-	-	x	-
Process step list	x	x	x	x	x	-	x
(scope) certificate	-	-	x	-	x	x	-
Self-Assertion	x	x	x	x	x	x	x
Assessment study document	x	x	x	x	x	x	-
Product Sustainability Characteristics							
Bill of material	-	-	x	x	x	-	-
Bill of chemical	-	-	-	x	x	-	-
Bill of waste	-	-	x	x	-	-	-
Bill of direct emissions	-	-	-	x	-	-	-
Bill of energy	-	-	-	x	-	-	-
Bill of used water	-	-	-	x	-	-	-
Bill of treatments	x	x	x	x	x	-	-
Bill of transport	x	x		x	-	-	-
Internal wastewater treatment plant	-	-	-	x	-	-	-
ORGANIZATION							
General data	x	x	x	x	x	x	-
Self-Assertion	-	-	-	-	-	x	-

(scope) certificate	-	-	-	-	-	X	-
List of Facilities	X	X	-	-	-	X	-
FACILITY							
General data	X	X	X	X	X	X	-
Process step list	X	X	X	X	-	X	-
Self-Assertion	-	-	-	X	-	X	-
(scope) certificate	-	-	-	X	-	X	-
Assessment study document	-	-	-	X	X	X	-
Facility Sustainability Characteristics							
Bill of waste	-	-	-	X	-	-	-
Bill of direct emissions	-	-	-	X	-	-	-
Bill of energy	-	-	-	X	-	-	-
Bill of Used Water	-	-	-	X	-	-	-

Annex B
(informative)

The activity diagram of the traceability workflow in TRICK traditional pilot

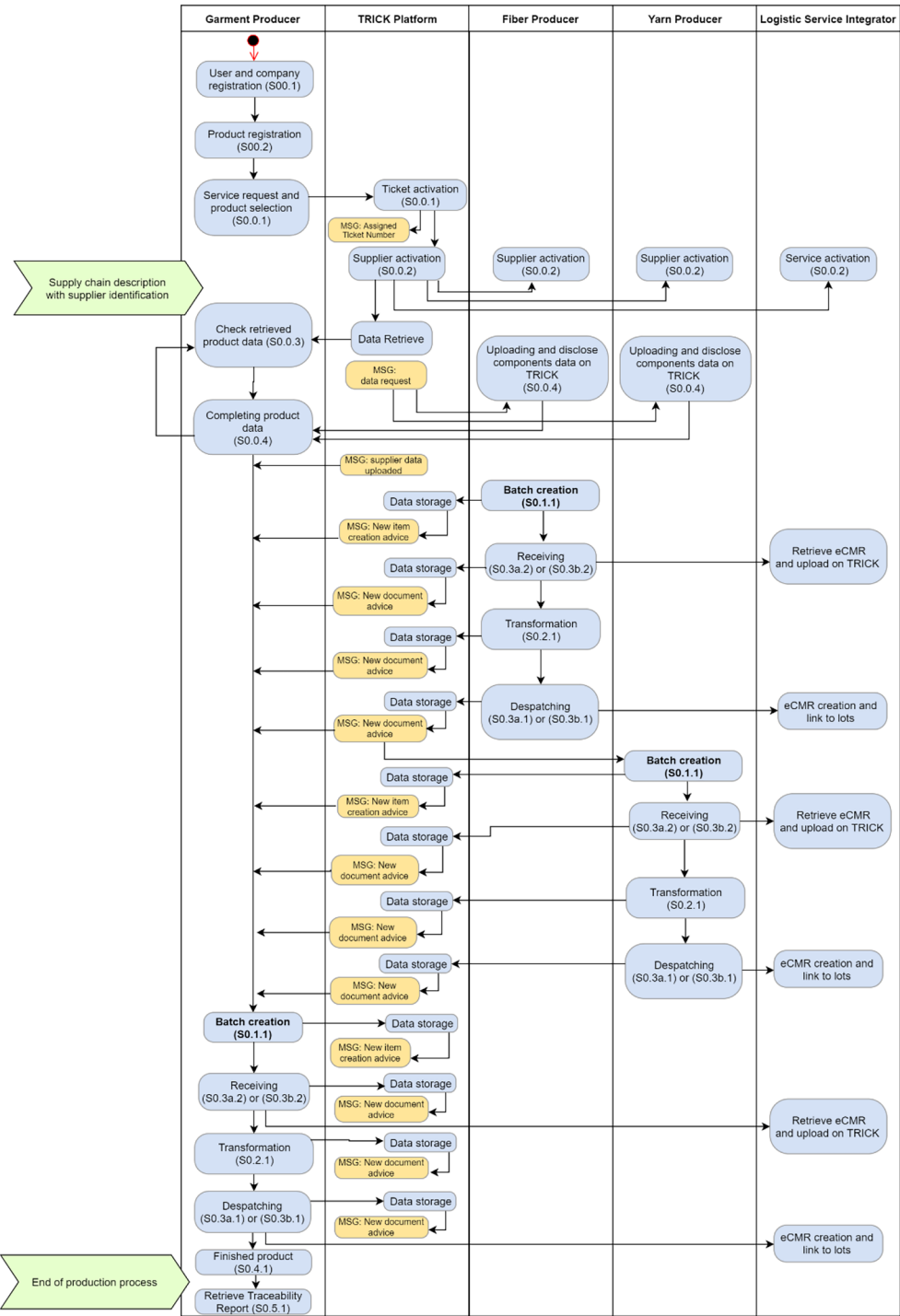


Figure B.1

Annex C (informative)

The Traceability Report in TRICK project [12]

Traceable asset(s) report n.1
 Report about primary Item: true
 Content limited by disclosure policy: false
 Exhaustive information about the mentioned item(s): false
 Accomplished Production: false

▼ **Final traced assets list (of the whole report)**
 - limited by disclosure: false
 - exhaustive information: false

#	Traced asset description
1	LOT fabric (finished) (non knitted) Id: IT01606600029\$C83335 (cod. TRICK) made of IT01606600029\$70236/T13/41929 (cod. TRICK) Quantity: 42.5 (mtr)
2	LOT fabric (finished) (non knitted) Id: IT01606600029\$T207365 (cod. TRICK) made of IT01606600029\$70236/T13/41929 (cod. TRICK) Quantity: 25 (mtr)
3	LOT fabric (finished) (non knitted) Id: IT01606600029\$T207721 (cod. TRICK) made of IT01606600029\$70236/T13/41929 (cod. TRICK) Quantity: 25 (mtr)
4	LOT fabric (finished) (non knitted) Id: IT01606600029\$T207722 (cod. TRICK) made of IT01606600029\$70236/T13/41929 (cod. TRICK) Quantity: 25 (mtr)

Notes:
 - Note about this report in the whole.

▼ **Event(s) list**

#	Event description
1	Event ID: TRICK-EVENT-4b-finishing (cod. SU) Event type: TRCTransformationEvent, Action: addition Event date: 16/12/2023 Event registration date: 17/12/2023 Performed Business Step: Manufacturing step (no:Application Platform cl:http://www.ebiz.enea.it/moda-ml/repository/codelist/Draft/gc_TRK03.xml ln:TRK03 lv:1.0) Manufacturing step: 3 - Finishing and Dyeing Description: (English) Finishing and cut into small pieces ▶ - Traced assets local to the event: ▶ - Where, Who, Why: Note about the event: - Finishing and cutting of the second piece of dyed greige fabric; note that the original pieces have been cut and originated 3+3 new shorter pieces, furthermore the original pieces now have different type (finished fabric) and different lenght (after cutting the new ones)

Notes:
 - Note that the events of this list are registered by the garment producer, other events might be registered by subcontractors and suppliers. This list of events contains the full history of the product, up to selling them (association <https://www.ebiz.enea.it/moda-ml/repository/istanze/trick2/EN/TRICTRAreport%28Piacenza%29-2-onestep.xml#>)

Figure C.1 — Screenshot of a part of a Traceability Report



Figure C.2 — Link to a complete example of Traceability Report⁶⁰

Examples of the updated eBIZ documents developed in order to support traceability and transparency processes designed in the TRICK project can be found following the QR Code in Figure C.3:



Figure C.3 — Link to examples of eBIZ document developed during the TRICK project⁶¹

⁶⁰ The complete link is the following: https://www.ebiz.enea.it/moda-ml/repository/istanze/trick/EN/TRCTRAreport_ReferenceTest.xml

⁶¹ The complete link is the following: <https://www.ebiz.enea.it/moda-ml/repository/istanze/trick/default.asp?lingua=en&nomenu=1&sito=TRICK&css=TRICK>

Annex D (informative)

The Events identified as relevant in TRICK project traditional pilot

TRICK's indicative events with supply chain mind-set (Traditional textile clothing – Fashion pilot)

Supply Chain Actor	Events
Importer of wool and combing	Object event: batch creation of fibre Object event: fibre receiving Transformation event: raw fibre into top Object event: top sending
Spinner	Object event: top receiving Object event: top preparation Transformation event: top into yarn Object event: yarn sending
Fabric producer	Object event: yarn receiving Transformation event: yarn into fabric Object event: fabric treatment/finishing Object event: fabric sending
Subcontractor of fabric producer	<u>case 1</u> (subcontractor direct participating in the traceability system): Object event: fabric receiving Object event: fabric treatment/finishing Object event: fabric sending <u>case 2</u> (producer declares on behalf of subcontractor): Object event: fabric treatment/finishing
Fabric producer	Object event: fabric receiving Object event: fabric treatment/finishing Object event: fabric sending
Apparel producer	Object event: fabric receiving Event aggregation: fabric and accessories into garment Object event: garment packing Transaction event: garment associated with an invoice Object event: garment sending
Retail and usage	a mixed sequence of Object event: garment sending / receiving Transaction event: garment associated with an invoice
Recollection and sorting	<u>case 1</u> : Object event: discarded garment receiving Object event: batch creation of sorted garments

	Object event: discarded garment sending <u>case 2:</u> Object event: waste fabric receiving Object event: batch creation of waste fabric Object event: waste fabric sending
Recycling (dismantling, shredding, carding, casting...)	Object event: discarded garment receiving Object event: Laboratory testing on discarded garment Transformation event: discarded garment into recycled fibre Object event: recycled fibre sending

Annex E (informative)

Standardization baseline

E.1 General

At the basis of the contents of this document there are several standardization initiatives and standards taken as background. In the following the most relevant for the European project that contribute to this CWA are listed.

E.2 Background of TRICK project

The identification of standardized resources (transactional standards, nomenclatures, ontologies) relevant for the analysed context and their need for extensions/customization have been one of the core activities to set up the approach to traceability and sustainability data collection and sharing along the supply chain in TRICK project.

According to its most common agreed definitions, the interoperability, intended as “*the ability of two or more systems or components to exchange information and to use the information that has been exchanged*”⁶² is the key for enabling the data exchanges along the supply chain.

Standards and approaches related to both semantic and organizational interoperability was analysed⁶³, with a focus on most used standards related to collaborative process and data models relevant for the traceability and sustainability data collection. The EPCIS and UNECE approaches were chosen as foundations of the TRICK platform approach to the data gathering, management and sharing among all the actors involved in its pilots’ supply chains, while CEN/CWA 16667:2013 (eBIZ specification) and its framework of resources were the basis of the implementation of the TRICK data model.

E.3 A standardized approach to Traceability: EPCIS

EPCIS, promoted by EPCGlobal with the support of GS1, (for our purposes we consider both GS1 EPCIS 1.213, published in 2016 and formalized as ISO/IEC 19987:201714, as well EPCIS 2.015 approved in 2022) is an event-based model proposed to model the traceability data collection.

This approach aims at sharing information about ‘events’ that happen to the goods in a global supply chain; the most common applicative scenario foresees a network of worldwide distributed gates that allow to track when goods pass-through a gate and their RFID identifiers are registered. The key element of such schema is the concept of ‘Event’ that happens to an object (a product, a logistic unit, a batch of product, etc.) and is registered on a common infrastructure that allows sharing such information between the involved actors.

EPCIS, as other approaches based on its model, aims at collecting 5-W information, that are data answering to the 5-W questions that define basic data needs to be registered in a shared data resource (such as a distributed database, a cloud database or a blockchain) at each processing and transfer point (called an “event”) in order to implement traceability:

⁶² Reza Rezaei, Thiam Kian Chiew, Sai Peck Lee, Zeinab Shams Aliee, Interoperability evaluation models: A systematic review, Computers in Industry, Volume 65, Issue 1, 2014, Pages 1-23, ISSN 0166-3615, <https://doi.org/10.1016/j.compind.2013.09.001>.

⁶³ More details in the TRICK deliverable D1.4 Harmonized set of semantic standards, ontologies, nomenclatures, <https://doi.org/10.5281/zenodo.14006995>

- **WHAT?** The traceable product, identified using a unique ID for each product, batch and/or logistics (shipping) unit
- **WHEN?** The date of transformation, physical transfer or change in ownership
- **WHERE?** The place of transformation or production
- **WHO?** The value-chain partner's unique ID (for example a GLN identifier or REX identifier often based on country ID with a national VAT number, depending on the country), and, if relevant, that of the facility
- **WHY?** An ID for the production method used and/or an ID for the underlying commercial contract (such as an invoice number)"⁶⁴

E.4 UNECE approach to Transparency and Traceability

According to the SDGs, in 2018 UNECE and UN/CEFACT (internationally recognized standardization bodies), jointly with key industry stakeholders, launched the “Enhancing Traceability and Transparency for Sustainable Value Chains in the Garment and Footwear Sector” project⁶⁵ to enhance transparency and traceability for sustainable value chains in the garment and footwear industry.

The aim of the project was to provide the tools (methodologies, reference models, guidelines, standard specifications, etc.) to support traceability and transparency of the value chain, in order to support and enable industries to improve the value chain management and to adopt more sustainable production and consumption patterns, favouring the reuse and recycling of products, identifying and managing labor, human rights violations and environmental impacts (mainly due to consumption of water, energy and chemicals through the supply chain), fighting counterfeits⁶⁶.

Specifically, for data interorganizational exchanges, the UNECE project adopts the EPCIS model and proposes an implementation of such model within the UN/CEFACT EDI/XML core components, messages, and data model libraries (thus a different syntax but the same model for traceability), without adopting the whole EPCIS global IT infrastructure. The novelty of this approach was that it sought, for the first time, to bring together the logistical approach of event-based traceability (EPCIS) with the need to collect data to support the fashion companies' sustainability claims with Traceability and Transparency.

E.5 eBIZ

eBIZ⁶⁷ (launched in 2008⁶⁸ and represented by its final CEN CWA: 16667 published in 2013) is a vertical specification for the Textile Clothing sector, developed for its supply chains through an initiative coordinated by Euratex.

⁶⁴ Business Process Analysis for Sustainability and Circularity in the Leather Value Chain, https://unece.org/sites/default/files/2021-04/E320_BPA-SVC-leather.pdf

⁶⁵ <https://unece.org/trade/traceability-sustainable-garment-and-footwear>

⁶⁶ BUSINESS REQUIREMENTS SPECIFICATION (BRS)- Traceability and Transparency in the Textile and Leather Sector, Part 1: High-Level Process and Data Model - Approved: UN/CEFACT Bureau on 15 February 2021 https://unece.org/sites/default/files/2021-03/BRS-Traceability-Transparency-TextileLeather-Part1-HLPDM_v1.pdf

⁶⁷ www.ebiz-tcf.eu; www.ebiz.enea.it

⁶⁸ De Sabbata P., Scalia M., Baker M., Somers J., Stefanova M., Brutti A., Frascella A. (2008), eBIZ-TCF: an initiative to improve eAdoption in European Textile/Clothing and Footwear industry, in proceedings of e-Challenges 2008 conference, Stockholm, pp. 1169-1180, ISBN 978-1-58603-924-0.

eBIZ covers the process from raw material up to the finished product and also supporting the subcontracting relationships; while technical sheets are supported on the purpose of commercial exchanges, the aspects related to traceability and sustainability were not fully supported.

Nevertheless, it is a relevant starting point for the easy implementation of intercompany data flows that need extensions and adaptation to cover the new topics relevant for the incoming regulations.

A positive aspect for eBIZ is that it is completed with a set of semantic tools (XML Schema, equivalent JSON Schema, dictionary, ontology, code lists, etc), that allow the work of designing and implement extensions coherent with the existing specifications.

The eBIZ specification framework was chosen as a basis for building the TRICK data model, improving its “eBIZ Document Factory”⁶⁹ through its customization and the development of additional features. During the entire TRICK project a total update of eBIZ specification was done, introducing the management of the main topics of the project: traceability and sustainability, environmental impacts, social and ethical assessment, health protection, material circularity.

E.6 Background of Pesco-UP project

The data model developed within the PESCO-UP project originates from TEXroad's extensive expertise gained over the past four years in addressing data needs for the post-consumer textile value chain. This co-development effort, led by TEXroad, involved diverse collaborations with municipalities, Dutch, Swedish, Estonian, and European Union-level initiatives, as well as various stakeholders such as post-consumer textile collectors, sorters, and textile-to-textile recyclers. The model aligns with TEXroad's commitment to meeting reporting requirements for policy monitoring and includes insights from multiple projects and stakeholders, including those engaged in Extended Producer Responsibility (EPR) systems and textile detection technologies.

The data model references a broad range of standards, open-access data structures, and tools currently in use by various entities. These include GS1 standards, circular.fashion's circularity.ID, EON, the Open Apparel Registry, UNECE product data recommendations, the HIGG Index, Textile Exchange guidelines, eBIZ framework, and Reverse Resources.

However, the model is not inherently aligned with or entirely based on any specific standard. Instead, it is designed to focus on defining minimum data requirements and enhancing interoperability to meet the unique challenges of the textile recycling value chain. The emphasis is placed on tailoring the model to support material specifications, batch data, and interpreted sensor data, ensuring traceability and transparency across all stages of the recycling process.

This methodology ensures adaptability to evolving industry needs while maintaining a strong commitment to fostering transparency and traceability. By developing a model that emphasizes interoperability and flexibility, the PESCO-UP project seeks to address the distinct challenges associated with the transition to a circular economy in the textile sector.

E.7 Background of Cisutac support tool

It is well-known that efficient and specific sorting of textile waste will be key to scaling up recycling facilities and providing the different recycling technologies with suitable feedstock in larger volumes. A digital shift is required to meet the circular transformation's needs for accurate and efficient access to information on a granular level and cost efficiency for circular business models viability. Thorough quality control is required to ensure that the sorted material meets the requirements for the best usage in its next lifecycle. For example, for a recycling process, data point such as fibre composition, tolerance levels of elastane content or fibre blends and in some cases dyeing processes is important. Studies have

⁶⁹<https://www.ebiz.enea.it/eBIZ/imple/eBIZTCU-Draft.asp?lingua=en&nomenu=4&sito=TRICK&contestoscelto=TRICK&pag=1>

shown that manual sorting is not sufficient, this applies also to the fundamental question of material composition as the information on the label of the item is not always correct. Today, NIR (Near Infrared) technology is sometimes used to remedy this problem, but this technology has limitations as well.

Having access to relevant data points when sorting textile waste can ensure high-quality output for reuse as well as for recycling. The gathering of these data points requires a combination of technologies, a future digital product passport has a potential to contribute to access to more data for sorters and recyclers.

The main purpose of CISUTAC's work on the support tool has been to identify and prioritise data points that support effective guidance of post-consumer products and materials towards the best route for value retention and to build a textile waste decision support tool based on these data points. The tool, integrated into an excel workbook with open access, is available through the CISUTAC website ([Solution for post-consumer textile waste management — CISUTAC](#)), and visualises prioritised data points and main channelling routes. The tool is designed to be adjusted and updated as sorting and recycling innovations evolve. The current version of the tool focuses on the major channelling routes: reuse (including repair), dismantling, mechanical recycling and chemical recycling (depolymerization to monomers or oligomers).

E.8 Vocabulary of textile terms

The CISUTAC tool emphasizes standardized data formats (classification and semantically clear sectoral vocabularies) to facilitate consistent input, use, and exchange of information among stakeholders. This approach helps to reduce manual processes and ensures data accuracy, which supports reuse, repair, and recycling efforts. This guide aims to bring clarity to the topic and helping organizations of all sizes.

In the CISUTAC decision tool for post-consumer textile waste the vocabulary and terms have followed ISO 5157 as much as possible. Some data points are more an overruling term for underlying granular data.

The terminology describing multi material and multi-layer are often confusing definitions in conversations with different stakeholders, in other words there are often different meaning, easy to misunderstand. These data points are playing an important role for fibre-to-fibre recycling. In the CISUTAC tool and report it was there for important to define and clarify the terminology was based on the Textile Environmental aspects Vocabulary standard ISO 5157, prepared by ISO/TC 38/WG 3560.

See Table E.1 for more clarification.

Other terms in the CISUTAC decision tool (Production year, Product type, Brand, Price, Product gender, Disruptor, Fabric weight, Fabric Colour) does not concern the Textiles – Environmental aspects – Vocabulary ISO 5157:2023.

Table E.1 — Overview of terms in CISUTAC and ISO 5157

CISUTAC terms related to Textiles	CISUTAC Underlying data	Textile – Environmental aspects – Vocabulary ISO 5157:2023	Textile Vocabulary that is not in ISO 5157
Condition			
Product construction (mono material and multi material)		3.1.1.7 mono material textile product, 3.1.1.9 multi material textiles product	
Multilayer (coating or membrane)		3.1.1.6 mono material textile, 3.1.1.8 multi material textile	Multilayer
Chemical content		3.1.4.1 chemical content	
Repairability		3.2.2.15 repairability	
Durability		3.2.2.8 durability	
Fiber composition		3.1.1.3 fibre composition	
Recycle content		3.1.1.11 recycled fibre, non-virgin fibre	
Recycle method	Mechanical recycling closed loop, Mechanical recycling Open loop, Chemical recycling, Thermomechanical regranulation, Thermo-chemical incineration	3.2.6.5 chemical recycling, 3.2.2.6 closed loop system, 3.2.6.13 fibre mechanical recycling, 3.2.6.19 open-loop recycling, 3.2.6.38 thermo-mechanical recycling process, 3.2.7.9 incineration	
Textile Finishing			
Fabric construction	Woven, knitted, non-woven		
Fabric colour			
Textile Fiber		3.1.1.12 textile fibre	
Fabric weight			
Product disassembly		3.2.6.9 disassembly	
Certificate		3.2.4.3 certification body	

E.9 Product construction

E.9.1 General

CISUTAC - Mono Material

Products that are made with only one layer or type of textile.

From ISO 5157:

3.1.1.7

mono material textiles product

textile product (3.1.1.13) made of textile fibres (3.1.1.12) and other components, which is only composed of single type of chemical composition

Note 1 to entry: Any additional chemicals (such as dyes or finishes) do not change the mono material textile product.

CISUTAC - Multi Material

Products that are made and constructed and made from more than one layer or type of textile.

From ISO 5157:

3.1.1.9

multi material textiles product

textile product (3.1.1.13) made of textile fibres (3.1.1.12) and other components consisting of materials made from more than one chemical composition

EXAMPLE: A jacket containing a pure cotton fabric, with a polyester sewing thread, a zipper with a polyester fabric and a polyoxymethylene hard parts (teeth, stoppers, and puller), a polyester woven label and metal press buttons.

Note 1 to entry: Any additional chemicals (such as dyes or finishes) do not change the multi material textile product.

E.9.2 Material construction

CISUTAC - multi-layer

Laminated and coated materials made from more than one distinct layer used in products also commonly constructed with taped seams.

From ISO 5157:

3.1.1.8

multi material textile

textiles made of textile fibres (3.1.1.12) or materials made from more than one chemical composition

EXAMPLE 1: Bi-component fibres are a multi material textile.

EXAMPLE 2: Multi material textiles are e.g. intimate blend of polyester and cotton fibre, different fibres in warp and weft or a polyurethane coated polyester fabric.

Bibliography

- [1] Fité Galan C. (2024). D7.8 Relations and exchange with other projects (Version V1). Zenodo. <https://doi.org/10.5281/zenodo.14274461>
- [2] Ciaccio G., Fité C., De Sabbata P., Brutti A. (2024). Enhancing Traceability and Faithfulness of Sustainability Data in the Textile and Clothing Supply Chain through Blockchain and a Standard Based Enriched Event Model (Final). Ecomondo 2024, Rimini. Zenodo. <https://doi.org/10.5281/zenodo.14357678>
- [3] Recommendation No U.N.E.C.E. 46: Enhancing traceability and transparency of sustainable value chains in the garment and footwear sector and its accompanying guidelines (document ECE/TRADE/C/CEFACT/2021/10). Available at https://unece.org/sites/default/files/2021-02/ECE_TRADE_C_CEFACT_2021_10E_Rec46-Textile.pdf
- [4] Fité Galan C., Tornero J.A. (2022). Critical services, barriers, de-risking for transition from linear to circular. Zenodo. <https://doi.org/10.5281/zenodo.13847538>
- [5] Sadowski M., Perkind L., McGarvey E. (2021) Roadmap to net zero: delivery science-based targets in the apparel sector, World Resources Institute working paper. https://apparelimpact.org/wp-content/uploads/2021/11/21_WorkingPaper_RoadmapNetZero .pdf
- [6] Canepa A., Carla F.G., De Sabbata P., Ciaccio G., Fantin V., Cortesi S. (2024). Data collection for DPP – Policy Brief Deliverable D5.6 - Performance evaluation report of TC pilot. Zenodo. <https://doi.org/10.5281/zenodo.14500605>
- [7] Svedlund J. (2023, July). Traceability tools for textile supply chains. Textile&Fashion2023. https://issuu.com/hogskolaniboras/docs/guidence_report_traceability_tools_for_textile_sup?fr=xKAE9_zU1NQ
- [8] Fité Galan C., De Sabbata P., Ciaccio G., Tornero J.A. (2024). Matrix for analysis and comparison of IT solutions for traceability (1.0). Zenodo. <https://doi.org/10.5281/zenodo.15298739>
- [9] Fité Galan C. (2024). D7.8 Relations and exchange with other projects (Versione V1). Zenodo. <https://doi.org/10.5281/zenodo.14274461>
- [10] Krousarlis T., Menesidou S., Giannetsos T. (2022). BC infrastructure design and deployment. Zenodo. <https://doi.org/10.5281/zenodo.13867532>
- [11] Krousarlis T., Menesidou S., Giannetsos T. (2022). Design and implementation of smart contracts for traceability. Zenodo. <https://doi.org/10.5281/zenodo.13867654>
- [12] Abdalla A., Gentilini L. (2022). Scientific, legal, and technical framework. Zenodo. <https://doi.org/10.5281/zenodo.13847400>
- [13] Canepa A., Fité C., De Sabbata P., Ciaccio G., Valentina F., Cortesi S. (2024). Performance evaluation report of TC pilot. Zenodo. <https://doi.org/10.5281/zenodo.14222563>
- [14] Ciaccio G., De Sabbata P., Massa G., Brutti A. (2022). Data Model and domain-specific ontologies implementation (2.0). Zenodo. <https://doi.org/10.5281/zenodo.14007106>

- [15] ISO 5157:2023, *Textiles – Environmental aspects – Vocabulary*
- [16] ISO 59004:2024, *Circular economy – Vocabulary, principles and guidance for implementation*
- [17] ISO 14025:2006, *Environmental labels and declarations – Type III environmental declarations – Principles and procedures*
- [18] ISO 24533-2:2022, *Intelligent transport systems – Electronic information exchange to facilitate the movement of freight and its intermodal transfer – Part 2: Common reporting system*
- [19] ISO/TS 24533:2012, *Intelligent transport systems – Electronic information exchange to facilitate the movement of freight and its intermodal transfer – Road transport information exchange methodology*
- [20] ISO 29404:2015, *Ships and marine technology – Offshore wind energy – Supply chain information flow*
- [21] ISO 9000, *Quality management systems – Fundamentals and vocabulary*
- [22] ISO/IEC 15459-1, *Information technology – Automatic identification and data capture techniques – Unique identification – Part 1: Individual transport units*
- [23] ISO/IEC 15459-6, *Information technology – Automatic identification and data capture techniques – Unique identification - Part 6: Groupings*
- [24] CWA 16667:2013, *Reference Architecture 2.0 for eBusiness harmonisation in Textile/Clothing and Footwear sectors*